SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE. MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXVI.—No. 17. [NEW SERIES.]

NEW YORK, APRIL 20, 1872.

$3 per Annum [IN ADVANCE.]

Endless Traveling or Railway Sidewalk.

The inventor of this novel mode of rapid transit for large cities is Mr. Alfred Speer, known as "The Wine Man," of Passaic, N. J., who obtained letters patent thereon, through the Scientific American Patent Agency, October 10, 1871. He feels very confident that, in this invention, he has reached the ultimatum of combined rapidity, comfort, and safety, and that, although generally adapted to use in all large cities, it is especially so for New York, Broadway being named as the route deemed most favorable for its erection, and most likely to accommodate the public.

Our readers are well aware that scheme after scheme has been projected to solve the knotty problem of transit in this city, so long in proportion to its width. So far, conflicting interests, added to the obvious defects of many projects, have defeated the adoption of any. Should this plan of Mr. Speer's be destined to a better fate, its unique character, as well as the magnitude of the work, will certainly render it the most remarkable feature among the other remarkable objects which interest visitors to the metropolis.

The nature of the proposed improvement may be described as consisting in the construction of an endless, perpetually and rapidly moving elevated sidewalk, with means to facilitate the getting on and off of passengers, without risk of injury to life or limb, or loss of time to others who are already traveling on it.

Fig. 1 is a perspective view of the proposed structure, and Figs. 2 and 3 represent details

From an exhaustive description of this invention, published in the *Paterson Guardian* of December 7, 1871, which has been furnished us as embodying some of the inventor's views of the project, we clip some paragraphs, which explain the principal features.

"In the first place, iron pillars of a pleasing design and ornamentation are erected adjacent to the curbstone on the edge of the sidewalk. These are placed at the necessary distances apart to support the structure, say five or six pillars in each block. These iron posts reach up to the second story, and upon their tops are fastened the rails for the sidewalk to move upon. The pillars will be pleasing to the sight, and the objection of frightening horses by passing cars will be obviated, as the motion will be continual and nothing unusual will come along to frighten the horses below. Neither will there be the danger of a fearful accident from the cars running off the track, as in the case of railways. On the top of these posts is a continuous sidewalk, sixteen or eighteen feet wide; the center of which is over the pillars at the curb line. The walk will then project eight or nine feet over the street, and eight or nine feet over the sidewalk, leaving a space from that to the buildings of about twelve feet, which may remain open; or at the option of the landowners of a block, they may build a permanent plank or glass walk from that to their buildings. As the walk will be even with the second story of the buildings, it will at once make that story as good for stores as the ground floor; or, in the case of large establishments, the second story could be used as a retail department, while the ground floor below, which could be reached by wagons and trucks, could be used as the wholesale department.

"This elevated sidewalk, even with the second story, is reached from the ground by stairways from every corner (or further apart, perhaps). People coming along the street below, and all who desire, can go up to that second

Fig. 2

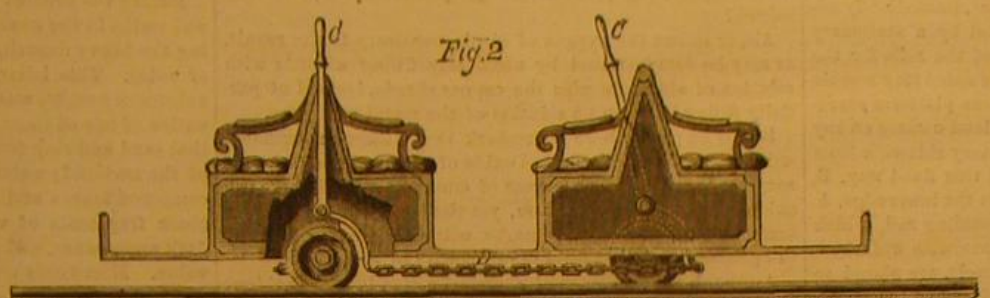


Fig. 3.

SPEER'S ENDLESS TRAVELING OR RAILWAY SIDEWALK.

story and get upon the elevated sidewalk, which itself travels along at the rate of ten miles an hour or faster, and never stops. On one side of the street it goes up and the other down. Pedestrians usually walk along at the rate of about four miles an hour, consequently, if one walks thus fast on this sidewalk, he goes four miles an hour faster than the walk goes. That is, he walks four miles and the sidewalk carries him ten or more. If you come across a friend, you do not lose any time in stopping to talk with him, for you are going along all the while with the sidewalk, whether walking, standing or sitting on one of the chairs or settees spread along the edge of the walk."

The sidewalk may be described as a train of low platform cars or a sidewalk in sections, the ends of which meet and form a continuous platform the whole distance, up one side of the street and down the other. This train of platform or sidewalk is to be moved by underground engines, which act upon the walk through any approved mechanism. The platforms are to be provided with awnings to shelter the passengers from sun and rain. The space between the exterior movable walk and the buildings will be some twelve feet, more or less, about one foot of which space, immediately adjoining the movable walk, will be occupied by a stationary plank way, upon which will be laid one of the rails for the use of a transfer seat. The balance of the space may remain open or be closed up with a lattice or glass platform reaching to the buildings at the option of the land owners on any block, thus turning this space into a stationary sidewalk from one corner to the next. On the edge of this fixed way, B, Figs. 2 and 3, is laid a continuous rail. On the inner edge, A, of the movable walk is also laid a corresponding rail, which of course moves at the same speed as the movable walk.

Transfer seats or settees, with four wheels, are placed so that two wheels rest on the fixed rail and two on the movable rail. It is evident that should the wheels on the fixed rail be kept from moving, while the others are left free to rotate, the transfer seats will stand still. When so standing, passengers may step with perfect safety from the fixed platform into the transfer seat. Now, if the wheels on the fixed rail be released, and those on the moving rail be kept from turning, the friction of the moving rail, on the wheels so held, will soon impart an advancing motion to the car or seat equal to that of the moving walk, at which time the passengers may step from the seat to the moving walk as safely as they stepped upon the platform of the seat. The alternate braking of the transfer car wheels is accomplished by the brake handles, C, the shoes of the brakes on each side being connected by the chain, D.

This then is, in brief, the simple arrangement by which Mr. Speer proposes to remove the present disabilities of transit in New York. A conductor, who will also be collector, will be placed upon each transfer car, whose duty it will be to collect the fares of passengers, attend to the brakes, and have the charge of the seat or car.

Suitable arrangements of telegraph wires will inform every engineer on the road in case of an accident that will require the stoppage of the walk; but it will be seen that such a thing as a collision cannot possibly occur, and there can scarcely be a possibility of accidents to passengers.

Although such a gigantic affair, Mr. Speer says the cost will not be one fiftieth that of the underground tunnel nor of the arcade railway proposed, and about both of which so much has already been said and written.

Mr. Speer intends putting up a full sized working section during the coming summer, either in Passaic or New York, and to operate it to demonstrate the simplicity and advantages of his plan.

Mr. Speer claims for his invention that it has many valuable advantages, both to the traveling public and to the owners of property along its route. No person will lose time by standing at street corners waiting the approach of a car or or stage; but he can, at any corner, get on without any delay by means of the transfer chair or settee, one being always in waiting or approaching within a few yards. A passenger loses no time by delays or stoppages, as with cars, to take on or let off new passengers. The getting on and off of persons will be accomplished while the other passengers will be continuously moving at the same rate of speed, unconscious of the stoppage or starting of the transfer seats.

As the walk will be wide and continuous in length, there will be ample room and no crowding for seats or packing up the standing passenger room, as in railway cars. By the outer railing may be the place for those who choose to stand; along the middle may be placed seats for those who choose to sit, and on the inner part, a wide space or passage, kept for those who desire to walk or run.

If adopted on Broadway, the street will be relieved from the omnibuses, and give more room for private carriages and cartage of merchandise. The ground floors could then be used for wholesale purposes, as there will then be room on the street for trucks, thus facilitating the receiving and shipping of goods from the same on a level with the street.

The Crystallization of Metals.

Dr. John Hall Gladstone, F.R.S., recently lectured at the Royal Institution on "The Crystallization of Metals," but he confined his attention chiefly to silver. By the aid of the electric microscope, he showed how crystals of silver vary in shape, when deposited upon slips of copper, from solutions of nitrate of silver varying in strength. He exhibited a piece of silver found in a tomb in the island of Cyprus; the piece of metal was probably 1,500 years old; it contained a little copper and a trace of gold, and had become as crystalline as cast iron. It was not a unique specimen, he said, for dealers in old silver knew that the metal very often became crystalline with age. There was a change in bulk as well as in the structure; the bulk of the silver was one tenth less than at first. This change in bulk of certain metals showed that it was a very serious question of what metals national standards of measurement should be made. Probably pure metals are less liable than others to change of form and volume. In decomposing nitrate of silver with strips of copper, when the strength of the solution is doubled the rapidity of the chemical action is trebled, perhaps in consequence of the increased electrical conductivity of the liquid; polarization alone will not account for it. When a piece of zinc, coated with particles of platinum by chemical decomposition, was placed in pure water, it would go on decomposing the water, and at elevated temperatures would decompose it with considerable rapidity; he proved this by experiment.

Cupro Ammonium.

Take a bottle about half full of ammonia solution, of gravity ·880, immerse some shreds of copper and notice the result. Almost immediately the solution acquires a tinge of blue, which tinge can be referred to the solution of a portion of the copper, the question being, by what is the metal dissolved?

Air, or rather the oxygen of air, is necessary to the result, as may be demonstrated by absolutely filling a bottle with solution of ammonia *plus* the copper shreds, instead of partially filling it, when no solution of the metal will issue.

It will be proper here to remark that, although ammonia will first precipitate hydrated oxide of copper from any ordinary copper salt, and an excess of ammonia will dissolve the oxide, yielding a blue solution, yet the latter is not the cupro ammonium to which our remarks will refer, having none of the properties of that fluid save identity of color.

Although the incidence of chemical action is made evident to the eye at once, yet the maximum degree of chemical action will only be arrived at after the lapse of about six weeks, and not even then except care has been taken to remove the stopper of the bottle, from time to time shaking the contents —still better, pouring the contents from one bottle to another —the general result arrived at being to give air. In practice on the large scale, the same result is more speedily attained by means of an air force pump. After the lapse of the requisite time, the solution will be found to have acquired a a deep blue color and also certain very curious properties, amongst others that of dissolving a number of things usually regarded as insoluble. For example, cupro ammonium so rapidly dissolves silk that, when in good condition, a yard length of white Persian or sarsanet, if plunged into the solvent, disappears as readily as a lump of sugar in a tumbler of hot water. Lignin or cellulose dissolves also with great facility, but with a facility not quite equal to silk. Of all forms of lignin, perhaps, white blotting paper dissolves most readily, but there is no form or variety of lignin which it will not dissolve under the condition of adequate time.

Taking advantage of this solvent property of the agent, a curious series of operations becomes possible. Paper, linen, wood, any sorts or varieties of lignin may easily be agglutinized together, without the intervention of any other cement than its own substance brought to the state of solution by cupro ammonium. A curious fact, too, is that, when surfaces of paper or other ligneous material have been thus agglutinated, the copper which they hold may be extracted by a weak acid, leaving the paper or other lignin pure and white, but not in any way interfering with the adhesion of one layer of lignin material to another.

The chemical inquirer need not be told that the designation cupro ammonium is only empirical. What the exact formularization of the substance may be, the name does not express and is not intended to express. That the copper exists in a peculiar electro-chemical state not participated by ordinary copper salts is well demonstrated by difference of the action of the two on iron. For example, whereas sulphate of copper (blue vitriol), if dissolved and iron immersed in the solution, deposits copper on the iron at expense of iron dissolved, the cupro ammonium does nothing of the sort, but actually guards the very brightest of iron and steel against all chemical action so long as immersion is continued. This reminds us of a reply to a naval surgeon who has sent us a letter in which he asks whether cupro ammonium would protect his instruments against rust, to which they are subject between decks. The answer is yes, cupro ammonium will infallibly do that; but, we are sorry to say, it will also dissolve all such parts of surgical instruments (*e.g.*, knife handles) as have ivory, wood, or bone entering into their composition.—*Engineer.*

Electricity at Niagara Falls.

Professor S. H. Lockett relates the following observation in a letter from Niagara Falls: "While crossing the new suspension bridge I had occasion, while conversing with a friend, to point towards the falls with my walking cane; as I did so I heard distinctly at the end of my cane a buzzing noise. Repeating the experiment, the same noise was heard. I stopped several passers and tried their canes with the same result, except in the case of one which lacked a ferule. I immediately supposed this might be an electrical phenomenon, and set to work to test the correctness of this supposition. I took a key and held it at arm's length toward the falls, and heard the same sound. Finally, at dark, I returned to the bridge, and, pointing my cane, had the satisfaction of seeing a clear beautiful electric brush on its end. The best point to observe this interesting phenomenon is in the middle of the bridge, and the cane must be held at arm's length, so that its end may be at some distance from any part of the bridge. The success of the experiment depends a good deal on the direction of the wind, and the amount of vapor blown over the bridge."

Muck.

The term *muck*, as used by farmers and agricultural writers, has a somewhat ambiguous meaning. It is often applied to cow dung and stable manure; but usually the term is employed to designate the black, unctuous deposits found in meadows and low basins, and upon the margins of ponds. As these deposits differ most essentially in composition, the significancy of the word is not well defined. To obviate the confusion or perplexity which exists, we think there should be a distinction made between *peat* and other low land deposits, and they should have different names. Peat is the proper term to apply to the vegetable matter found in meadows in different stages of decay, and which is unlike the heavy, dark deposits, consisting of sand, clay, and vegetable *débris*, found in slough holes, ponds, etc. The difference between peat and this wash is very great, and the advantage in maintaining a distinction is obvious, as farmers will be better able to understand what deposits have some value and what have none. Peat, or pure vegetable deposits, may under some circumstances be worthy of attention, but wash or *mud* seldom is.

During the present winter we have observed, in our rides and walks in the country, farmers busily engaged in removing the heavy deposits from ponds left dry from the absence of rains. This labor, from the worthless character of the substance sought, was wholly unremunerative. An examination of one of these deposits in process of removal showed that sand and clay formed nearly fifty per cent of the bulk of the material; water and a small amount of partially decomposed leaves and rushes made up the remainder. The black fragments of vegetable material gave to the mass a dark appearance, and hence it was supposed to have manurial value. Most fields would be positively injured by applying to them this heavy silt or mud, and the loss of time and labor to the farmer in removing it was a serious one. Before carting away such deposits, he should have taken a handful of the mixture and thoroughly diffused it in a quart of clear water. The sand and clay fall to the bottom of the vessel, and the lighter particles of vegetable material settle above; and by decanting or turning off the water after standing a few hours, a clear idea of the nature of the muck could have been obtained.

We are certain that the value of peat or muck, as a source of plant food, has been greatly exaggerated. From a considerable number of analyses of peat, taken from different localities, we will select two made the present winter, as fairly representing both extremes, one a very good, the other a very poor article. The first and best gave of—

Water	84·95
Ash	4·83
Organic matter	10·22
	100·00

The second gave of—

Water	63·73
Ash	28·56
Organic matter	7·71
	100·00

A tun of the first specimen held seventeen hundred pounds of water, the second, twelve hundred pounds. The best contained about two hundred pounds of vegetable matter, the worst one hundred and sixty. What fertilizing value the specimens possessed is to be found in the ash and organic matter. The ash of the first was composed of sand, sulphate and carbonate of lime, oxide of iron, with traces of magnesia and soda; the second was largely made up of clay and sand with small quantities of lime. These mineral constituents are insignificant in value, although, in one of the specimens, large in amount. It may be said that the ash constituents of the last specimen are, practically, of little account, and the first holds but traces of the costly materials of plant food.—*Boston Journal of Chemistry.*

A MOST EXCELLENT DOMESTIC CONFECTION.—This is the season for oranges. The peel of this fruit, preserved in sugar, is one of the most delightful confections which a family can use, far superior to the extracts sold in the shops. The peel should of course be perfectly clean, and should be cut in long thin strips. Stew in water till all the bitterness is extracted. Throw away the water and stew again for half an hour in a thick sirup made of a pound of sugar to one of peel, with just water enough. Put away, in a cool place, for flavoring puddings, pies, etc. For this purpose, it should be chopped very fine. No better or cheaper flavoring can be furnished to a household.

THE thirteen new Woolwich infants, guns of 35 tuns, now completed, are the most powerful pieces of ordnance in existence in England or any other country. The guns are specially intended for the navy, and are to be first used in the three large ironclads now in course of completion. Two of these ships, the *Thunderer* and the *Devastation*, are of 4,400 tuns burden, and the other, the *Fury*, is of 5,000 tuns. Each of these vessels will be provided with four of the 35 tun guns, which they will carry in two turrets, two guns being placed in each turret side by side.

ETHER GLUE.—An excellent liquid glue is made by dissolving glue in nitric ether. The ether will only dissolve a certain amount of glue, consequently the solution cannot be made too thick. The glue thus made is about the consistency of molasses, and is doubly as tenacious as that made with hot water. If a few bits of india rubber, cut into scraps the size of buck shot, be added, and the solution be allowed to stand a few days, being stirred frequently, it will be all the better, and will resist the dampness twice as well as glue made with water.

THE ELECTRO-MAGNETIC TELEGRAPH.

The two following extracts, from well known scientific journals, give a very concise history of the development of the electro magnetic telegraph, and require no note or comment:

Extract from the *Edinburgh Philosophical Journal* for 1825, Vol. XII, page 105: On the laws of electro-magnetic action as depending on the length and dimensions of the conducting wire. By Peter Barlow, F. R, S. (Published January 1, 1825.)

"In a very early stage of electro-magnetic experiments, it had been suggested that an instantaneous telegraph might be established by means of conducting wires and compasses. The details of this contrivance are so obvious, and the principles on which it is founded so well understood, that there was only one question which could render the result doubtful, and this was: Is there any diminution of effect by lengthening the conducting wire?

It had been said that the electric fluid, from a common electrical battery, had been transmitted through a wire four miles in length, without any sensible diminution of effect, and, to every appearance, instantaneously; and if this should be found to be the case with the galvanic circuit, then no question could be entertained of the practicability and utility of the suggestion above adverted to. I was, therefore, induced to make the trial, but I found such a considerable diminution with only 200 feet of wire as at once to convince me of the impracticability of the scheme."

Extract from Silliman's *American Journal of Science and Arts*, for 1831, Vol. XIX. pages 400—404: On the application of the principle of the galvanic multiplier to electro-magnetic apparatus, and also to the development of great magnetic power in soft iron, with a small galvanic element. By Professor Joseph Henry.

* * * * "The idea afterwards occurred to me that a sufficient quantity of galvanism was furnished, by the two small plates, to develop, by means of the coil, a much greater magnetic power in a larger piece of iron. * * * At the same time, a very material improvement in the formation of the coil suggested itself to me on reading a more detailed account of Professor Schweiger's galvanometer, and which was also tested with complete success upon the same horse shoe; it consisted in using several strands of wire, each covered with silk, instead of one. * * * With a pair of plates four inches by six, it lifted thirty-nine pounds, or more than fifty times its own weight.

These experiments conclusively proved that a great development of magnetism could be effected by a very small galvanic element, and also that the power of the coil was materially increased by multiplying the number of wires, without increasing the length of each.

The multiplication of the wires increases the power in two ways: first, by conducting a greater quantity of galvanism, and secondly, by giving it a more proper direction, for since the action of a galvanic current is directly at right angles to the axis of a magnetic needle, by using several shorter wires we can wind one on each inch of the length of the bar to be magnetized, so that the magnetism of each inch will be developed by a separate wire; in this way the action of each particular coil becomes very nearly at right angles to the axis of the bar, and consequently, the effect is the greatest possible. * * *

In order to determine to what extent the coil could be applied in developing magnetism in soft iron, and also to ascertain, if possible, the most proper length of the wires to be used, a series of experiments was instituted jointly by Dr. Philip Ten Eyck and myself. For this purpose, 1,060 feet (a little more than one fifth of a mile) of copper wire of the kind called bell-wire, ·045 ($\frac{45}{1000}$) of an inch in diameter, were stretched several times across the large room of the Academy. * * * *

In one experiment, the whole length of wire was attached to a small trough on Mr. Cruickshank's plan, containing twenty-five double plates, and presenting exactly the same extent of zinc surface to the action of the acid as the battery used in the last experiment. The weight lifted in this case was eight ounces; when the intervening wire was removed and the trough attached directly to the ends of the wires surrounding the horse shoe, it lifted only seven ounces. From this experiment, it appears that the current from a galvanic trough is capable of producing greater magnetic effect on soft iron, after traversing more than one fifth of a mile of intervening wire, than when it passes only through the wire surrounding the magnet. It is possible that the different states of the trough, with respect to dryness, may have exerted some influence on this remarkable result; but that the effect of a current from a trough, if not increased, is but slightly diminished in passing through a long wire is certain.

On a little consideration, however, the above result does not appear as extraordinary as at the first sight, since a current from a trough possesses more projectile force, to use Professor Hare's expression, and approximates somewhat in intensity to the electricity from the common machine. May it not also be a fact that the galvanic fluid, in order to produce the greatest magnetic effect, should move with a small velocity, and that, in passing through one fifth of a mile, its velocity is so retarded as to produce a greater magnetic action?

But be this as it may, the fact, that the magnetic action of a current from a trough is, at least, not sensibly diminished by passing through a long wire, is directly applicable to Mr. Barlow's project of forming an electro-magnetic telegraph, and also of material consequence in the construction of the galvanic coil."

Photo-engraving on Metals.

William A. McGill and Robert G. Pine, of Memphis, Tenn., have invented a new process for photographic engraving on metals and other substances, which they describe as follows:

"We take, as a base of operation, a pure silver surface or an alloy; and, after finely polishing or frosting it, it is subjected to the action of iodine, and a film of the iodide of silver is formed on the plate. We then expose the plate to the action of light in the *camera obscura*, or under a photographic negative, until a faint image of the object is formed. The plate is then submitted to the action of an electrotype battery (copper solution), when a well defined image of the object in copper is formed, the cupreous deposit attaching itself only to those parts of the plate which were rendered conductors of electricity by the action of light, while the unexposed parts will remain non-conductors of electricity. The plate is now dried and etching solution poured on it, composed of sulphuric acid saturated with nitrate of potash, or their equivalents. This solution immediately attacks the shadows or exposed portions of silver surface, while the cupreous deposit from the electrotype bath is not affected. After etching the required depth, the copper deposit on the plate may be readily removed by *aqua regia*, which will not act on the silver plate, leaving a finely etched image in the silver plate.

To engrave or etch on steel, gold, copper, and other substances, the surfaces are first coated with pure silver. We then proceed substantially as above explained, with the exception that different acids or combinations of acids are used on the various metals or other substances after the silver plating or surface is etched through, according to the nature of the base to be operated upon; for instance, in etching on gold, after the silver is etched through with the saturated solution of sulphuric acid and nitrate of potash, we use *aqua regia* or nitro-muriatic acid, which acts on the gold, but leaves the silver intact.

The invention is specially applicable to the ornamentation of silver plate and jewelry."

Recurrent Vision.

In the course of some experiments with a new double plate Holtz machine, belonging to the college, I have come upon a very curious phenomenon, which I do not remember ever to have seen noticed. The machine gives easily intense Leyden jar sparks, from seven to nine inches in length and of most dazzling brilliance. When, in a darkened room, the eye is screened from the direct light of the spark, the illumination produced is sufficient to render everything in the apartment perfectly visible; and what is remarkable, every conspicuous object is seen twice at least, with an interval of a trifle less than one quarter of a second—the first time vividly, the second time faintly; often it is seen a third and sometimes, but only with great difficulty, even a fourth time. The appearance is precisely as if the object had been suddenly illuminated by a light at first bright, but rapidly fading to extinction, and as if, while the illumination lasted, the observer were winking as fast as possible.

I see it best by setting up, in front of the machine at a distance of eight or ten feet, a white screen having upon it a black cross, with arms about three feet long and one foot wide, made of strips of cambric. That the phenomenon is really subjective, and not due to a succession of sparks, is easily shown by swinging the screen from side to side. The black cross, at all the periods of visibility, occupies the same place, and is apparently stationary. The same is true of a stroboscopic disk in rapid revolution; it is seen several times by each spark, but each time in the same position. There is no apparent multiplication of a moving object of any sort.

The interval between the successive instants of visibility was measured roughly as follows: A tuning fork, making 92½ vibrations per second, was adjusted so as to record its motion upon the smoked surface of a revolving cylinder, and an electromagnet was so arranged as to record any motion of its armature upon the trace of the fork; a key connected with this magnet was in the hands of the observer. An assistant turned the machine slowly, so as to produce a spark once in two or three seconds, while the observer manipulated the key.

In my own case, the mean of a dozen experiments gave 0″·22 as the interval between the first and second seeing of the cross upon the screen, separates results varying from 0″·17 to 0″·39. Another observer found 0″·24 as the result of a similar series.

Whatever the true explanation may turn out to be, the phenomenon at least suggests the idea of a reflection of the the nervous impulse at the nerve extremities, as if the intense impression upon the retina, after being the first time propagated to the brain, was there reflected, returned to the retina, and from the retina, traveling again to the brain, renewed the sensation. I have ventured to call the phenomenon "recurrent vision."—*Professor C. A. Young, in the American Journal of Science.*

Poisoned Collars.

Some of the brands of paper collars are glazed with a mixture containing white lead, which is a dangerous poison when brought into contact with the skin. An exchange mentions the case of a clergyman who became troubled with numbness of the limbs, which, with other symptoms, led his physician to suspect poison. On combustion of the paper collars worn by the clergyman—the "Dickens" brand—the ash was found to contain white lead.

THE tunnel under the city of Genoa, connecting the other railways with that going to Nice, is to be opened during the present month.

IMPORTANT TRADE MARK DECISION.

Before the Supreme Court of the United States.

The President, Managers, and Company of the Delaware and Hudson Canal Company, appellants, *versus* Henry C. Clark. Appeal from the Circuit Court of the United States for the Southern District of New York.

The complainants commenced mining on their lands in Lackawanna valley about the year 1828, and they have ever since been engaged in taking out coal and carrying it to the Hudson river and to the markets of the country. The averment of their bill is that about the time they commenced their operations they sought out, devised, and adopted the name "Lackawanna coal" as a special, particular, and distinctive name or trade mark by which their coal might be introduced to dealers as the product of their mines in distinction from the coal of other producers, and that prior to their adoption of the word "Lackawanna" it had never been adopted or used in combination with the word "coal" as a name or trade mark for any kind of coal. Their bill also avers that ever since their adoption of the name their coal has been called and known in the market as "Lackawanna coal" and by no other name. These averments of the bill are supported by no inconsiderable evidence. The complainants were undoubtedly, if not the first, among the first producers of coal from the Lackawanna valley, and the coal sent to market by them has been generally known and designated as Lackawanna coal. Whether the name "Lackawanna coal" was devised or adopted by them as a trade mark before it came into common use is not so clearly established. On the contrary, the evidence shows that long before the complainants commenced their operations, and long before they had any existence as a corporation, the region of country in which their mines were situated was called "the Lackawanna valley;" that it is a region of large dimensions, extending along the Lackawanna river to its junction with the Susquehanna, embracing within its limits great bodies of coal lands, upon a portion of which are the mines of the complainants, and upon other portions of which are the mines of the Pennsylvania Coal Company, those of the Delaware, Lackawanna, and Western Railroad Company, and those of other smaller operators. The word "Lackawanna," then, was not devised by the complainants. They found it a settled and known appellative of the district in which their coal deposits and those of others were situated. At the time when they began to use it, it was a recognized description of the region, and of course of the earths and minerals in the region.

It may be observed there is no averment that the other coal of the Lackawanna valley differs at all in character or quality from that mined on the complainants' lands. On the contrary, the bill alleges that it cannot easily be distinguished therefrom by inspection. The bill is therefore an attempt to secure to the complainants the exclusive use of the name "Lackawanna coal," as applied, not to any manufacture of theirs, but to that portion of the coal of the Lackawanna valley which they mine and send to market, differing neither in nature or quality from all other coal of the same region.

Undoubtedly words or devices may be adopted as trade marks which are not original inventions of him who adopts them, and courts of equity will protect him against any fraudulent appropriation or imitation of them by others. Property in a trade mark, or rather in the use of a trade mark or name, has very little analogy to that which exists in copyrights or in patents for inventions. Words in common use, with some exceptions, may be adopted if at the time of their adoption they were not employed to designate the same or like articles of production. The office of a trade mark is to point out distinctively the origin or ownership of the article to which it is affixed, or, in other words, to give notice who was the producer. This may in many cases be done by a name, a mark, or a device well known, but not previously applied to the same article.

But though it is not necessary that the word adopted as a trade name should be a new creation, never before known or used, there are some limits to the right of selection. This will be manifest when it is considered that, in all cases where rights to the exclusive use of a trade mark are invaded, it is invariably held that the essence of the wrong consists in the sale of the goods of one manufacturer or vendor as those of another, and that it is only when this false representation is directly or indirectly made that the party who appeals to a court of equity can have relief. This is the doctrine of all the authorities.

No one can apply the name of a district or country to a well known article of commerce, and obtain thereby such an exclusive right to the application as to prevent others inhabiting the district, or dealing in similar articles coming from the district, from truthfully using the same designation. It is only when the adoption or imitation of what is claimed to be a trade mark amounts to a false representation, express or implied, designed or incidental, that there is any title to relief against it.

These principles, founded alike on reason and authority, are decisive of the present case, and they relieve us from the consideration of much that was pressed upon us in the argument. The defendant has advertised for sale and he is selling coal not obtained from the plaintiffs, not mined or brought to market by them, but coal which he purchased from the Pennsylvania Coal Company, or from the Delaware, Lackawanna and Western Railroad Company. He has advertised and sold it as Lackawanna coal. It is in fact coal from the Lackawanna region. It is of the same quality and of the same general appearance as that mined by the complainants. It is taken from the same veins or strata. It is truly described by the term Lackawanna coal, as is the coal of plaintiffs. The description does not point to its origin or ownership, nor indicate in the slightest degree who mined the coal or brought it to market. All the coal taken from that region is known and has been known for years by the trade, and rated in public statistics, as Lackawanna coal.

We are, therefore, of opinion that the defendant has invaded no right to which the plaintiffs can maintain a claim. By advertising and selling coal brought from the Lackawanna valley as Lackawanna coal he has made no false representation, and we see no evidence that he has attempted to sell his coal as and for the coal of the plaintiffs. If the public are led into mistake it is by the truth, not by any false pretence. If the complainants' sales are diminished it is because they are not the only producers of Lackawanna coal, and not because of any fraud of the defendant. The decree of the circuit court dismissing the bill must, therefore, be affirmed.

THE electric light has been introduced into the lighthouse at the South Foreland. This is now the third lighthouse station in England at which the electric light is established, and the French have established one at Cape Grisnez.

PROFESSOR MORSE.

Our engraving is an excellent portrait of the late Professor Morse, of telegraphic fame. Once in a while, for the gratification of his friends, he would produce the various decorative honors that were bestowed upon him by the crowned heads of Europe, and some of these are represented in our picture.

All the principal nations of Europe gave him tokens of distinction. So early as 1848 the Sultan presented him a decoration set in diamonds. Gold medals were awarded him by Prussia, Austria and Würtemberg. France made him a Chevalier of the Legion of Honor. Denmark gave him the cross of Knight of the Danneborg; Spain, the cross of Knight Commander of the Order of Isabella the Catholic. At the instance of the Emperor of the French, representatives of the European States—France, Russia, Sweden, Belgium, Holland, Austria, Sardinia, Tuscany, the Holy See, and Turkey—met at Paris to decide upon a collective testimonial to him, and the result of their deliberations was a vote of 400,000 francs. Scores of learned societies, all over the world, admitted him to membership. In 1856, the telegraph companies of Great Britain gave him a banquet in London. In 1858, the American Colony in France entertained him at a grand dinner in Paris. On the 29th of December, 1868, the citizens of New York gave him a dinner at Delmonico's. In June, 1871, a bronze statue of Professor Morse, erected in the Central Park by the voluntary contributions of telegraph employés throughout the country, was formally unvailed, with an address by William Cullen Bryant; and in the evening a reception was held at the Academy of Music, where one of the first instruments used on the original line between New York and Washington was placed upon the stage and connected with the wires, that Professor Morse might send, with his own hand, a word of greeting to all the cities of the United States and Canada.

Stenographic Machine.

The *Chronique de l'Industrie* gives an account of a new machine for printing speeches, lectures, and sermons during their delivery, in place of the more tiresome and less exact method of manual stenography. The apparatus is described as containing a series of keyboards similar to a piano, each key representing a letter or character to be printed, and connecting with a corresponding type. Whenever a key is depressed, its type will be pressed against a travelling strip of paper to impress its image thereon. The operator, using both hands like a pianist, can depress several keys at once, thus forming whole syllables and words at single motions of the hand. It is stated that a few months' practice will enable a person to follow a speaker without difficulty and to reproduce an immediate and perfect print of the speech with all words properly spelt. The delay of rewriting, always necessary where short hand writing is employed, is thus avoided. M. Gensoul is named as the inventor.

The machine above described is of American origin, and examples of it are or were recently in operation at the Automatic Telegraph Company's offices, 66 Broadway, New York. By its use, words may be printed nearly as fast as they can ordinarily be written, but by no means as rapidly as the utterances of a speaker. To accomplish the latter purpose, the words must be abridged into signs, capable of execution by slight movement of the fingers. Any extensive movement of the fingers or hands, such as key playing, would be fatal to stenography, and the use of the above machine, for such a purpose, we therefore consider to be impracticable.

Sam'l F. B. Morse.

SCIENTIFIC AND PRACTICAL INFORMATION.

FIREPROOF BUILDINGS.

An English architect proposes the building of floors of sheet iron and fire clay tubes, using these as a skeleton construction, and agglomerating the whole into a mass with concrete. This floor, he claims, is a non-conductor of heat and is entirely fireproof, and the hollow tubes can be employed for ventilation or for distributing the heat of a furnace, all over the floor of each room. Experiments on the strength of this flooring are said to have given satisfactory results.

DEXTRIN.

The *Polytechnisches Journal* recommends the preparation of dextrin by mixing 500 parts potato starch, 1,500 parts cold distilled water, and 8 parts pure oxalic acid in a vessel on a water bath, and heating till the mixture does not show the starch reaction when tested with iodine. When this point is reached, the vessel is removed from the water bath, and the liquid neutralized with pure carbonate of lime. Having stood for two days, the liquid should be filtered, and the filtrate evaporated on a water bath till it becomes of a pasty consistency. It can then be removed with a knife and dried into a cake in a warm place. Two hundred and twenty parts of pure dextrin are thus obtained.

STEEL HEADED RAILS.

The steel headed rails have been found, on trial by the engineer of the Reading railroad, Pa., to separate at the welds to an extent of 25 per cent of the rails laid down. It may be predicted that the use of the compound article is likely to be discontinued, especially as the price of steel has been brought so near to that of iron.

Ramie.

At the Exhibition of the Mechanics' Institute in San Francisco last year, the Pacific Ramie Company exhibited a single plant of this new textile. Like all the nettle family, to which it belongs, it makes a very vigorous growth in California soils.

From experiences with the plants now in growth, producers can count on two crops a year, making one tun of clear raw fiber to the acre, worth $350 in England. The plant is perennial and is propagated from roots, one planting lasting for years.

After the first year, the cost of cultivation is small, for the vigorous plant outgrows all weeds—from twenty-five to one hundred stalks springing up from a single root. The bark yields the fiber, which is of great strength, and from which a fine and durable quality of drsss goods, usually interwoven with wool or silk, are manufactured. It takes a permanent dye.

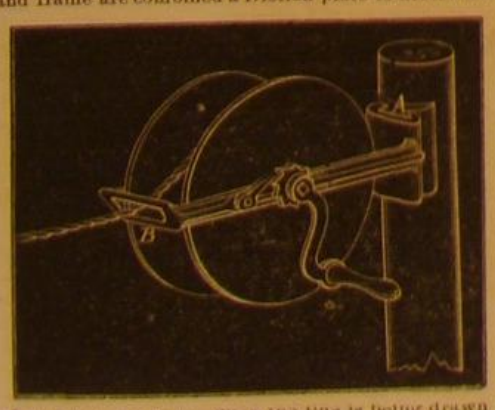
Up to a recent date, the process of separating the fiber was expensive, but the Lefranc brake does the work cheaply and effectually, doubling the value of the crop and freeing our farmers from all risk in its cultivation. The only safe place to grow it is in moist bottom lands.

Tanite Wheels.

Through frequent references to the tanite wheels, for grinding, polishing, etc., our readers have become in a measure familiar with their merits. The Tanite Company, of Stroudsburg, Pa., the manufacturers of these wheels, having ceased the contract system, now make all their own machines and are extending their works to meet the increasing demand for them. A false impression has obtained in some quarters, owing to this change in their method of doing business, that their machines are now put upon the market for the first time. This is not the case. Their merits have long been practically proved by use in many large establishments. The Company have now reduced both the manufacture of the wheels and of the machines to a system, and are employing the best mechanical skill, not only to maintain the character of their work at its present high standard, but to improve it if possible.

CLOTHES LINE REEL.

This is a new construction of the supporting frame of the reel, the frame having attached at one of its ends a dovetail tenon, A, for the purpose of connecting it to a corresponding dovetail mortise made on or attached to the post or building. The opposite end of the frame is provided with a guide, B, for the line as it passes on to or off from the reel. With the reel and frame are combined a friction plate to arrest the motion of the reel, so that, when the line is being drawn out, sufficient resistance will be offered to prevent any portion of it from dragging on the ground and thus becoming soiled. In ordinary reels, this precaution has been overlooked, and it is difficult to draw out the line without having it sag so as to touch the ground.



This invention was patented Nov. 21, 1871, by Mr. Charles H. Staffin, of Boston, Mass.

[For the Scientific American.]

FRICTIONAL GEARING.

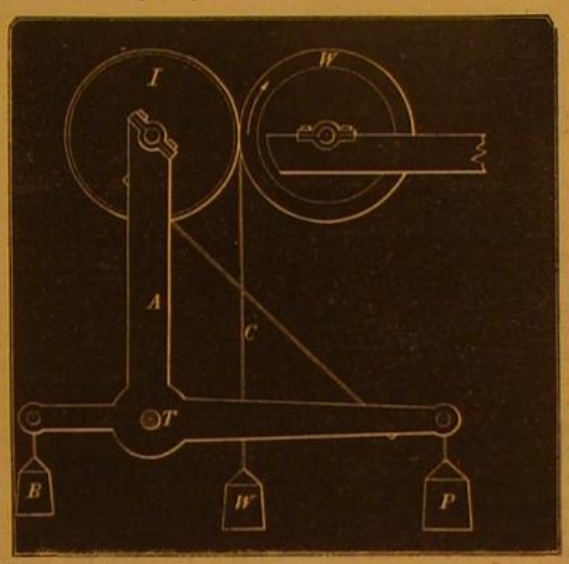
BY E. S. WICKLIN.

NUMBER III.

In the practice of mechanics, we are generally satisfied with an old and familiar principle, without giving ourselves any great trouble to inquire into the comparative degree of its efficiency. But this does not satisfy the requirements of science; nor is it sufficient for the practical mechanic when applied to principles less familiar.

When new modes are introduced as rivals of the old, the question of comparative efficiency is at once raised, and should be met by crucial experiment. But unfortunately for both science and practice, these questions are not generally so met. Too few experiments are made, and those without sufficient care and accuracy to establish principles or remove doubts. No experiment is, however, without some degree of interest, and when all the conditions of a test are known it is not difficult to estimate approximately the value of results. With this view, the conditions and results of a few experiments, made to test the tractive power of smooth-faced friction pulleys, are here given. These experiments, when made, were not meant for publication or for the benefit of science, but to establish rules for private practice. They should be repeated by others before being taken as conclusive.

For the experiments, two pulleys were made in the usual way, one being of wood—soft maple—and the other of iron. Both were accurately and smoothly finished. These pulleys were each seventeen inches in diameter and of six inches face, and were put up as shown in the annexed diagram.



A, in the diagram, is a double belt crank frame, with arms two feet long. The ends of the upright arms receive the bearings for the iron pulley, I. The journals of this pulley are one and a half inches in diameter and three inches long, and run in Babbitt boxes. The frame is hung upon journals or trunnions, *t*, and balanced by the weight, B. W and P are strong packing boxes, which are filled with scrap iron to the extent required. The face of the pulley, I, is extended beyond the six inches to receive the cord, C, for which purpose a shallow groove is cut in the pulley so as to bring the center of the cord just to the periphery. The driving pulley, W, is put upon a shaft where it may be made to revolve slowly in the direction of the arrow.

It will be seen that the weight in the box, P, upon the horizontal arm will bring the pulleys together with a pressure just equal to the weight. The wooden pulley being in motion, the pressure, when sufficient, will roll the other pulley and raise the weight, W.

The manner of experimenting was to put a given weight upon the cord, C, and, while the driving pulley was moving, to load the box, P, until the weight, W, was carried up. The machinery was then stopped, when the weight would slowly descend, slipping the iron pulley backwards upon the wood. The weight in the pressure box was now noted; the weight was again raised, and the pressure increased sufficiently to hold the weight from slipping down, and the pressure again noted.

In the following table, the figures on the left show the weights raised. The second column gives the pressure just sufficient to bring the weight up; and the third column shows the weight necessary to raise and hold the weight, without slip.

After these experiments were made and twice repeated with the pulleys, the frame, A, was reversed, so that the weight in the pressure box would tend to separate the pulleys. They were then connected by a six inch leather belt, and the experiments repeated with the results given in the fourth and fifth columns of figures.

FRICTION PULLEYS.			BELTED PULLEYS.	
Weight raised	Pressure required to just raise the weight.	Pressure required to raise the weight without slip.	Pressure required to raise the weight.	Pressure required to raise the weight without slip.
Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
10	29	35	30	84
20	58	65	60	89
30	87	96	91	120
40	115	129	121	159
50	143	154	151	199
60	171	185	183	242
70	199	214	213	281
80	228	244	239	321
90	264	269	278	375
100	295	313	310	419
120	354	397	373	497
140	416	453	443	565
150	477	486	524	652
180	538	561	604	731

It will be seen that, in this test, the traction of the friction wheels was greater than that of the belted pulleys, and considerably more than is usually supposed to be obtained from belts upon pulleys of either wood or iron; and that, while there is a marked falling off in the adhesion of the belt as the work increases, that of the friction increases as the labor becomes greater. Also, that the difference in the pressure required to just do the work, and that necessary to do it without loss or slip, advances in an increasing ratio with the work of the belt; but in the friction it is almost constant throughout the whole range of experiments. The figures applied to the friction wheels are the mean results of repeated experiments; those applied to the belted pulleys are each of a single test. It is not thought that these experiments were sufficient to fully establish all that the figures show; but they were enough to prove that smooth faced wheels possess a much higher tractive power than has been generally supposed. They are given without further deduction or comment.

And now a word as to some of the advantages of friction gearing. Being always arranged with a movable shaft, so that the wheels may be thrown together or apart with the greatest ease, the machine driven by it is started and stopped at any moment while the driving wheel remains in motion. And when stopped, the separation is complete, and may so remain for any number of minutes or months without attention, and may be again started at any moment without the least inconvenience or injury. So slight is the separation required that it is done almost without an effort. And by it, we entirely dispense with the nuisance of loose pulleys, belt shifters, and idle running belts; and with the risk of throwing off and putting on belts. It obviates the delay and labor of shipping and unshipping pinions, and the rattle and bang and frequent breaking of clutches. It is durable, and requires no repairs; it is compact, and economizes room. It does not increase the pressure on journals when the speed is quickened, as is the case with belts running with great velocity, but remains constant at all speeds. And it will transmit any amount of power, from a hundredth part of a horse power to one hundred horse power, with no greater per centage of loss, and with less pressure on journals than can be done by belts.

It is not contended that this style of gearing should supersede the belt. There are hundreds of situations in which nothing can take the place of belts. The ease with which they can be carried in almost in any direction, and to any reasonable distance, will perhaps always place them foremost as a means of transmitting power. But where several machines, that must be run independently of each other and be stopped and started without interference, are driven by the same motor, one connection, at least, should be frictional; and that, if practicable, should be the connection nearest the motor. Where the motions are slow and the occasions for stopping few, this is of less importance; but where the speed is considerable, and the stoppages are frequent, it will be found a very great convenience.

MEASURING THE CLEARNESS OF THE SKY.

John Leslie invented, in the beginning of this century, an apparatus intended to measure the amount of clearness of the sky, and he called it therefore an aethrioscope. It consisted of a differential thermometer, *d t*, which operated as usual by the difference of expansion of the air in two glass globes, thus moving the liquid column, *c*, in the tube connecting them; and this motion is observed on the scale, *s*. One of the globes, *d*, of this thermometer is placed in the focus of a parabolic reflector, *r f*; the other globe, *t*, outside the reflector, has a silvered surface and is highly polished. By those means, Leslie expected to withdraw the globe, *d*, totally from terrestrial radiation, which keeps the globe, *t*, at the constant temperature of the surrounding bodies; and, as he had found that clouds reflect heat and radiate heat, he anticipated that the descent of temperature of the globe, *d*, and the consequent rise of the liquid column on the scale, *s*, would be a direct measure of the clearness of the atmosphere. His anticipations were, however, only partially fulfilled. He found, for instance, that when the sky was cloudy, the liquid column did not move, whether the reflector, *r f*, was covered or not, proving that the radiation from the clouds counterbalanced the radiation of the mirror towards them; but he also found that the amount of cloudiness had very little influence on the instrument, and that even a total absence of clouds showed sometimes little radiation while at other times with an equally clear sky, very powerful upward radiation manifested itself by the cooling of the bulb, *d*, and the rise of the liquid column. This utterly perplexed him, and he publicly expressed his inability to interpret the indications of his instrument, which, he said, "sometimes under a fine blue sky will indicate a cold of 50°, while, on other days when the sky is equally bright, the effect is scarcely 30°." The instrument was thus useless, for more than half a century; but recently, by investigation concern

ing the different powers of absorption by gases and vapors of the radiant heat passing through them, the apparent difficulty was perfectly explained, and Leslie's aethrioscope became a direct measure for the amount of totally invisible vapor in the atmosphere in the inaccessible upper strata.

In order to make this clear, we will first notice that the heat, when accompanied by powerful light, will pass through many transparent substances which will not transmit this heat when radiating without this light. So the solar rays will radiate with most of the sun's heat through the glass panes of a hot house, while the heat without that light cannot return and be radiated upward; such glass acts thus as it were like a check valve, letting the solar heat in, but preventing its return in the opposite direction. Our atmosphere acts in a similar way; notwithstanding some of the heat and light is absorbed in passing through its strata, we are the gainers, as it prevents the return of the heat, by being a powerful check to the obscure radiation of the same. The intense cold prevailing high up on the tops of mountains, where the atmosphere is very rare, and higher up still on the moon, where, practically, there is no atmosphere at all, is partially due to this cause.

In the second place, it must be remarked that a perfectly dry atmosphere is quite transparent for obscure radiant heat; this explains several facts which otherwise would be difficult to understand; for instance, the nights in Persia and still more in the desert of Sahara are so cold, for the simple reason that the atmosphere is so dry and gives an easy egress to the obscure caloric rays which, during the night time, radiate upwards to the celestial space. This effect is still stronger in high regions where the air, besides being very dry, is more rarefied than it is lower down. So the accounts of our countryman, Mr. Squiers, who was sent by the United States Government to the high lands of Bolivia, South America, inform us that, after a burning hot sun during the day, night frosts devastate the vegetable kingdom to such a degree that only grasses fit for cattle can continue their existence, and no forests can keep alive; people live mostly on animal food, and use the droppings of the cattle for fuel to cook it. At the other hand, Louisiana, especially New Orleans and the country south of it, is always covered with such a moist atmosphere that night frosts are very rare, even in midwinter, and we find the most luxurious subtropical vegetation, for the double reason of a moist atmosphere being favorable to vegetable growth, by the continual supply of a kind of irrigation in the state of vapor, and the preservation of the surface heat during the night, the moist atmosphere covering the ground and preserving the heat like a blanket on a sleeping couch. The phenomenon of the dew, formerly so ill understood, is also easily explained by the radiation of obscure heat through a transparent cloudless atmosphere, which radiation cools the surface of the earth to such a degree that the air, in contact with that surface and cooled by it, loses its capacity for watery vapor, becomes foggy, and deposits water on the surface of the ground.

Several investigators have occupied themselves to determine the amount of absorption which different kinds of vapors and gases offer to radiant heat. Tyndall, in his late publication "On Radiation," gives a comparative table from which we extract the following:

Name of gas or vapor.	Amount of absorption.
Dry air	1
Geranium vapor	33
Lavender "	60
Oil of laurel "	80
Oil of cassia "	109
Oil of aniseed "	372

These figures have been found by passing the obscure radiant heat over a bibulous paper which was moistened with the perfume, and the intensity of these rays, on the surface of a thermo-electric pile, was measured by the amount of electricity generated, a method which we will explain in a future article.

If watery vapor is then a powerful absorber of obscure caloric rays, the amount of this absorption can be used as a measure for the amount of the absorber in the atmosphere, that is, for the amount of watery vapor; and this is exactly what is accomplished by means of the aethrioscope: a total absence of radiation from the bulb, or perhaps rather the perfect compensation of its loss by radiation, by the downward radiation or reflection of the heat absorbed by the watery vapor, is of course indicated by an absence of motion in the liquid column, *c*, of the instrument. This takes place as soon as the sky is commencing to be covered with a thin film of cloudy mist; but before this point of the beginning of the condensation is reached, the sky is clear, notwithstanding it is charged with a great deal of vapor; and there is an infinite graduation in the amount of this vapor, from the point of visible condensation mentioned to that of drying, which will all show itself by the amount of radiation toward the celestial space, and the consequent greater or less motion, of the column in the aethrioscope, taking place as soon as the surface of its reflector is uncovered, the same being directed towards that part of the upper atmosphere of which we wish to determine the amount of invisible moisture.

We need not say that, between the point of condensation when the vapor commences to be visible and that of actual rain, there is also a gradual increase of the amount of floating water particles and consequent density of the clouds, which finally will discharge their excess of liquefied vapor in the form of rain.

MEN are often capable of greater things than they perform. They are sent into the world with bills of credit, and seldom draw to their full extent.

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

Steam Propulsion on the Canals.

To the Editor of the Scientific American:

Although more than a year has passed since the award was offered for a new motive power for the propulsion of boats upon the canals, no plan has as yet been submitted which is capable of superseding the old system in point of economy, a point which seems to have been generally overlooked, in consequence of the prevailing erroneous impression that the principal difficulty, to be overcome in the application of steam power for canal propulsion, is to prevent the washing of the banks by the commotion, created in the water by the propelling instrument, in connection with the increased rate of speed of the boat. It is a noticeable fact that the merits, of nearly all the new plans produced, are based upon the prevention or neutralization of the swells, which are claimed to work so much damage to the banks of the canals.

The report of the commission appointed by the act, also the report of the engineer of the commission, have just been published, and will no doubt place the matter in a clearer light, so that the object aimed at by the authorities can no longer be misunderstood.

Section third of the act requires a speed of not less than three miles per hour, as an average, "without injury to the canals or their structures." It was soon discovered that this phraseology was calculated to lead many inventors into serious errors, by which their time and money would be wasted. The commission, therefore, in August last, unanimously adopted a resolution whereby the subject was thoroughly explained. The principles involved in the ordinary systems of propulsion are also thoroughly explained in the engineer's report referred to. The writer of this article has made numerous experiments in steam propulsion, for the purpose of ascertaining the causes of the evident waste of power resulting from the use of even the most approved propelling instruments acting upon the water. The inferences drawn from these experiments are fully sustained by the engineer, so far as the points considered are identical.

One point in the report, with reference to those systems in which the water displaced at the bow is forced through a channel or flume under the boat, furnishes, in my opinion, the key to the whole mystery of the enormous waste of power in the use of paddle wheels or screws acting against the water. It is shown that the water driven back, by contact with the sides of the channel, produces the effect of seriously retarding the progress of the boat, and explains the very slow rate of speed attained by boats propelled in this manner. A similar action, although somewhat modified, undoubtedly exists with the wheel at any other part of the boat than the bow. When the wheel is at the stern, the water acted upon must recede at a rapid rate of speed and must also be replaced by that adjacent and ahead of the wheel, for the latter acts in two directions, namely, backward and centrifugally, and creates a suction ahead of the screw. The proof of this lies in the fact that when an ordinary tug boat drawing, say, six feet of water is placed upon the canal, having a depth of seven feet, upon the screw being set in motion a settling of the boat takes place, by reason of the water drawn out from under the hull—first, that adjoining the screw, followed by the whole volume under and at the sides some distance above the keel; and this forced receding of the water in contact with the boat also materially retards its progress. This is more noticeable upon canals and narrow streams than in the open sea; in fact, by reason of the great expanse of water, it is in the latter case additionally modified. The facility for comparison, between the work of a given number of horses in towing and steam of equivalent horse power as applied for propulsion, when applied to act against the water, is the chief cause of rendering the waste of power more noticeable, and of course it cannot be made available at sea. It would seem, therefore, that in order to apply steam power profitably for propulsion, an entire departure from all systems of acting against the water is required, and the latter should be employed for flotation only.

PRO BONO.

Schoharie Court House---Hub and Spoke Factory. Schoharie Valley---Geological Features and Reminiscences.

To the Editor of the Scientific American:

Though not strictly a manufacturing village, Schoharie contains one establishment, at least, the special and peculiar character of which makes it interesting. I refer to the American Hub and Spoke Factory, which the proprietor, Mr. Treat Durand, kindly gave me an opportunity to inspect.

Into the hub department, are brought the logs of elm, white oak, and birch, which are first cut with circular saws into pieces of the proper length, which is determined by the diameter of the stick. These pieces are then bored by machinery, after which they are turned on self regulating power lathes, which are the characteristic features of the establishment. They were the invention of Mr. A. Richard of this place, and have been in use since 1859. The turning is done by means of knives which resemble plane irons, being somewhat shorter and stronger, the edge being shaped to correspond with the edge of a vertical section of a hub. These knives, four in number for each machine are fastened with bolts to the sides of a strong shaft about four inches square. Two straight edged knives cut the straight portion of the convex surface at the ends; two others of proper shape cut the curved and grooved central portion. This knife bearing shaft is made to revolve with great rapidity; while the block to be turned, after being fixed in a sliding frame or carriage (a strong bar driven through the hole in the center serving as a mandril), is drawn up to the cutting knives at the same time that it is made to revolve slowly by means of two spirally threaded shafts and corresponding cog wheels at one side which gear the cutting shaft with the carriage. The diameter of the hub is regulated by putting a pin into a hole in the frame on which the carriage moves. The lathes are of different sizes, each machine being adjustable to several sizes of hub. The smallest hubs made are six inches long and three in diameter, the largest, eighteen by twenty inches. Of the smaller sizes, one machine will turn four hundred hubs in a day; of the larger, from one hundred to one hundred and fifty. A few lathes were sold by the American Hub Company, the former owners of this establishment; but this is believed to be the only factory in the country where hubs are extensively manufactured by power lathes. On the order book, nearly all the States are represented, large shipments being made to the extreme West and South. After passing through the lathe, the hubs are painted and then laid away to season. Previous to shipment, they are mortised by machinery, according to directions given by purchasers. Spokes also are turned by automatic lathes, not peculiar to this establishment, the cutting gouges being fastened to the periphery of a wheel about ten inches diameter, which revolves rapidly while it moves slowly in the direction of the length of the spoke, which also revolves slowly, the frame which holds the spoke in the meantime moving back and forth so as to give the spoke an oval form. The spokes are smoothed on sand belts, and tenons are cut by machinery. The timber used for spokes is hickory and white oak.

In the vicinity of this factory are several localities and objects of scientific and historic interest. The beautiful valley of the Schoharie, with its rich alluvial soil to which General Washington looked for wheat for his armies, and which has ever since teemed with abundant harvests, is bordered with hills several feet high, which Nature has laid up in gigantic terraces, and of which the exposed rocky faces with their wealth of minerals and organic remains are a standing invitation to geologists and palæontologists to gather stores of trilobites, encrinites, minerals, and fossil shells, "butterflies," as they are frequently called. Mr. Albert Lintner, curator of the New York State geological rooms, and his predecessor, Mr. John Gebhard, acquired a large share of the scientific information, by which they were fitted for the office, by the exploration of these rocks and the careful study of their contents.

A short distance above the hub factory, there issues from a cave at the base of a limestone ledge, a clear cold fountain of sufficient capacity to supply the village with water. Near the spring stood the old Lutheran church, and Lawyer's tavern, the resort of the friends of freedom during the Revolution. A mile below is the "Old Stone Church," which was built in 1772, and served as a fort during the war; and which is now owned by the State and used as an arsenal.

C. H. DANN.

Schoharie, C. H., N. Y.

Amalgamation of Gold Ores.

To the Editor of the Scientific American:

Within the past few months there have appeared, in your valuable journal, various articles upon the amalgamation of gold ores. Being engaged in gold mining in South Carolina, I have read these articles with great care; but I must confess that none of them have pointed out a satisfactory process whereby the gold, that is now lost by imperfect amalgamation, can be saved. The great want is something, or some way, that is rapid, simple, cheap, and efficient. At present, blankets, copper plates, either quicksilvered or silver plated, and the use of "quick" in the battery are the methods, mostly relied upon by miners, for saving the gold. But they know that from forty to sixty per cent of the gold is lost by the use of these means. They are, however, the best, cheapest, and most rapid of any means yet discovered for saving the gold in the ordinary class of ores.

In your issue of March 9th, there is an article calling attention to the process of Mr. Percival Stockman, and it is stated that "practical men" recommend it "to the mining world." The process, however, so far as the amalgamation of "free gold" is concerned, is simply a modification of Wyckoff's chloride of silver process, and I doubt if it is any great improvement upon it. The difficulties with both processes are slowness and expense.

A great majority of mines yielding free gold produce ores that will not work more than ten dollars per tun; and, of course, a large quantity must be worked to make it pay. Hence any process that is not rapid and cheap will not answer.

As to the working of sulphuretted or "rebellious" ores: Of the hundreds of patented and other processes, hardly one is worth a moment's consideration. It may be said, however, that many of the so called improved and newly discovered methods work well enough in the laboratory, but, when put to a practical test, are found to be worthless.

After many experiments, I have found the following process to be the best: I first roast the ore (though it is free gold ore) in large piles, thus rendering it very friable, and thoroughly drying all the dirt and clay. In every tun of the ore, there is about 300 pounds of fine rock and dirt, which I have screened out through wire sieves of about one quarter inch meshes, and this fine stuff I run through a common drag mill, and then through a "Georgia rocker," thus saving nearly all the gold. In fact, by this simple process I obtain nearly fifty dollars of gold per tun of dirt; whereas, when run through the stamp mill and over copper plates, I obtain only about ten dollars per tun. The rock I crush in one of the Wilson patent stamp mills, using quicksilver in the bat-

tery, and then running the crushed matter over the ordinary copper plates. The rock is worth fully ten dollars per tun, but I save only about half of this.

As to working tolerably high grade sulphuretted ores: The best way, if not too far from a shipping point, is to send them to Swansea, England. But if this cannot be done, then erect a common furnace, having the fire surfaces of good soapstone; then, to every 150 pounds of ore, put in one bushel of charcoal and ten per cent of salt. The ore will readily melt to a slag, and will be pretty well desulphurized. The slag can be drawn off, and when cold can be broken up and worked like free gold ore. A small trial furnace can be built of good fire brick, and an ordinary blacksmith's bellows will answer to blow the fire.

As the loss of gold, by the present process of amalgamation, is known to be very great and, in many cases, disastrous to those engaged in mining, it is important, it seems to me, that the different processes which have been found to work the best, by different miners, should be made known to the public. In this way much good may be done, and a great industry made more valuable than it is. And I am sure the SCIENTIFIC AMERICAN will do its part in giving all such information "to the mining world."

Philadelphia, Pa. CALIFORNIAN.

Coating Cast Iron with Other Metals.

To the Editor of the Scientific American:

Thinking the importance of this subject will warrant a further consideration of it, I submit the following:

After tinning iron, as described in the SCIENTIFIC AMERICAN, page 312, another coating of brass, copper, silver, or gold may be laid on, as the nature of the case may require; this process being known in the arts as "plating."

Plating is done in various ways. Electro-plating has of late years become very popular, but, unfortunately for the art, is of inferior quality. Dry plating is also practised to some extent, and is also of inferior quality. I will therefore pass over these two methods, and consider others of more utility. Yet, respecting dry plating, I would invite artisans to try the experiment of subjecting dry plated articles to heat, since it is probable that by fusion the plating may be rendered more compact and serviceable; indeed, it is not at all certain that electro-plating cannot be improved in the same way.

Iron articles, having been first tinned, may be plated with more precious metals by first reducing the latter to thin plates or foil; this is cut into small pieces and laid upon the parts to be plated, observing the rule of first washing the surface to be plated with muriatic acid or its equivalent in another form. Then rub over the foil with a soldering iron, sufficiently hot to fuse the tin; thus the tin coating, first laid on, becomes the solder to fasten the plating to the iron. If the articles to be plated are large or of uneven surface, the foil is to be bound on with binding wire and the articles submitted to a steady heat from burning charcoal until fusion takes place.

Another method is to apply the foil to the polished surface of iron (without the aid of tin or solder of any sort), the articles being heated until fusion takes place in the foil itself, which is rubbed down with a burnisher when hot; and the process is repeated until a sufficient thickness of plating is obtained. This is the most difficult and the most expensive way of coating iron with other metals, and is also the best, because it is wholly free from solder of any kind, which is easily melted off.

It seems to me that there is a chance for improvement here; that copper and other fine metals, reduced to powder with acids and laid on to the inside of iron pots, spiders, and other cooking utensils, and afterwards subjected to fusing heat, the process being repeated until a thorough coating is laid on, would produce a good and substantial lining to iron hollow ware. If a company of enterprising manufacturers were to act upon this hint, they might make a good thing for themselves and, at the same time, do the country a great service. CHARLES THOMPSON.

St. Albans, Vt.

Balancing Saws, Cylinders, etc.

To the Editor of the Scientific American:

In your remarks upon my letter, published March 23, relating to the balancing of saws, you state that "the remarks of our correspondent relative to balancing cylinders or pulleys on straight edges, will be demurred to by some of our readers who have had experience in balancing cylinders destined to run with high velocities." An examination of my letter will show that the word "cylinder" does not occur, but that the words 'disk' and "pulley" are used, as being the only words to express my meaning; and though, mathematically speaking, a disk or pulley is a cylinder, still in the practical way of speaking it is not so called unless the width of face is equal to a large percentage of the diameter.

The principle to which you refer, regarding the balancing of long cylinders, is that the resultants of the balancing forces must rotate in the same plane; and this is shown in Fig. 5 of my last letter, where C and B are two weights on the disks, equidistant from the center of the crank pin F, and the effect is the same as if it were possible to combine the weights C and B at X, which rotates in the same plane with F. Again, in Fig. 8, the two weights, B and C, have their resultant in the plane of F; hence, as stated, two cranks are used, one on each side of F, because a single weight, at B or C, equal to A would tend to produce a tilting motion in the crank shaft. In conclusion, I would state that the practical way of balancing a long cylinder or drum after determining the weight and the distance at which it is to be placed from the axis when resting upon the leveled straight edges, is to revolve it on its journals, in boxes supported by springs, and to shift the weight lengthwise in accordance with the indications afforded by the vibration.

WM. H. HARRISON.

Philadelphia, Pa.

The Right Kind of Windmill.

To the Editor of the Scientific American:

Some time ago I made some suggestions which you were kind enough to publish and to prefix the word "useful." This encourages me to add some more on another subject which, I think, is of great importance and commands too little attention; and that is, the proper construction and use of the oldest and most economical motor known, the windmill. It seems strange to me that this power is so little used, and passing strange that a man so sensible and acute as Captain Ericsson should spend his valuable time and highest, or at least most experienced, energies in attempting to utilize the sun's heat directly, when he might utilize the same force, correlated into a much more convenient and useful form, by the aid of this ancient device, and perhaps plan out something better than heretofore known.

I think that the main cause of the neglect of wind power arises from the general but wrong impression that regularity of motion is necessary in most mechanical operations, and this has led to a multitude of cumbrous and expensive regulating devices which are the patented parts of all modern wind machines. I believe that, although in all kinds of work the power to command regularity of motion is desirable, in most kinds it is far from necessary, and that one hundred revolutions per minute will frequently give as large a percentage of profit as one thousand, or *vice versâ*.

This, if true, leads at once to the conclusion that the best windmill is made in the simplest manner, say a short horizontal shaft set in boxes in a circular frame or head, which forms the top of the tower and is capable of revolving with the wind, so as to keep the rigid and unalterable arms, which are set at the best angle for efficiency, to the wind; on this shaft is set a miter or bevel gear, which imparts motion to a perpendicular shaft set in its center of horizontal rotation, and a vane to keep it "head on," and it is complete. The upright shaft has a gear to match on its upper end, and a pulley to drive whatever is driven—usually by a half twist belt on its lower end—and should be made adjustable up and down, so as to be thrown in and out of gear. Let everything be made as light as is consistent with proper strength; and the iron work of a machine of this kind, of two or three horse power in a stiff wind, need not weigh over three hundred pounds or cost over twenty-five dollars. All the wood work could be made by an ordinary farmer and on the spot. Perhaps if, instead of a set of arms on one end of the horizontal shaft and a fishtail vane to hold them to the wind at the other, two sets of arm vanes—one on each end of the shaft, and one larger than the other, or farther from the center, were constructed, it would be better. I think the end of keeping it to the wind might in this way be attained, and both sets be acted on by the air, so as to increase the power as well as to more perfectly balance the shaft. Now the objections that will be raised against this plan will be "no regulator" and "it will run away with itself in a gale." To the first I answer: if to do your work it is necessary to have a steady motion, get some other power; and to the second, let it flicker. The arms can turn in a gale as fast as they are driven, without danger if decently balanced, and even be much safer than if confined; and if the journals are properly oiled, they will never wear out. Let it run night and day; it will always be ready to yield the largest amount of power its surface will give.

And here let me say that I have sought in vain for any table or statement of the amount of power yielded by a wind wheel per square foot of surface, or for any direction in regard to the best angle at which the arms can be set. I presume there are such tables published, and I would be obliged, as would be many others, no doubt, if you would hunt them up and republish. How many square feet of sail are required, in a twenty mile breeze, to a horse power, and at what angle with the direction of the wind should it be set? is the question I would like to have answered.

I hope that every machine shop in the country will get up the patterns for the castings of the "common sense windmill," and that hereafter no barn will be built without a tower to support one. C. B.

Memphis, Tenn.

Spark Arrester.

To the Editor of the Scientific American:

In 1866, our saw mill at this place was burned by sparks from the smoke stack, igniting the roof of an adjacent building. Subsequently, after rebuilding, the sawdust in our mill yard was constantly taking fire from the same cause. Having occasion to repair the furnace in August, 1870, we adopted the plan of one of your contributors, since which the sawdust has never been fired, nor do we recollect having seen a spark coming out of the smoke pipe: and whereas previously a volume of dense black smoke was pouring out of the pipe nearly all the time, but little smoke has since been seen.

The furnace is for two 42 inch double flue boilers, 16 feet long. We cleaned out the inside of our furnace down to the level of the bottom of the ash pan, then put up the usual bridge wall, back of the grates, another intermediate, just back of the first and a little below the top. We put in a 4 inch iron pipe passing through both sides of the furnace, open at both ends and perforated, inside the furnace, full of ¼ or ⅜ inch holes. We have no doubt that, with a larger pipe and more and smaller holes, the smoke would be effectually and entirely consumed.

We can therefore, after 18 months trial, confidently recommend a similarly constructed furnace as in our judgment, better than all the screens and spark arresters ever constructed; besides, it costs nothing, except for the pipe.

Handsboro, Harrison County, Miss. TAYLOR & MYERS.

[The plan referred to by our correspondents is, no doubt, that illustrated and described on page 129, volume XVII of the new series of the SCIENTIFIC AMERICAN. It was communicated by Mr. F. W. Bacon, M. E.—EDS.

Counterbalancing Gang Saws.

To the Editor of the Scientific American:

E. F. J., in your issue of March 2d, says he has a great deal of trouble with his gang of forty saws, in trying to get it to run steadily. The gate, he says, weighs about 5,500 lbs., and he wants to find the point on which to put a counterbalance. As to this point, I do not wish to advise; but it appears to me that a gate weighing 5,500 lbs. is very much out of proportion for a gang of forty saws, and here I think lies the point of his trouble. He does not state what length of saw or crank he uses, or whether it saws boards or plank; but, from the experience I have had in running gangs of saws, he should reduce his gate in weight 2,000 or 3,000 lbs., instead of adding counterbalance. I have run, for more than ten years, two cast iron gates, each weighing 1,550 lbs. The space between the stiles or sides of gate was 3 feet 9 inches, in which I hung 28 saws, each 4½ feet long, to cut 1½ plank, and 35 for one inch boards. These gates are connected to a crank pin, 11 inches from center of water wheel shaft, by a pitman 18 feet long, the water wheels making 180 to 200 revolutions per minute without any counterbalance for gate or pitman. The crank and wrist pin are balanced, the whole being made to give as little resistance as possible in passing through the water. The counterbalance, so far as my experience goes, if the gate is proportional to the saws it contains, is a detriment instead of benefit. The weight of gate helps to force the saws through the logs, giving more uniform motion when the saws are cutting than with counterbalance. If E. F. J. has too much weight of gate for the saws, and does not reduce it, a counterbalance will help to equalize the motion; but it will only add useless weight and increase the friction. Now the point I would consider first is: Is it necessary to use a gate weighing 5,500 lbs. for a gang of forty saws? The great difference in the weight of your correspondent's gate and the ones I am using, the number of saws being nearly equal, induces me to make this statement; and he can now compare the relative condition of these gangs of saws.

Please allow me to say further that a less number of pounds of cast iron makes a better and stiffer gate than wrought iron, of which most gang gates are made.

J. N. WALTERS.

Gang Mills, Herkimer Co., N. Y.

Exhaust of Slide Valve Engines.

To the Editor of the Scientific American:

One of your correspondents suggests that the exhaust of an engine should always open three inches before the stroke is completed. Any such arbitrary rule is an error, and will not work. A nine inch cylinder would have one third its stroke to complete, while one of forty-eight inch stroke would only have one sixteenth. An engine going slowly, with all it could do, would very probably not complete its stroke at all.

As you observe of turbine wheels, no invariable rule can be given for all sorts of steam engines. The work they have to do must cause them to differ, both in cut off, or expansion of steam in the cylinder, and letting the steam go when it is in. For pumping water, propelling a side wheel steamboat, or drawing heavy freight trains up steep grades, the steam should be forced into the cylinder till within a few inches of the end of the stroke, and it should be kept there so long as it can possibly do any good. For rapid motions, expansion of steam may be used to much better advantage, and the exhaust may be opened sooner when every part of the engine is under full headway.

Every engine should be specially arranged, both for induction and eduction of steam, to the special work it has to do, if the object is to get the full amount of its power out of it. B. T.

Mechanic's Institute of San Francisco.

We are indebted to the Mechanics' Institute of San Francisco for a report of their proceedings for 1871, in which we find much interesting and valuable matter. The essay on "the Manufacturing Interests of the State" by Messrs. Morris and Bennett, is a very valuable paper. Dr. D. J. Macgowan contributes several essays upon curious Chinese arts and productions, from which we shall make extracts. The essays and illustrations of "Rope Railways" for transporting ores, by D. R. Smith, and upon the best systems of "Clearing and Cultivating Tide Lands," by A. J. Bigelow, are full of valuable information.

The Exhibition of the Institute in 1871 was a great success, and the reports of the various divisions present an encouraging and satisfactory view of the industrial resources of California.

RELIABLE RECIPES.—For corns, easy shoes; for bile, exercise; for rheumatism, new flannel and patience; for gout, toast and water; for the toothache, a dentist; for debt, industry; and for love, matrimony.

Fireman's and Builder's Elevator.

Our engraving illustrates a fireman's and builder's elevator, which can either be placed upon the ground, as shown, or attached to a truck to be drawn about by horses, and by which an elevation of any hight can be easily, rapidly, and safely attained.

In the engraving, A represents the different adjustable sections of the elevating frame, and B a fixed section which is hinged to the frame of the derrick. To the section, B, are pivoted braces, C, the lower ends of which are wedge pointed, to engage with the timber of the derrick frame and hold it at any angle during the elevation. The upper section, A, has attached to its upper end two wheels, D, as shown, which, during the extension of the frame, roll up along the side of the building. The sections, A, are joined, as shown, by metallic sleeves, E, the upper ends of each section entering the sleeves which are attached to the lower ends of the next section, and so on, as many sections being used as may be needed to secure the required elevation.

To the lower crossbar of each section is attached an eye, F, which is engaged by a hook attached to the cord, G, during the extension of the elevating frame. The cord, G, is wound up by the windlass, H. Thus suppose it was required to extend the frame from the position shown in the engraving. The windlass, H, being turned, the lower section, A, would be raised, sliding in ways on the section, B, till its lower ends reached the position now occupied by the lower ends of the second section, at the same time carrying upward the superposed sections. When this had been done another section would be inserted, which would hold the upper ones from descending.

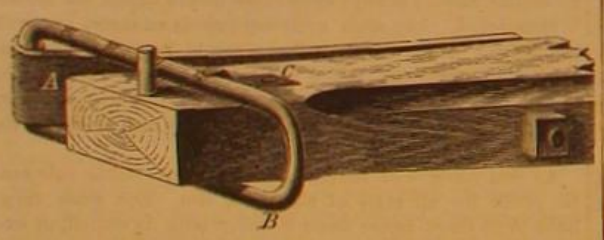
To the upper section is attached a sheave, I, over which the rope from the elevating bucket passes, thence downward and under a roller, J, attached to the derrick frame, and thence to the drum of the derrick, which is operated in the usual way. A hand screw, K, operates a lever friction brake, to hold the bucket and its load at any required elevation. Folding platforms, L, afford a standing place for the operator on either side of the derrick, whether the latter be mounted on wheels or not.

This invention was patented through the Scientific American Patent Agency, Feb. 13, 1872, by Andrew M. Patrick, of Long Lane, Mo., who may be addressed for further information. Patents are also pending, through the same source, in foreign countries.

PATRICK'S FIREMAN'S AND BUILDER'S ELEVATOR.

GIBBS' WHIFFLETREE.

Our engraving shows a portion of an improved whiffletree, designed to subserve two useful ends. It is intended, first, to give greater elasticity to the whiffletree, so that by the sudden starting of the team no portion of the harness



shall be broken by the shock; and, second, to supply a means whereby the draft applied, to propelling vehicles, plows, mowing machines, etc., will be indicated with sufficient accuracy for comparison.

The improvement consists in applying to the back side of the ends of the whiffletree a strong strap spring, A. The traces are to be hooked to the graduated links, B. A pointer, C, in connection with the graduations on the link indicates the pressure of the draft in pounds.

This invention, with or without the graduations on the link and the pointer, would be an excellent thing for street cars, and would save much expense in repairs, besides making it much easier for the horses to start the cars. For general use, the improvement has also advantages that will be obvious to the reader. By its use, farmers will be able to see whether the draft of their reapers has increased unduly by the friction or binding of parts, and to make the proper adjustment in time to relieve their horses.

The spring may be composed of one or more leaves, as may be required; and, while not very expensive, is a valuable addition to the whiffletree where heavy work is required.

Messrs. George Gibbs and William Gibbs, of Canton, Ohio, are the inventors and joint patentees.

The Dandelion or Taraxacum.

Taraxacum roots are used in a variety of ways in India; one useful form is that of a paste, which is made by pounding the fresh roots, putting the mass into tins or jars, and gently baking or heating in an oven; when cool, the paste is ready for use and can be kept for a long time. To prepare dandelion coffee, the roots are washed, dried in the sun and cut up into small pieces, after which they are roasted in a similar manner to true coffee; they are then ground, and to every nine ounces of coffee one ounce of pounded dandelion root may be added; these proportions make an excellent and useful beverage. The use of this coffee in India has been much recommended.

Lieutenant Pegson, in a communication to the Agri horticultural Society of India, advocating the more general cultivation and use of the dandelion, says: "Medical men admit the value of this preparation, and I know several gentlemen in India who are, by their own admission, kept alive by the daily use of taraxacum coffee. It is fairly entitled to be called a specific for the cure of torpid liver, a complaint from which the majority of Europeans suffer; the fact being made known when they proceed to a cool or hill climate and shiver and shake with cold while the thermometer is at 62° Fah. only. The sallow complexion of such men, women and children, their languid movements and their enjoyment of heat, all alike proclaim that they are suffering from sluggish action of the liver. The conserve of taraxacum may be made into sirup for use. Horses and valuable dogs, sheep and poultry, all suffer in India from disease of the liver. A bolus of taraxacum conserve to a horse, and a pill thereof to a fowl, would be most beneficial and act as a curative agent."

WINN'S SHAMPOOING APPARATUS.

Of all the luxuries vouchsafed, in this civilized age, to heated, weary, head-achy mortals, a vigorous, cooling, cleansing shampoo deserves to take a place in the front rank. How delightfully it soothes the irritable nerves! What a delicious sense of coolness steals through the blood, till hands, limbs, and even the tired hot feet share it! How pleasant the manipulations of the accomplished operator! It is a luxury so grateful that it has almost seemed to reach the acmé of perfection, yet Mr. Mark L. Winn, of this city, has

won the fame of having perfected what seemed before perfect. Instead of now sitting with elbows upon knees and nose over a washbasin, while the cooling jets descend upon our willing pates, we discover that we need not even keep awake during the process, unless we wish to do so. We may almost recline, with elevated feet, on chairs cunningly devised and cushioned soft, and without the exertion of a muscle, receive passively that which has heretofore required some effort.

This desirable result is accomplished by, among other devices, a helmet of peculiar construction, which is supported by a suitable adjustable standard and bracket attached to the chair. In addition to the helmet, a safety trough and collar is employed to protect the person from the dripping, a flexible pipe, leading therefrom, carrying off the water which the trough collects.

The helmet has an expansible and adjustable bottom, with a sort of rubber packing, which fits the head. The trough also has a rubber collar, which fits the neck water tight.

A detachable sprinkler is employed to convey water to the head. A cushion or platform extends to the rear to support long and thick hair, like that of ladies, which, of late years, has grown to an unprecedented extent, and is at present generally very thick, especially at the back of the head.

A dryer, composed of a hollow sheet metal vessel, is used, and is provided with a cushioned metallic plate, upon which the hair is spread to dry, when the plate is heated by an alcohol lamp. This is considered a requisite for long and thick hair, which is slow in drying and is apt to become musty unless the moisture is thoroughly removed from it. The cushion alluded to is of non-conducting material, and is placed at the back of the head to protect the latter from the heat.

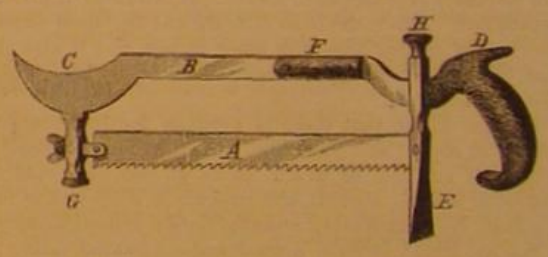
The arrangement of parts is such that any of these appliances may be attached or detached at will, as the circumstances of the case require. Thus, totally bald headed individuals will not require the dryer, which, of course, will not be used in their case. Young ladies (all ladies are young, we believe) will need a good deal of drying, and even chronically dry individuals of the male gender, whose hair happens to be luxuriant, may need the dryer after the use of the helmet.

At all events, all sorts of heads may find their requirements fully met in this invention, and the business of shampooing will doubtless be revolutionized by it.

AN IMPROVED GRAFTING TOOL.

The season for grafting being now at hand, many of our readers will inspect with interest the accompanying engraving of a convenient grafting tool, the invention of Mr. John Maddy, of Clearfield, Pa.

The invention consists in the combination of a hack saw, A, a splitting knife, C, and a wedge, E. The instrument is used by taking hold of the handle, D, in the usual way to saw off the stock. The handle, F, is used to place the knife, C, properly, and the head, G, is struck to split the stock. The



stock being split the instrument is reversed, and the wedge is driven by striking the head, H. Thus all the tools used for grafting, except the mallet, are combined in a single tool, a great convenience where trees are to be climbed in the performance of this kind of work.

An old gentleman, traveling on the railway a few days ago discovered hanging on the side of the car what he took to be a time piece, but which was nothing more or less than a thermometer arranged with a dial and hands like a clock to easily denote the temperature of the coach. The old man eyed it very closely, finally adjusted his spectacles, then took out an old fashioned bull's eye watch, compared time, and with his key made the necessary correction. He said he expected to be on the railroad for several days, and he wanted the car time. We think he will have a lively time of it, if he attempts to keep his watch with the variable temperature of a railroad car.

Curled Soap Root.—The curling of "soap root" as a substitute for hair for mattrasses is quite an industry in California. It employs a capital of nearly $50,000, with sixty men, and machinery and engine of 40 horse power. The value of the product is nearly $100,000 annually, and is steadily increasing. It grows in unlimited quantities in all the foot hill districts of the State.

Detection of Ammonia.—*Lee* announces a new process for the detection of ammonia, not less sensitive than the Nessler test. The suspected liquid is mixed with phenol, and hypochlorite of lime is added. The ammonia shows itself by a green color, more or less intense, according to quantity.

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW (PARK BUILDING) NEW YORK.

O. D. MUNN. A. E. BEACH.

☞ "The American News Co.," Agents, 121 Nassau street, New York.

☞ "The New York News Co.," 8 Spruce street, New York.

☞ A. Asher & Co., 20 Unter den Linden, Berlin Prussia, are Agents for the German States.

VOL. XXVI., No. 17. [NEW SERIES.] *Twenty-seventh Year.*

NEW YORK, SATURDAY, APRIL 20, 1872.

Contents:

(Illustrated articles are marked with an asterisk.)

A Confection	256	*Measuring the Clearness of the Sky	259
Amalgamation of Gold Ores	260	Mechanics' Institute of San Francisco	261
*An Improved Grafting Tool	262	Muck	256
Answers to Correspondents	266	New Books and Publications	267
Balancing Saws, Cylinders, etc.	261	Notes and Queries	265
Beet Root Sugar in the United States	264	Official List of Patents, Extensions, Designs, etc.	268
Business and Personal	265	Photo-engraving on Metals	257
*Clothes Line Reel	259	Piston Rod Packing	263
Coating Cast Iron with other Metals	261	Poisoned Colors	257
Convulsions of Nature	265	*Professor Morse	258
Counterbalancing Gang Saws	261	Ramie	259
Cupro Ammonium	256	Railroad Time	262
Curied Soap Root	262	Recent American and Foreign Patents	266
Death of Erastus Corning	264	Resurrent Vision	257
Declined	266	Reliable Recipes	261
Detection of Ammonia	262	Schobaric Court House	260
Drying by the Direct Application of Heat—Distillation	263	Scientific and Practical Information	259
Electricity at Niagara Falls	256	Spark Arrester	261
Electric Lights in Light Houses	257	Steam on the Erie Canal	264
*Endless Traveling or Railway Sidewalk	255	Steam Propulsion of the Canals	260
Ether Glue	256	stenographic Machine	258
Exhaust of Slide Valve Engines	261	Tanite	259
*Fireman's and Builder's Elevator	262	The Advance in the Price of Iron	264
*Frictional Gearing—No. 3	259	The Crystallization of Metals	256
Grass Cloth	265	The Dandelion or Taraxacum	262
Important Trade Mark Decision	257	The Electro-Magnetic Telegraph	257
*Improved Shampooing Apparatus	262	The Relation of Science to Religion	263
*Improved Whiffletree	262	The Right Kind of Windmill	261
Inventions Patented in England by Americans	267	The Woolwich Infants	256
		Tunnel at Genoa	257

DRYING BY THE DIRECT APPLICATION OF HEAT-DISTILLATION.

The drying of substances by the direct action of heat, the separation of solid substances from the water they contain, and the separation of fluids by virtue of the different temperatures at which they are converted into vapor, comprise some of the most important operations in the industrial arts. The manufacture of alcohol, turpentine, the separation of petroleum oils, and many chemical processes depend more or less upon the principle of distillation.

Solid substances that are uninjured by the action of heat may have their moisture expelled by heating them directly, or without the intervention of conveyers of heat like air or steam. The heat required in this process is, in surface drying and exclusive of waste, just that required to convert the adhering fluid into vapor. In distillation, unless the apparatus be properly constructed, a very large portion of the heat employed will be wasted. This may be illustrated by the attempt to distil off water from a long necked glass flask, the heat being applied at the bottom. The water will be converted into steam and, rising, will condense in the neck of the flask and trickle down the sides, only a small percentage of the steam passing out from the mouth of the flask.

Now if in trickling down the sides, the fluid should arrive at a ledge or trough, so to speak, which would arrest its flow downward and conduct it to a pipe or tube leading out of the flask, the water would be conveyed away, and would not require the repeated addition of heat to expel it. This redistillation is, however, useful in some processes, and so some stills are constructed with a view to encourage the action described rather than retard it.

The process of distillation may be applied to remove useless fluids from substances which are valuable, or to extract from a worthless substance a valuable fluid, as brandy from fermented grape pomace, etc. It is often employed to separate substances from each other, none of which are worthless. This is the case in the manufacture of petroleum oils.

Crude petroleum is a mixture of a great number of fluids of widely different specific gravities and boiling points. If the mixture be exposed, in a still, to the constant temperature at which the most volatile of its constituents distils over, this lightest hydrocarbon will be separated from the others. Then if the heat be raised and maintained steadily at another temperature, another hydrocarbon distils over, and so on, the successive operations constituting what is called fractional distillation.

The proof of alcohol is raised by repeated distillation, the alcohol boiling at 180° and water at 212°; a portion of the latter distils over with the alcohol, a less percentage remaining at the end of each distillation: till a certain limit is reached, at which the attraction of the alcohol for the remainder of the water is so great that heat will not separate them.

Both chemical and mechanical action may be employed in connection with the direct action of heat for the drying of single, or the separation of mixed, substances, but as we propose to discuss these methods in future articles, we will not touch upon them further at present.

It is as proper to speak of drying a liquid or a gas as a solid. The chemist sees no distinction between these operations, except that of detail. Yet it is obvious that when a liquid does not unite or mingle with water, it can be wet only on one surface. It will float like oil, in which case only its lower surface is moistened, or sink like mercury, the water stratum rising to the surface. In such cases the application of heat is not the best way to perform the separation, decantation being much quicker and more economical.

There is also a very wide difference in the attraction of substances for water. Thus solutions of potash, which yield a portion of their water under the action of heat, finally reach a point of concentration beyond which no further loss of water will take place, no matter how high the heat may be carried. In such cases, the remaining water generally chemically combines with the substances under consideration, forming what chemists style hydrates. Sulphuric acid is another example of this class of substances. It can be concentrated to a given point by heat, but beyond this no further evaporation of the water takes place without a proportional evaporation of the acid.

There are also certain substances which, having the same or very nearly the same boiling points, cannot be separated by distillation.

The construction of stills for different purposes greatly varies, and we cannot well discuss it in this place. Those interested in pursuing the subject can find information in Moffitt's Chemical Manipulations, Ure's Dictionary of Arts and Manufactures, Dussauce's Treatise on the Manufacture of Vinegar, and Duplais on Alcoholic Liquors, in one or other of which works the processes of distillation, as conducted in different industries, may be found.

THE RELATION OF SCIENCE TO RELIGION.

In America, where the law of primogeniture does not exist, and the office of President is open to the aspiration of any adult citizen who may be politically shrewd or militarily lucky enough to obtain it, we do not esteem birth and ancestry as much as do people who reside in Europe. We judge men more on what they are than upon what their ancestors were. We would not care much if it should be proved that, some million of ages ago, our ancestors were apes, as Professor Rudolf Virchow* and others would have us believe. Those distant relatives are no doubt entitled to our respect, but it is not to be supposed that the account of them, given to us by Darwin, Wallace, and others of that school, should inspire us with rapturous affection. Neither are we thereby induced to own the members of the simian race, who occupy sumptuous apartments in Central Park, as men and brethren. To have sprung from this apparently ancient line does not seem to humiliate Professor Virchow. On the contrary, he prides himself on it.

"Morally speaking," he says, "it assuredly affords a higher satisfaction to think that man has raised himself, out of that state of rudeness, ignorance, and bondage, to one of morality, knowledge, and freedom, than to imagine that by his own fault he has fallen from a condition of Godlike perfection into one of meanness, pollution, and sin, to redeem him out of which his own strength is insufficient."

This passage, which occurs near the close of Professor Virchow's essay, gives a clear insight into the theological attitude of the author's mind, which is far from orthodox. In this age, however, heterodoxy is not as horrifying as it was once, when to doubt a religious dogma was to be doomed to social ostracism, if not to active persecution. Besides, at present many eminent scientific men are advocating similar views to those of Professor Virchow, and share his heterodox opinions. It is quite impossible, therefore, to disregard, if we were so inclined, this modern scientific skepticism, which meets us almost everywhere in scientific discussions.

Müller teaches us that the mythology or religion of the ancients was an attempt to express ideas and conceptions of things which were to them mysterious and inexplicable in the state of knowledge which then prevailed. Geologists affirm that the Mosaic account of the creation of the world must be either taken in an allegorical sense, or rejected. Huxley holds views decidedly antagonistic to what is generally called revealed religion. Darwin and his school endeavor to explain existence by the development theory, and so on to the end of the chapter. We repeat that it is impossible to avoid meeting this phase of scientific discussion, and as the essay of Professor Virchow affords an excellent sample of the reasoning which gives such skepticism birth, we propose to base upon it some general remarks.

All scientists have agreed that what can neither be demonstrated as a fact, nor logically inferred from facts, has no place in science. Reasoning by analogy can therefore have a comparatively limited sphere in science. For although well determined analogies are facts, the chances are ten to one that a supposed analogy will, when critically examined, turn out to be only a *pseudo* resemblance.

What we charge against the teachers of this school is that, while their development theory is purely a system of analogical reasoning, they do not declare that this or that conclusion is *probably* correct, but assert it as fact, and as dogmatically as the most ultra and fanatical religionists, whose bigotry they denounce. Thus Huxley, in his address on protoplasm, asserts as positively that in this substance we have the ultimate physical basis of life, and that protoplasm has its origin in the chemical combination of carbon, hydrogen, oxygen, and nitrogen in the presence of living protoplasm. The whole tone of his address, though he did not say as much in words, was a sort of triumphant self congratulation that there was no need of supposing a special creator, since chemical affinity was the general cause of animated existence. Is then chemical affinity the cause uncaused? Have we yet, or shall we ever arrive at the cause uncaused? Does the development theory, the knowledge of protoplasm, help us in recognizing the first of all causes? Would even spontaneous generation, if proved to take place, as many have sought to prove, reveal a cause behind which we can affirm no other cause can stand? From the very nature of the case, we can answer these questions in the negative.

So long, then, as mysteries exist, and this will always be the case, man will by faith stretch out his hands toward the hidden realm, and hope that in that realm there may be something, to satisfy the aspirations of his soul, brighter and better than what he has found through all his gropings. And this faith will form the basis of some kind of religion. The majority of men may perhaps be taught to believe that the human race sprang from apes, but so believing, and seeing the enormous distance they have progressed from the condition of those animals, they will hardly set limits to progress, and will be little convinced that all opportunity for individual advance is limited to the few toilsome years which form the average term of human life.

The skepticism of the present day is based upon as blind a faith as the belief of the orthodox. But we do not care to quarrel with this faith, or with conclusions derived from pure speculation, any more than we would quarrel with faith in revealed religion. The question of religious belief is one which has no place in scientific discussion. All scientists admit this, yet there are many who omit no opportunity to give sly and sarcastic thrusts at the belief held by many wise and good men, which, forming the very character of the men who entertain it, is deserving of respect rather than ridicule, not to speak of its intrinsic claims to the acceptance of intelligent minds. Professor Huxley has been particularly obnoxious in this way, and has thereby greatly limited his influence as a public teacher.

It may be replied that as the religionists attack the scientists, the latter must make some reply in self defence. We do not see the necessity. It is the business of science to discover, record, and classify facts. Whether these facts conflict with or confirm the religious faith of any, does not concern in the least the scientific investigator. If he discovers that the ancestors of mankind were apes, it is his duty to announce his real or supposed discovery; it is not his province to turn upon those who have held a different view and hold them up to scorn or ridicule because they believe they sprang from a higher source, and repudiate their anthropoid ape ancestors. If religion be false, it needs no direct attacks to kill it. If the discoveries of science be facts, they will outlive all false notions and superstitions. Science and religion should not be directly antagonized, for, besides that this is needless, neither one nor the other is benefited by such controversies.

All this we can say, while we own to a decided leaning toward the evolution theory. It seems more consistent with the way in which an All-wise Being would work, that through eternal and immutable laws He should evolve the varied complex structures which people the universe, than that each should be the result of a special act of creation. In this we see nothing that conflicts with such an interpretation of the Mosaic account as would harmonize with the now very generally conceded allegorical and poetical character of that portion of the Bible.

*Half-Hour Recreations in Popular Science, No. 2. The Cranial Affinities of Man and the Ape. By Professor Rudolf Virchow, Author of Cellular Pathology, etc. Boston: Lee & Shepard. New York: Lee, Shepard & Dillingham.

PISTON ROD PACKING.

It is probable that, on the whole, with engines of plain construction, no part is more frequently out of order and gives more annoyance than the packing of the piston rod. The hemp gasket, when properly made, serves a good purpose, but its usefulness is limited. The gland requires frequent tightening; and, after a time, a peculiar change in the character of the material takes place, where high pressure steam is used, resulting in loss of elasticity and final worthlessness.

A vast deal of study and ingenuity have been applied to the removal of this annoyance, and the production of an unobjectionable piston rod packing. Wire packing has been patented. Copper wire gauze has been employed to pretty good purpose, though with not wholly satisfactory results. Combinations of various materials such as cotton, rubber, etc. have been tried without much success. There is still a general want of a permanent and reliable piston rod packing. The latest substance successfully employed in this country for this purpose is, we believe, asbestos, sometimes called mineral flax. Asbestos consists of silicates of magnesia and lime, generally with protoxide of iron and manganese. This substance is pliable when massed together, and is absorbent of oil, unchangeable under the action of even very high temperatures, can be wrought into gaskets like flax or hemp, and seems well adapted to supply the want named. It exists in large quantities, and can be cheaply put in market, in quantity and quality suited to the purpose.

Mr. St. John Vincent Day, C. E., recently read a very instructive and suggestive paper* on packing piston rods with asbestos, before the Institution of Engineers and Shipbuilders in Scotland, in which he states that asbestos has now been employed in that country with results justifying its further trial. He exhibited examples of asbestos packing, one of which had been used three months on an American locomotive with steam at 130 lbs., the locomotive making an average run of 150 miles per day, the packing being apparently as flexible and tenacious as when first employed.

Another example was shown, taken from the locomotive employed to draw the fastest train on the Caledonian line; and it was stated that the best ordinary packing lasted, with constant screwing up, only two months at most, rarely so long. The packing shown had been in use three weeks, during which the engine had run 2,000 miles, while the gland screws had never been once touched. The packing was as good as when put in.

An asbestos packing put into the stuffing box of a passenger

*See page 113 of the current volume of the SCIENTIFIC AMERICAN.

engine was stated to have lasted during a service of 14,070 miles. This was a coiled packing, and, at the end of the service named, the gland had been screwed so nearly home as to require the addition of another coil.

These facts, in connection with what we personally know of this packing, lead us to believe that a much more extensive use of asbestos packing might profitably be made. But there are other substances that might, we think, prove adapted to this purpose.

Common hard soap forms an impervious durable packing for stems and spindles in gas meters, gaslight machines employing light hydrocarbon, etc. It is possible that some of the insoluble soaps, the bases of which are the oxides of lead, calcium, magnesium, aluminum, etc., might be found sufficiently indestructible under the action of lead to afford a good packing, at least for low pressure engines. Some or all of these soaps might easily be made the subject of experiment for this purpose, and we think there is at least a probability that one or more of them would prove available either singly or as the basis of a mixture or compound. Neither steam nor oil would dissolve some of these soaps, and the only destructive action that could take place would be their possible fusion or decomposition at high temperatures.

THE ADVANCE IN THE PRICE OF IRON.

An advance of ten dollars per tun on manufactured iron, and fifteen dollars per tun on pigs, during the short space of three months, at a time when no special event has occurred to which such a rise can be directly attributed, is a noteworthy fact calculated to cause the manufacturing and commercial public to do for themselves a little hard thinking. In such an emergency, when large enterprises are retarded through the increased cost of an indispensable material, the elaborate essays of theorists and the harangues of partisan speech makers will do little to allay the anxiety caused by the check, in many kinds of business, this advance has made and is yet likely to make. The old wordy warfare between protectionists and free traders will rage with renewed vigor, but the people are at present in want of something besides words; they want cheap iron.

It has been the avowed purpose of protectionists to keep American labor from being reduced, in the respect of wages, to the level of European labor. A large share of those called protectionists have, like ourselves, conceded the justice and wisdom of this policy, limiting its action to those industries in which our natural advantages are equal to those possessed by other countries. No legislation can place coal and iron closely in proximity, so as to render possible cheap iron. Legislation may, however, place American manufactures on a par with foreign producers so far as the item of labor is concerned. To step beyond this limit is to create monopolies and to enrich manufacturers at the expense of the public.

It would seem, through the combined effect of their own efforts and the logic of events, that foreign labor is fast appreciating in value. This, together with the increased general demand for iron in Europe, has affected the iron market throughout the world. Importations have fallen off, and home manufacturers, doubtless in anticipation of further advance, are refusing to make contracts at fixed prices for further fulfilment. It is stated that most manufacturers are running their establishments chiefly on orders as received.

Another equalizing effect upon labor is produced by the unusually high price of pig iron as compared with that of manufactured iron; the skilled labor requisite to produce the latter is therefore correspondingly at a discount.

It has been truly said the great want of the age is cheap iron. This being the case, the general reader will at once comprehend how disastrously this upward tendency of the iron market affects most manufacturing interests, how it specially retards the progress of railroad building, and thus affects the entire business of the country, to a greater or less extent according to the relation various industries bear to the development of the new resources which the roads now in progress and those projected are intended to open up.

Happily, this state of things cannot long continue. With our inexhaustible stores of ore and coal, we can produce our own iron in any quantity required to meet the home demand; and capitalists will not be slow to see the opportunities, for profitable investment, the iron manufacture is likely to offer. We may therefore expect active competition, and a final return to former prices, with a large and permanent increase of home manufacture.

STEAM ON THE ERIE CANAL.

The reward of one hundred thousand dollars offered last year by the State of New York for the best plan for a motor for canal boats still remains open, no person having as yet brought forward a boat that satisfies the Commissioners. In a recent report to the Legislature, these officials state that the almost universal impression among inventors is that the important point to be overcome is the prevention of the wash of the banks of the canal. But this impression is wrong. There is no danger to the canal banks, as the boats are only required to run three miles an hour. What is wanted is a plan by which the boats may be towed or propelled more cheaply than by animal power.

In order to set the matter straight, the Commissioners have adopted the following resolution:—

Resolved, That the experiments, heretofore made in navigating the canals by freight boats propelled by steam, have not been failures by reason of injury done the banks of the canals by the swell caused either by the motion of the boat or the wheels through the water; and that, in the judgment of this Commission, there is no practical difficulty, in navigating the canals by boats carrying 200 tuns of cargo at the rate of three miles per hour, that arises from "injury to the canals or their structures." The main difficulty to be overcome is to establish the economy of steam or other motor as compared with animal power.

The Commissioners state that inventors in nearly all the States of the Union, in the Canadas, in England, Scotland, Wales, Holland, South America, southern Africa, and in short nearly every part of the world, have written letters of inquiry to various members of the Commission and to its engineer and secretary. About 700 communications in all have been received and been replied to, giving, as far as practicable, the information sought. Various models and drawings have been sent to the Commission, and among them several the productions of women.

Among the plans presented are many ingenious and elaborate devices accompanied with carefully prepared drawings, while very many of them are evidently the result of immature or inexperienced study, and in some instances the propositions are, to all but the inventors, absurd. A vast number of methods of applying motive power have been presented, from plans that were decided useless years ago, to the introduction of the modern narrow gage railway on the banks of the canals.

As evincing the general character of a large proportion of the plans presented, the following may be mentioned: Plans to propel the boats by large screws or wheels, placed on deck and designed to act upon the air. The use of automatic poles attached to the sides or stern of the boat, or a wheel with long arms placed in a well in the center of the boat, to act on the bottom of the canal. A variety of tracks laid on the bottom of the canal, on which the boats are to be moved. Elevated and submerged cables and cables attached to the banks. A plan called by the inventor the "Siphonic system." The power to be derived from water supplied by a trough to be elevated above the canal and to extend its entire length, which is passed through a syphon, the short leg of which to be inserted in the trough, and the long leg to pass through the stern of the boat. A fly wheel passed over the stern of the boat and designed to receive and store up power, to be exerted by the crew during their leisure from other duties, and to deliver it again through the medium of a screw propeller connected with it by proper gears, and many others of a like character.

The anxiety of the inventors to secure the money offered by the State is such that a large number of devices, we are informed, are now in the course of construction, and there is every reason to expect that, during the coming season, many more boats will attempt the trial trips required by the Commission. Some of the inventors express great confidence in success, while others insist that the law should be amended in such a way as to be more favorable to their particular schemes.

The Commission does not advise any change in the law of the kind desired by such persons as think its objects cannot be secured as it now stands and is construed by the Attorney General; on the contrary, they think all the things now required by the law should be insisted upon being complied with before the money should be awarded.

All the time allowed by the law will be given to the competitors, but the Commission will adhere to the determination, expressed at its first meeting, that boats in actual service, and not drawings or models, will be considered as competing for the money offered by the State.

We last week published illustrations of Goodwin's method of canal propulsion, which we understand is to be tried practically during the present season. It is one of the most promising of any of the plans that have been devised.

BEET SUGAR IN THE UNITED STATES.

Believing as we do that the production of beet sugar is destined to become one of the important industries of this continent, we regard any facts which tend to hasten this result as of importance. Through much ignorance, timidity, and consequent failure, we are, by the efforts of persevering and hopeful men, gradually groping to the light in this matter. The conditions, for the successful growth of good beet crops on the different varieties of soil contained within our borders, are gradually becoming understood; and, after all, this is perhaps the greatest essential of success. Given good crops of beets rich in sugar, and the profitable extraction of the sugar will certainly follow in time.

We have perused, with much interest, the report of Professor Charles A. Goessman, Ph.D., on sugar beets raised upon the farm of the Massachusetts Agricultural College, published in the ninth general report, of the trustees of that institution, to the Governor and Council of Massachusetts, in January of the present year, which contains facts which we propose to make the basis of a few remarks.

An experiment was made on the college farm with 4·7 acres of land, prepared in the best manner possible for the reception of beet seed. Owing to the want of a suitable drill for sowing the seed, the rows were made two and one half feet apart, instead of from eighteen to twenty inches apart, as should have been the case, thus leaving considerable waste land. The seed drill also worked imperfectly, leaving blank spaces in some of the rows. Still, under these unfavorable circumstances, the root crop averaged 22,200 pounds to the acre.

Seeds of the following varieties of beets were planted, namely: Vilmorin of 1869, Imperial of 1869, ditto of 1870, Electoral of 1870, Vienna Globe of 1869, varieties of mangold of 1870. The Imperial sugar beet crop—seed of 1870—gave 12·59 per cent of sugar; Vilmorin, 12·95 per cent; Electoral, 12·30 per cent; Vienna red, white, and yellow globe beets, 8·904 per cent; ordinary mangolds, 5·035. These results were obtained by analysis, and not in the regular process of manufacture.

A computation, made with these results as a basis, shows a handsome margin of clear profit obtainable on the assumption that the extracting process would be economically and skillfully conducted.

In concluding his report, Professor Goessman touches upon a vital point relative to the profitable extension of the beet sugar manufacture in the United States. It has been argued, against the introduction of this manufacture, that the difference in the price of American and European labor forbids the hope of our competing with foreign producers. This argument is so ably met by Professor Goessman, that we quote a portion of his remarks upon it:

"Although duly recognizing the great weight of this point for with the farmer rests the success of the enterprise in the end, I believe that its influence as an obstacle is frequently overrated and based on somewhat obsolete assumptions. The government tax of from $40 to $50 per acre of sugar beets, in Germany and France, as well as our higher prices of sugar, will go far towards covering our most expensive labor. The interests of the Louisiana sugar planters and the sugar beet cultivators of more northern sections of the country are the same, as far as a proper protection of their industry is concerned; and the public opinion, in view of the requirements of the government, is apparently prepared to accord to them, for some time at least, this advantage. Great improvements in agricultural implements and in modes of securing the juice have reduced labor by hand to a considerable extent. A short enumeration of the most conspicuous instances may place this statement in its proper light. Various seeding machines, improvements more or less on Garrett's famous seed drill, are used in planting the seed, in four or more rows at once, and at any desired distances from twelve to twenty inches apart. According to the size of the machine, one or two men, with one or two horses or oxen, may seed from eight to sixteen acres per day; the same implement can also be modified by replacing the seed boxes with suitable knives to be used as cultivators, to clean the space between the rows of plants, and to cover the roots. Ploughs with two knives are used to break up the soil on both sides of the rows of beets, to loosen the latter in such a manner, without lacerating them, that children may do the harvesting of the roots. In fact, the whole work in the field, after the soil is once properly broken up, calls for no extraordinary labor. A good deal of the work can be done by boys. Machines do the washing, the grinding or cutting, and general handling of the roots to the centrifugal apparatus. The task of handling the pulp of beet roots for the press requires, comparatively speaking, a large supply of hands to do the business connected with that process, but Roberts' diffusion method dispenses with a large number of the hands formerly required in the press room—nearly one half."

In further support of his position, the author cites the introduction of the Roberts diffusion process, which though it reduced the expenses for labor in the press room one half; but this reduction only made one sixth of the extra earnings of the manufacturer. It is thus seen to what an extent the success of this industry depends upon the skillful culture of the roots; and though skill is undoubtedly requisite in all the subsequent processes of extraction and manufacture of the sugar, it appears plain that, with increasing knowledge, we shall be able ultimately to establish this department of agriculture and manufacture on a sound and permanent basis.

Death of Erastus Corning.

Mr. Erastus Corning, who for more than sixty years has been one of the most active business men of New York State, died on the evening of Monday, April 8th, at his house in Albany. He was born at Norwich, Conn., on December 14, 1794, and was therefore in the seventy-eighth year of his age. His commercial life commenced in a hardware store, and being shrewd and persevering, he soon became the proprietor of the concern. After some years of continued prosperity, he bought 250 acres of land near Albany, and became one of the most advanced agriculturists of his day. He was, moreover, an active politician, and was rewarded therefor by the confidence of his fellow citizens, he having held several important offices. The railroads of New York State owe much to his enterprise and ability, he having been a director of many of them, and, for some time, president of the leading one, the New York Central.

Of late years, Mr. Corning was chiefly known in connection with the iron manufacture, his fortune being largely invested in iron and steel works at Albany and Troy. He lived to see the growth from the beginning of this important industry in America, and had the satisfaction of knowing that he contributed much to its development. He leaves for his heirs a fortune of some five million dollars of his own acquiring.

Don't Use Galvanized Iron Pipes.

We have, on several occasions, called the attention of our readers to the danger which arises from the use of galvanized or zinc covered iron pipes for conducting water for household purposes. Such pipes render the water poisonous, sickness and death being the result. In a recent case at Portsmouth, N. H., where a family of four persons were made ill by the drinking of water supplied through galvanized iron pipes, Dr. Jackson examined the water, and found it to contain six grains of oxide of zinc to the gallon.

THE Goodyear hard rubber patent expires May 6, 1872. The Goodyear soft rubber patent expired sometime ago.

Grass Cloth.

Grass cloth is manufactured from the fibers of a plant called by the Chinese *Ma;* it is a generic term, under which several varieties of that species are included. It is a *canna bis*, or hemp.

It has an irregular cellular root of a yellowish white color, which sends up annually ten, fifteen or more stems, to the hight of from 7 to 10 feet. The stems are upright, slightly fluted, pilous and herbaceous; its leaves are on long petioles, alternate, ovate, roundish, serrate, simple. The upper surface pilous and dark green, the lower of a silver gray. The flowers are described as minute, numerous, of a light green color, on a catskin-like receptacle or spike. It is found at the base of hills and on dry soils, from Cochin-China to the Yellow river, and from Chusan to the farthest west that researches for the present can extend, and abounds chiefly in Kiang-su, Kiang-nau, Chih-kiang, Fuh-kiang, and the Canton provinces.

The plant is mentioned in the Chinese classics, and was undoubtedly cultivated and employed by them a thousand years prior to our era.

The plant yields three crops every year. The first cutting takes place in June. On being cut, the leaves are carefully taken off with a bamboo knife by women and children, generally on the spot. It is then taken to the house and soaked in water for an hour, unless it is already wet by recent showers. In cold weather, the water should be tepid. After this the plant is broken in the middle, by which the fibrous portion is loosened and raised from the stalk; into the interstice thus made, the operator, generally a woman or child, thrusts the finger nails and separates the fibers from the center to one extremity and then to the other. The stripping process is very easy.

A partial bleaching is effected on the fibers before they undergo further division, sometimes by boiling and at other times by pounding on a plank with a mallet. These operations are in some places repeated. After being dried in the sun, an important operation then proceeds by women and children, to whom is entrusted the tedious process of splitting the fibers, which they do with their finger nails. Expert hands are able to carry this division very far. When this process has been preceded by hatcheling, the threads are finer and softer. The threads are formed into balls and subjected to frequent soakings and washings. The ashes of the mulberry leaf are recommended to be put in the water with the hemp (some use lime) for a whole night. Others simply expose it to dew and sun. In rainy and cloudy weather, it should be exposed to a current of air in the house; moisture darkens it. The threads are now ready for splicing—the work of women and children, the labor of the agriculturist being concluded—when the threads are rolled into balls after being sized or stiffened with congee. Before the thread is ready for the weaver, the balls are steamed over boiling water in a closed oven. They are then spread out to dry.

Grass cloth is superior to linen for garments in hot climates; the latter, being a rapid conductor of caloric, is often unsafe; the former is not so good a conductor and is therefore more suitable. This may be owing to the fact that the latter is hotpressed, by which it is rendered compact and smooth, while the process to which the other is subjected for the same purpose but partially affects it, or there are original differences in the fibers of European and Chinese linen.

Convulsions of Nature.

A tornado on its windy way struck the earth at St. Louis recently, demolished one large building, demoralized several others, caused the loss of one life and the serious personal hurt of several persons, and then bounded up into the air and has been heard of no more, though the St. Louis people surmised that Illinois might be struck by the same hurricane. This was a strange storm, and was organized on novel principles. It is one of a class not uncommon in the West, though rare in the cold season. But the whole winter has been prolific in meteorological wonders. Snowstorms of intense severity in the Rocky Mountains, winds of fierce and cruel coldness in Iowa and Minnesota, steady cold in the East, little rain and snow over large portions of the North, and frequent snow falls in the States below the Potomac—these are some of the peculiarities of a season which will be long remembered for its eccentricity.

Now, too, we have an account of a terrible earthquake in Southern California. Three hundred shocks were felt in the space of three or four hours. The first shock destroyed the small town of Lone Pine, and buried its inhabitants in the ruins of their low adobe huts. Thirty persons were killed and three hundred wounded. The earth was cracked and torn up, and a volcano is reported. The water in Owen's Lake was raised four feet, and Owen's river overran its banks. The district visited is volcanic, and so far removed from the more populous and better known portions of the State that no fear is apprehended of seismic commotions at San Francisco.—*Commercial Advertiser.*

WEBSTER'S spelling book has been on sale for the past ninety years, and more than fifty millions of copies have been sold. During a period of twenty years, the author received a royalty of less than one cent per copy; but his nett income from the sales was sufficient to support his family while he prepared his greater work, "Webster's Dictionary."

COMMODORE BROWN, Chief of the Virginia Oyster Police force, expresses the opinion that the whole Chesapeake may be made an oyster bed by a judicious policy. The water is nowhere too deep for the oyster to live and flourish.

Examples for the Ladies.

Mrs. T. M. Scullin, Troy, N. Y., has used her "dear friend," a Wheeler & Wilson Machine, since 1858, in dress and cloak making. The last six months she earned $332, and the year before, $417.

Mrs. Mary Hacher, Muscatine, Iowa, has used her Wheeler & Wilson Machine since September, 1857, and earned from $10 to $20 a week, making dresses and cloaks, from the finest to the heaviest, and her machine is now in as good order as when she bought it.

Mrs. C. D. Goodman, Cleveland, Ohio, has used her Wheeler & Wilson Machine 4½ years with the same No. 2 needle that came in it without breaking or blunting it.

Mrs. J. R. Bowen, Wellsboro, Pa., has used her Wheeler & Wilson Machine almost constantly since 1859 on all kinds of material, without any repairs or personal instruction.

The Public have for years endorsed *Burnett's Cocoaine* as an unrivaled hair dressing.

Watch No. 12003, Stem Winder—bearing Trade Mark "United States Watch Co., Marion, N. J."—manufactured by the United States Watch Co. (Giles, Wales & Co.,) has been carried by me two months; its total variation from mean time being six seconds in the entire time.—W. S. DUNN of H. B. Claflin & Co., New York.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4 00 a year. Advertisements 17c. a line.

Millstone Dressing Diamond Machine—Simple, effective, durable. For description of the above see Scientific American, Nov. 27th 1869. Also, Glazier's Diamonds John Dickinson, 64 Nassau st., N. Y.

Over 800 different style Pumps for Tanners, Paper Makers, Fire Purposes, etc. Send for Catalogue. Rumsey & Co., Seneca Falls, N. Y.

Portable Mulay Saw Mill, that may be run profitably by the power of a Thrashing Engine. Manufactured by Chandler & Taylor, Indianapolis, Ind. Send for circular.

For Diamond Turning Tools for Truing Emery Wheels and Grindstones, address Sullivan Machine Co., Claremont, N. Hamp.

Billiard Cushions—Manufacturers of Billiard Tables, use Murphy's Patent Cushions. The finest made. Send for sample set. Gutta Percha and Rubber Manufacturing Company, 9 & 11 Park Place, New York.

If you want a perfect motor, buy the Baxter Steam Engine.

For the best and cheapest Water Wheel Regulator "in all creation," address Sullivan Machine Co., Claremont, N. H.

We will Remove and Prevent Scale in any Steam Boiler or make no charge. Geo. W. Lord, 232 Arch Street, Philadelphia, Pa.

Painters, attention—New Pat. Quick, Clean, Easy, and Cheap Way of Graining, first class Imitations of Oak, Walnut, Rosewood, etc. Send Stamp for Circular. J. J. Callow, Cleveland, Ohio.

Right, for Sale, of a valuable improvement in Sad Irons. Address, H. W. Seaman, Millport, N. Y.

Williamson's Road Steamer and Steam Plow, with Rubber Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1809.

Improved Foot Lathes, Hand Planers, etc. Many a reader of this paper has one of them. Selling in all parts of the country, Canada, Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

Drawings and tracings made of Machinery, Models, etc. C. Delafield, C. E., 26 Broad Street, New York.

The Baxter Steam Engine is safe, and pays no extra Insurance.

We have a soft white rock, entirely free from grit of any kind. I wish to know the most feasible plan of cutting, dressing, and preparing for market. It is easily cut with any kind of saw, and will polish easily. Please give me reliable information as to the best tools used—how used, where made, and also if there is any planer or dresser for finishing the same. My engine is twenty horse power. W. S. Almond, Sherman, Texas.

Wanted—Peck's Patent Lifter, medium size, second hand, in good order, at reasonable price. Kittredge, Clark & Co., M'fr's Sheet Metal Architectural work, Salem, Ohio.

For Circulars of Miter Dovetailing Machines, with or without the Angular Attachment, patented Nov. 28, 1871, address, for price and particulars, Asahel Davis, Lowell, Mass.

Tested Machinery Oils—Kelley's Patent Sperm Oil, $1 gallon; Engine Oil, 75 cts.; Filtered Rock Lubricating Oil, 75 cts. Send for certificates. 116 Maiden Lane, New York.

Kelley's Chemical Metallic Paints, $1, $1·50, $2 per gallon, mixed ready for use. Send for cards of colors, &c., 116 Maiden Lane, N. Y.

Kelley's Pat. Petroleum Linseed Oil, 50c. gal., 116 Maiden Lane.

For the best Recording Steam and Indicating Gauges, address The Recording Steam Gauge Co., 91 Liberty Street, New York.

Patent Steel Measuring Tapes, manufactured by W. H. Paine (send for Circular), Greenpoint, N. Y.

Hoisting and Pumping Engines (Locomotive principle); best and simplest, from 6 to 40 H. P. J. S. Mundy, 7 R. R. Av., Newark, N. J.

Cutlery Grindstones, equal to the best foreign, made by Worthington & Sons, North Amherst, Ohio.

Farmer's Grindstones, $4.00 to $8.00—J. E. Mitchell, Phila., Pa.

Wanted—The best machine in the market for making Boiler Rivets. Address, giving full particulars, P. O. Box 169, Milton, Pa.

Mowing Machine Grinders, new plan—Mitchell, Phila., Pa.

Wanted, Cuts of Stave and Heading Machine by horse power. J. B. Moorcroft, Thebes, Alix Co., Ill.

Wanted—A Partner in a well established Machine Shop—with from $3,000 to $7,000. Must be a practical man, and capable of taking charge of the manufacturing. Address John Dane, Jr., 95 Liberty St., N. Y.

Patent Sheet Iron Roofing, Fire, Water, Wind and Rust Proof. No Nails, Screws, or Solder used. C. A. Scott, Patentee, Cincinnati, Ohio.

Saw Maker Wanted—A good mechanic who will take an interest preferred. Splendid opportunity. Address John Ritter & Co., Cin., O.

The most economical Engine, from 2 to 10 H.P., is the Baxter.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N. Y.

In the Wakefield Earth Closet are combined Health, Cleanliness and Comfort. Send to 26 Dey St., New York, for descriptive pamphlet.

To Ascertain where there will be a demand for new Machinery, mechanics, or manufacturers' supplies, see Manufacturing News of United States in Boston Commercial Bulletin. Terms $4.00 a year.

Our Home Physician. By Dr. Beard and other eminent Physicians. Is the latest and best Family Guide. 1067 pages. $5. E. B. Treat, Pub., 805 Broadway, New York. Agents wanted.

If you want to know all about the Baxter Engine, address Wm. D. Russell, office of the Baxter Steam Engine Co., 18 Park Place, N. Y.

Shive's Patent Watchman's Clock and Time Detector—the best ever made. Price $15. Shive Governor Company, Philadelphia, Pa.

Save your Boilers and Save Fuel—Use Thomas's Scale Dissolver, pr. 5c. per lb., in bbls. and ½ bbls. N. Spencer Thomas, Elmira, N. Y.

Enameled and Tinned Hollow-Ware and job work of all kinds. Warranted to give satisfaction, by A. G. Patton, Troy, N. Y.

Best and Cheapest—The Jones Scale Works, Binghamton, N. Y.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

Derricks built by R. H. Allen & Co., New York and Brooklyn.

Pattern Molding Letters (metallic), to letter or number the patterns of castings. All sizes. H. W. Knight, Seneca Falls, N. Y.

Peck's Patent Drop Press. For circulars address the sole manufacturers, Milo, Peck & Co., New Haven, Ct.

Power Punching and Shearing Machines. For car builders, smith shops, rail mills, boiler makers, etc. Greenleaf Machine Works, Indianapolis, Ind.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Belting as is Belting—Best Philadelphia Oak Tanned. C. W. Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

Boynton's Lightning Saws. The genuine $500 challenge. Will cut five times as fast as an ax. A 6 foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

Over 1,000 Tanners, Paper-makers, Contractors, &c., use the Pumps of Heald, Sisco & Co. See advertisement.

L. & J. W. Feuchtwanger, 55 Cedar St., New York, Manufacturers of Silicates, Soda and Potash, Soluble Glass, Importers of Chemicals and Drugs for Manufacturers' use.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro., 414 Water st., N. Y.

Presses, Dies & all can tools. Ferracute Mch Wks, Bridgeton, N. J.

Hydraulic Jacks and Presses, New or Second Hand, Bought and sold, send for circular to E. Lyon, 470 Grand Street, New York.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

Notes & Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—REVOLVING SHAFT.—Is there a point in a revolving shaft that does not move?—C. C. H.

2.—BATTERY POWER FOR SUBMARINE CABLES.—What battery power is used on the Atlantic cables, and how little will work them?—S. B. P.

3.—DURABLE WHITEWASH.—What will render whitewash as durable as paint? Will sugar of lead do it? White zinc and barytes cause it to wash off.—E. C. W.

4.—POLISHING SHELL.—Will some one be kind enough to inform me the best way to obtain a fine polish on shell combs and eyeglasses?—H. E. R.

5.—CONDUCTING POWER OF SILVER WIRE.—Can you inform me which is the best conductor of electricity, hard drawn or annealed silver wire?—G. F. G.

6.—FINISHING FURNITURE.—Will some of your correspondents inform us of the cheapest and best method of staining and finishing common bedsteads?—A. & M.

7.—LAMP CEMENT.—I would like to know if there is anything that I can use to soften the material used to fasten on the tops of kerosene lamps, so that the tops can be easily removed?—T. S.

8.—ASBESTOS PACKING.—Will some one, of the host of engineers who read your journal, inform me of the method of using asbestos packing on piston and valve rods? Can the powdered asbestos be used for packing?—D. A. N.

9.—PACKING RINGS.—Should cylinder packing rings have the recess for Babbitt's metal turned out, or should a place be left solid through which to cut them? Also what is the proper thickness of rings for a 14 inch cylinder?—S. S. I.

10.—DOMESTIC EMPLOYMENT.—E. S., of Canada wants to know a branch of industry which will enable him and his children to find constant home employment without necessitating the separation of the family.

11.—POLISHING PICTURE FRAMES.—I wish to know in what manner moldings for picture frames are polished. They are of black walnut. I wish to know the process and the materials. I wish also to know the process of varnishing chromo pictures, and the necessary material.—E. B.

12.—CANVAS BOAT.—How can I make a canvas sporting boat, composed of two sections, to be handy for transportation? What should be the length and breadth, and of what should the framework be? How can I shrink the canvas on the frame and make it water tight? The boat is to be large enough for two persons.—W. V. J.

13.—MORTAR FOR DRYING OVENS.—I use four inch brick walls, in drying ovens exposed near the furnaces to a temperature of 250° Fahr.; and I find that lime mortar crumbles and soon loses its adhesive properties. What can I use that will be free from the above objections, and that will give a strong and durable bond?—J. K. C.

14.—DOUBLE BASS.—Will some one give me the size and proportions for a double bass, and the best material and varnish for the purpose?—M.

15.—PRESERVING BIRD SKINS.—I wish to cure some bird skins. Can any of your numerous readers give me the desired information?—W. J. L.

16.—TEMPERING BARREL SAW.—How can I best temper a barrel saw to saw staves? Is there any way to temper it after it is rolled?—J. E. R.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at $1 00 a line, under the head of "Business and Personal.

ALL reference to back numbers must be by volume and page.

FROZEN WATER MAIN.—Query 6, March 16.—C. H. J. asks which is the quickest and cheapest way to thaw out 150 feet of frozen water main, etc.; and as he has taken the liberty to use my initials in asking the question, I will use his in answering it. Put a jet of steam (under a moderate pressure) into the top of the waste cock of your frozen pipe, and allow the water to escape from the bottom of the pipe, and you will very soon remove the ice.—C. H. J., of N. Y.

CONCRETE BUILDING.—To B. L. V. A., January 27. Molding the concrete into blocks, and laying with lime, mortar, or cement will answer; but it takes one half to one fourth more time and expense, and is not as good as when done by the following method: The basement or cellar walls should be 18 inches thick, the first story, 14, and the second, 12 inches. If granite or other good rock cannot be had in a quarried state for the underground wall, I should substitute a concrete of hydraulic cement, sand, and rock, till I got above the ground, dumping it into a trench where it was convenient to do so. The fireplace, if any, should be of iron, brick, or rock; and after the flue is started, it may be carried up in the concrete, by means of a coffin shaped box, or elongated hexagon, separated into two parts by a long wedge, which, being drawn out after the concrete has hardened, will allow the box to collapse; and it can then be raised and set for another course. The flues above the wall should be carried up with brick. There is no appreciable shrinkage about such walls. To J. P., January 27, 1872.—One fifth part of good lime, with clean sharp sand will make a substantial house wall. Such walls should be well anchored at the corners by long pieces of wood, stone, or iron. One thirteenth part of lime will answer equally well, by using eight parts of broken rock, brick, or other imperishable material, rammed into the mortar, as it is poured up. Masons require more lime, because it renders the mortar more plastic.—Z. L. H., of S. C.

CRACKED FLUTE.—Query 13, March 16. The experience of nearly forty years warrants me in offering the following advice: Anoint the flute thoroughly and repeatedly with pure raw linseed oil prepared by letting it remain unshaken for several weeks, when the clear oil should be poured off for use. It should be applied, inside and out, every time the flute is put away, it having been carefully cleaned from moisture for the first year, after which an application once a month will be sufficient. Pure olive oil will do better, but it must be oil of olives. On taking the flute from its case for use, the oil should be wiped out with an old silk handkerchief (cotton will do for the outside) wrapped tightly around a stick, using as much friction as possible. This will produce a burnished surface, which, besides aiding in filling the pores, adds to the mellowness of the tone. Care must be had to prevent the metal or anything other than the silk from touching the flute, and to apply the pressure equally on all sides, otherwise the bore will become distorted. To stop cracks that have already appeared, pack them full with good beeswax which has been mixed, by melting and stirring, with a small portion (say one sixth) of rosin, sufficient to stiffen but still leave it viscid; apply when cooled, and cram it in with the finger. Do not be tempted to use shellac or any rigid cement, as it will fall on account of the distention and contraction of the wood by change of temperature. It is well to pass your thumb over the cracks, filled as above, before commencing to play, the object being to smooth them down and insure their being tight, which rigid cement will not admit of.—AKT.

MADSTONE.—R. A., of North Carolina, sends us a stone discovered by a neighbor which he states "has been compared with the famous madstone (owned by the Pointer family of Halifax county, Va. for the past half century, and which extracts the poison of mad dogs, snakes, spiders, etc.), and found to be exactly alike in every respect, adhering to the flesh like a leech, and extracting the poison by absorption. The specimen I send you has been, to my own knowledge, applied in a case of bite by a copperhead snake and effected a complete cure in twelve hours. The patient was very sick and delirious. The flesh is moistened before application. Are there any other stones in the country of a similar character? I am arranging to advertise it for sale, and therefore wish your opinion before offering it to the public."—Answer: The stone which our correspondent sends is half an inch square and one eighth thick, black in color. In it we have determined the presence of alumina, which we suspected, and are now quite confident, is the "charm" of the madstone. We do not think there is anything in the stone which acts as an antidote; its virtue is its property of absorption, and any other aluminous mineral, as Websterite, pure clay, etc., would undoubtedly serve as well. Another correspondent, writing from Purdy, Tenn., describes the rampages of a mad dog in his vicinity, several children having been bitten, and great alarm among the residents having been occasioned. The parents of some of the suffering children immediately went to procure the use of madstones. Our correspondent says: "There are many fabulous stories told about the virtues of the madstone. I have seen one sold to Mr. David Riding, four miles south of this place, for $5, and have heard of several more sold by an old man who passed through the country shortly after the war with his pockets full. Will some one learned in the arts and sciences give your readers a short comment on the mad stone, its physical structure and appearance, its virtues and *modus operandi*, how long after the infliction of the bite may its wondrous virtues be depended upon, and above all, its origin? The specimen in Mr. Riding's possession is about ¾x1 inch, and looks very much like a dark species of slate."—W. C. K. Answer: The "madstone" of the Southern States is an aluminous mineral, and its charm lies in its power of absorption. It is not an antidote. But we would have more faith in ten drops of ammonia than in ten pounds of this "madstone." It is not to be denied, however, that "snake stones" have been used in several countries with wonderful success. Sir Emerson Tennent, in his "Sketches of the Natural History of Ceylon," calls attention to the "pamboo-kaloo" as a remedy in cases of wounds by venomous serpents, and gives more than one well authenticated instance of its virtue when the patient was bitten by the deadly cobra di capello. The stone is intensely black and highly polished, and, being porous, rapidly imbibes the blood and with it the poison. The stone adheres for a few minutes, like the "madstone," and then drops off. The celebrated Faraday, after an analysis, declared his belief that it is a piece of charred bone, evidence of which is afforded both by the apertures of cells or tubes on its surface and by the fact that it exhibits an organic structure within. When heated, water and ammonia escape, and finally the carbon burns away, leaving a white ash which is phosphate of lime. The snake charmers from the coast also visit Ceylon proper to prepare the snake stones themselves, and to preserve the composition a secret. Dr. Davy says the manufacture of them is a lucrative trade carried on by the monks of Manilla, who supply the merchants of India. The Mexicans also have a snake stone, *piedra possonar*, which is nothing more than charred hart's horn. This adheres firmly and is very absorbent, and when speedily applied, has been found efficacious in the case of a bite from a rattlesnake. We would caution our readers against putting too much faith in these stones; they certainly are of no avail unless used immediately after the wound has been made.

CHLORO-ACETIC ACID.—No. 21, March 30.—Place a quantity of glacial acetic acid in a white glass bottle, which fill with chlorine gas. Place this in the direct sunlight for some hours; and eventually you will have a crystallization of the acid around the sides. There will also be oxalic acid formed, and some free acetic acid will remain. Mix all together, and place in shallow vessels under the receiver of an air pump, together with dishes containing fused potash and strong sulphuric acid. Oxalic acid will first crystallize out, and then the chloro-acetic, in rhombic crystals which may be dried on blotting paper.—E. H. B., of Mass.

RANCID BUTTER.—To J. B. B., No. 24, March 30.—Melt the butter at a tolerably high temperature, in fact, till nearly boiling. Strain clear through cloth, and thoroughly wash with water, to which has been added a little solution of chlorinated soda, or, as it is commonly called, Labarraque's solution. Finally wash with clean water, and I think you will find the butter sweet, though it will not have the flavor of the fresh made article.—E. H. B., of Mass.

BROWNING GUN BARRELS.—To W. H. R., query 10, page 154.—Your recipe is very good, and if you will have your barrel bright and free from grease, you can get a pretty glossy appearance by the following mode: Apply the fluid with a sponge, being particular not to touch it with your hands. Let it remain for from six to ten hours, or until it gets a brown coat of rust. Then scrape it off with a steel brush, give it another coat and scratch as before until the desired color is obtained, which you will readily see when you wet it with the fluid. Now take half a pound of carbonate of soda to one gallon of water and boil; scald the barrel with it after it is scratched off the last time, and, while it is warm, apply grease and it is finished with a beautiful glossy appearance. Five or six coats are enough to bring the desired color.—M. M., of Texas.

TO TAN SMALL SKINS.—When taken from the animal, let the skins be nailed in the shape of an oblong square on a board to dry, fur side down. Before taking them from the board, clean off all the fat or oily matter with a dull knife. Be careful not to cut the skins. When you wish to tan them, soak thoroughly in cold water until soft; then squeeze out the water, and take of soft water three quarts, salt, half a pint, and best oil vitriol, one ounce. Stir well with a stick, and put in the skins quickly, and leave them in thirty minutes. Then take them in your hands and squeeze (not wring) them out, and hang in the shade, fur side down, to dry. If you get the quantity of liquor proportioned to the skins, they will need no rubbing to make them soft; and, tanned in this way, the moths will never disturb them.—F.

BUFFALO ROBES.—These are not, strictly speaking, leather, as they are prepared without the use of bark or tannin in any form. They are simply a raw hide made soft and pliable by manipulation and the use of grease or oil. The Indian process, in principle, is the same we use in making our soft leathers, chamois, buckskin, lash or string leather, etc. The Indian women, in making buffalo robes, first "flesh" and pare down the green hide with a bone, toothed something like a saw, and knives. They then cover it on the flesh side with the brains, blood, liver, grease, and the contents of the gall bladder of the buffalo or elk. This is thoroughly worked in near a fire or in the sun. They then, after the hide is partially dried, work it over a cord and beam till the rope becomes soft and flexible. They sometimes make a species of leather by taking off the wool by the use of lime, and then preparing it as above, smoking it thoroughly. The hide of the buffalo is covered, not with hair, but with a true wool, which has the property of felting or fulling, and out of which cloth can be manufactured.—P. W.

BATTERY FOR PLATING.—To W. B. J., query 12, March 16. I have obtained excellent results in plating with a battery made as follows: Take a gallon jar, and get a shoemaker to make a leather cup, of the same hight as the jar, and about 2½ inches in diameter, and water tight. Solder a connecting wire to a strip of scrap zinc as wide as the length of the leather cup; roll it up and put it into the cup. Get a strip of sheet copper, no matter how old or thin, clean it, solder a wire to it, and bend and insert in the gallon jar. Set in the leather cup with the zinc inside and fill with a solution of common salt. Fill the gallon jar outside the leather cup with a concentrated solution of blue vitriol, and the battery is complete.—D. G. P., of Ill.

"Several new subscribers," of Three Rivers, Michigan, will find C. F.'s rule for screw cutting on page 58 of the current volume.

FLUIDS AND LIQUIDS.—To H. W. H., query 2, page 185.—Fluids are of two kinds, liquids and gases. In the first, the attractive force of the atoms equals the repulsive, as in water and in alcohol. In the second, the repulsive force exceeds the attractive, as in air, oxygen, illuminating gas. A quart of a liquid will fill two pint measures; a quart of gas will fill two gallon measures.—B. G., of N. J.

HYDROGEN GAS.—To E. X., query 4, page 185.—The metallic base of hydrogen has not been discovered, though a supposed amalgam of that element with platinum excited some interest a few years ago.—R. G., of N. J.

MICROSCOPY.—To A. M., query 20, page 185.—Use a condensing lens or mirror for viewing opaque objects; and view them on a black background.—R. G., of N. J.

IRON IN WATER.—To M. M., query 13, page 200.—The iron in your water should benefit you.—R. G., of N. J.

FUSIBLE METAL.—To O. E., query 14, page 200.—Cadmium makes the most fusible alloys. One alloy of cadmium, tin, lead, and bismuth melts at 63° to 65° Fah.—R. G., of N. J.

J. H., of N. J.—The shock experienced by you in approaching your hand to water in wash basins, gas jets, etc., is owing to the electricity in your system. It is not due to any galvanic action in the tin lined water pipe. By turning on the gas and shuffling your feet across the floor, then holding your knuckle to the jet at the point of emission from the burner, you may light the gas.

E. C. W., of Mo.—Your idea is erroneous; do not waste money on it.

T. C. B.—To make emery cloth belts use strong glue; put it on evenly with a brush, and then sift on the emery from a box with a perforated cover like a pepper box.

T. F. G., of Ga.—We believe gas made from gasolene and furnished through pipes is as safe as ordinary illuminating gas.

H. P. R., of O.—We never yet saw the foundation of a stationary engine too solid, and don't believe it can be made so. The idea that timber is necessary between the bed and the masonry is erroneous.

E. P. J., of Mass.—It would be difficult to contrive a more uneconomical way of using steam than the one you propose. To let the piston move a short distance before the full admission, and to exhaust at the end of the stroke with a full cylinder of high pressure steam, would be to exactly reverse the effect of expansion.

WET COAL DUST.—To G. W. F., query 3, March 30.—Coal dust burns better when moistened. The moisture helps it to coke, and if the back part of the fire is a bright red, the steam, being decomposed, acts as so much additional fuel, the oxygen promoting the combustion, and the hydrogen inflaming.—E. H. B., of Mass.

TESTING BARK FOR TANNIN.—To J. F. A., query 4, March 30.—Make a decoction of the bark or wood, from a definite quantity of the material, and filter. Make a solution of gelatin of a determined strength. Add of this to the liquor until no further precipitate is formed. Separate this precipitate, dry, and weigh. Knowing the quantity of gelatin added, it is easy to calculate now the quantity of tannin. This will be found accurate enough for practical purposes.—E. H. B., of Mass.

CLEANSING STOVEPIPE.—To N. C., query 15, March 30.—I presume you burn wood in your stove and that your pipe is horizontal. During the burning of the wood a vast quantity of water is formed, and the intense cold has condensed it, and, the pipe being horizontal, it has accumulated, and the soot mixed with it, forming a paste and thus the obstruction. A perpendicular pipe would not act so, as the condensed water would run back on to the heated surface and become again converted into vapor, until the pipe would become hot enough to allow the whole to pass off without condensation.—E. H. B., of Mass.

FUSIBLE PLUGS.—To W. H. W., query 1, March 30.—These are made of bismuth 8, lead 5, tin 3 parts. Increase proportions of lead and tin according to the temperature it is desired for the alloy to melt at. E. H. B., of Mass.

HYDROGEN.—To E. X., query 4, page 185.—Gas has been passed through many processes to produce hydrogen, but none, so far as I know, has been considered practical. Hydrogen is a base of itself.—E. H., of Mass.

BATTERY FOR PLATING.—To W. B. J., query 12, page 185.—I would advise you to purchase a Bunsen battery, as I have found that no other is as cheap in the long run.—E. H., of Mass.

MATCHES FOR MOLDING.—Query 21, March 16.—Take new sand and dry thoroughly, then mix, with boiled linseed oil and a small quantity of litharge, to the proper consistency. Care must be taken not to use too much oil. Ground pumice stone is sometimes used mixed with the above, and is generally approved.—K., of Conn.

ELECTROMAGNET.—In answer to F. L. T., query 5, page 154, I will state that the wire should be insulated, by first winding with best cotton or silk, and then coated with shellac dissolved in alcohol.—E. H. of Mass.

P., of Pa.—Ultramarine is doubtless the substance referred to in the recipe as refiner's blue.

MELTING POINTS OF PLATINUM AND STEEL.—To J. A. H., query 5, page 200.—Platinum melts at 3,080° Fah., and steel at 2,500° Fah.—L. V. B., of N. C.

DEMAGNETIZING STEEL.—For the information of J. B. W., query 17, March 23, I send the following: When the iron cores in telegraph relays become permanently magnetized by heavy currents of electricity, they are relieved of all residuary magnetism by pounding them on the ends with lead.—J. C. H., of Kan.

Declined.

Communications upon the following subjects have been received and examined by the Editor, but their publication is respectfully declined:

COLORING SEED.—O.

ENGINE PHENOMENON.—F. M. C.

ROTARY ENGINE.—D. B. K.

THE U. S. NAVY.—B. T.

TURBINE WHEELS.—G. C. P.

VITAL OR PSYCHIC FORCE.—B. T.

WHAT IS A MACHINE?—G. L. B.

ANSWERS TO CORRESPONDENTS.—C. O. I.—G. R. M.—J. P. W.—W. A. McH.—F. C.—A. M.—S.—J. C. H.—K.—H. J. H.—S. B. H.—G. A.

QUERIES.—H. J. R.—W. A. H.—R. F. D.—F. K.—Y.—R. D. P.—W. B.—W. M. G.—S. R. B.—C. D. W.—W. R. B.—J. P. H.—A. N.—O. S.—J. C. S.—C. A. H.—A. S.—L. E. S.—A. L.—W. P. B.—E. K. D.—F. E. K.—M. E.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the most important home and foreign patents.

WATER WHEEL.—William G. C. Masteraun, Proctorsville, Vt.—This is a wheel of the turbine class, but so strikingly different in many ways from those familiar to most of our readers that it will be very difficult to give any idea of its construction in a verbal description. The entire wheel, the rotary part as well as the chute, although independent of each other, may be raised by the water, receptacles being formed, beyond the outlet slots of the rim for water, which acts as a cushion and also as a regulator to steady the motion like a balance wheel. The gate is self acting. The mechanism by which these results are attained is very unique and ingenious, showing that the inventor is fertile in mechanical resources.

HARROW.—Oradon J. Leabo, Forest Grove, Oregon.—Two or more pairs of bars, pivoted in the middle under the frame, are provided with teeth at each end, and connected through rods with bars attached to a reciprocating pitman, so that the teeth are moved by the mechanism in such a way as to constantly cross their own furrows in a single passage over the ground, thereby, it is claimed, giving the ground a more thorough harrowing than can be done in the old way by twice harrowing. The harrow runs on wheels, and has a seat for the driver.

WHEEL FOR VEHICLE.—George R. Duval, Salem, Oregon.—The hub is made of cast iron or other metal, and provided with a projecting flange. Around the flange is shrunk a wrought iron band, which projects beyond both sides of the flange. The band is perforated with holes, which alternate from side to side of the flange, they being thus arranged in a zigzag row to receive the inner ends of the spokes on alternate sides of the flange. The rim of the wheel is made of wood or metal, semi-cylindrical in cross section so that its convex side forms the inner circumference. Each spoke is made in form of a bolt with a head at the outer end—a screw thread on the inner end. The spokes are fitted through apertures of the tire and rim, so that their heads are countersunk into the outside of the tire, and their inner end, are then passed through the band, shrunk in the flange of the hub, receiving the nuts on the inner side of the same. A plate is then slipped over each end of the hub to fit within the band and rest against the nuts. The plates serve, therefore, to prevent the nuts from working loose, and also to protect them from mud and dust. Bolts hold these plates in place.

FIREPROOF ROOF.—Samuel Smith, of Mattoon, Ill.—This improvement in the construction of roofs of buildings has been made with a view of rendering them not only durable and fireproof, but a support to the side walls of the building. An arch, composed of tiles which lock into each other, laid so as to break joints with each other, is supported by bars of angle iron laid into the wall, which form the abutments of the arch. The bed plate of each of these bars extends from the wall over the joists, and where wooden joists are used the bars may be spiked or bolted to them, which would serve to support the walls and prevent them from spreading. Rods of iron pass through the flanges of the abutment bars and form chords to the arch at suitable distances from each other. These chords are protected from the action of heat in case of fire, and prevented from expanding, and consequently damaging the arch, by means of cylindrical fireproof tiles or composition placed on the chords, and secured thereto in any permanent manner. The water gutters of the roof are formed by gutter tiles, the latter of which are laid into the walls. Orifices in the end walls permit the discharge of the water from the gutters into the conductor pipes. The tiles are all laid in good cement, and the arch is formed on a temporary skeleton arch of wood, the same as in laying a brick or stone arch. When completed the arch is covered with a coating of caustic or other cement, so as to render the entire roof (with the gutters) perfectly waterproof. The side walls may be anchored to the angle iron abutments, or to the chords, in any manner, if necessary, but as described they would, in ordinary cases, be held together and supported in case of fire. It is claimed that a building provided with this roof cannot be destroyed, as everything combustible inside may burn, but the roof and walls will remain. The arch may be built on a circle of any radius, the arc simply diminishing or increasing according to the width of the building, so that tiles of the same pattern may be used for all roofs.

SELF ADJUSTING THREAD TENSION FOR SEWING MACHINES.—John Bromley, Macon, Ga.—The invention consists in a delicate tension device for sewing machines which automatically adjusts itself to any size of thread, and yet allows any thread to be readily inserted by persons who are unexpert in machine sewing. It is simple, applicable to any sewing machine, and not liable to get out of order.

POTATO DIGGER.—Robert G. Dayton, North Granville, N. Y.—In this invention a patent has been allowed on the following parts, namely: Gear wheels, crank shaft, connecting rod, rods, and pivot rods, arranged in connection with the frame and shaker in a peculiar manner, whereby the shaker is operated. Also a combination of spring bars and guide bars with the frame and shaker. The potatoes are scooped up with the soil by a sort of scraper or plow which rises in a peculiar curve, slightly descending at the rear. The potatoes fall some distance upon the shaker, with sufficient force to jar the soil and break lumps. The shaker, which is of the grid variety, being violently agitated by the mechanism above referred to, separates the earth, while the potatoes, passing from the edge of the shaker, lie upon the top of the separated soil, in convenient position for drying and gathering.

FIRE EXTINGUISHER.—Jacob B. Van Dyne, Louisville, Ky.—This fire extinguisher has the distinguishing feature of not being liable to mix the chemicals unless completely inverted. Then it acts with unerring certainty and with great efficiency.

DETACHABLE LAMP COLLAR AND SAFETY TUBE.—Chas. B. Mann, Baltimore, Md.—This invention consists in forming a lamp collar in two parts, one of which is secured on the neck of the lamp in the usual way, while the other is a permanent attachment of the long wick and safety tube and has vent holes for escape of gas. The device is to be attached to glass lamps by the manufacturer, and thus they will be put upon the market ready provided with a perfect safety attachment, and can be sold at a trifling cost above that of the ordinary kind, or those having the ordinary burner.

RIGGING FOR VESSELS.—George Taylor, of Harwich, Mass.—The main object had in view in the present invention is to save life by rendering it unnecessary for sailors to go on to the bowsprit of the vessel in rough weather. On the great number of schooners which comprise the fishing squadron of the eastern coast, as well as on most sailing vessels, the bowsprit is the point of danger to the sailors. Connected with the lower end of the jib is what is known as the "bonnet," which is, when in use, a prolongation of the jib. This bonnet reaches out over the bowsprit, and has to be furled or removed in rough or stormy weather. To do this the sailor must go out on to the bowsprit, which is almost always wet, and frequently covered with ice, and many a poor sailor, in the line of his duty, goes on to it who is never seen again. The present invention consists in so attaching the bonnet to the jib and supporting it by the bowsprit as to render it unnecessary for the sailor to leave the deck in furling or removing it. The method of removing or furling the "bonnet" of a schooner or other vessel without the necessity of causing the sailor to go out on the bowsprit, by attaching the said bonnet, by loops and line to the jib, and operating said line in a peculiar manner, constitutes the claim allowed.

CONICAL STOP COCK.—J. Evans Jones, of Tidioute, Pa.—This invention has for its object to permit the removal of truncated conical plugs or stop-cocks from their shells for inspection or repair without endangering the fastening devices. The invention consists in causing the small end of the plug to protrude through the shell, and in providing it with a projecting button that may be struck by a hammer or mallet whenever it is necessary to loosen the plug for removal. The ordinary stop cocks also protrude through the shell, but are held in place by nuts applied to their small ends. When, after removal of the nut, a plug is to be loosened in its seat, it must be hammered at the small end. Thereby the plug is frequently very much injured, and often entirely ruined, the screw threads being destroyed or battered. This injury is prevented by the projecting plug, which has no screw thread at the small end, but is held to its place by a cap and screw applied to the larger end, and fastened to the shell by screws. Whenever the plug is to be loosened for removal, it can, after the screws are taken off, be struck on the button at the bottom without injury.

DEVICE FOR FORMING LETTERS ON THE CIRCUMFERENCE OF METAL DISKS.—Stephen M. Ott, of Newark, N. J.—This invention furnishes an improvement in forming raised letters and other devices upon the edges or circumferences of metallic disks, which will, it is claimed, enable said devices to be formed more accurately and at much less expense than when engraved upon said edges in the ordinary manner. In forming the letters or devices, the disk or blank to be operated upon is placed in the circular cavity formed by dies, and is operated upon by a press, drop, or other suitable device to force the metal of the said wheel or disk into the sunken letters or devices of the dies, and thus form the raised letters or devices upon the circumference of the disk or wheel. If desired the dies may be used as a mold, and the wheel or disk cast into the circular cavity. This device is designed especially to form the letters upon the wheels of printing telegraph instruments, hand stamps, etc., but may be used with equal advantage for various other purposes.

DRESS GOODS HOLDER.—Albert S. Grant, of Rochester, Minn.—This new and improved dress goods holder, for use in stores upon counters or tables or in windows, for holding the goods as they are commonly held by hand for exhibiting them to customers, consists in a hook, or other equivalent holder, adapted for holding the piece of dress goods when gathered as they are customarily held in the hand, supported above the counter by metal socketed holders, for the support of rods, having on the tops the yoke or hook, or any equivalent, for holding the goods. The rods are fitted into the metal sockets by a tapered point, so that while always fitting snugly to prevent swinging or rattling, they will admit of being taken out readily. It is proposed to employ these hooks in show windows also, in place of the frames, boxes, cords, or other devices used therein; but they are intended more particularly for use over the counter. The present mode of holding the goods by hand is very laborious for the attendant and highly desirable to avoid. By this invention the work can be done equally as well as, if not better than, by hand. Among other advantages of the invention, to salesmen as well as to buyers, is that a salesman can arrange a pattern or patterns of dress goods in these holders for the inspection of the purchaser, and then attend to other customers; for by the above arrangement he would not have to hold the goods by hand, and thus keep other customers waiting, while the first at his counter were inspecting his goods at their leisure.

BRAKE FOR RAILWAY CARS.—Anton Tatzel, Sr., and Friedrich Kinn, of New York city.—Frames pivoted to or hung upon the axles are connected rigidly with the brake shoes and guards by arms. The frame cannot ordinarily swing on the axle to drop the brake on the track, as rods, above the axle, connect it with levers at both ends of the car, which levers are locked in suitable manner. In case of an emergency, when the car approaches a place of danger or a person falls in front of the wheels, the front lever is quickly dropped by the attendant, which allows the brake in front of the wheel, by its own weight and the friction of the wheel, to drop upon the track right in front of the wheel. The wheel in its further motion runs upon the concave part of the brake, and is thereby lifted from the track, spending its power against the brake, while, it is claimed, the motion of the car is speedily but gently arrested by the excessive friction of the brake shoe on the track. The shoe is flanged to prevent it from running off the track. The rods connecting the shoes with the levers are jointed, to permit lateral bending, which is necessary when the car runs on a curve. By the introduction of this invention, the inventors believe, many accidents will be prevented to the cars in motion and to persons falling upon the track.

BLACKING AND BRUSH HOLDER.—Ephraim H. Sweetser, of Salem, Mass.—This invention consists of a large flat bottomed metal cup with a set screw and stud, adapted for receiving and holding blacking boxes of different sizes upon the bottom, with a long, partly cylindrical and partly conical case fitting on it in the place of a cover, and being open at the top to receive the daubing brush, which is made round with a knob at the top for a handle, to adapt it to fit into the top of said case for being kept in said case, and so that the top of the brush forms the cover of the case. This apparatus makes a neat and simple device for holding the blacking and the daubing brush, and preventing the smearing of the shelf wherever the articles are kept.

KNITTING MACHINE.—Hugo Guenther, of New York city.—This invention relates to the Lamb or other knitting machines, and consists in providing the needles with detachable shanks. The shank is provided with a hook, and is used in combination with a needle having a short upturned ear, by which means certain ends are accomplished not easy to explain in a mere verbal description. The invention is ingenious and applicable to many knitting machines now in use.

RECIPROCATING STEAM ENGINE.—John Shepherd and Carlos A. Clark, of Bloomfield, Iowa.—The steam cylinder has a piston rod working through a stuffing box in the cylinder head in the ordinary manner. The rod has two pistons. The steam chest is an open cylinder, piston valves working therein over the steam ports. The exhaust port is in the middle of the cylinder and the steam pipe is at the middle of the steam chest. The water of condensation, as well as the steam, is claimed to be discharged twice at every stroke or revolution of the engine. By this arrangement, the inventor claims that there is no place for waste steam, and that the piston cannot be retarded by the water of condensation, as the latter finds its way to the exhaust port by its own gravity. If desired, the steam chest and cut off valves or pistons and the induction ports might be applied to engines in common use.

ANIMAL TRAP.—John Rollins, of Kingston, Tenn.—The animal, say a rat, is induced by suitable bait to enter upon a peculiarly safe looking floor or trap door in the end of a box. Reaching the bait, he nibbles. Nibbling he is lost, for the slightest motion of the bait unlatches the trap door, precipitating him into a chamber and closing the entrance. Seeking to escape from this predicament, he finds a promising looking wire grating which yields readily to the pressure of his insinuating nose, and he passes into another chamber, the fatal grating closing behind him. The motion of the grating operates a device whereby the trap door is again set in position to admit a second prowler, while it shuts off all communication with the first. Second prowler, being arrested in his work of theft, travels the same road as the first, setting the trap for a third and so on. The whole arrangement is ingenious and cheap, and forms an undoubtedly good and efficient trap.

MACHINE FOR SOLDERING CAN CAPS.—William B. Bishop, of Brooklyn, N. Y.—This invention has for its object to improve the construction of an improved machine for soldering the caps upon sheet metal cans, for which Letters Patent were granted November 29, 1870, to make it more convenient and effective. This machine was in its original form a most ingenious combination of devices. Five claims have been allowed for improvements which now render it, we think, a first class machine for the purpose.

WATER WHEEL.—William G. C. Mastersun, of Proctorsville, Vt.—This is a wheel of the turbine class, but so strikingly different in many ways from those familiar to most of our readers, that it will be very difficult to give any idea of its construction in a verbal description. The entire wheel, the rotary part as well as the chute, although independent of each other, may be raised by the water, receptacles being formed beyond the outlet slots of the rim for water which acts as a cushion and also as a regulator to steady the motion like a balance wheel. The gate is self acting. The mechanism by which these results are attained is very unique and ingenious, showing that the inventor is fertile in mechanical resources.

BRAKE LOCK FOR WAGONS.—Lawrance and Henry Egeberg, Columbus City, Iowa.—This is an improved lock for wagon brakes, which holds the brake securely locked when applied, and prevents rattling when the brake is not applied. A bar of wrought iron is bent into V shape and secured to the wagon box. The ends of the bar are bent outward, and to them are bolted the ends of a curved or arched bar, the forward edge of which has ratchet teeth formed upon it. The brake lever is made with a band or offset, so that it may cross the outer edge of the bar. By suitable devices a spring locking arrangement is caused to engage teeth in the arched ratchet bar, with sufficient force to hold the brake when applied, and to prevent it from rattling when not applied.

COMPOSITION FOR COLORING LEATHER.—Lewis C. May, Cochituate, Mass.—This invention relates to a compound to be applied to leather in the manufacture of boots and shoes, and for leather used for other purposes, for changing the color or complexion of the leather, designed more especially for changing the color of the soles or bottoms of boots and shoes, but not confined thereto. It consists in a compound which fills the pores and makes the leather bright and hard. By the use of a revolving brush, or friction applied otherwise, after the application of the composition, the complexion or color of the leather may be changed, as desired. The bottom of a boot or shoe, or other leather, may be made of a very light color, or of a dark red or other complexion or shade. This color, it is claimed, will not fade, but improves the wear or durability of the leather.

SCROLL SAWING MACHINE.—Samuel Ide, Medina, N. Y.—This is a device for straining scroll saws, and causing the upper belt on which the saw is held to draw exactly in line with the saw, whatever may be the rake or horizontal sweep of the same. The invention consists, first, in connecting the said belt with a segment mounted upon a shaft in an adjustable frame, which is acted upon by springs to draw the belt straight. Secondly, in making the bearings of said shaft laterally adjustable, and also in the arrangement of a vibrating and adjustable belt guide. By this means the belt is at liberty to be lengthened or shortened at will. The frame, shaft, and segment can be thrown more or less far forward to adjust the belt exactly in position with the saw and with the degree of rake or sweep to be given the same.

NEW BOOKS AND PUBLICATIONS.

SHAKSPEARE: His Life, Art, and Characters. With a Historical Sketch of the Origin and Growth of the Drama in England. Two Volumes. By Rev. H. N. Hudson. Boston: Ginn Brothers.

The Rev. Mr. Hudson has long been known as an able critic, and as a devoted student of Shakspeare. In these volumes he gives us the accumulated information and opinions derived from years of attentive research into the historical and other facts pertaining to the career and writings of the great poet. The biography of Shakspeare which Mr. Hudson presents is very clear and interesting, while it is supported by many collateral evidences which assure its correctness. The histories of the various works of the immortal bard, the analyses of the various plays and their several characters, are all written in masterly style. No one can rise from the reading of these volumes without experiencing a renewed interest in the works of Shakspeare, and having his attention directed to many new features of beauty and attraction that might ever have passed unnoticed but for the rare and striking suggestions of the author.

GATEWAYS TO THE POLE: An Address Delivered before the St. Louis Mercantile Library Association, January 6th, 1872, Upon the Thermal Paths to the Pole, the Currents of the Ocean, and the Influence of the latter upon the Climates of the World. By Silas Bent. Saint Louis: The R. P. Studley Co., Printers.

The author makes an able argument to support the proposition that only by following the warm waters of the Gulf Stream and the Kuro Siwo, can the North Pole be reached.

We are in receipt of the THIRD ANNUAL REPORT OF THE BOARD OF RAILROAD COMMISSIONERS OF MASSACHUSETTS, an elaborately prepared document, containing voluminous statistics. The Legislative Reports of Massachusetts, on various matters pertaining to the commonwealth, prepared under special commissioners, contain a great deal of valuable statistical information of importance and interest, and are creditable to the intelligence of her people.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]
From March 18 to March 21, 1872, inclusive.

BREECH LOADING ORDNANCE.—N. Thompson, Brooklyn, N. Y.
BUTTON HOLE SEWING MACHINE.—A. L. Wood, Boston, Mass.
CLEANING CARPETS, ETC.—R. W. Knowles, New York city.
HOSE COUPLING.—W. Osborn, New York city.
MACHINE FOR COVERING PAMPHLETS.—E. H. Andrews, W. H. Clague, R. B. Randall, Rochester, N. Y.
OVEN.—G. E. Bailey, Mansfield, C. B. Goodrich, Charlestown, J. A. Locke, Watertown, Mass.
PRINTING TELEGRAPHS (two patents).—G. B. Field, E. W. Andrews, New York city.
RAISING AND LOWERING BOATS.—G. W. Mallory, Mystic Bridge, Conn.
SETTING HOOKS IN LEATHER, ETC.—H. C. Bradford, Providence, R. I.

Practical Hints to Inventors.

MUNN & CO., Publishers of the SCIENTIFIC AMERICAN have devoted the past twenty-five years to the procuring of Letters Patent in this and foreign countries. More than 50,000 inventors have availed themselves of their services in procuring patents, and many millions of dollars have accrued to the patentees whose specifications and claims they have prepared. No discrimination against foreigners; subjects of all countries obtain patents on the same terms as citizens.

How Can I Obtain a Patent?

is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them: they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row New York, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible, and send by mail. An answer as to the prospect of a patent will be received, usually by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention, if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

Caveats.

Persons desiring to file a caveat can have the papers prepared in the shortest time, by sending a sketch and description of the invention. The Government fee for a caveat is $10. A pamphlet of advice regarding applications for patents and caveats is furnished gratis, on application by mail. Address MUNN & Co., 37 Park Row, New York.

Reissues.

A reissue is granted to the original patentee, his heirs, or the assignees of the entire interest, when, by reason of an insufficient or defective specification, the original patent is invalid, provided the error has arisen from inadvertence, accident, or mistake without any fraudulent or deceptive intention.

A patentee may, at his option, have in his reissue a separate patent for each distinct part of the invention comprehended in his original application by paying the required fee in each case, and complying with the other requirements of the law, as in original applications. Address MUNN & Co. 37 Park Row, for full particulars.

Trademarks.

Any person or firm domiciled in the United States, or any firm or corporation residing in any foreign country where similar privileges are extended to citizens of the United States, may register their designs and obtain protection. This is very important to manufacturers in this country, and equally so to foreigners. For full particulars address MUNN & Co., 37 Park Row New York.

Design Patents.

Foreign designers and manufacturers, who send goods to this country, may secure patents here upon their new patterns, and thus prevent others from fabricating or selling the same goods in this market.

A patent for a design may be granted to any person, whether citizen or alien, for any new and original design for a manufacture, bust, statue, alto-relievo, or bas relief; any new and original design for the printing of woolen, silk, cotton, or other fabrics; any new and original impression, ornament, pattern, print, or picture, to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture.

Design patents are equally as important to citizens as to foreigners. For full particulars send for pamphlet to MUNN & Co., 37 Park Row, New York.

Rejected Cases.

Rejected cases, or defective papers, remodeled for parties who have made applications for themselves, or through other agents. Terms moderate. Address MUNN & Co., stating particulars.

European Patents.

MUNN & Co. have solicited a larger number of European Patents than any other agency. They have agents located at London, Paris, Brussels, Berlin, and other chief cities. A pamphlet pertaining to foreign patents and the cost of procuring patents in all countries, sent free.

MUNN & Co. will be happy to see inventors in person, at their office, or to advise them by letter. In all cases, they may expect an *honest opinion*. For such consultations, opinion, and advice, *no charge is made*. Write plain; do not use pencil, nor pale ink; be brief.

All business committed to our care, and all consultations, are kept secret *and strictly confidential*.

In all matters pertaining to patents, such as conducting interferences, procuring extensions, drawing assignments, examinations into the validity of patents, etc., special care and attention is given. For information, and for pamphlets of instruction and advice,

Address

MUNN & CO.,
PUBLISHERS SCIENTIFIC AMERICAN,
37 Park Row, New York.

OFFICE IN WASHINGTON—**Corner F and 7th streets, opposit Patent Office.**

[OFFICIAL.]

Index of Inventions

For which Letters Patent of the United States were granted

FOR THE WEEK ENDING APRIL 9, 1872, AND EACH BEARING THAT DATE.

Acid, apparatus for the treatment of liquids with nitric, C. W. Volney 125,635
Alloy of copper for bearings, C. J. A. Dick 125,549
Armlet, A. S. Potter 125,407
Asphaltum, process for burning, L. Stevens 125,497
Atomizing, drying and concentrating liquid substances by, S. R. Percy 125,406
Bale tie, D. L. Miller 125,474
Bank note, bond, revenue stamp, etc., J. Duthie 125,550
Bed bottom, D. A. Scott 125,490
Bed bottom, Turnbull and Webb 125,421
Bedstead, J. P. Zeller 125,653
Bedstead, invalid, H. A. Scott 125,491
Bedstead, spring cot, F. C. Hall 125,389
Bee hive, C. C. Aldrich 125,427
Bell, door, H. D. Blake 125,530
Bellows, Miller and Faris 125,605
Bevel, carpenter's adjustable, Robinson and Fairbanks 125,617
Billiard cue, O. C. Wilbur, Jr 125,643
Bit brace, C. Whitus 125,642
Bleaching and disinfecting, P. Marcelin 125,469
Boat, solid bilge, D. Brader 125,435
Bobbins, machine for winding, W. V. Gee 125,564
Boiler, agricultural, Sill and Bennett, (reissue) 4,863
Boiler, steam, I. Barton 125,520
Boot and shoe pierced heels, forming, H. H. Bigelow 125,528
Boot and shoe heels, machine for making, H. H. Bigelow 125,529
Boring hubs, machine for, Roberts and Daily 125,616
Bracelet, J. Barclay 125,516
Bracelet, M. H. Mason 125,402
Bracelets, safety latch for, G. H. Soule 125,495
Bracket sheave, C. H. Straffin 125,419
Brake cylinders, relief valve for, T. W. Welsh 125,639
Brass instrument, military, B. F. Quinby 125,614
Brick press, W. Wakely 125,636
Brogan, C. E. Tyler 125,506
Broom clamp, W. D. Merick 125,603
Brushes to hats, device for attaching, A. A. Veer 125,422
Buckle, trace, W. S. Thayer 125,631
Bullets, die for pressing, E. Brown 125,376
Butter mold, D. G. Williams 125,644
Button hole, edge finish for, D. W. G. Humphrey 125,393
Can, shipping, E. H. Campbell 125,437
Candles, manufacture of, J. K. Truax 125,632
Car coupling, P. G. Gardiner 125,561, 125,562
Car wheel, J. A. Woodbury 125,649
Car wheels, tempering the tread of, J. A. Woodbury 125,651
Card stripping mechanism, G. E. Taft 125,501
Carding machine, E. French 125,447
Carriage, children's, F. Boylston 125,533
Carriage curtain fastener, J. Taynton 125,502
Carriage springs, connecting, Toplift and Ely, (reissue) 4,857
Carriage springs, mode of equalizing the action of, C. W. Saladee 125,413
Carriage wheels, metallic hub for, E. A. Archibald 125,514
Carriages, fifth wheel for, D. A. Johnson 125,397
Cartridge shells, machine for re-enforcing, C. S. Wells 125,508
Chandelier, I. P. Frink 125,560
Chandeliers, extension tube for, E. Russell 125,619
Churn, R. B. McCormick 125,601
Churns, dasher staff for, D. L. Grover 125,453
Clamp, rope, P. P. Jenney 125,396
Clip, suspension, T. H. Lee 125,590
Cloth, machine for cutting, A. Warth 125,638
Compound for gilding, A. S. De Vries 125,383
Compound for cleaning carpets, etc., L. Marks, (reissue) 4,860
Confection, L. P. Eleuterius 125,446
Cord covering machines, stop motion for, B. Lewis 125,467
Corn sheller, W. W. Holt 125,392
Corn sheller and straw cutter, combined, J. P. Smith 125,415
Corsets, fastening for, M. F. Bray, (reissue) 4,858
Culinary vessel, W. J. Burnett 125,538
Cutter head, E. A. Rowley 125,618
Dental plugger, W. F. Griswold 125,452
Desk bracket, school, J. L. Riter 125,411
Distilling apparatus, J. Kunze 125,463
Dough, apparatus for raising, S. V. Dodge 125,445
Earth closet, B. L. Kent 125,575
Earth commode, G. F. Stone 125,627
Eaves trough supporter, Prugh and Austry 125,483
Electricity for gas lighting, distributing, S. Gardiner, Jr 125,387
Electromagnetic engine, W. G. Thornton 125,504
Electromagnetic watchman's register, W. D. Sheppard 125,624
Embossing linen and other fabrics, press for, L. H. Olmsted 125,610
Emery vulcanite or hard rubber compound, preparing, T. J. Mayall 125,600
Engine, rotary, J. B. Bennett 125,524
Engine, rotary, J. J. and B. Clark 125,378
Engine, rotary steam, W. Darker 125,442
Engines, supplying steam to traveling, E. Lamm 125,577
Fabric for bags, roofs, etc., H. W. Johns 125,573
Fabrics, machine for hot pressing textile, R. R. Wilson, (reissue) 4,861
Fastener, shutter, Wunderlich and Mauch 125,425
Feed water regulator, R. Berryman 125,527
Fertilizers, treating phosphates for manufacture of, N. A. Pratt 125,613
Files, paper, Smith and Cheever, (reissue) 4,864
Fire extinguisher, J. B. Van Dyne 125,634
Fire extinguisher, automatic, R. Lapham, (reissue) 4,855
Fire arms, breech loading, H. A. Schesch 125,630
Flour, method of dressing, R. Barter 125,518
Furnace for calcining ores, J. H. Dunstan 125,384
Furnace for smelting ores, T. L. R. Scheuner 125,621
Galvanic bath for treating diseases, J. B. Hatting 125,567
Garments, money pocket for, E. Schnopp 125,499
Gas apparatus, J. H. Steiner 125,496
Gas, manufacture of illuminating, P. H. Vander Weyde 125,633
Gate, T. P. Wilcox 125,511
Gate, operating, J. L. Betts 125,375
Glass knobs, grinding off the shanks of, J. W. Haines 125,565
Grain binder, J. Pearson 125,481
Grate bar, air conducting, R. G. Orwig 125,404
Grater, nutmeg, H. J. Amerling 125,428
Grinding machine, Battell and Worrell 125,469
Gun, cane, A. Karutz 125,460
Gun lock, F. Wesson 125,640
Gun, revolving battery, R. J. Gatling 125,568
Hair, switch for the, G. H. Cutter 125,382
Harrow, A. Jacobson 125,528
Harrow, rotary, E. Bennett 125,373
Harrow, rotary, Jenson and Mathison 125,572
Harvester, C. B. Wolgemuth 125,512
Harvesters, spring seat for, T. Brett, (reissue) 4,859
Head dress for smoke, safety, W. N. Ball 125,515
Heater, feed water, R. Berryman 125,526
Hemp brake, W. S. Lawrence 125,466
Hinge, blind, O. S. Garretson 125,450
Hoe, J. S. Carroll 125,488
Hoisting apparatus, J. D. Warner 125,507
Hook, leader, C. D. Woodruff 125,652
Horse power, A. H. Haltom 125,455
Hose nozzle, G. O. Wickers 125,510
Insect exterminator, A. B. Ewing 125,557
Iron and steel, manufacture of pure, Larkin, Leighton, and White 125,464
Kettle, D. Stuart, (reissue) 4,865
Knife, trimming guard, Lander and Hill 125,578
Knitting machine, F. M. Comstock 125,543
Lamp collar and safety tube, C. B. Mann 125,588
Lathe, metal turning, J. W. Hyatt, Jr 125,571
Leach, ash, D. F. Miller 125,607
Lead, machine for cutting, C. Koehler 125,462
Leather, machine for cutting, E. A. Holbrook 125,457
Letter case, post office, A. F. Miller 125,606
Liniment, surgical and fresh wound, J. S. Stratton 125,628
Lock, combination, J. Moffet 125,475
Lock for canteens, H. W. Shepard 125,622, 125,623
Locomotive exhaust pipe, A. S. Smith 125,414
Loom shuttle actuating mechanism, Sheffield and Horton 125,493
Lubricator, axle, Mowerson and De Baun 125,477
Mash, process and apparatus for forming, F. W. Wolf 125,645
Medical compound for treating hogs, J. Shannon 125,492
Medical compound for treating diseases in horses, P. Cope 125,441
Mercury from its ores, apparatus for obtaining, H. Johnson 126,398
Meter, grain, Pooley, Roberts, and O'Brien 125,612
Meters, propeller wheel for fluid, W. Van Anden 125,506
Milk cooler, A. M. Blanchard 125,531
Mill, fanning, G. E. Clarke, (reissue) 4,853
Mill, grinding, J. G. and W. J. Lane 125,399
Millstones, apparatus for leveling, Meitzler and Hoos 125,472
Mowing machine, W. Anderson 124,429
Mowing machines, friction clutch for, G. S. Reynolds 125,409
Nails, machine for making horseshoe, M. D. and L. W. Whipple 125,423
Oil cup, H. McGraw 125,602
Oil cup, C. H. Parshall 125,405
Ornamentation of hat tips, etc., T. W. Bracher 125,534
Oven, baker's, A. Crumbie 125,546
Ovens, construction of, H. Chatain 125,439
Oyster basket, C. D. Martin 125,470
Packing, etc., rubber flanged tubing for, T. J. Mayall 125,594
Paddle wheel, G. H. Cushman 125,381
Paint compound, W. T. Burrell 125,436
Paper, machine for calendering, T. B. De Forest 125,548
Pavement, wood, J. I. Peyton 125,482
Pavement, wood, H. M. Stow 125,416, 125,417
Pavements, preparing blocks for, H. M. Stow 125,418
Pavements, compound for, R. Cranford, Jr 125,545
Pawl and ratchet device, A. M. Hills 125,391
Pen holder, W. J. Dewey 125,443
Photographic background, D. and D. Bendann 125,522
Pipe, machine for molding earthen, P. McIntyre, (reissue) 4,856
Pipe, tool for cutting off, H. Collinson 125,380
Pipes, machine for making concrete, G. I. Eagan 125,551
Planter, walking, G. W. Heath 125,568
Plow, J. M. and G. W. Moyers 125,478
Plow, shovel, G. H. Smith 125,494
Plowshare, design for, R. H. Taylor, (reissue) 4,866
Power, animal, J. R. Deyo 125,444
Preserving meat, apparatus for, C. F. Carr 125,540
Press, baling, G. F. Grund 125,454
Press, hay and cotton, J. W. McIntyre 125,471
Printing press, feed gauge for, Barth and Morgan 125,432
Propeller wheel, R. Johnson 125,458
Pulley, loose, J. P. Grosvenor 125,388
Pulley attachment, loose, C. F. Thayer 125,503
Pump, steam vacuum, C. S. Riker 125,410
Railroad rails, tempering steel, J. A. Woodbury 125,650
Railway rail, G. W. N. Yost 125,426
Railway rail, J. A. Woodbury 125,648
Railway switch, J. J. Pardee 125,611
Railway rails, splice piece for, R. French 125,448
Rakes, tooth fastening for horse, B. C. Taylor 125,630
Roaster, coffee, A. Larson 125,579
Roofing fabric, A. Robinson (reissue) 4,862
Roofing fabric, H. W. Johns 125,574
Roofing metal, W. S. Hawley 125,456
Roofing felt, machine for coating, J. B. Barker 125,517
Rubber tubing, vulcanized, T. J. Mayall 125,596
Rubber hose, machine for making, J. Murphy 125,479
Rubber hose and tubing, machine for making india, T. T. Mayall 125,598
Rubber flanged tubing, machine for making india, T. J. Mayall 125,599
Rubber rolls, manufacture of vulcanized india, T. J. Mayall 125,595
Rubber sheets into bands for hose and belting, machine for cutting india, T. J. Mayall 125,597
Saddle, harness, J. H. Martin 125,589
Sash holder, S. N. Weston 125,509
Sash holder, J. J. Callen 125,539
Saw set, H. R. Lavey 125,465
Saw mill, Woodard and Snyder 125,647
Saw tooth swage, A. J. Keyes 125,576
Sawing machine, C. L. and L. P. Hoyt 125,570
Scabbard frog, H. Metcalfe 125,604
Seat, folding, C. J. Eversickx 125,556
Seats, attachment for backs of, H. M. Beidler 125,521
Seed dropper, Morton and Spalding 125,476
Separator, grain, J. Allonas 125,513
Sewing machine, O. W. Baker 125,374
Sewing machine, A. Steward 125,498
Sewing machines, binder for, W. N. Martin 125,590
Sewing machines for button holes, D. W. G. Humphrey 125,394
Sewing machines, thread tension mechanism for, J. Bromley 125,535
Sewing machines, ruffling attachment for, J. D. Moore 125,608
Sewing machines, cloth gathering attachment for, Willcox and Carleton 125,634
Shade, window, Metcalf and Allen 125,473
Shoe fastening, A. Lawson 125,466
Shovel and tongs combined, T. O. Newnam 125,480
Siphon, J. W. Fox 125,559
Slate frame, W. N. Bartholomew 125,519
Smut machines, composition stone for, Elliott and Wood 125,385
Soap and other materials, machine for mixing, C. Elling (reissue) 4,854
Soda fountain, J. Matthews 125,591
Spikes, machine for making, J. H. Swett 125,629
Spittoon, J. W. Wetmore 125,641
Stair rod, E. Rath 125,615
Stand, book, H. M. Sweeney 125,500
Staves, machinery for jointing, Clark and Smith 125,440
Steam trap, C. Cammerer 125,459
Steam trap, W. Robinson 125,487
Steels, machine for grooving butchers', J. Sureras 125,499
Stone, artificial, G. L. Eagan 125,552
Stone, tool for turning, J. E. Mitchell 125,409
Stone, cement for artificial, J. A. Henshaw 125,390
Stove, cooking, P. N. Burke 125,377
Stove pipe shelf, H. P. Chapman 125,541
Straw cutter, L. Evans 125,555
Stuffing box, metallic, W. H. Holland 125,569
Sugar, apparatus for dissolving, W. Hocking 125,454
Sugar mixer and packer combined, Cogswell and Sendering 125,379
Sugar, machine for cutting loaf, P. O. Brunjes 125,536
Table, folding, J. Quevedo 125,484
Telegraph apparatus, G. Little 125,582, 125,583, 125,584, 125,585, 125,586, 126,58
Thill coupling, E. S. Roberts 125,486
Thill coupling, I. N. Ellis 125,553
Thill coupling, W. W. Wallis 125,637
Thrashing machine reel, J. H. Hanna 125,566
Tooth plugging instrument, T. L. Buckingham 125,537
Track cleaner, railway, A. Day 125,547
Trap, animal, Fisbie and Hart 125,449
Truck, steering apparatus for hook and ladder, J. Schmidlapp 125,448
Truss, E. P. Banning, Jr 125,431
Turbine, J. J. Faulkner 125,558
Valve, compression, E. Bourne 125,532
Valve, puppet, R. Berryman 125,525
Vehicles, seat for, J. R. Linton 125,468
Vehicles, wheel for, S. C. Tillinghast 125,420
Vehicles, adjustable metallic dash for, G. M. Peters (reissue) 4,861
Velocipede, S. A. Gregg 125,451
Ventilator, car, S. C. Maine 125,401
Ventilator, car, S. E. Kirkpatrick 125,461
Vise, A. P. Stevens 125,625
Vise, pipe, Barwick and Farre 125,433
Wagon standard support, G. Stiber 125,626
Wagon for fountains charged with soda water, J. Matthews 125,592
Washing machine, C. Robinson 125,412
Washing machine, J. S. Balsly 125,430
Washing machine, Cole and Hoxie 125,542
Washing machine, Cowgill and Hill 125,544
Washing machine, S. Entwistle 125,554
Washing machine, Norris and Cole 125,609
Water cut off, W. H. Lilley 125,581
Water elevator, steam, E. Reese 125,408
Windmill, S. W. May 125,593
Yeast for brewers and others, J. Wolff 125,646

DESIGNS PATENTED.

5,752 to 5,756.—CARPETS.—J. Barrett, New York city.
5,757.—WATCH KEY OR CHARM.—J. Goldsborough, Philadelphia, Pa.
5,758.—STOVE.—J. Hackett, Louisville, Ky.
5,759.—TYPE.—C. E. Heyer, West Roxbury, Mass.
5,760 and 5,761.—OIL CLOTHS.—H. Kagy, Philadelphia, Pa.
5,762.—DRAWER PULL.—J. M. Maris, Philadelphia, Pa.
5,763.—HAND STAMP.—W. E. Osborn, Brooklyn, N. Y.
5,764 and 5,765.—CARPETS.—W. R. Parks, Palmer, Mass.
5,766.—DOOR LATCH.—A. Wunder, New Haven, Conn.

TRADE MARKS REGISTERED.

737.—PLUMBAGO LUBRICANT.—American Graphite Co., New York city.
738.—SEWING SILK, ETC.—Calhoun, Robbins & Co., New York city.
739.—LIQUORS.—Cazade & Crooks, New York city.
740.—MULEY SAW HANGINGS.—W. S. Colwell, Allegheny, Pa.
741 to 743.—WHISKY.—M. R. Cook & Co., New York city.
744.—SUSPENDERS.—Fisk, Clark & Flagg, New York city.
745.—MEDICINE.—Hall & Alger, Taunton, Mass.
746.—MEDICINE.—N. Jenkins, New Orleans, La.
747.—FLOUR.—McCutcheon, Gordon & Co., Sparta, Ill.
748.—SNUFF.—A. Ralph, Philadelphia, Pa.
749 to 754.—MOWING, REAPING, AND HARVESTING TOOLS.—The Greenwoods Scythe Company, New Hartford, Conn.
755.—CUTLERY.—E. Ward & Co., Sheffield, England.
756 to 758.—MEDICINES.—C. Fleming, Sewickley, Pa.
759 to 762.—CORSETS.—Ottenheimer, Rothschild and Co., New York city.
763.—DRY GOODS.—A. T. Stewart & Company, New York city.
764.—PREPARATION OF COD LIVER OIL.—E. H. Truex, New York city.

SCHEDULE OF PATENT FEES:

On each Caveat	$10
On each Trade-Mark	$25
On filing each application for a Patent, (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Examiners-in-Chief	$10
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (three and a half years)	$10
On an application for Design (seven years)	$15
On an application for Design (fourteen years)	$30

For Copy of Claim of any Patent issued within 30 years $1
A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from $1
upward, but usually at the price above-named.
The full Specification of any patent issued since Nov. 20, 1866 *at which time the Patent Office commenced printing them* ..... $1·25
Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.
Full information as to price of drawings in each case, may be had by addressing

MUNN & CO.,
Patent Solicitors, 37 Park Row, New York.

APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending, for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

20,815.—SAUSAGE FILLER.—J. G. Perry. June 19, 1872.
20,841.—RAILWAY SIGNAL.—A. Burnham. June 19, 1872.
21,275.—ICE STAND.—H. A. Roberts. August 7, 1872.
21,311.—SECURING PLANE IRON.—L. Bailey. August 14, 1872.
20,804.—DEVICE FOR PLANING.—H. B. Smith. June 19, 1872.
20,840.—BOILER FURNACE.—H. Yates, June 19, 1872.
15,995.—FIRE ARM.—G. W. Morse. May 22, 1872.
15,996.—CARTRIDGE.—G. W. Morse. May 22, 1872.

EXTENSIONS GRANTED.

19,819.—LIGHTNING CONDUCTOR.—O. White.
19,787.—WINDLASS.—J. P. Manton.
19,747.—WIRE STAPLE.—B. Boardman.
19,786.—LATHE CHUCK.—J. L. Mason.
19,806.—ROTARY CUTTER.—J. A. Woodbury.

FOREIGN PATENTS—A HINT TO PATENTEES.

It is generally much better to apply for foreign patents simultaneously with the application in the United States. If this cannot be conveniently done, as little time as possible should be lost after the patent is issued, as the laws in some foreign countries allow patents to any who first makes the application, and in this way many inventors are deprived of valid patents for their own inventions. It should also be borne in mind that a patent is issued in England to the first *introducer*, without regard to the rights of the *real* inventor; therefore, it is important that all applications should be entrusted to responsible agents in this country, who can assure parties that their valuable inventions will not be misappropriated. The population of Great Britain is 31,000,000; of France, 37,000,000; Belgium, 5,000,000; Austria 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address

MUNN & CO.,
37 Park Row, N. Y.

☞ Circulars, with full information on foreign patents, furnished free.

THE NEW VOLUME OF

SCIENTIFIC AMERICAN

commenced JANUARY FIRST; therefore, now is the time to organize Clubs and to forward subscriptions. Clubs may be made up from different post offices.

TERMS FOR 1872.

One copy, one year		$3.00
One copy, six months		1.50
One copy four months		1.00
CLUB RATES	Ten copies, one year, each $2.50	25.00
	Over ten copies, same rate, each	2.50

One copy of Scientific American for one year, and one copy of engraving, "Men of Progress," - 10.00

One copy of Scientific American for one year, and one copy of "Science Record," - - - 4.00

Ten copies of "Science Record," and ten copies of the Scientific American for one year - - - 35.00

CLUB PREMIUMS.

Any person who sends us a yearly club of ten or more copies, at the foregoing club rates, will be entitled to one copy, gratis, of the large steel plate engraving, "Men of Progress."

Remit by postal order, draft or express.

The postage on the Scientific American is five cents per quarter, payable at the office where received. Canada subscribers must remit, with subscription, 25 cents extra to pay postage.

Address all letters and make all Post Office orders or drafts payable, to

MUNN & CO.,
37 PARK ROW, NEW YORK

Advertisements.

RATES OF ADVERTISING.

Back Page - - - - - - $1·00 a line,
Inside Page - - - - - - 75 cents a line
for each insertion.

Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

The value of the SCIENTIFIC AMERICAN *as an advertising medium cannot be over-estimated. Its circulation is ten times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading-rooms of the world. We invite the attention of those who wish to make their business known to the annexed rates. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. If it is worth 25 cents per line to advertise in a paper of three thousand circulation, it is worth $2.50 per line to advertise in one of thirty thousand.*

Tin-Lined Lead Pipe

Is a Block-Tin Pipe, heavily coated with solid lead. It is the best and cheapest Water Pipe when strength and durability are considered. By its use iron-rust, lead and zinc poison are all avoided, and general health promoted. Price 15 cents a pound for all sizes. Circulars and sample of pipe sent by mail, free. Address the COLWELLS, SHAW & WILLARD M'F'G Co., No. 213 Centre Street, New York. Also, manufacturers of Block-Tin Pipe, Sheet Lead, Lead Pipe, Solder, &c. Orders solicited, and filled at sight.

LIGHTNING ROD POINTS AND NUTS, in every style. Samples free. J. R. GILCHRIST, Mt. Pleasant, Iowa.

HERE IT IS—MONEY IN IT.—READY FOR AGENTS and pedlars—the most novel, useful, saleable Cork-screw in the world. WALTER DICKSON, Albany, N.Y.

CINCINNATI BRASS WORKS. — Engineers and Steam Fitters' Brass Work, Best Quality at lowest Prices. F. LUNKENHEIMER, Prop'r.

WHO WANTS A HOME IN TEXAS?—Three hundred acres of the choicest land in Tyler County, Texas, is offered for sale cheap for Cash, or will be exchanged for property in any one of the following named States: New York, New Jersey, Maryland, North Carolina. For further information, address Mrs. J. A. B. SEIVER, Houston, Florida.

PATENTS.—Send for our Descriptive List of Patents for Sale or Exchange. Parties desiring to dispose of meritorious Inventions should consult us. More Agents wanted. E. H. GIBBS & CO., 11 Wall St. N.Y.

ARTIFICIAL STONE,
CHEAPER FOR ANY PURPOSE than any other. State Rights, $200—ten States, $1,500—California and New York, $1,000 each. Send Stamp for Circular.
THOS. HODGSON, 17 Beach Place, Brooklyn, N.Y.

PATENT BAND SAWING MACHINES

Of the most approved kinds to saw bevel as well as square without inclining the table, by FIRST & PFYBIL, heretofore at 422 19th avenue—now removed to a more spacious place, 461 to 467 West 30th street, cor. 10th avenue, New York, where we manufacture various sizes of our well known sawing, moulding, double spindle boring and mortising Machines, general and oval turning Lathes, Shafting, Pulleys, &c. &c.

Prices for Band Saw Machines (of which at the present time, April 1st, 156 of our make operate in New York City alone), are $250, $275, $350, and $400. To the largest a feed can be attached to resilt boards. A machine to resilt heavy timber is in construction. Have on hand a large stock of best French bands and blades.

5000 AGENTS WANTED.—Samples sent free by mail, with terms to clear from $5 to $10 per day. Two entirely new articles, saleable as flour. Address N. B. WHITE, Newark, New Jersey.

100 Envelopes, Letter, or Bill Heads printed with 20 or less words, and mailed for 60c. 1000 Bristol Cards, $2.50. F. SAFFORD, Scotland, Conn.

$10 **To $20 Daily Paid Canvassing Agents.** Exclusive territory. New monopoly. Sells in every family to entire satisfaction. **Agents wanted.** MYERS M'F'G CO., 104 John St., New York.

DAVIS' PATENT RECORDING GAUGE.
Adopted by the Board of U. S. Supervising Steamboat Inspectors. Simple and Cheap. NEW YORK STEAM GAUGE COMPANY, 46 Cortlandt Street, New York.

NEW YORK STENCIL WORKS,
87 NASSAU ST., NEW YORK.
Stencils of all kinds; Brass Labels for Manufacturers; Steel Stamps and Dies, and Stencil materials. Terms reasonable, and good work guaranteed.

MACHINISTS' TOOLS.—Send for Illustrated Catalogue. CHAS. GOOCH, Cincinnati, Ohio.

YOU WANT THE CHOICEST

ORNAMENTAL FOLIAGE PLANTS

Ever Offered in this Country.

☞ See our Illustrated Catalogue of new and rare plants. Send Stamp. Address
OLM BRO'S, Springfield, Mass.

40 LB. FORGE HAMMER—For light and heavy work. Good machine, at low price.
EDWARD HARRISON,
New Haven, Conn.

500,000 AGENTS WANTED to sell "Eureka Shirt front holder." Every Gent buys it. Sample 50c. GURNEY PROPRIETORY Co. Salem, Columbiana Co., Ohio.

AGENTS WANTED to sell articles needed by every one. Address PLUMB & CO., Phila. Pa.

Whalen Turbine. No risks to purchaser. Send for Pamphlet, free. SETH WHALEN & BRO., Ballston Spa, N.Y.

JUST ISSUED:
NEW, ENLARGED, AND IMPROVED EDITION OF
NYSTROM'S MECHANICS,
A POCKET BOOK OF
MECHANICS & ENGINEERING:
Containing a Memorandum of Facts, and Connection of Practice and Theory; abounding in Valuable Formulæ and Important Information concerning a Great Variety of Technical Operations. By JOHN W. NYSTROM, C. E. Eleventh Edition. Revised, and Greatly Enlarged by the Addition of Original Matter. 16mo. Pocket Book form. Gilt edges. $3.50.
FULLY ILLUSTRATED.
*** For sale by Booksellers generally, or will be sent by mail, postage prepaid, on receipt of the price by
J. B. LIPPINCOTT & Co., Publishers,
715 & 717 *Market St., Philadelphia.*

Andrew's Patents.

Noiseless, Friction Grooved, or Geared Hoisters, suited to every want.
Safety Store Elevators. Prevent Accident, if Rope, Belt, and Engine break.
Smoke-Burning Safety Boilers.
Oscillating Engines, Double and Single, 1-2 to 100-Horse power.
Centrifugal Pumps, 100 to 100,000 Gallons per Minute, Best Pumps in the World, pass Mud, Sand, Gravel, Coal, Grain, etc., without injury.
All Light, Simple, Durable, and Economical. Send for Circulars.
WM. D. ANDREWS & BRO.,
414 Water street, New York.

RIVERVIEW Military Academy, Poughkeepsie, N. Y. A thorough-going school for boys.

SOLUBLE GLASS
SILICATES OF SODA AND POTASH. FIRE, WATER and MILDEW PROOF. Manufactured by L. & J. W. FEUCHTWANGER, 55 Cedar St., N.Y.

P. BLAISDELL & Co.,
MANUFACTURERS OF FIRST CLASS **MACHINISTS' TOOLS.** Send for Circulars.
Jackson st., Worcester, Mass.

EDWARD H. HOSKIN,
CONSULTING AND ANALYTICAL CHEMIST,
Lowell, Mass.

LIGHT GREY IRON **CASTINGS**—all kinds made to order promptly. Light Cast Goods a Specialty. LIVINGSTON & CO., Pittsburgh, Pa.

ELECTRIC APPARATUS for BLASTING and Submarine Work, manufactured solely by GEORGE E. LINCOLN & CO., Room 9, 32 Summer St., Boston, Mass.
Consisting of:
Electric Batteries of various sizes,
Electric Fuses of any required length
Electric Fuse Heads, detached,
Connecting Wire, Leading Wire, &c., &c.
Send for Circular.

Fruit, Shade, **Trees!** Garden, Hedge, **Plants!** Flower, Garden, **Seeds!**
Apple and Crab Rootgrafts, best sorts, 10,000 .....$50.00
Pear, Std. Extra, 1 yr., Bartlett, &c., 3 to 4 ft., doz.. 2.50
Seeds, Peach, bu., $2; Apple, Osage, new, bu.... ....12.00
Potatoes, White Peach Blow, Early Rose, bu..... 2.00
Seedlings, Soft Maple, 1,000, $1; Ash, $3; Elm..... 2.00
Illustrated Catalogue, 100 page, and New Price List. 10c.
F. K. PHŒNIX, Bloomington, Ill.

MACHINERY, NEW and 2d-HAND.—Send for Circular. CHAS. PLACE & CO., 60 Vesey st., New York.

SCHENCK'S
WATERPROOF SHIPPING TAG.
CHEAPEST and BEST.
90 Ann Street, New York.
P. O. Box 2564.
Send for prices and samples. Superior for cotton.

WE warrant every Steam Gauge bearing our name and numbered above 12,000 **FOR TWO YEARS.**
☞ See Circulars.
UTICA STEAM GAUGE CO., Utica, N.Y.

PROPELLER PUMPS
Of any capacity and elevation, without Valves. For clean water, sand, sawdust, &c. W. B. BUCK, Sec., 61 N. Front St., Philadelphia, Pa.

THE WOODWARD
STEAM PUMP.
Woodward Pat. Improved Safety Steam Pump and Fire Engine, Steam, Water, and Gas Fittings of all kinds. Dealers in Wrought-Iron Pipe, Boiler Tubes, etc. Hotels, Churches, Factories, and Public Buildings heated by Steam, Low Pressure. Woodward Co., 76 and 78 Center st., N.Y.

AGENTS, LOOK! Genteel Business. Most attractive little article. Everybody wants one. Our agents are surely making $3 to $20 daily. Send Stamp for Circulars to CHURCHILL & TEMPLETON, 74 B'dw'y, N.Y.

STEAM PUMPS WRIGHT'S Bucket Plungers are the best. Send for circular. Valley Machine Co., Easthampton, Mass.

E. M. MAYO'S BOLT CUTTER—Patented in 1867—Revised and improved in 1871 and 1872. Send for Illustrated Circular, Cincinnati, Ohio.

IMPROVED FOURNEYRON TURBINES. These celebrated Turbine Wheels constructed on scientific principles by WM. J. VALENTINE, Fort Edward, N. Y. No fancy prices.

STEEL CASTINGS,
UNDER HAINSWORTH'S PATENT.
We are making **Steel Castings, Smooth, True, Free from Porosity,** capable of receiving **Very High Polish,** Can be **Forged** or **Welded** easily as **Bar Steel,** and **Strong as Forged Steel.** Send for Circular.
PITTSBURGH STEEL CASTING CO. Pittsburgh, Pa.

Highest Premium awarded by American Inst. Fair, 1871.

TRADE MARK.

CAUTION.

Purchasers and consumers of PRINCE'S METALLIC PAINT will please see that each package has our trade mark, and name on the side, as *Mineral* and other worthless paints are frequently sold upon the merits, and often in the name of PRINCE'S METALLIC, to the great loss and injury of the consumer. For sale by the trade, and PRINCE & BASS, Manufacturers, 96 Cedar St., New York.

BUERK'S WATCHMAN'S TIME DETECTOR.—Important for all large Corporations and Manufacturing concerns—capable of controlling with the utmost accuracy the motion of a watchman or patrolman, as the same reaches different stations of his beat. Send for a Circular.
J. E. BUERK,
P. O. Box 1,067 Boston, Mass.
N. B.—This detector is covered by two U. S. Patents. Parties using or selling these instruments without authority from me will be dealt with according to law.

WROUGHT IRON BEAMS & GIRDERS

THE Union Iron Mills, Pittsburgh, Pa. The attention of Engineers and Architects is called to our improved Wrought-Iron Beams and Girders (patented), in which the compound welds between the stem and flanges, which have proved so objectionable in the old mode of manufacturing, are entirely avoided, we are prepared to furnish all sizes at terms as favorable as can be obtained elsewhere. For descriptive lithograph address Carnegie, Kloman & Co. Union Iron Mills, Pittsburgh Pa.

"Buckeye" Hominy Mill.

IN THE WORKING OF THIS MILL the Corn requires no preparation except shelling. It has a regular feed and discharge, and needs but little attention. IT IS COMPLETE IN ITSELF. Hominy can be made from common as well as flint corn. It occupies very little room, and any miller can work it. There is nothing the miller can manufacture to a better profit than Hominy. Send for descriptive pamphlet. BALTIMORE PEARL HOMINY CO., Baltimore, Md., Sole owners of Patent.

MAGIC For the Parlor. Send a Stamp for a price list. **HARTZ CONJURING REPOSITORY, No. 743 Broadway, New York.**

You ask WHY we can sell First Class 7 Octave Pianos for **$290?** We answer—It costs less than $300 to make any $666 Piano sold through Agents, all of whom make 100 per ct. profit. We have no Agents, but ship direct to families at Factory price, and warrant Five Years. Send for illustrated circular, in which we refer to 300 Bankers, Merchants, &c. (some of whom you may know) using our Pianos in 40 States and Territories.
U. S. Piano Co., 865 Broadway, New York.

Sturtevant Blowers
Of every size and description, constantly on hand.
GEORGE PLACE & CO.,
121 Chambers & 103 Reade Streets, New York.

Machinery,
Wood and Iron Working of every kind. Leather and Rubber Belting, Emery Wheels, Babbitt Metal, &c.
GEO. PLACE & CO., 121 Chambers & 103 Reade Sts. N.Y.

Machinists' Tools.
The largest and most complete assortment in this country, manufactured by
NEW YORK STEAM ENGINE COMPANY,
121 Chambers & 103 Reade Streets, New York.

Cold Rolled Shafting.
Best and most perfect Shafting ever made, constantly on hand in large quantities, furnished in any lengths up to 24 ft. Also, Pat. Coupling and Self-oiling adjustable Hangers.
GEORGE PLACE & CO.,
121 Chambers & 103 Reade Streets, New York.

WOODBURY'S PATENT
Planing and Matching
and Molding Machines, Gray & Wood's Planers, Self-oiling Saw Arbors, and other wood working machinery.
S. A. WOODS, 91 Liberty street, N. Y.; 107 Sudbury street, Boston
Send for Circulars.

Good 2d Hand Machinery for Sale.

One 28 in. 6 Roll Cincinnati Double Surfacer and Matcher	$1,000
One 24 in. 4 Roll Rogers' Surfacer	350
One 26 in. Endless Bed Planer	350
One 24 in. 4 Roll Ball Surfacer	225
One Good Rogers' Power Mortising Machine with Boring Shaft	200

POWER, TAINTER & CO.,
1003 Chestnut St., Philadelphia, Pa.

TO INDIA RUBBER MANUFACTURERS
For Sale—One four Roll Calender and three Grinders. They are nearly new, and in complete order.
Address, T. SAULT, Consulting Engineer,
New Haven, Conn.

NEW PATTERNS.
MACHINISTS' TOOLS—all sizes—at low prices.
E. & R. J. GOULD, 97 to 113 N. J. R. R. Ave.,
Newark, N. J.

PORTABLE STEAM ENGINES, COMBINING the maximum of efficiency, durability and economy, with the minimum of weight and price. They are widely and favorably known, more than **900** being in use. All warranted satisfactory or no sale. Descriptive circulars sent on application. Address
J. C. HOADLEY & CO., Lawrence, Mass.
46 Cortlandt st. New York.

Niagara Steam Pump.
CHAS. B. HARDICK,
23 Adams st., Brooklyn, N. Y.

AUSTRALIAN COLONIES.
BENCRAFT & SMITH, Solicitors and Patent Agents, Melbourne, Victoria. Agencies in all the Colonies.
References—*New York*: John Stephenson & Sons. *Melbourne*: United States Consul.
Powers of attorney to Charles Chichester Bencraft.

STAVE MACHINERY
And WOODWORTH PLANERS for 12 years a specialty.
T. B. RICKER & SONS, Harrison, Me.

ROPER HOT AIR
ENGINE COMPANY, 124 Chambers St., New York.

OTIS' SAFETY HOISTING **Machinery.**
OTIS, BROS. & Co.
No. 348 BROADWAY, NEW YORK.

Reynolds'
TURBINE WATER WHEELS.
The Oldest and Newest. All others, only imitations of each other in their strife after complications to confuse the public. We do not boast but quietly excel them all in staunch, reliable, economical power. Beautiful pamphlet free. GEO. TALLCOT, 96 Liberty st., New York.
Gearing, Shafting.

1832, SCHENCK'S PATENT. 1871.
WOODWORTH PLANERS
And Re-Sawing Machines, Wood and Iron Working Machinery, Engines, Boilers, etc. JOHN B. SCHENCK'S SONS, Matteawan, N. Y. and 118 Liberty st., New York.

UNIVERSAL WOOD WORKER,
HORIZONTAL AND UPRIGHT BORING MACHINES.
McBETH, BENTEL & MARGEDANT, Hamilton, O.

LOADSTONE, Bloodstone, Fluoric Acid, Asbestos, Bismuth, Cadmium, Platina, Antimony & Nickel Metals—Oxide of Manganese, Tungsten or Wolfram Ore, Black Lead, Zaffre, etc., etc., for Sale in any quantity, by L. & J. W. FEUCHTWANGER, 55 Cedar Street, New York.

WOOD-WORKING MACHINERY GENERALLY. Specialties, Woodworth Planers and Richardson's Patent Improved Tenon Machines. Nos. 24 and 26 Central, corner Union st., Worcester, Mass.
WITHERBY RUGG. & RICHARDSON.

MACHINISTS.
Illustrated Catalogue and Price List of all kinds of small Tools and Materials sent free to any address. GOODNOW & WIGHTMAN, 23 Cornhill Boston, Mass.

Milling Machines.
STANDARD, UNIVERSAL, INDEX AND PLAIN, in every variety, of unequalled design and first class workmanship. Send for illustrated catalogue to the BRAINARD MILLING MACHINE COMPANY, 80 Milk Street, Boston. Works at Hyde Park.

AGENTS WANTED. Agents make more money at work for us than at anything else. Particulars free. G. STINSON & Co., Fine Art Publishers, Portland, Me.

RICHARDSON, MERIAM & CO.
Manufacturers of the latest improved Patent Daniels' and Woodworth Planing Machines, Matching, Sash and moulding, Tenoning, Mortising, Boring, Shaping, Vertical, and Circular Re-sawing Machines, Saw Mills, Saw Arbors, Scrol. Saws, Railway, Cut-off, and Rip-saw Machines, Spoke and Wood Turning Lathes, and various other kinds of Wood-working Machinery. Catalogues and price lists sent on application. Manufactory, Worcester, Mass. Warehouse, 107 Liberty st. New York. 17 1

SHINGLE AND BARREL MACHINERY.—Improved Law's Patent Shingle and Heading Machine, simplest and best in use. Also, Shingle Heading and Stave Jointers, Stave Equalizers, Heading Planers Turners, etc. Address TREVOR & Co., Lockport, N.Y.

PUMPS.—For Description, Price Lists etc., of the Best Centrifugal Pump ever invented, with Overwhelming Testimony in its favor, send for new illustrated pamphlet (40 pp.) to Messrs. HEALD, SISCO & CO. Baldwinsville, N. Y.

LATHE CHUCKS—HORTON'S PATENT from 4 to 36 inches. Also for car wheels. Address E. HORTON & SON, Windsor Locks, Conn.

MODELS FOR THE PATENT OFFICE, and experimental machinery of all kinds. HOLSKE MACHINE CO., 279 Cherry St., New York, near Jefferson St. A special shop for Patent Models. Many years experience. Refer to Scientific American Office.

PATENT IMPROVED
VARIETY MOLDING MACHINERY
And Adjustable
CIRCULAR SAW BENCHES.
For Machines and information, address
J. P. GROSVENOR, Lowell, Mass.

STEAM
PUMPING MACHINERY

INDEPENDENT
BOILER FEEDER.
Works Hot and Cold Water.
LARGE AND SPLENDID
Illustrated Catalogue,
Sent Free on Application.
Cope & Maxwell Man'fg Company,
118, 120 & 122 East Second St.,
CINCINNATI, O.

$100 to 250 per month guaranteed sure to Agents everywhere selling our new seven strand **White Platina Clothes Lines.** Sells readily at every house. Samples free. Address the GIRARD WIRE MILLS, Philadelphia, Pa.

HAND SAW MILL.—Do work of 3 men. Rip 3 inch lumber with ease. Thousands in use. Agents wanted everywhere. HILLS & HOAG, 32 Courtlandt Street New York.

THE "PHILADELPHIA"
HYDRAULIC JACK.
PISTON guided from both ends; all working parts guarded from dust; single or double pumps, cylinders, shafts, rocker arms, pistons, etc., entirely steel.
No. 14 N. 5th st., Philadelphia. } PHILIP S. JUSTICE.
No. 42 Cliff st., New York.

MASON'S PAT'T FRICTION CLUTCHES are manufactured by Volney W. Mason & Co., Providence, R. I. Agents, R. BROOKS & CO., 128 Ave. D, New York; TAPLIN, RICE & CO., Akron, Ohio.

A CAREFULLY SELECTED assortment of
PATENT RIGHTS
Constantly on hand and for sale, either for cash or on royalty. We offer those only, which, after a business experience of fourteen years, we can thoroughly endorse, both in a pecuniary and mechanical aspect. Manufacturers and capitalists negotiating through us will therefore continue to find safe and profitable investments, as in former years. See advertisements in the New York daily papers. Patentees and inventors will do well to communicate with us for terms, &c. E. E. ROBERTS & CO., Consulting Engineers, 13 Wall St., New York.

MACHINISTS' PATTERN and BRAND Letters—Every size or style on hand, OR TO ORDER.
VANDERBURGH, WELLS & CO.,
18 Dutch St., corner Fulton, N.Y.
Engravers' BOXWOOD—METAL for Machinists.

BUY BARNES'S BIT BRACE.

$10 from 50 cts.
12 SAMPLES sent (postage paid) for Fifty Cents, that retail easily for Ten Dollars.
R. L. WOLCOTT, No. 181 Chatham Square, N.Y.

Advertisements.

Advertisements will be admitted on this page at the rate of **$1·00** *per line for each insertion. Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.*

VULCANIZED RUBBER

Adapted to Mechanical Purposes. New York Belting and Packing Co., 37 & 38 Park Row.

ASPHALTE ROOFING FELT.

A WELL tested article of good thickness and durability, suitable for steep or flat roofs; can be applied by an ordinary mechanic or handy laborer. Send for circular and samples to E. H. MARTIN, 20 Maiden Lane and 9 Liberty Street, N. Y.,

THE AMERICAN WATCHMAKER'S, JEWELER'S, AND SILVERSMITH'S JOURNAL. All these branches treated in their artistic, mechanical, and commercial details. Each number contains original designs. Price $2.50 per annum, invariably in advance. Send 25c. for April number. But a limited number of advertisements allowed. Published by SHAW & CO., No. 41 Park Row, New York.

FOR SALE, CHEAP—Stave and Heading Factory. Located in the city of Charlotte. Fine timbered country; 2 railroads; engine 60 horse power; machinery nearly new; may be converted into other manufacturing purposes, if desired. For particulars, address H. S. ARNOLD, Charlotte, Mich.

The Union Stone Co.,

Patentees and Manufacturers of

EMERY WHEELS & EMERY BLOCKS,

In Size and Form to Suit various Mechanical Uses;

GRINDERS, SAW GUMMERS, DIAMOND TOOLS, and WOOD'S PATENT KNIFE-GRINDER,

For Planing, Paper Cutting, Leather Splitting, and other Long Knives.

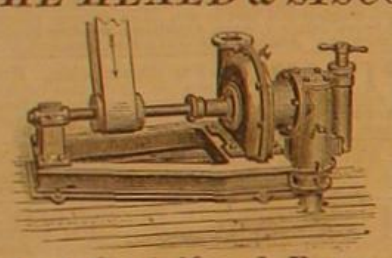
OFFICE, 29 KILBY STREET, Boston, Mass.

BRANCH OFFICES { 93 Liberty Street, New York. 502 Commerce Street, Philadelphia.

☞ Send for circular.

THE HEALD & SISCO

HORIZONTAL PUMP, WITH PRIMER & BED FRAME.



Patent Centrifugal Pumps,

VERTICAL AND HORIZONTAL,

ARE USED ALL OVER THE UNITED STATES and the Canadas, and also in Great Britain. Send for our new Illustrated Pamphlet, containing hundreds of references to Tanners, Paper-makers, Contractors, Brick-makers, Distillers, etc., with 15 pages of the strongest possible testimony.

Address HEALD, SISCO & CO., Baldwinsville, N.Y.

☞ The H. & S. Pump took the First Premium at the recent Louisiana State Fair, over the most celebrated Centrifugal Pumps known in the United States, including one from New York. As a Wrecking-pump, and as an Irrigator, it is unrivalled, both for cheapness and efficiency.

Steam Super-Heaters.

For latest improvements,
Address HENRY W. BULKLEY, ENGINEER, 98 Liberty Street, New York.

BUSINESS WANTED.

PARTIES WITH CAPITAL and Manufacturing facilities would like to arrange with some party who has first class Sewing Machine with late improvements (or any other invention of real utility) for the manufacturing and introducing the same. Address BUSINESS, Newburyport, Mass.

VALUABLE TOOLS.

CLOSING OUT SALE OF THE WOODRUFF & BEACH IRON WORKS PROPERTY, HARTFORD, CONNECTICUT.

One Large Double Tool Post Planing Machine—Table 24½ ft.—width and hight, 10 ft. between uprights—Up and down feed—Tool raised on back stroke—Cross head raised and lowered by power—Weight about 77 Tons. In good order.

One Large Lathe—Swings 72 in. over shears—Turns 28½ feet between centers—Screw feed and Screw cutting gears, with cross feed. Can easily reduce shaft 2½ in. each revolution. Nearly new. Weight about 31 Tons.

Also, a large stock of smaller tools.

HENRY B. BEACH, JONATHAN B. BUNCE, } AGENTS.

And Shaped Diamond Carbon Points, indispensable for Turning Emery Wheels, Grindstones, also Tracing up hardened Steel and Paper Calender Rollers, &c. Address J. DICKINSON, Patentee, 64 Nassau St., N.Y.

Diamond-Pointed STEAM DRILLS.

THE adoption of new and improved applications to the celebrated Leschot's patent, have made these drills more fully adaptable to every variety of ROCK DRILLING. Their unequalled efficiency and economy are acknowledged, both in this country and Europe. The Drills are built of various sizes and patterns; WITH AND WITHOUT BOILERS, and bore at a uniform rate, of THREE TO FIVE INCHES PER MINUTE in hard rock. They are adapted to CHANNELLING GADDING, SHAFTING, TUNNELLING, and open cut work; also, to DEEP BORING FOR TESTING THE VALUE OF MINES AND QUARRIES. TEST CORES taken out, showing the character of mines at any depth. Used either with steam or compressed air. Simple and durable in construction. Never need sharpening. Manufactured by

THE AMERICAN DIAMOND DRILL CO., No. 61 Liberty St., New York

IMPORTANT IMPROVEMENT on the Diamond Pointed Steam Drill—Stevenson's Spring Core Retainer, patented Dec. 12, 1871, which prevents all choking of the drill and secures a perfect core, can be applied to the Diamond Pointed Steam Drill at small expense. Rights to use may be had on application to HARDING, HAYDEN & CO., 325 Washington Street, New York.

PAT. SOLID EMERY WHEELS AND OIL STONES, for Brass and Iron Work, Saw Mills, and Edge Tools. Northampton Emery Wheel Co. Leeds, Mass.

Swain Turbine.

"Our Low-Water Wheel from this on"

WILL DO TEN PER CENT MORE WORK on small streams, in a dry season, than any wheel ever invented. Gave the best results, in every respect, the Lowell Tests.

For Report of tests at Lowell, with Diagrams and Rules of Power address

THE SWAIN TURBINE CO., North Chelmsford, Mass.

Working Models

And Experimental Machinery, Metal, or Wood, made to order by J. F. WERNER, 62 Center st. N.Y.

RISDON'S IMPROVED

Turbine Water Wheel.

There are now several hundreds of these in successful operation. Their simple and tight gate, and their economical use of water at all stages of the gate, makes them every where liked. One of these was tested by James Emerson, of Lowell, and gave EIGHTY-FOUR AND SIX ONE-HUNDREDTHS PER CENT.

Send for a circular.

T. H. RISDON & CO., Mount Holly, New Jersey. Manufacturers of all kinds of Mill Machinery, and Circular Saw Mills

RANSOM SYPHON CONDENSER perfects and maintains vacuum on Steam Engines at cost of one per cent its value, and by its use Vacuum Pans are run with full vacuum without Air Pump. Send to G. S. WILSON, 51 Chardon St., Boston, for a personal call, or the Company, at Buffalo, N. Y., for a circular.

PATENT COLD ROLLED SHAFTING.

The fact that this Shafting has 75 per cent greater strength, a finer finish, and is truer to gage, than any other in use, renders it undoubtedly the most economical. We are also the sole manufacturers of the CELEBRATED COLLINS PAT. COUPLING, and furnish Pulleys, Hangers, etc., of the most approved styles. Price lists mailed on application to JONES & LAUGHLINS, 120 Water street, Pittsburgh, Pa.

☞ Stocks of this Shafting in store and for sale by FULLER, DANA & FITZ, Boston, Mass. GEO. PLACE & CO., 126 Chambers street, N. Y.

Water Feed Reg's. Pat. Gage Cocks. Boiler Feeders.

Send for circulars. MURRILL & KEIZER, Balt., Md.

IRON PLANERS, ENGINE LATHES, Drills, and other Machinists' Tools, of superior quality, on hand, and finishing. For sale low. For Description and Price address NEW HAVEN MANUFACTURING CO., New Haven, Conn.

STANDARD AMERICAN BILLIARD TABLES

NEW DESIGN

H. W. COLLENDER Successors PHELAN & COLLENDER.

738 Broadway, New York.

ILLUSTRATED PRICE-LIST SENT BY MAIL.

CLOTHING **FREEMAN & BURR,** CLOTHING

WAREHOUSES. 138 and 140 Fulton St., New York. WAREHOUSES.

THE IMMENSE STOCK, both of Goods in the piece and the same made up for immediate wear, embraces all the most desirable Styles and Fabrics, Manufactured in qualities and colorings adapted to the requirements of all.

SPRING SUITS, $10 to $50. SPRING OVERCOATS, $5 to $30. BOYS' SUITS, $5 to $25.
SPRING SUITS, $10 to $50. SPRING OVERCOATS, $5 to $30. BOYS' SUITS, $5 to $25.
SPRING SUITS, $10 to $50. SPRING OVERCOATS, $5 to $30. BOYS' SUITS, $5 to $25.

TO ORDER BY MAIL. FREEMAN & BURR'S NEW SYSTEM FOR SELF-MEASURE, of which thousands avail themselves, *enables* parties in all parts of the country to order direct from them, with the certainty of receiving the most PERFECT FIT attainable. RULES FOR SELF-MEASURE, Samples of Goods, Price List, and Fashion-plate, sent FREE on application. TO ORDER BY MAIL.

THE BAND SAW!

Its ORIGIN and

HISTORY, with Engravings of the OLDEST MACHINE, sent gratis. Address RICHARDS, LONDON & KELLEY, 22d st (above Arch), Philadelphia.

C. J. Bandman. L. Jaffe.

Portland CEMENT,

For making **Artificial Stone.** EXTRA QUALITY, imported by the NEW YORK STONE WORKS. Send for circular. 1193 BROADWAY, New York.

GEORGE PAGE & CO., Manufacturers of Portable and Stationary

STEAM ENGINES AND BOILERS;

Patent Circular, Gang, Mulay, and Sash

SAW MILLS, with OUTFITS COMPLETE,

combining all reliable improvements—Grist Mills; Shingle Machines; Wood Working and General Machinery.

Send for Descriptive Catalogues. Address No. 5 W. Schroeder Street, Baltimore, Md.

H. W. JOHNS' ASBESTOS ROOFING

FIRST PREMIUM (MEDAL) AWARDED IN 1870 AND IN 1871. Endorsed by Certificate from AMERICAN INSTITUTE as **"The Best Article in the Market."**

Also, manufacturer of **Asbestos Boiler Felting,** Roofing and Sheathing Felts, Acid, Water and Fire Proof Compositions, Boiler Scale Preventive, and dealer in ASBESTOS, ASPHALTUM and GENERAL ROOFING MATERIALS.

☞ Descriptive Pamphlets, Price Lists, &c., by mail.

{ Established in 1858. } H. W. JOHNS, 78 William St., New York

MACHINERY, Safes, and Mechanical Supplies, A. S. & J. GEAR & CO., 60 to 62 SUDBURY STREET, BOSTON, MASS.

STEAM HAMMERS FERRIS & MILES 24TH & WOOD STS PHILA.

$20.—ADVERTISERS.—$20.

ONE THOUSAND CARDS, CIRCULARS, or CATALOGUES, distributed in Seventy Cities and Towns in the New England States by our travelling men for TWENTY DOLLARS. SEND FOR LIST. EDW. B. ADAMS & CO., 125 Pearl Street, Boston, Mass.

VENEERS

AND

HARDWOOD LUMBER.

BUTTERNUT, FRENCH AND AMERICAN WALNUT, ASH AND CHERRY BURLS; HUNGARIAN ASH, BIRDSEYE & BLISTER MAPLE, etc. etc.

☞ Mahogany, Rosewood, Cedar, etc., in boards, plank, and logs. Large and choice stock at low prices.

GEORGE W. READ & CO., 170 & 172 Center St., New York.

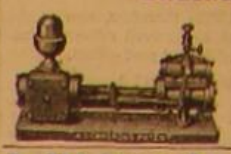
Mill and Yard, 186 to 200 Lewis, bet. 5th & 6th Sts., E. R.

PYROMETERS, *For Ovens,* Boiling, or Brass, Hot-blast pipes, Oil stills, Super-Heated Steam, &c. Address HENRY W. BULKLEY, 98 Liberty Street, New York.

☞ T. V. Carpenter, Advertising Agent. Address hereafter, Box 773, New York city.

A. S. CAMERON & CO.,

ENGINEERS,



Works, foot of East 23d street, New York city.

Steam Pumps,

Adapted to every possible duty.

Send for a Price List.

L. W. Pond---New Tools.

EXTRA HEAVY AND IMPROVED PATTERNS.

LATHES, PLANERS, DRILLS, of all sizes; Vertical Boring Mills, ten feet swing, and under. Milling Machines, Gear and Bolt Cutters; Hand Punches and Shears for Iron.

Office and Warerooms, 98 Liberty st., New York; Works at Worcester, Mass.

A. C. STEBBINS, New York, Agent.

American Saw Co., Manufacturers of

And Perforated Circular and Long Saws. Also Solid Saws of all kinds. No. 1 Ferry st., corner Gold street, New York. Branch Office for Pacific Coast, No. 606 Front street, San Francisco, Cal.

BUILDING PAPER

FOR SHEATHING, PLASTERING, ROOFING, DEAFENING, AND CARPET LINING.

Samples & circulars sent free, by ROCK RIVER PAPER CO., Chicago; or, B. E. HALE & CO., 22 & 24 Frankfort St., N.Y.

Sole Agents for Eastern States.

COLT'S ARMORY TESTING MACHINE—Strength of Materials.—The Colt's Arms Company, of Hartford, Conn., is prepared to measure the strength of all materials by its testing machine, which is capable of determining strains from 1 oz. to 100,000 lbs., in specimens from 7 inches to 8 feet in length, and with cross-sections up to 1 square inch in area. The price of testing half a dozen specimens of the same material, $25. See Scientific American, March 16, 1872. For further information, apply direct to the Company.

BEACH'S SCROLL SAWING MACHINE. Agents wanted in every large city. Send for circulars and price list. See cut and description on page 214, Vol. 26. Address H. L. BEACH 90 Fulton St., New York.

TODD & RAFFERTY, Manufacturers of Steam Engines, Boilers, Flax, Hemp, Tow Bagging, Rope and Oakum Machinery. Steam Pumps and Governors always on hand. Also Agents for the New Haven Manufacturing Co.'s Machinists' Tools. ☞ We invite especial attention to our new, improved, Portable Steam Engines. Warerooms, 10 Barclay st. Works Paterson, N.J.

Agents Wanted—**$75 to $250 per month,** everywhere male and female, to introduce the GENUINE IMPROVED COMMON SENSE FAMILY SEWING MACHINE. This Machine will stitch, hem, fell, tuck, quilt, cord, bind, braid and embroider in a most superior manner. Price only $15. Fully licensed and warranted for five years. We will pay $1000 for any machine that will sew a stronger, more beautiful, or more elastic seam than ours. It makes the "Elastic Lock Stitch." Every second stitch can be cut, and still the cloth cannot be pulled apart without tearing it. We pay Agents from $75 to $250 per month and expenses, or a commission from which twice that amount can be made. Address SECOMB & CO., *Boston, Mass.; Pittsburgh, Pa.; Chicago, Ill.; or St. Louis, Mo.*

$20,000 IN PREMIUMS.—SIXTH Grand State Fair of the Mechanics' and Agricultural Fair Association of Louisiana, will be held on the Fair Ground, in the City of New Orleans, April 24, 25, 26, 27, 28, 29, and 30, 1872. Exhibitors are invited from every section of America. Those visiting the Fair by railway or steamer should procure their return tickets at the point of departure. Premium Catalogues will be sent to any address, free of charge, by application to LUTHER HOMES, Secretary and Treasurer Office Mechanics' Institute, New Orleans, La.

STEAM PIPE AND BOILER COVERING.

ECONOMY, Safety, Durability. CHALMERS SPENCE CO., foot E. 9th st., N.Y., 1207 N. 2d st., St. Louis.

SCHLENKER'S PATENT

BOLT CUTTER

NEW INVENTION. ADDRESS, HOWARD IRON WORKS, BUFFALO, N.Y.

PORTLAND CEMENT,

OF the well known manufacture of John Bazley White & Brothers, London, for sale by JAMES BRAND, 55 Cliff st., N.Y.

Brass & Copper

SEAMLESS TUBING

FOR LOCOMOTIVE, MARINE, AND STATIONARY BOILERS.

Merchant & Co.,

507 Market Street, Philadelphia.

WIRE ROPE.

JOHN A. ROEBLING'S SONS,

MANUFACTURERS, TRENTON, N. J.

FOR Inclined Planes, Standing Ship Rigging Bridges, Ferries, Stays, or Guys on Derricks & Cranes, Tiller Ropes, Sash Cords of Copper and Iron, Lightning Conductors of Copper. Special attention given to hoisting rope of all kinds for Mines and Elevators. Apply for circular, giving price and other information. Send for pamphlet on Transmission of Power by Wire Ropes. A large stock constantly on hand at New York Warehouse No. 117 Liberty street.

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK, Tenth and Lombard sts. Philadelphia and 59 Gold st. New York.

SCIENTIFIC AMERICAN

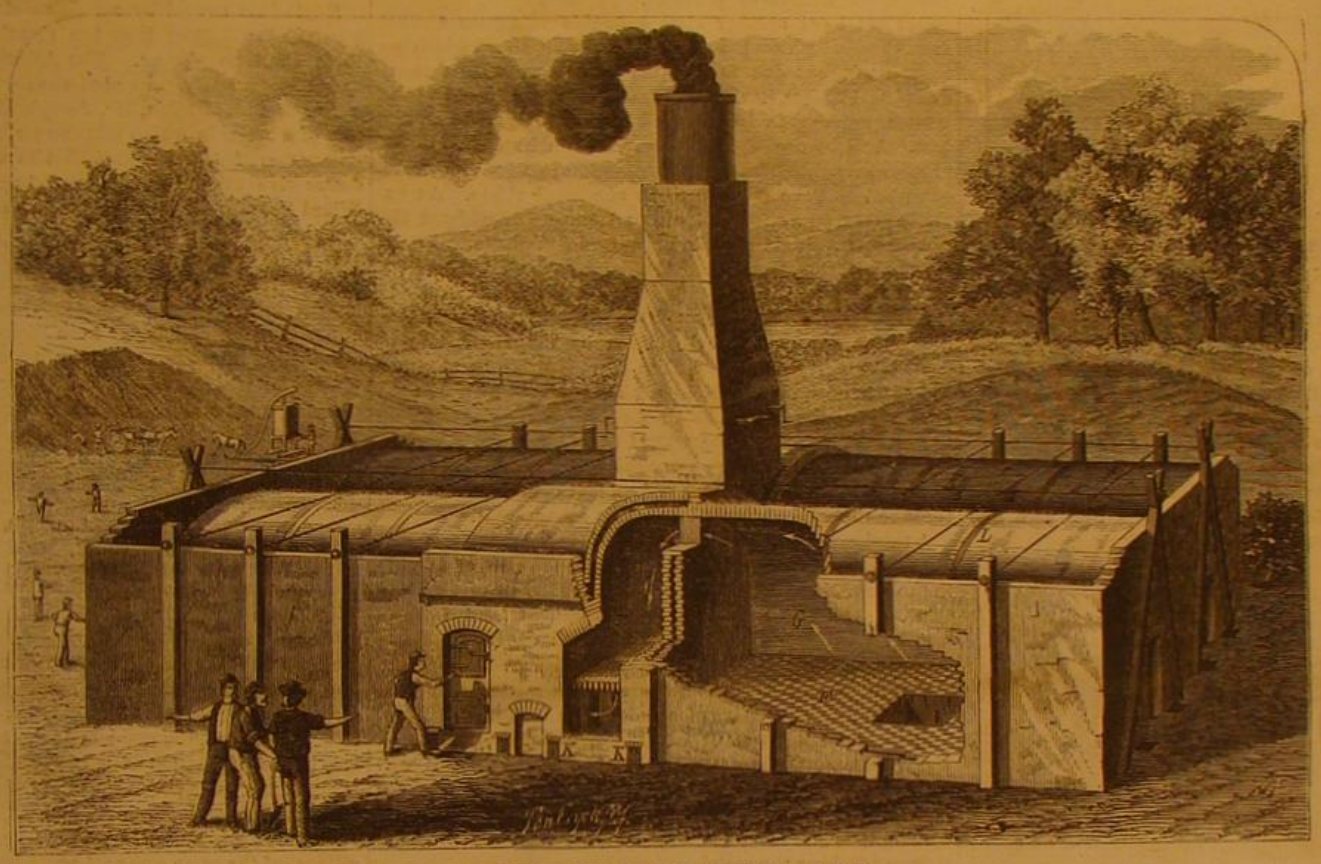
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE. MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXVI.—No. 18. [NEW SERIES.] NEW YORK, APRIL 27, 1872. $3 per Annum [IN ADVANCE.

Improved Brick Kiln.

Scientific men, for the past few years, have devoted themselves anew to a study of the laws of heat; and a philosophy has arisen which effectually disposes of the old notions about caloric and its properties. Among other things, the subject of ventilation has undergone a thorough revolution; it has been found necessary, in order to produce a comparatively uniform temperature throughout a room, to exhaust from the bottom, thus absolutely inverting the old method of providing an inlet for heated air in the floor and an exit at the ceiling. Heated air tends in an upward direction, and this is based upon the natural law which causes all fluids to seek a level according to relative weight or specific gravity; therefore, when we desire to secure an equal temperature everywhere upon the same level in a room, whether it be the moderate temperature of a dwelling or the intense glowing heat of a burning oven or kiln, we must exhaust from below.

This principle has lately been happily applied, and with complete success, to kilns for the burning of bricks, tiles, and wares of different kinds. And in this direction we take pleasure in referring to the subject of our illustration, "The Hawley Kiln."



THE HAWLEY BRICK KILN.

Fig. 1 represents a perspective view, showing the left hand anterior chamber in process of burning, while a part of the walls of the right hand chamber, furnace, and floor, is broken away in order to show something of the internal arrangement. Fig. 2 is a vertical section, with arrows showing the course of the currents during the process of utilization of heat. Fig. 3 is a diminished foundation plan, showing the location of the wells for retaining condensed steam and ducts leading from the chimney. Fig. 4 represents a portion of the permanent floor of the burning chambers, showing the construction and mode of support.

(To illustrate the manner of burning the first chamber, refer to Fig. 2, left hand furnace and oven, isolating in imagination this part from the rest of the drawing. The course of the arrows, beginning at the ash pits, shows the direction of the currents during burning).

The room, A, is filled with green material, and the chimney damper, D, opened. The cold air draft to feed the fires in the furnace enters through openings, K K, seen in Fig. 1) on each side of the ash pit doors, and rises in appropriate vertical flues until it enters the open space between the double arch over the furnace; thence it passes downward between the double side walls of the furnace, and enters the ash pit under the grate bars.

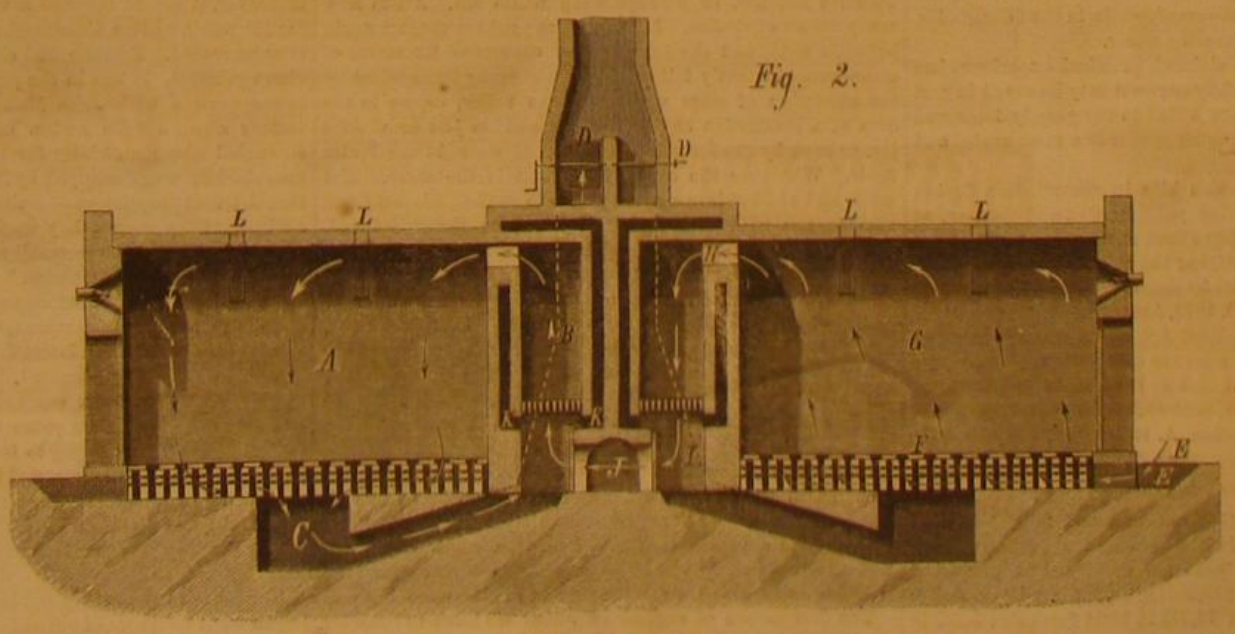
During the progress of burning, the furnace walls become intensely hot, and the incoming fresh air, by contact with these walls, during its transit to the grates becomes so highly heated as to ignite all the smoke and the gases generated from the fuel (whether wood or coal), thus securing almost perfect combustion.

The products of combustion rise upward in the furnace, B, and enter through the opening (in the direction shown by the arrows) into the burning chamber, A. Having no avenue of upward escape, the heated air spreads itself in a level stratum throughout the top of the chamber, displacing and expelling at the same time an equivalent in bulk from the bottom of the room into the sub chamber or condensing well, C, situated underneath the floor of the burning oven, from which it escapes up the chimney flue, controlled by the damper, D.

Hawley, by his method of burning, aims at an entirely novel process, which serves to distinguish his invention from all others who have adopted the down draft principle.

In all other kilns adopting this principle, there are two distinct stages to the process, namely, drying and burning. The first step is to drive off the moisture (steam, "water smoke"); and when this is accomplished, not before, a more intense degree of heat is applied to complete the burning process. During the latter stage, the heat passes almost without obstruction, indeed is conducted rapidly through the already dried and thoroughly warmed mass of material, and is carried forward into another room or oven, previously filled with green material in order to dry and prepare that for the final process. The experience of every observing brick burner shows that it requires a much larger expenditure of fuel to burn bricks to the proper degree of hardness after they have been completely dried by means of a slow fire; under such circumstances they say "the heat runs away from them," and they therefore strive to follow as closely as possible the line of "water smoke" with a sufficient degree of heat to complete the process; but as they approach the top courses in the kiln, the heat unavoidably escapes into the sky and fails to do its perfect work; and they therefore are likely to have pale or insufficiently burned brick to a greater or less extent, and no reasonable amount of firing will remedy this difficulty. This same defect is met with in all down draft kilns, when the drying off process is completed before heavy firing is begun, or where they pass the heat from the already dried oven over into a succeeding one, necessitating much longer firing and, of course, a larger expenditure of fuel.

Fig. 2.



By Hawley's device, this defect is overcome. During his process of burning, the incoming heated air generates steam freely from the green material contained in the oven; this steam gravitates in a level stratum, is condensed below (thoroughly saturating the material), and acts as a sort of automatic damper, which resists or retards the closely following or descending stratum of ignited gas which, at a white heat, is thus caused to expend its force completely, above; for while this steam damper prevents the escape of heat, at least above the steam point (212° Fah.), it does not materially obstruct the natural draft. This action is analogous to the formation of clouds around mountain peaks by the condensation of moisture from ascending warm currents of air.

This task of retarding the descending stratum of intense heat until after it completes the burning process, through and below the lowermost courses in the burning chamber, is effected by providing the sub-chamber or well, C, under the floor, F, of the oven, in which the descending steam is received, condensed, and retained in sufficient quantity to effectually arrest the escape and consequent loss of heat until the process of burning is completed.

In the burning of material requiring extraordinary and prolonged exposure to intense heat (fire brick, etc.), he finds it necessary sometimes to furnish an artificial supply of water in this well, to be generated into steam (damper) and thus check for a longer time the escape of heat up the chimney.

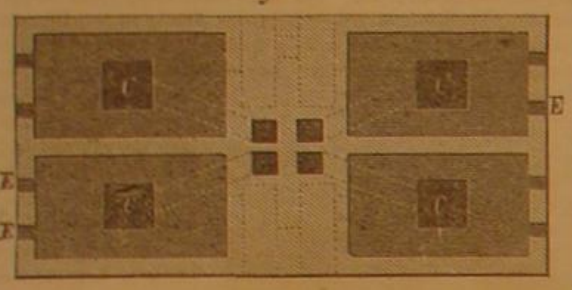
Another and almost equally important feature is his admirable method of utilizing the immense amount of surplus heat stored in the material just burned.

To illustrate the utilizing process, we again refer to Fig. 2, where we will imagine the process, just above described, as having taken place in chamber, G, instead of A; therefore,

the right hand chamber is now filled with a glowing mass of hot material. The left hand chamber, A, is filled with green material. The damper, D, to chamber, G, is closed, thus closing the outlet from under the floor into the chimney. The damper, D, of the chamber, A, is opened, the dampers controlling the communication between the ash pits, I, of the furnaces are opened, the direct draft dampers are shut (see K K, Fig. 1), and the dampers at E, for the cold air inlet under the floor of the hot oven, are opened.

By the course of the arrows, it may now be seen, the inventor takes all his draft in at E, and converts the whole incandescent mass contained in the oven, G (equivalent in fifty thousand bricks to three and one half tuns of coal, all in a state of actual combustion), into an enormous furnace, passing this torrent of heated air over into the chamber, A, and thus using it at the proper stage for a hot blast, and under the furnace, B, and at the same time cooling rapidly and safely the contents of G.

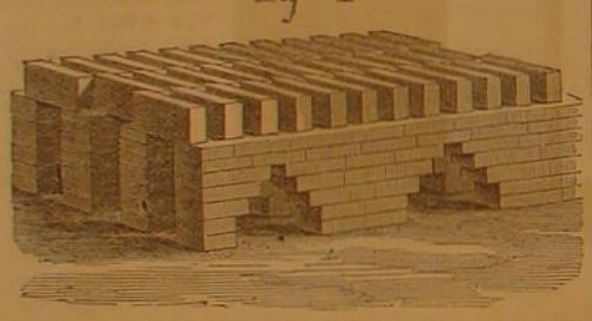
Fig. 3



By means of the sub-duct, J, connecting all the ash pits, the heated air may be transferred to either of the burning chambers at discretion; or by a prolongation of the sub-duct, J, outward, any desirable amount of heated air may be conveyed to the outside structures for drying or other purposes.

The ovens, being constructed in a group of four, permit continuous operation; cooling one while burning another, charging the third, and discharging the fourth, all at the same time. The feature, also, of their double walls separated by a dead air space (to prevent cold air from coming in direct contact with inner and heated walls, thus preventing them from cracking) renders this kiln far more permanent and lasting than if thicker and solid walls were used, and at the same time reduces its cost.

Fig 4



While the saving of fuel is an item of vast importance to all interested in burning processes, and while, on scientific principles, we think that no other kiln or oven extant presents equal advantages in this direction, save, perhaps, the single exception of the celebrated German kiln of Hoffman, a scarcely less important feature is that of the greatly improved average quality of the stock turned out.

In the common grade of bricks, for instance, the general appreciation in value, by having them uniformly hard (avoiding "benches," "clinkers," and "salmon" bricks), may be reckoned as at least $1 per thousand, while, in the finer grades, the difference is of course much greater.

In the Hawley kiln, it is claimed, practical experience has demonstrated that at least fifty per cent may be saved in cost of fuel alone; and this, when added to the greatly improved quality and value of stock, must render it a most useful and important invention.

We have not only seen this kiln in operation on Croton front bricks, at the extensive yards of Cox and Barlow, at Croton Landing, N. Y., but have been shown a certificate from this firm, substantially verifying the claims herein set forth.

The invention is protected by three separate patents, dated respectively, September 20, 1870, August 22, 1871, and April 2, 1872; also by a reissue dated April 2, 1872. Applications for patents in foreign countries are now pending.

This kiln is equally important and valuable to all manufacturers of tile, terra cotta, pottery, queen's ware, etc. Address, for further information, A. R. Morgan, proprietor of the Hawley kiln, 103 Fulton street, New York.

The Iron Interest.—One hundred and forty thousand operatives are employed in the production of iron in the United States; 42,000 of these are employed in preparing ore and fuel; 25,000 in preparing fuel for rolling mills; 42,000 in the rolling mills; 12,500 in blast furnaces; 3,500 in bloomeries; 800,000 are engaged in manufacturing articles of iron. Thus we have a total of 925,000 men employed in the iron interest. The value of pig iron manufactured last year was $75,000,000. The product of the rolling mills and forges was $63,000,000, the value of other manufactures was $762,500,000, and the entire value of manufactured iron for the year was $900,000,000.

ON THE HEATING OF WATER AND BOILERS.—CURIOUS EXPLOSIVE PHENOMENA.

A large proportion of all the explosions that occur are produced by a continuous increase of pressure without the means of escape.

Of these, many are caused by a defective state of the safety valves. Any cause that shall obstruct or prevent their free action will cause a rapid increase of steam pressure. Such obstruction may occur as a result of unequal expansion in the metal of which the valve is composed, or in the steam-pipe which supplies steam to it. Says the *Evening Mail:*

Some of the most violent explosions upon record are traceable to this easily preventible cause.

The accumulation of scale or sediment upon the bottom of the boiler will eventually weaken it. Another method by which the strength of the boiler may be diminished is found in the negligence of the engineer when he permits the water to become too low in the boiler.

All these causes are simple enough. No one will pretend that explosions resulting from them can in any sense be called accidental. Defective construction, negligent management, remiss attention, the whole catalogue of agencies by which man's negligence is put to test or his sense of danger dulled are antecedents of that class of explosions which we refer to the increase of pressure.

But we have another class referable to causes distinct from those which we have stated. They are those which we name explosions due to unequal expansion. Thus many cylindrical boilers, having the feed water introduced on the bottom, are broken by the cooling and contraction of the iron. A difference of temperature of two hundred degrees or more may thus occur in the same plate; so that its different portions are subjected to an enormous strain. An explosion may occur from an unequal expansion without the presence of a single particle of water in the boiler. In one remarkable case, a man was clearing an empty boiler from scale and sediment, and finding these adhering too firmly to the inner surface of the boiler to be easily removed, conceived the plan of loosening them by the application of heat. He therefore lighted a fire of pine shavings at either end of one of the principal flues. This caused an irresistible expansion of the flue. The shell of the boiler was not able to resist the enormous force thus developed, and a violent explosion was the result. The head of the empty boiler was blown off in the most sudden and violent manner, and driven through the wall of the building that contained it.

A third cause of explosions is found in what we may call "repulsion of the water." There may be no sign of trouble in the condition of the water in the boiler. The temperature of the boiler may not be elevated, at least in any way that subsequent examination would disclose. There may be no indication of weakness in the boiler.

Any of our readers who have seen a drop of water fall upon the smooth surface of a heated flat iron have noticed that it does not touch or wet the heated metal, but rolls about its surface like a marble on the floor. This it will continue to do for some time without evaporating. The little globe of water is surrounded by a thin film of vapor, which protects it from the action of the heat, and prevents it from touching the metal.

This phenomenon is known as the "spheroidal state" of water. The same state may be produced within a steam-boiler, at least in a portion of the water that it contains. When the fires under a certain part of the boiler are especially intense, they may so violently heat the metal above them as to drive away from it, in spite of the pressure which forces the water down, that part of the water which is directly above the heated iron. A thin film of vapor is now interposed between the metal and the water. The iron thus separated from the good conductor with which it has been in contact, and covered only by the comparatively poor conductor, vapor, will rapidly increase in temperature until it becomes red hot, or perhaps even white hot. All is now ready for an explosion. Let any force produce contact again between water and the iron, and an enormous liberation of steam must instantly follow. This force may be supplied by the admission of more water into the boiler, or, as in the case of a locomotive engine, by any sudden jolt or violent jar, or even by the forcible circulation of water in the boiler itself. Whatever the cause, the result is the same. Hot water and red hot iron are brought into sudden contact; and nothing can withstand the explosive force thus produced. When the water once strikes violently, the soundest iron may be broken and the strongest workmanship be destroyed.

Mr. Robinson made numerous experiments in which he produced these explosions by repulsion. In these cases, however, he guarded against dangerous results by employing safety plugs composed of weak metal, which broke at the first explosion of steam. In these cases, says he, "there were no indications whatever of trouble in the boiler till the plugs broke."

In Paterson, New Jersey, an explosion of this character occurred in the case of a locomotive engine just finished. But a moment before the crash, the safety valves indicated a very moderate pressure. In an instant, a considerable portion of a three story workshop was blown down; four men were instantly killed, and a number of others were injured.

The last causes of explosions which we have to consider are those due to what is called overheating of the water.

Water by long boiling loses the air which it contains in solution. The result of this deprivation is, little by little, to raise its boiling point. A French experimenter, M. Denny, found that by careful heating he could raise water to the temperature of 275° Fahrenheit before it vaporized. By his careful treatment, the water had been freed from the air it contained. In consequence, its particles adhered more closely to each other than those of water in its ordinary condition, and it resisted vaporization. But when the heat grew so great as to overcome this cohesive force, the water vaporized with a sudden explosion. An open pan of boiling water, which had been thus freed of its air, has exploded with fatal results. As one class of explosions already described have occurred without any water in the boiler, so the present explosions may occur without any boiler. Either water or metal alone may thus fatally explode upon the application of heat. In the cases now under consideration, the water, gradually freed from its contained air by heat long maintained at or near its boiling point, trembles just upon the brink of a sudden explosion. When more heat is added, or when the pressure is reduced by starting the engines, the sudden vaporization will occur, and the whole mass of water contained in the boiler will flash at once into steam. The resulting explosion is often of the most terrific character.

Such is the nature of explosions in which the shells of boilers have been shattered when the steam pressure and the fires are low. It is pleasant to know that they may be prevented by the use of safety plugs, so constructed as to be broken by a very low pressure. The gradual escape of the overheated water is thus provided for; and the temperature of the fire will be reduced without any dangerous agitation of the water.

Explosions caused by repulsion may be prevented by so constructing boilers that the circulation of water within them shall be perfect. The American Academy of Arts and Sciences lately presented the Rumford medals to an engineer of Philadelphia, Mr. Joseph Harrison, for the invention of a boiler in which this danger is guarded against. The Committee of Award stated that in this boiler a violent or destructive explosion is almost impossible. Mr. Norman Wiard has also devised a boiler in which the same result is attained.

It is of importance to remember that in no case will any contrivance, or patent, or invention take the place of human intelligence and watchfulness in preventing accicents. No patent has yet been discovered which will take the place of the human brain. An engineer whose wits are about him will prevent a bad boiler from bursting, when a careless one would destroy the strongest boiler in use. And when the public, through the courts, insist that boilers shall *not* burst, ample means will be found to prevent boilers from bursting.

CARPETS AND KNITTED MANUFACTURES OF AMSTERDAM, NEW YORK.

Amsterdam lies in the Mohawk Valley, about thirty three miles from Albany, on the line of the New York Central Railroad. From the hights above the valley, the Chuctanunda Creek rushes at right angles through the town into the Mohawk river, and furnishes ample water power to the numerous mills built along its course. A bale of wool ought to be, if it is not, the emblem of the town of Amsterdam, for it is in the production of woolen manufactures that the majority of the mills are engaged.

I should think it would be difficult, says a correspondent of the New York *Times*, to find in the State of New York a village, of the same size as Amsterdam, which displays more manufacturing enterprise; for, although the manufacture of knitted goods forms by far the largest single branch of its business, knitting is not the only business carried on in the place. There is a large boot and shoe factory, a linseed oil factory; the seed crushing mill of Kellogg and Miller, which can turn out 2,000 gallons of oil a day; the paper mill of Stuart and Carmichael, for making paper four strand; Shuler's steel carriage spring factory; MacElwain's turbine water wheel works; and other smaller factories.

Wool knitting by machinery, as it is now carried on in Amsterdam, is a very different thing to what it was ten or twelve years ago. Invention has done marvels for it; and moreover, it passed through a very troublous childhood. In fact, it was for some time doubtful whether the babe would ever be reared. Fortune and circumstances seemed to combine against it. It was in the year 1857 that Adam W. Cline, in conjunction with John Maxwell, built a small knitting factory about a mile and a half from the village. They struggled along manfully for two years, but in 1859 their manufactory was destroyed by fire. Fire is the one great antagonist that proprietors of knitting factories have to contend against. They cannot buy wool suitable to their purposes which is not apt to have small stones in it; and as the wool is passed through the "picker" which separates it, a spark is often struck from one of these little stones, and the flimsy mass is in a blaze in a moment, and of course soon communicates the fire to the inflammable material piled about in all directions. Nothing daunted, however, by his misfortunes in 1859, Mr. Kline built another knitting factory in the following year. For some years business prospered, but just as Mr. Kline was beginning to feel himself firmly established, his factory was again destroyed by fire in 1866. In the meantime, other factories had sprung up, four new ones have since been built, and in 1868 Mr. Kline rebuilt his factory, and is now running it most successfully in partnership with his son, Harlan P. Kline.

A short time ago, a lady wrote to the New York *Times* asking in what branches of manufacture in the State, girls and women are employed. She should visit Amsterdam, and see the number of females employed there. In the knitting mills, nearly all the employees are girls; while at Mr. Stephen Sanford's carpet manufactory, in the upper part of the village, out of a labor force of 700 hands, the bulk of the operatives are women and girls.

The knitting machine is a circular parcel of needles, some-

thing like elongated crochet needles, in and out of which the strand of wool is passed by machinery which knits it into stitches as it goes along.

The leading knitting factory is that of William K. Greene's Sons. They employ 200 hundred hands, on thirteen sets of machines. Their average daily production is about 200 dozen of shirts and drawers, of different sizes. The business of Schuyler, Blood, & Co., is nearly one half that amount. Among the older firms, there are A. W. Kline & Co., McDonald, Kline, & Co., John M. Clark, McFarlan & Marcellus, and the American Hosiery Mills, where they make a coarse grade of knitted stockings and socks. The two new mills in the village are owned by De Forrest & Wanner and Phillips, Dent & Lowden.

HOW CARPETS ARE MADE.

Mr. Stephen Sanford's carpet manufactory is supposed to be the most extensive one in the United States under one sole proprietorship and management. The average production of the factory is one thousand yards of carpet a day.

None but the very commonest wool is suitable for carpet manufacture. The finer wools have not sufficient toughness and fiber to enable them to resist the rough wear which a carpet always gets.

The wool is first of all thoroughly washed, and is then thrown, completely saturated and dripping, into the hydraulic extractor, a large receptacle, something like a huge cauldron, which revolves very rapidly. A few seconds after the extractor is started, the wool and the cauldron alike are lost to sight from the rapidity of revolution. I asked the operative who had charge of it how many revolutions the extractor made in a minute. He replied, "Three thousand, Sir." Such a momentum appears almost incredible. The extractor is about four feet across; therefore, a given spot on it would travel a distance of twelve feet 3,000 times in one minute, or at the rate of 410 miles an hour. In a few minutes, what was dripping wool is taken out so nearly dry that there is only a slight feeling of dampness to the touch. The wool is then taken upstairs to the drying room, where it is laid out in layers on extensive sheets of wire netting. A powerful blast of hot air is forced into the room, and an undercurrent downward through the wool. By this means, the wool is quickly dried and is ready for combing, drawing and carding. The spinning of the wool seemed to me an endless business. At first, the strands are as thick as your finger; but they are spun again and again, each time into a smaller strand, till they have been reduced to the required fineness. The wool is then wound from the bobbins into skeins, and is sent away to the color house to be dyed. The brighter colors of the dyed skeins have a very gaudy appearance. But this gaudiness is lost in the careful harmonizing of colors in the process of weaving. It has often been a mystery to me how they weave such beautiful and many colored patterns in carpets; but putting the machinery on one side, it is a very simple operation to watch. The pattern is punched on a series of plates of thick card board, certain holes corresponding to certain colors, and the pieces of cardboard being fastened together like the photographic plates in a revolving stereoscope. The cardboard pattern presses against the pins which govern the many cords forming the web and the woof; and, of course, where there are holes the pins pass through the card board, and so allow certain of the cords to take a different position as the shuttle flies backward and forward. The weaver stands before his loom with as many shuttles on either side of him as he has colors to weave. The shuttles are placed one below the other; and by raising or depressing them with a lever, the right shuttle is brought into play. When the weaving of the carpet is completed, it is carefully gone over by experienced hands, and all lost and faultly stitches are put in with a common carpet needle. But the carpet is covered all over with short woolen bristles. To remove these, it is passed through the dresser, a machine very similar in its operation to the mowing machine; for as the carpet passes through the dresser, the bristles are all removed by a series of knives, arranged like those of a mower.

ON COTTON SEEDS.

BY HORATIO N. FRASER.

Since small hullers have been introduced on many of the plantations, the planters are enabled to hull their own seeds. These are thrown into the top of the hullers, and first come in contact with knives, which cut the hull; then they are passed through sieves, by which process the kernel and hulls are separated. The kernel is divided into two portions; the first is that part which has been broken or cut by the knives; this is ground to make the meal used for feeding, and constitutes one third of the whole weight of the kernel. The remaining two thirds come out whole, and are sold for other purposes. This meal has been found to be as rich, in flesh and fat producers as linseed meal, for stock, and supersedes the use of it in the cotton growing States. The hulls are piled in heaps until they arrive at the right state of decomposition to be used as a fertilizer, for which they are well adapted, being rich in the phosphates and lime, characteristic of substances used for this purpose. The seeds contain a fixed oil to the amount of about thirty-seven per cent of the weight of the kernel, most of which is obtained by expression.

At the factory on Long Island, which the writer visited, the seeds are bought with the hulls on, although the whole kernel is generally brought directly from the planter. These are first thrown into a gin, which separates some more of the lint. This is packed in bundles and sold for ordinary cotton batting. From this, they are conveyed to the hullers and undergo the decorticating process. The kernel is then carried by an elevator to a box which feeds two large iron rollers, converting it into meal; the meal is put into a large vessel, heated by steam to render the oil more fluid, and then is put between iron plates which are forced together by hydraulic pressure, which presses out nearly all the oil and some mucilage. About eight per cent of oil is left, which cannot be removed except by solvents. This oil, as then obtained, is of a handsome dark wine color and sweet taste. This then undergoes the purifying and bleaching process, which is kept a secret by the manufacturers.

The purified oil is either a golden yellow or white color. An oil is also produced, by chilling the purified oil and expressing, to obtain a variety almost free from stearine, called by the manufacturers "winter oil," from the fact that cold will not thicken it.

This oil is used extensively in the arts, chiefly to adulterate and substitute higher priced oils. Cheap paints are ground in it, and it is used to a certain extent to adulterate linseed oil. But being a non-drying oil, only a small percentage could be used.

It is also used for adulterating sperm oil for burning, and for mixing with lard oil. The most practical way to detect these is to heat the suspected oil with distilled water; separate the water and add a solution of subacetate of lead. If it contained cotton seed oil, a white precipitate will be formed on account of the presence of mucilage, which is always found in this oil. If the sperm or lard oil is pure, it would be indicated by the absence of any milkiness.

It is also used to adulterate olive oil, and chemistry has found no practical mode by which they can be definitely distinguished apart.

A soap has been made of the residue left after refining. It is of a more or less dark brown color and disagreeable smell. It is used in the laundry, and sells at from three to seven cents a pound, according to quality. It was also attempted to make a soap from the white oil. This, when first manufactured, is of a handsome white color, but after standing some length of time it becomes dark and finally almost black. It is not made now.

It is used to the amount of ten per cent in making fancy soaps, to give them a good lather, for which the oil is said to be the best known; but even in this small amount, the odor of the rancid oil can be detected.

The hulls are used for fuel in the factory, and the greater part of the cake meal was sent to Europe, the farmers of this country, at that time, not being generally acquainted with its properties. It sold for about thirty dollars a tun.

A few years ago, the oil was noticed in the journals in connection with preparations of pharmacy, to be substituted for oils in liniments and ointments, for which it is adapted by its properties as an emollient; but nothing definite was arrived at. Being cheaper than even the commonest grades of olive oil, and resembling it so much in its behavior, it is peculiarly fitted for the preparations of the pharmacopœia in which the olive oil is used. Mixed with aqua ammoniæ in the officinal quantities for "Liniment Ammoniæ," it makes a product which has all the essential properties that are indicated by the olive oil, and has the advantage of not forming so thick a mixture, thereby making it more convenient. In the "Liniment. Camphoræ," it seems to serve exactly the same purpose as the officinal oil.

Lead plaster made with the cotton seed oil has been substituted with advantage for the officinal, and has been used to mix with it to the amount of fifty per cent by some manufacturers of the plaster. This, made with the cotton seed oil alone, forms a handsome, light colored plaster, apparently equal in all respects to the English, with the exception that it does not become hard enough to keep its shape, in the usual form of selling it. But when mixed with olive oil in equal proportions, this difficulty is entirely overcome.

The cost of the plaster made with the cotton seed oil, using the best English litharge, is twenty cents per pound. This difference in the cost, combined with the practicability of using it, will recommend it to the more careful examination of druggists who deal extensively in this preparation.—*American Journal of Pharmacy.*

Origin of Microscopic Living Forms.

In a recent lecture before the Scientific School of Yale College, Professor W. H. Brewer said: "The most reliable observers are overwhelmingly of the belief that all life is from antecedent life, or, in the words of the old Latin aphorism, *omne vivum ex vivo.* And each good investigation reduces the number of supposed cases of spontaneous generation.

The facts of the case may be stated as follows: 1. The old view of organic and inorganic compounds in chemistry has been broken down. 2. All allow that beings do arise where the germs cannot be distinguished by the best microscopes yet made. 3. That some of these lower forms are so variable that what were once supposed to be several species are now known to be often only phases of the same thing. 4. Although it is highly improbable that all forms of living beings are derived from one original, yet many of the so called present species appear to have been produced from earlier similar species. The whole question must be regarded as yet among those that are unsolved, and should be approached in a candid and scientific spirit. I believe, said the lecturer, that it will ultimately be shown that all life is derived from antecedent life, and that the beginning rests with the Creator.

Some microscopists use instruments which magnify 5,000 or even 10,000 diameters. But notwithstanding the power of the instruments used, it should not astonish us if we cannot even then see the original germs. For let us make a simple calculation. Some of the great trees of California are over 300 feet high and 30 feet in diameter. Such a tree is estimated to contain 250,000 feet of lumber exclusive of the branches, or 36,000,000 of cubic inches. The cubical contents of a seed of one of these trees may be put at from $\frac{1}{1000}$ to $\frac{1}{2000}$ of a cubic inch, and its length at from $\frac{3}{100}$ to $\frac{3}{100}$ of an inch. In one of these trees, then, we have a living being from 10,000 to 15,000 times as large as the largest dimension of the seed—not the germ however—and from 50,000 to 75,000 million times its cubical contents. And if we may suppose suppose that the relation between these microscopic living forms and their germs is at all analagous, it is not unreasonable to consider that they exist, though we may not be able to see them.

But have these questions no practical bearing? Are they merely curious and interesting speculations? It is indeed a subject of immense practical importance. Diseases of both man and animals are caused by microscopic organisms. As samples of these may be mentioned, the itch, a disease known as favers, and all the phases of ring-worm. So also certain diseases of vegetables, such as rust, mildew, and blight of crops, the grape disease, and the potato rot. In all these cases, the animals are known to reproduce from others. There are also numerous other contagious and epidemic diseases, which seem to be of like character, although their causes are not so well known. Such are small pox, kine pox, and sheep pox. Extensive experiments, made on these diseases, go to show that the infecting material is minute particles, and the problem becomes to destroy them. It is also but a step from these contagious diseases to epidemic and malarious ones, such as cholera and the plague, although the cause is here more obscure. That treatment of these diseases, however, has been most successful which regards them as caused by living organisms. Some malarious diseases are checked by cold, as the yellow fever by a frost. The silk worm disease may also be placed in this category. The subject may be summed up as follows: 1. We know that some diseases are caused by minute organisms. 2. That others apparently are so. 3. That of those that are certainly so caused, the organisms are not spontaneously evolved. Beyond this, we are still in the dark, but every year brings a solution to some new case, and they all point the same way, namely, that these great scourges are caused by minute organisms not spontaneously generated. If so, the remedy is simply to keep the seeds or spores away from the body, but if they are spontaneously generated, there is no hope of extirpating them, and unless a specific is found the race must continually suffer.

Bone Felon Arrested by Congelation.

Dr. James B. Walker, of St. Louis, Mo., says, in the *Medical Archives*: Not long since I was consulted by a young lady who was suffering from an incipient felon. The distinguishing characteristics of the painful affection were already manifest—pain, throbbing, some tumefaction, and the nervous excitement, indicated plainly what was in advance, unless the inflammation was arrested; and the command was: Arrest it at all hazards.

The starting point had been two days previous to her application for treatment. I could think of nothing offering such a prospect of success as cold, as low as the freezing point. Adding equal parts of snow and salt in a tumbler, I placed the finger, it being the middle one, in the freezing mixture. For a few seconds, there was an increase of the sensibility of the part, and it was with difficulty I could persuade her to hold her finger in the mixture. By degrees the pain subsided, and, at the end of two minutes, perfect insensibility had followed. I removed the finger, and after a few minutes the sensibility returned, and with it came the pain, throbbing, etc. The application was renewed, and the pain again ceased and insensibility ensued. This was repeated as often as the pain returned, and in about two hours, alternating the application and removal, there was no return of the painful sensations, and the difficulty entirely ceased and there was no felon. The induration remained several days, and the skin gradually exfoliated.

Manufacture of Horseshoes by Machinery.

Our young and promising contemporary, the *Chronique de l'Industrie*, prints a communication from the pen of M. A. Verhaeren on the above subject. He gives it as his opinion that the most remarkable factory of the kind is that of MM. Mansoy et Cie., who supply the horseshoes used by the Omnibus Company and the Cab Company of Paris, and who, during the siege, furnished all the shoes required for the cavalry. The machinery employed by MM. Mansoy is described as very simple—a rolling mill, a shaping machine, two steam hammers, and two punching machines, with, of course, dies for each size of shoe made; the value of all this is said not to exceed $6,000. The hammers require 15 horse steam power, and a 6 horse engine suffices for all the rest; but, it is added, a 15 horse engine would probably answer all purposes. With the above machines, the company turns out 2,000 shoes a day with six laborers and three apprentices, and the space occupied by the factory is about four hundred square meters. The production is constant; when working only during the day, the fires are covered up at night, but when working night and day there is, of course, a considerable economy of fuel and working expenses. The engines are worked with the lost heat of the plate furnace, as in rolling mills.

THE ODORS OF PLANTS.—It may be laid down, as a general principle, that a larger proportion of white flowers are fragrant than those of any other color; yellow come next, then red, and lastly blue; after which, and in the same order, may be reckoned violet, green, orange, brown, and black.

MULLER'S IMPROVED ROPE RAILWAY.

Muller's Rope Railway.

The use of rope railways as a means for transporting heavy freights, mining products especially, has within the past five years become quite extensive. In England, Scotland, and on the continent, many miles of these railways are now in successful operation, and contracts for the erection of lines thereof, several hundred miles in extent, are now out. In Colorado, they are now in use to a considerable extent, and many new lines are being projected.

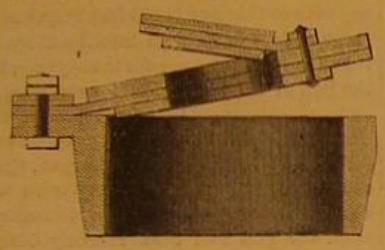
Among the especial advantages of the rope railway as a means of locomotion are its economy of first cost, the quickness with which it can be set up, and the cheapness of its operation. It consists of traveling ropes suspended on poles, the ropes taking the place both of the rails and the locomotive of the common railroad. On the rope railway, the burden to be carried is attached to the traveling rope, the movement of which is not affected by the form or grade of the surface of the ground. In this respect, it resembles a telegraph line, and works just as well whether it passes over the roughest chasms or the smoothest levels.

The improvement illustrated in our engraving is the invention of Mr. Hermann Müller, an Austrian engineer, and has lately been patented in this country. The distinctive features of the improvement consist in peculiar devices whereby the ordinary mining cars with their loads are transferred with facility from the usual ground railway tracks to and from the rope railway. This will be readily understood by a glance at our picture. It will be observed that, at each end of the rope railway, there is a drum of considerable size over which the traveling ropes pass. The ground tracks are arranged to run in connection with the upper and lower surfaces of the drums, and it is only necessary to push the cars, into contact with the ropes at either drum, in order to connect them with the ropes and effect the transport of the cars in either direction. Our sketch is not purely a fanciful one, for these railways are used in places far rougher and more inaccessible than the scene here represented.

This invention has for some time been in practical operation at Sigl's great machine establishment in Vienna (Austria) where it passes from the roof of one of the buildings over the fortification walls, ditch, and streets to a neighboring piece of ground pertaining to the concern. Its operation gives great satisfaction. The invention is particularly adapted for large manufacturing works, also for coal and mining purposes. It costs comparatively little for erection, and may be used in long or short sections. Further information concerning the expense of erection, plans, etc., will be furnished by S. S. Townsend, No. 31 Liberty street, New York, sole agent for the United States.

Noiseless Pump Valve.

Mr. H. Teague, of London, suggests the form of valve shown in our engraving, which is stated to be very effective and to operate without noise. It will be observed that an opening equal to one third of its area is made in the ordinary clack valve, and over this opening another valve is hinged. The two valves are thus arranged in opposite directions. This is a very simple and excellent invention.



Green Corn Fodder.

A correspondent of the *Country Gentleman* says: "Having three cows, and not having the grass for them, I concluded to soil them with sowed corn entirely. I commenced about the first of June, and have fed them bountifully ever since, with the aid of 18 or 20 heads of small loose cabbage apiece. Now for the result; The cow, that would have given on grass 20 quarts per day, now gives only 12 quarts; No. 2, instead of 14 quarts per day, now only 8; No. 3, a heifer that did give in the past winter, on dried stalks and feed, 6 quarts per day, now only 2 quarts. The three cows are perceptibly decreasing in milk every day, and I fear, by the time cool weather sets in, there will be more milk taken from the corn than from the cows. They have a shady, cool yard to run in during the day, and are stabled at night. I was always under the impression that sowed corn was a great supplier of milk. But I have come to the conclusion, so far as these cows show, that sowed corn fed alone and continually is not as valuable as we think. But grass and sowed corn fed together are all that we can ask."

Submarine Telegraph Cables.

A cable of the very best construction, containing four conductors, was manufactured and recently laid between Lowestoft, on the coast of Suffolk, Eng., and Emden, on the Hanoverian coast, for the German Union Telegraph Company, by the Telegraph Construction and Maintenance Company, and is now in perfect working order.

The conductors are of stranded copper, of excellent conductivity, weighing 107 lbs. per nautical mile, and insulated with three coatings of Willoughby Smith's improved gutta percha to the weight of 140 lbs. per mile, so that each insulated conductor weighs in the aggregate 247 lbs. per mile. The insulation, it is hardly necessary to state, is excellent.

The several "cores" or insulated conductors were wormed and served in the ordinary manner, and then sheathed with 12 No. 3 B. B. galvanized iron wires for the main cable, and with 12 No. 000 B. B. galvanized iron wires for the shore ends. Each type of cable was further protected with servings of tarred yarn and bituminous compound.

The length and weight of the cable necessitated its being laid in two sections, but the whole was successfully accomplished. The end landed on the coast of Suffolk, at Lowestoft, adds some additional importance to that place from a submarine telegraph aspect. This makes the fourth cable landed there. The others are the Lowestoft and Zandvoort north and south cables, and the Lowestoft and Nordeney (Reuter's), the property of the Post Office; this additional cable makes up a total of sixteen wires starting from that point for continental traffic. How strangely the traffic has grown since 1853, when one wire alone stretched across the North Sea. And now, in addition to the cables mentioned, there are other existing cables northward, which swell the number.

A cable well manufactured and laid on such good ground may be expected to last many years—take, for instance, Reuter's cable, separated by but a short distance from the German Union cable; how well that has lasted through these years! And, indeed, it would be vain to attempt to define the life of such a cable, when we have already the Dover cable still in existence and still working, of the ripe age of twenty-two years.

[For the Scientific American.]

FRICTIONAL GEARING.

BY E. S. WICKLIN.

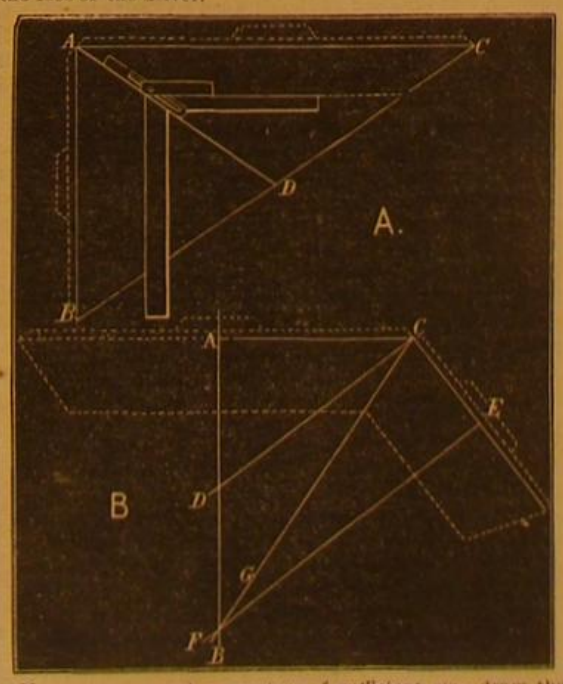
NUMBER IV.

Since the introduction of friction as a means of transmitting motion, it has often been desirable to apply the principle to bevel gearing. Frequently, however, this has been unsuccessful. The failures have resulted either from the want of a correct knowledge of the principles of bevel gearing, or from imperfect workmanship in the application of those principles.

When correctly and substantially built and accurately put up, bevel and miter friction pulleys, within certain limits, operate just as well as in the other form. True, we cannot in these, as in the cylindrical pulleys, extend the face *ad libitum* without greatly increasing the diameter; and for this reason, when great power is to be transmitted, it is not convenient to use this form of gearing. But in all fast motions, where not more than ten horse power is to be transmitted, the bevel friction is one of the best means of connecting at an angle. It may be adapted to almost any change of speed, and set to any angle, either right, obtuse, or acute, and has the same advantages in operation as the other form of friction. And when it is required to reverse the motion at pleasure, it is most conveniently done by setting two bevel pulleys upon one shaft, facing toward each other, and placing one, upon another shaft, between them so that it may be brought into contact with either.

In building this gearing, the iron cone, or pulley, is made similar to a bevel pinion, except as to the teeth, instead of which there is a smoothly turned face. The same care should be bestowed upon the accuracy of finish and balance that is required in the other form of friction pulley; but the pulley may be made somewhat lighter in the rim, as the conical form gives additional strength. In making the wooden driver—the iron pulley being furnished—the first point is to determine the exact diameter and bevel, for upon the correctness of these, to a great extent, depends the success of the work.

To obtain these dimensions, place a square across the smaller end of the finished iron pulley, and set a bevel to it, as shown in diagram A. This will give the correct bevel for the face of the driver.



Next, upon any plane surface of sufficient size, draw the lines, A B and A C, making the length of the line, A B, just equal to the larger diameter of the iron pulley, and the angle at A a right angle. Then, with the square and bevel, or with a movable T square adjusted to the bevel, draw the lines B C and A D. The distance, A C, is the diameter required for the driver, and the other dimensions are easily obtained.

To obtain the bevels for pulleys to work on shafts placed at acute angles, draw the lines as in the annexed diagram marked B.

First, draw the line, A B, to represent the driving shaft. Then, at a right angle, draw the line A C, making its length equal to half the diameter of the driving pulley. Next, at the angle at which the shafts are to be set, draw the line C D; and at a right angle from this line, draw the line C E, making its length equal to half the required diameter of the other pulley. From the point, E, parallel to C D, draw the line E F, which will represent the other shaft. Now, from the point of a section of this and the line A B, draw the line G C, which will give the bevels for both pulleys.

If not above two and a half feet in diameter, the driver of the bevel pulleys may be built upon a "hub flange"—a disk of iron of about two thirds the diameter of the pulley, with a hub projecting from one side. The hub should extend half an inch beyond the thickness of the wood to receive an annular disk of smaller diameter, through which the whole may be securely bolted together.

Upon the flange, around the hub, the pulley should be built. The first two or three inches, to form the back, should be of hard wood put on radially. For the balance, use soft maple. It is, in the present state of our knowledge, the only wood that can be recommended for this form of friction gear. It should be laid on this, as upon all friction drivers, with the grain running tangentially as nearly as possible. And each subsequent course should be made smaller, so as to form the bevel. The layers are put together with glue or white lead, and carefully and thoroughly nailed. The builder should be careful to make the joints perfect, and to put the wood snugly around the hub.

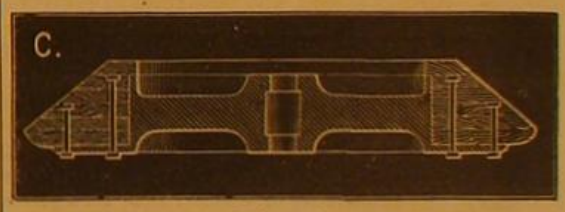
When the wood is built up to sufficient thickness, the other flange should be put on, and the whole bolted together and turned to the exact diameter and bevel required, and the pulley should be balanced with the utmost care.

For a larger bevel driver, it is best to use an iron center with arms, and a flanged rim something like a car wheel. The diameter of the rim or cylinder should be a few inches less than the smaller diameter of the face of the pulley, and that of the flange something less than the larger diameter. Upon this wheel, the wooden rim is built as directed upon the hub flange, except that the bolts must be put in as the work progresses, so that subsequent layers will cover the heads; and the pulley is finished without the smaller flange.

The diagram, marked C, shows a cross section of this pulley, which will be understood without further explanation.

In setting up this gearing, it is of the utmost importance that the countershafts line exactly to the centers of the main or line shafts, and at the precise angle for which the pulleys were fitted; and that they are substantially set, so as not to get out of line.

This gearing is thrown on and off, connected and separated, by moving the countershafts endwise in their bearings. This may be done by allowing the end of the shaft to extend through beyond the outer bearing far enough to receive ar



extra box, one end of which is closed and Babbitted to receive the end pressure. This box is set up by a lever to which it is pivoted. And by having the end of the shaft grooved where it is embraced by this box, it will be drawn back where the lever is released. In light work, it is as well to make the outer bearing do the whole by making it both an end and side bearing, and having the box movable in a line with the shaft.

The pressure required, to hold these pulleys up to the work, is not great, and is easily applied by finishing the end of the shaft, and using a flat bearing of anti-friction metal, the full size of the shaft. Sometimes a steel point, like a lathe center, is set against the end of the shaft to receive the pressure, but this is a very bad arrangement. It makes the bearing surface too small, and is one of the worst forms of bearing to keep supplied with oil. A flat bearing of wood, especially of hard maple, is very much better than this.

When there is considerable difference in the sizes of bevel pulleys working together, the end pressure is most upon the shaft carrying the larger, but this may frequently be neutralized, upon lines having several of these drivers, by setting them with their faces reversed.

A point that should never be lost sight of, in constructing setting levers for all friction work, is to make them adjustable so that the pressure may be easily increased if required. This is sometimes done by a ratchet with several notches, into any one of which the lever may be drawn; but it is generally better to have but one catch, and to make the adjustment elsewhere. This may be done by connecting the lever, to the part to be moved, by a rod having adjusting nuts, or by making the fulcrum adjustable by bolt or set screw.

These adjustments should be made by the person having charge of the machinery, not by the operator of each machine. They should be kept tight enough to do the work required, but more than this is a waste of power, and a useless strain upon the machinery.

It may seem unnecessary to give the diagrams of lines for the dimensions of bevel gearing, as these are well understood. But it must be remembered that we have no work on millwrighting, at present, that gives information on this point of any scientific or practical value, and that our millwrights are not all familiar with the construction of this gearing. Our mills, though superior, are built without rules or uniformity of construction.

[For the Scientific American].

PORTLAND CEMENT.

BY DR. ADOLPH OTT.

Portland cements are those artificial hydraulic mortars which are burned so that vitrification has partially taken place, and which, in this condition, contain no free lime and have a specific gravity above 3. The name originated with Joseph Aspdin in Leeds (England), in 1824. The solidified cement, having an appearance and quality equal to those of Portland stone, of which the finest edifices of the English metropolis are built, he gave to his product the name of Portland cement. When we learn that this stone is classed among the most valued building materials of England, the said designation might be considered too assuming, but it will be shown that its qualities are not overrated—in fact, that the name must be considered as very appropriate.

The Portland cement presents itself as a sharp, crystalline powder, of a color varying from light to dark gray and of a bluish or greenish tint. Chemically, it is essentially a combination of lime, silica, alumina, and oxide of iron. When mixed with water to a stiff paste, it soon solidifies into a stone of an agreeable bright gray stone color, which in its best quality attains a hardness and power of resistance equal to that of the most valued limestones, even of those of the oldest formations. Such stone, according to Major-General Gillmore, acquires during the first two years fully nine tenths of the strength and hardness which it finally attains in the course of time. Both the tensile and crushing strength vary, of course, according to the quality of the cement; but they are generally the greater the denser the mortar. The tensile strength per square inch of blocks seven days old was found by Mr. Grant to be 236 pounds for English cement powder weighing 103 pounds per U. S. bushel, while it was 406 pounds for cement weighing 126 pounds, thus showing a difference of 170 pounds per square inch. The strength of Boulogne cement for blocks, fifteen months old, was found to be by Gillmore 496 pounds. At the age of one month, according to this authority, the tensile strength of pure Portland cement is equal to about two thirds of what it attains during the first two years. With regard to the crushing strength of the cement, it does not reach its maximum limit within a period of two or perhaps three years. The crushing weight of English Portland cement was found by Grant to be, per square inch, 3,806 pounds for blocks three months old, 5,388 pounds at the age of six months, and 5,973 pounds at the age of nine months.

Cement unmixed with other material finds but a very limited application, firstly because it would be too expensive, and secondly for the fact because, though mixed with inert materials, it is yet sufficiently strong for most practical purposes. Portland cement, with three times its quantity of sand, becomes in a few months superior to mortar more than a hundred years old, while the cost of the material is reduced in no small degree.

For foundations, flooring, houses, constructions in the sea, etc., chips or small stones, gravel, broken bricks, burned clay, cinders, etc., are generally used in combination with sand. Such a mixture is then termed *béton* or concrete (from *concresco*.) The substitution of common lime for a portion of the cement results always in a sacrifice of strength in proportion to the extent of the adulteration; however, when mixed with a small quantity of lime milk, it loses proportionately but little of its solidity, while it can be worked much better and surer, as the setting is greatly retarded by such an admixture.

With regard to the durability and healthfulness of constructions of Portland cement, European experience, extending over a period of more than forty years, has established the fact that they will resist climatic influences and changes equally well as the very best building stones. Portland cement stone, if properly made, is almost impervious to water, while this cannot be said of brick and sandstone. Since warmth and moisture are peculiarly favorable to vegetable growth, these building materials are more liable to disintegration than other materials with less absorptive power. The resistance to frost is absolute, even in those buildings the roofs of which are terraced in this material. Being non-absorbent of moisture, it will not appear strange that houses built with it are from eight to ten degrees warmer in winter than houses built of brick.

Concerning the cost, 100 cubic feet of superior wall can be built, according to close estimation, for $17. This is considerably less than half the cost of construction of brick and mortar. Lintels, sills, caps, and arches can all be made at the same time and with only a slight increase of expense. The partition walls need not be eight, but four, at most five, inches being required.

By the addition of proper colors, the brown stone of New York city is imitated so accurately in Portland cement stone that the eye can scarcely detect the difference. With regard to the proportion in cost of these two stones, it may be stated that the price list of one of the companies in this city shows that the rates for ashlars, caps, corner blocks, keys, etc., range from one half to one third those usually paid in this market for blocks of cut brown stone of corresponding shapes.

For such stone, as well as for ornamental work, only fine washed sand is used as admixture for the cement.

The cost of artificial stone being so much smaller for plain work, it is evident that the difference must be much greater for ornamental work, for the cost of producing the most elaborate designs, the molds being once made, is but little more than that of the simplest blocks. When we consider that in the ornamentation of our public and private edifices there is no limit except that of design, and that duplicates of celebrated statuary can be furnished with ease, the invention of Portland cement is to sculpture and architecture what photography is to the arts of drawing and painting.

HUMAN HAIR AND ITS SUBSTITUTES.

Formerly, as ladies grew in years and their hair became thin, a false "switch" was procured, and combined with the growing hair to repair the ravages of time. Great care was taken to conceal the fact that false hair was worn, and it was only to her most intimate lady friends that the fact was whispered even.

But now all this is changed. Nineteen twentieths of all the women in the country who make any pretense to dress wear false hair or some artificial equivalent, and the lady who, no matter how luxuriant her tresses, should presume to appear in society without supplementing their natural growth with "rats," "mice," "switches," "bands," or some other specimen of the wigmaker's handiwork, would find herself so hopelessly in the minority and so laughed at by all, from her dressing maid to her most intimate friend, that resistance would be impossible, and surrender at discretion imperative.

WHERE THE HAIR COMES FROM.

The hair which adorns the heads of our belles and matrons comes mainly from the heads of the peasant women of France, Germany, and Italy. The hair buyer, supplied with sundry stores best calculated to captivate the rural eye, travels from village to village, seeking out those whose wealth of hair gives promise of a handsome price in the Paris market, the great center of the hair trade, and drives the best bargain he can in obtaining it. Sometimes the price is paid in money, but more generally in finery of various kinds, such as ribbons, cheap laces, trinkets, etc., a trade in which the buyer realizes a handsome profit both ways, and the seller parts with the adornment which Nature has provided for almost worthless ornaments which she will soon tire of and throw aside.

Having completed his purchases, the buyer takes or sends the hair he has collected to the broker, who buys it at a price which pays the buyer well for his trouble. It next goes into the hands of the merchant, under whose supervision it is cleaned with meal, sorted as to length and color, and put up in packages weighing from one to four ounces, each consisting of hairs of uniform length and color, but not all the product of any one head.

HOW HAIR IS RUINED.

Strange as it may seem, the hair which grows upon the heads of our fashionable ladies has no commercial value. Through much crimping, curling, and dosing with various hair "invigorators," "restorers," pomades, etc., it not only becomes variegated in color, but hard and brittle, rendering it wholly unfit for use in the manufacture of hair work. Indeed, it is found that the more people "take care" of their hair, the more they injure it, while those European peasants who let Nature take its course, and seldom even comb their hair, produce the finest and most delicate article.

ITS VALUE.

In the shape in which the buyer brings it in from the country, this hair is worth about $20 per pound, in gold. After it has been sorted, the different lots vary in value according to length and shade, from $1.50 to $100 per ounce. Indeed, it is almost impossible to set a limit to the outside price of choice lots of long hair of desirable shades, for so difficult are they to obtain, and so urgent is the demand from parties with whom money is a secondary consideration altogether, that the fortunate holders can set their own price and be sure of a customer. "A switch of very light gray hair," said a dealer, "thirty-six inches long and weighing five ounces, is worth $1,000, and can rarely be found at that price.

SUBSTITUTES.

In a country like ours, where fashion is a law to the poor as well as to the rich, it has been necessary to provide some cheap substitute for human hair, in order that factory and shop girls, and others of slender means, may vie with their wealthier sisters in the adornment (?) of their heads.

For this purpose, several substances are in use. The first material applied to this purpose was jute, which, after passing through several processes, is reduced to a long and glossy fiber which, in general effect, closely resembles hair, and which, owing to its comparative cheapness, rapidly came into general use. By means of dyeing, it was produced in all possible shades, and was eagerly bought in the shape of "switches," "waterfalls," etc.

ITS INJURY TO THE SKIN.

In the process of adapting jute to this use, *nicotin*, the essential principle of tobacco, and corrosive sublimate, a most deadly mercurial poison, are used. It is also rendered exceedingly brittle, and breaks as easily as spun glass. The small particles find their way through the hair to the scalp, and, their edges being ragged from the combing process, act like so many poisoned barbs, which, entering the pores and being held in place, introduce the poison beneath the skin and cause irritation and ulceration. It is owing to this that the idea became current that the jute contained animal parasites that bored into the skin and laid their eggs beneath it. The most careful examination has failed to discover any vestiges of animal life in jute, but the little barbs we have spoken of have been distinctly seen protruding from the pores of the scalp, and the sores they produce give every evidence of being the result of mercurial poison.

LINEN AND COTTON.

A more recent and harmless substitute for human hair is found in fine cotton and linen thread, dyed to the proper shade and sized to give it the requisite gloss, and then made up into the various forms in which it can be used. Switches of this material are sold at retail for about one dollar each, a price at which a very handsome profit is probably realized by the dealer.

SILK AS A SUBSTITUTE.

Probably the best substitute for human hair yet introduced is silk fiber. Its fineness and strength render it peculiarly suitable, while its brilliant luster adds to its resemblance to the real article. It is used both alone and in connection with real hair, especially in those cases where a switch just sprinkled with gray is required. To produce this effect, dark hair and gray silk fiber are taken in unequal proportions, varying according to the shade desired, and woven together, the result being with difficulty distinguished from a combination of real hair, yet costing, owing to the immense price of long gray hair, a moderate sum comparatively. Bands and braids are also made of silk, the exposed portion only being of this material, and the filling of jute or "combings."

THE EXTENT OF THE TRADE.

Formerly hair work was sold only in a few of the leading hair dressing establishments. Now large and expensive stores are devoted to its sale in the large cities, nearly every dealer in fancy articles keeps some of the grades of so called "hair goods," and in every country store neat card board boxes, containing switches, *chignons*, and other head gear, are offered for sale. So long as fashion holds its present course, every woman in the land nearly is a customer, and thus an enormous bulk of business is done, paying handsome profits to all engaged in it. At first the percentage of profit was extremely large, but competition has reduced this materially. But the volume of business has increased in a like ratio, and the sale of hair and hair work continues to be exceedingly profitable.—*Commercial Bulletin.*

Perkins' Steam Gun.

It is now more than thirty-five years since Jacob Perkins, an American, exhibited his steam gun in London, where it attracted great attention. It was shown in operation at the Adelaide Gallery, and the inventor, writing home at the time, thus describes its working, together with a curious electrical phenomenon that took place on one occasion:

"The Adelaide Gallery, of which you have frequently heard, continues to attract attention. When I first proposed the establishment of such an exhibition as that which is made there, its success was a subject of much doubt. It is now, however, firmly established. Its average number of visitants is 300 per day, each paying one shilling for admittance; on some occasions there have been 1,000; and the visitors are of the most respectable class. My steam gun showers its balls every hour from 12 to 4 o'clock. The gallery opposite to this gun is 150 feet long, and it is frequently filled, three or four deep, with intelligent spectators; and although it has been thus in use for three years, it still continues to be the lion of the day. Foreigners who visit the gallery not unfrequently avow that the object of their journey from the continent was to see this gun. On a recent occasion, just before the last volley was discharged, the atmosphere became suddenly very dark, and many were waiting to see the last shower of balls; the steam was somewhat higher than common, the gun had been recently lengthened, and from the concurrence of these circumstances the velocity of the balls was much increased, and a very remarkable effect was produced. When the balls came into contact with the cast iron target, a very brilliant group of stars was seen on the plate, each about the size of a marigold, and somewhat resembling it in appearance; light was seen also at the mouth of the gun, and the leaden balls were completely pulverized. What could have produced these effects? Was it not the result of the development of electricity by the friction, or from some uninvestigated cause?"

A Lost Art--Glass Cloth.

More than thirty years ago, M. Bonnel, of Lille, France, discovered a method of weaving cloth, out of spun glass threads, which was described as perfectly flexible and applicable to a variety of purposes, more especially the ornamentation of the walls of apartments. This fabric, the making of which seems to be at present a lost art, was described in the papers of 1837 as follows:

This cloth of glass is extremely beautiful; and, from the manner in which it reflects the light, it surpasses in brilliancy everything that has ever been attempted with silk, even when combined with gold and silver. Some specimens of this new manufacture have been exhibited in the Passage de l'Opera in Paris; and the Queen of the French was so much pleased with them, that she ordered a golden medal to be sent to the inventor. The following passage is extracted from a French paper: "When we figure to ourselves an apartment decorated with cloth of glass and resplendent with lights, we must be convinced that it will equal in brilliancy all that it is possible for the imagination to conceive; it will realise, in a word, the wonders of the enchanted palaces of the Arabian tales. The lights flashing from the polished surface of the glass, to which any color or shade may be given, will make the room have the appearance of an apartment of pearls, mother-of-pearl, or diamonds, or composed of garnets, sapphires, topazes, rubies, emeralds, amethysts, etc., or, in short, of all these precious stones united and combined in a thousand ways, and formed into stars, rosettes, bouquets, garlands, festoons, and graceful undulations, varied almost to infinity."

STUDY contentment. In these days of inordinate greed and self indulgence, keep down the accursed spirit of grasping.

BELTING AND PULLEYS.

The following interesting particulars of experiments on the capabilities of belting are by Mr. D. Hussey, published in the proceedings of the New England Cotton Manufacturers' Association of the United States:—

BELTING.—A leather strap or belt an inch wide will sustain 1,000 lbs., before breaking. Eight per cent of the breaking weight, or 80lb. to the inch, or about 400ft. to the horse power, is a tension that will not materially injure the leather, for a long period, by overstraining or stretching. This is used for single belts—main drivers only. A double belt will give one third more equally well.

Ordinarily, counter belts, where the centers are not more than 12ft. apart, will require 1,000ft. to horse power per minute, and card and loom belts from 2,000ft. to 3,000ft. to horse power per minute. When at the Nashau Co.'s mills, I ran a 20in. single belt 7,200ft. per minute, from a 14ft. diameter to a 4ft. diameter pulley, which ran successfully on the 14ft. diameter, but the centrifugal force on the 4ft. diameter pulley caused it to jump or fly from the surface and run a little uneven, owing to the uneven weight and thickness of the leather.

I think it would have run well on a 6ft. diameter pulley. When it was running 6,000ft. per minute, it ran very satisfactorily indeed. From this experiment, I have come to the conclusion that 6,000ft. is as fast as a belt should run when the pulley is not over 4ft. diameter. Taking this as a basis of calculation, a 10ft. pulley may run a belt 10,000ft. per minute with safety. It is, however, seldom in practice that we should use such quick speed. Some three weeks since I commenced running a single belt 5,400ft. per minute, the smaller pulley being about 4ft. diameter, which gives excellent satisfaction. I know of no definite rule for running belting; everything depends upon surrounding circumstances.

A horizontal belt, running on not less than a 7ft. diameter pulley, 50ft. from center to center, and working side at bottom, will run well with 400ft. to a horse power, the slack being taken up by its own weight. The same belt, at an angle of 45°, will require 5,000ft. to the horse power, and with a vertical belt it will be almost impossible to run it any length of time without a binder (which of all things we dread in a mill). I will now mention one law of belting that may not be known to you all—that is, the hug or adhesion is as the square of the number of degrees which it covers on the pulley, or, in other words, a belt that covers two thirds of the circumference of a pulley, requires four times the power to make it slip as it does when it covers one third of the same pulley.

Belts, like gears, have a pitch line, or a circumference of uniform motion. This circumference is within the thickness of the belt, and must be considered, if pulleys differ much in diameter and you must get a required speed.

Owing to the slip, elasticity and thickness of the belt, the circumference of the driven seldom runs as fast as the driver. With two pulleys of equal diameters, one may be made to run twice as fast as the other without slipping, if you use an elastic belt of india rubber.

I simply mention this to show the effect of elasticity in belts. As the power of a belt is as its velocity, it is well to run it as fast as possible, to avoid lateral pressure and consequently friction of the shaft.

PULLEYS.—One of the greatest objections to the fast running of shafting and belts is the want of pulleys properly constructed. My experience leads me to the conclusion that it is not safe to run a cast iron pulley, 4ft. diameter, 400 revolutions per minute, owing to the unequal shrinkage of castings in cooling and other imperfections. Running slow, the centrifugal force has but little effect; but as the centrifugal force is as the square of the velocity, it is not so easily overcome in rapid motions.

If you make the rim of the pulley thicker, the centrifugal force increases with the thickness, and consequently nothing is gained by the extra iron. I have, therefore, substituted white pine felloes made of one inch boards, breaking joints for the rim, built on cast iron hubs and arms. The centrifugal force of material is as the specific gravity, and the specific gravity of cast iron is thirteen times that of pine, hence the centrifugal force must be thirteen times greater; but the tensile strength of cast iron is only two to one of that of pine, therefore the rim of a pulley made of white pine felloes will sustain from four to six times the centrifugal force of a rim made of cast iron, that is, the same diameter with white pine felloes will run more than double the velocity without being torn asunder. It is less likely to be broken by jar or blow, and is less than half the weight, and of course takes less power to run it. I have run a pulley made in this way, 16ft. diameter, 4ft. wide, 90 revolutions per minute for 18 months. I have just started another, 17ft. diameter, 62in. wide, 100 revolutions per minute, driving on to one made the same way, 4ft. diameter and running 425 revolutions per minute. Both of these are working well. I am fully convinced that, with quick shafting, wood must take the place of cast iron for the rims of pulleys 3ft. diameter and above.

No. 2 section of Lawrence Manufacturing Co. has been running with gears, shafting, pulleys and belts, conforming as nearly as possibly to the above rules, and is driving the shafting for 38,000 spindles (throstle, ring, and mule,) with the same amount of power as it formerly required for 19,000 spindles

---

IT cannot be too deeply impressed upon the mind that application is the price to be paid for mental acquisitions, and that it is as absurd to expect them without it as it is to hope for a harvest where we have not sown the seed.

The Chili Saltpeter Deposits of Peru.

In travelling eastward through Peru, from the sea to the Cordilleras, on the 20th parallel of south latitude, seven zones are crossed, the third of which, the Pampa of Tamarugal, and the fifth, Serrania Alta, or the inner chain, (Upper Peru, or Bolivia) are explored for saltpeter. The treeless Pampa, a plain somewhat depressed in the center, has a very scanty vegetation, and the only thing which grows there is a single variety of lucerne grass (*mendicago*); the cultivation of even this is attended with difficulty, on account of the large proportion of common salt, borax and saltpeter in the soil. It serves in part for the support of the beasts of burden used for transporting to the coast the salts and metallic minerals found here. In the south of the Pampa is a large deposit of borax, pieces of which weigh on an average from 100 to 200 grammes; soda saltpeter is found on the borders of Pampa and Serrania, but too far distant from the sea. On the western slope of the Cordilleras, salt is only found in small quantities; but in Upper Peru, where frequent rains wash it together into great lakes, there are large quantities of it. The saltpeter mines consist of different strata. The surface of the ground is composed of silicates, sandstone and pieces of lime. At a depth of from 8 to 16 inches, very regular prisms are usually found, which sparkle with a mass of very small microscopic crystals; the strata below this, which is of rocky hardness, consists principally of common salt, with a little chloride of potassium and soda saltpeter, mixed with earth and pieces of silicates and carbonates, and has a thickness of 20 to 25 inches. Beneath this crust is the pure soda saltpeter, in more or less perfect crystals, from 20 to 40 inches long, and 3 to 7 feet in diameter. Guano is seldom found there, and only in small quantities; and it always occurs just below a stratum of salt. It is not in a powder, like that from the Chincha Islands, but adheres together, and is of a a brown color, containing the bones and remains of birds and insects, and has an ammoniacal smell.

The chloride of sodium and lime present furnish mineral constituents required for the formation of the saltpeter. According to Thiercelin, the guano furnishes the nitrogen; but since the guano is always found below the salt crust, Kœnig is compelled to refer the nitrogen to some other nitrogenous organic bodies, from whose decomposition ammonia is formed, and this in turn is converted by the action of the air and organic bases into nitric acid. Besides the three substances named, all the conditions favorable to the formation of saltpeter are found in that neighborhood, namely, a pure dry atmosphere, absence of rain to wash away the saltpeter when formed, and the regular night fogs. The latter, leaving the salt undissolved, dissolve the saltpeter and filter it through this stratum, under which it crystallizes.

The search for saltpeter is conducted thus: The workman recognizes its presence by certain undulatory elevations of the ground, and numerous lumps of lime and disintegrated sandstone. He bores a hole some 12 to 18 inches in diameter, going down till the mineral is plainly visible. When the lowest layer is reached, the hole is widened to about three feet, filled with charcoal and sulphur and fired. The explosion breaks and tears up the ground for twice that distance around, and then properly begins the bringing up of saltpeter. The crude article varies considerably in compactness, color and quality and is named accordingly. The so called sulphuret, which owes its name to its mode of manufacture, is the purest. The porous, earthy and the congealed are different in quality. If the raw product contains less than 50 per cent, the mine is abandoned as not worth working; a yield of 70 to 80 per cent is exceptionally good. The raw material is transported on pack animals or wagons to the factory, where it is refined in two different ways. One method is to break it up in pieces and put it in an iron kettle half full of water, which is then heated over fire for an hour, the insoluble matter removed and a fresh quantity of raw material added until the solution is saturated. The clear solution is run off into crystallizing vessels, the crystals collected when formed and allowed to dry in the sacks in which it is shipped. In the second method, steam heat is employed; the crude material is put in perforated iron baskets and suspended in boiling water, and the process repeated until the liquor is saturated. The saltpeter prepared in this way contains less than one per cent of common salt, while that obtained by the former method contains upward of two per cent. Large quantities of iodine are annually reclaimed from the mother liquors of the saltpeter works of South America.

Xylol as a Remedy for Small Pox.

Xylol, called also xylene and dimethyl benzole, is one of the coal tar products analogous to benzole and toluol. It was first found by Cahours, among the oils which are separated from crude wood spirit by the action of water, hence its name from the Greek word *xulon*, wood; its formula is $C_8 H_{10}$. The series is: Benzole, $C_6 H_6$; toluol, $C_7 H_8$; xylol, $C_8 H_{10}$.

Xylol has been accurately investigated by Dr. Hugo Muller, who prepared it from coal naphtha, by fractional distillation until a distilate was obtained having the specific gravity of ·866, and a boiling point of 140° C. This distilate is mixed with sulphuric acid, which dissolves the xylol, and forms xylol sulphuric acid; this acid is decomposed by dry distilation, and the xylol thus obtained is further purified. It is colorless, has a faint odor somewhat like benzole, but different in boiling point and specific gravity.

Xylol appears likely to become of great importance, if its application in cases of small pox is really followed by such good results as have been reported from Berlin. It should be given in the early stages, whenever the physician has reason to anticipate small pox. Ten to fifteen drops a day may be used as a safeguard in addition to vaccination. It is presumed to destroy the poison in the blood. Raspberry sirup covers the taste and forms an eligible method for administering it, particularly to children. The dose is three to five drops for children, ten to fifteen drops for adults, every hour to every three hours. A teaspoonful at a time has been taken without injurious effects. It is necessary to proceed with caution, as its specific action is not closely defined and must be made the subject of research.—*Journal of Applied Chemistry.*

Wilkinsen's Machines for Cleaning and Finishing Carpets.

Mr. John Wilkinson Jr., a carpet manufacturer of Leeds, England, has recently patented, through the Scientific American Patent Agency, improvements in the process of and machinery for cleaning and finishing carpet fabrics. The invention relates to that class of carpet fabrics in which the pattern is produced by printing after the fabric is made. It is well known that the colors used for printing these fabrics are mixed with earthy and vegetable matters so as to make them of a proper consistence for printing from blocks or rollers.

When the printing has been completed (and the colors have been fixed by steaming the fabric), the earthy and other matters are usually removed by washing the carpet in water. It has been found that, when dark colors are used in the printing operation, this washing process is very liable to (and, in fact, almost invariably does) injure the brilliancy of the lighter colors, and also discolors the white ground.

The object of Mr. Wilkinson's invention is to dispense with the washing, and to remove the earthy matters from the fabric by a totally different process. To this end, when the fabric has been printed and steamed in the usual way, it is taken to a drying room and thoroughly dried, so as to render the earthy and other matters brittle and easily detachable from the textile fibers of the fabric by means of friction.

The mechanical appliances, found most convenient for the purpose of detaching the earthy matters from the fibers, consist principally of a series of blunt knife edges or scrapers, which may be secured either in a reciprocating frame or frames so that they may be dragged to and fro in contact with the printed surface of the fabric, to break up the earthy and other matters and detach them from the fibers as the fabric is being carried slowly through the machine: or these knife edges or scrapers may be adapted to the peripheries of cylinders or rollers, which may be made to rotate, at a suitable speed, and scrape the fabric as it is being drawn forward by drawing rollers or other equivalent appliances or devices. This latter is the arrangement of mechanism preferred.

A Very Good Compost.

A gentleman residing at La Grange, Ga., wrote to us, some time since, that the following mixture had been used upon the cotton fields of that section with excellent results:—

Nitrate of soda	40 lbs.
Sulphate of ammonia	60 "
Muriate of potash	20 "
Bone dust	200 "
Gypsum	200 "
Salt	50 "
Soil or muck	1,430 "
	2,000 lbs

This mixture embraces quite all the great essentials of plant food, but we think it is too much attenuated. The proportions might be doubled (leaving out half the soil) with advantage, as it would not be so heavy to handle. We would, however, suggest an improvement in the proportions employed: instead of 60 lbs. of sulphate of ammonia, it had better be, for cotton, 100 lbs.; and good, true superphosphate might take the place of the bone dust with advantage. The cotton plant needs the active influence of phosphoric acid to push it forward vigorously. If the planters will combine together and purchase these commercial articles, good and true, at the lowest wholesale rates, and make this compost, they will save the tens of thousands of dollars thrown away upon the factitious mixtures sold so freely in the South.—*Boston Journal of Chemistry.*

WE mentioned some months ago that a member of the Odontological Society had succeeded in replanting teeth which had been extracted in consequence of disease. To the process by which this was accomplished, he gave the name of *Reimplantation*. Another member of the same Society has now had the operation tried on himself, and with success. The tooth, which had for some time been painfully affected by changes of temperature, was carefully pulled out, to prevent straining or tearing of the gum; the dental canal was cleansed, the decayed part was scraped from the crown, and stopping applied in the usual way, and then the tooth was replaced in its socket. The operation lasted about half an hour: for three or four hours there was a dull aching pain, which, however, entirely ceased before noon of the following day, though some tenderness remained. This in turn disappeared; and by the end of a fortnight, the replanted tooth did without difficulty all the duty which a tooth is expected to do. From this it will be understood that a tooth slightly diseased at the root need not be thrown away, and that persons who object to an artificial tooth may with proper care retain the teeth which Nature gave them.

REFINED nickel is worth $3 a pound. The ore is found in Pennsylvania and Missouri. The Pennsylvania mines furnish the principal supply at present, and are said to be very profitable.

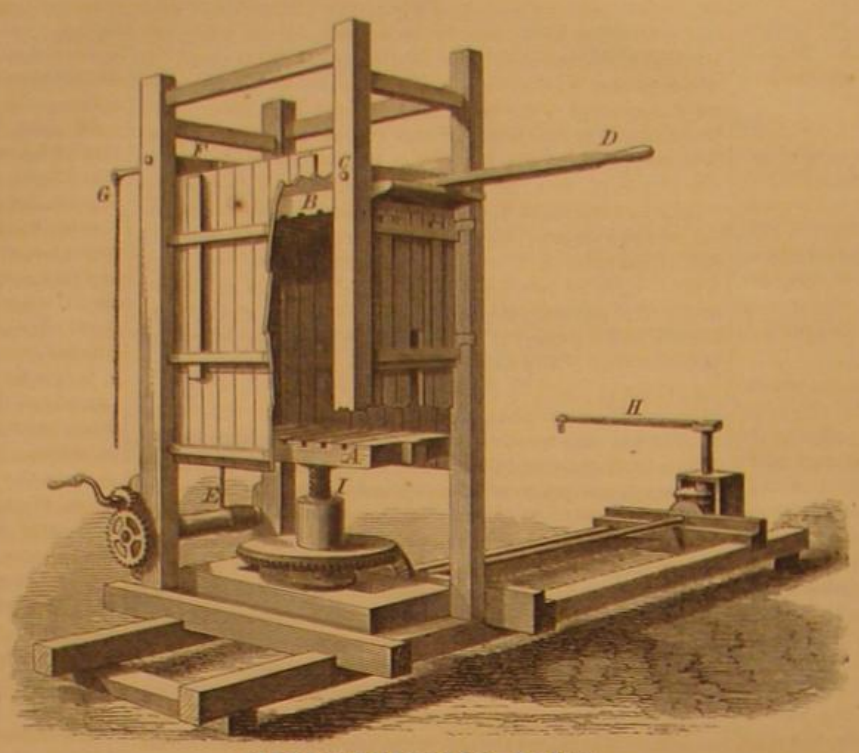
Improved Baling Press.

The peculiarities of this press are that an auxiliary follower is hinged to one side of the part of the press into which the loose material is filled, which, in closing rapidly, compresses the material to a certain extent, when, being supported in a manner described below, more powerful pressure is applied to the opposite follower, by which means the bale is consolidated as much as desired.

A, in the engraving, is the principal follower, and B the auxiliary follower, pivoted to the case at C. This follower is thrown open on its pivots by means of the lever, D, and is forced down by means of the windlass and rope, E. When thus closed, it is fastened by a pivoted section, F, of the side of the case, actuated by the lever, G, and rope, which section swings down and engages the edge of the follower. When the press is thus closed, horse or other power is applied to the lever, H, which, through a system of shafting and gearing, actuates the screw, J, forcing up the principal follower and finishing the compression of the bale.

This construction will facilitate the compression of hay, cotton, wool, and other loose and bulky substances which, in ordinary presses, require nearly as much time to reduce them in volume sufficiently to apply great power advantageously as to complete the compression. The improvement has the further advantage that it does not make the press bulky or unwieldy, and adds little to the cost of manufacture.

Application pending through the Scientific American Patent Agency. Address, for further particulars, John Myers' Sons, Washington, N. C.



MYERS' IMPROVED PRESS.

Improved Hot Air Furnace.

Our engraving represents a hot air furnace, which, through the extent of heating surface secured in its construction, obviates the necessity of overheating the plates in cold weather in order to obtain the requisite heat in the apartments to be warmed, thus preventing the burning of the organic matter, floating in the air and so far vitiating the latter. This is a common fault of hot air furnaces, and may often be detected in the faint oppressive smell imparted to the air which has been overheated. Provision is also made in this furnace for more perfect combustion than is usually obtained in apparatus of this kind. By a peculiar automatic device, the heat is made self-regulating, as will appear in the following description.

Cold air enters at A, passes up through the annular space between the outer shell, B, and fire box, C, and, circulating through the heating tubes, D, is led from the top of the furnace, wherever desired, through suitable pipes or flues. The gases of combustion, rising from the fire box, are reverberated in the gas deflector, E, consisting of a double cylinder, the inner one being closed at the top, and having a perforated bottom to which air passes through the tube, F, to complete the combustion of the gases. Thence the heated gases pass up into the cylinder, G, which is closed at the top but has an opening in the side, shown at H, whence the gases issue and circulate about the outer surfaces of the heating tubes, finally passing out into the smoke pipe on the opposite side of the furnace from that shown.

A prominent feature of the furnace is the damper regulator. I is the draft tube, admitting air to the fire box through the opening, J, this opening being controlled by the valve, K, automatically operated by the expanding rods, L and M, the rocking bar, N, and the levers, O and P. The rod, L, has one end permanently fixed at Q. The other end is pivoted to the rock bar, N. As it expands by the action of heat, it raises the end of the rock bar to which it is pivoted and depresses the opposite end. This moves the bar, M, downward, this rod also expanding by heat so that the combined movement of expansion is communicated to the levers, O and P, and increased by the latter so as to close the valve, K, more or less, according as the heat increases. By means of the sliding rod, R, the lower end of the rod, M, is moved nearer to or farther from the fulcrum of the lever, O, to regulate the degree of opening or closing of the valve, K.

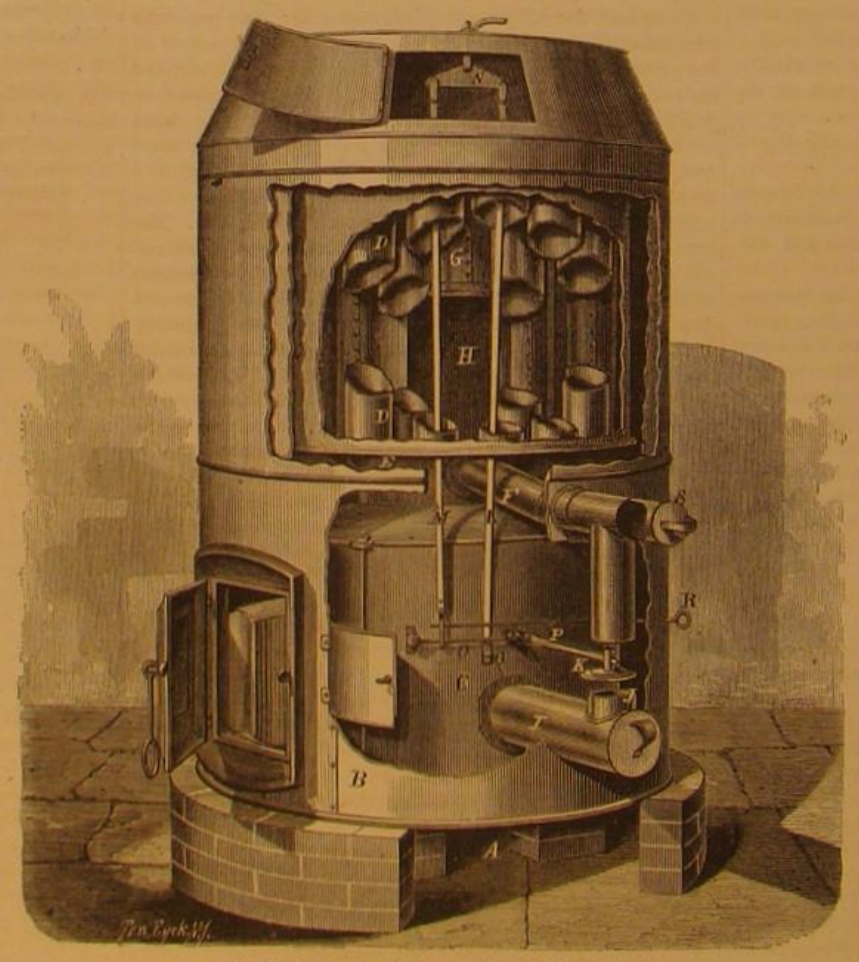
The tube, F is supplied with a damper, S, by which the inflow of air to the gas deflector is regulated.

In burning wood, the gas deflector, E, performs another office from that above described. Besides completing the combustion, it so mingles air with the watery vapors as to prevent their subsequent condensation and dripping in the pipes, when the combustion proceeds slowly. Those who have experienced the annoyances, caused by such condensation and dripping in the use of hot air furnaces, will appreciate the importance of an improvement which removes these inconveniences.

The furnace does not need to be inclosed by masonry; a slight excavation in the earth bottom of a cellar is made to receive a foundation of bricks laid without mortar. The fresh cold air is led in from the outside of the building through a board flue, and the setting may be done quickly and cheaply. In case the cellar has a brick or cement bottom, no excavation will be required. The radiating pipes are of sheet iron, and therefore radiate their heat to the passing currents of air with rapidity. A suitable water pan for regulating the hygrometric condition of the heated air is provided.

The heater can be used where a cast iron heater would take up too much room. By setting the dampers properly, it is claimed the fire can be kept smoldering for forty-eight hours. It is further claimed that the furnace is made with air tight joints, so that leakage of gas is impossible. It requires but slight attendance, and seems a very perfectly contrived apparatus for the purpose of heating buildings.

For further information address Holcomb & Gould, of Painesville, Ohio, in whom the patents on the original furnace and recent improvements are now vested.



HOLCOMB'S HOT AIR FURNACE.

THE manufacture of hoop iron is fast getting to be a speciality, limited to those who make no other kind of iron, roll trains being adapted in speed and constructed with a view solely to this purpose. The rolls are turned so that the iron can be rapidly reduced and greater quantity produced with better finish, while very strict attention is given to the selection of metals for mixture.

THE fourth Atlantic telegraph cable is now being made by the French Transatlantic Telegraph Company, and is to be laid between the coast of Massachusetts and France in 1873. Three Atlantic cables are now in operation, two *viâ* Ireland and one *viâ* France.

Maple Sugar.

Nearly all our hard wood trees will yield more or less sugar but only a very few of them furnish it in large quantities or pure enough for domestic use. The *Acer* or maple family stands at the head of the list in this respect, and chief among these is the *Acer saccharinum* or sugar maple, the juice of which contains from three to six per cent of cane sugar. That which comes from the tree when it is first tapped is much richer than that which flows later in the season. The first sap ascending the stem naturally dissolves out the largest proportion of the starch and gum.

After the sap is drawn, it is concentrated by boiling until it commences to crystalize, when it is allowed to cool and deposit the sugar. During this concentration of the sap, the lime salts which have been held in solution are gradually precipitated as the sirup becomes more dense. This deposit, or "niter," as it is called consists, according to some authorities, of carbonate of lime; others consider it to be malate of lime or saccharate of lime.

The flow of sap varies much with the state of the weather, being most abundant when the nights are cool and the days warm. This has been explained on the supposition that on warm days the air contained in the trunk of the tree expands, thus forcing the sap out; while as the tree cools off at night the air contracts, and the sap rises from the roots to supply the vacuum, to be again forced out the next day. As soon as the leaves commence to expand the flow ceases, because then the leaves are able to evaporate all the water that the roots can supply. But the continual tapping of the tree and the withdrawal of its stores of nourishment soon cause it to languish, and it cannot survive such treatment many years any more than a man could survive the loss of a considerable portion of blood each day.

Telegraphing at Sea.

Captain Columb, R. N., in a paper recently read before the Society of Telegraph Engineers, London, said:—

Telegraphing at sea by night was confined to a very few set messages, represented by white lights displayed in different numbers and forms; this was continued until twelve years ago, when what is now called the "flashing system" was introduced, which has since been completely adopted in the English navy and army. This is nothing more than the adoption of the "dot and dash" of Morse, or the "long and short flash," as they are now called, to universal application.

It was shown how, by the long and short display of a single light, the long and short wave of a flag, the long and short appearance of any object, or the long and short sound on a horn or steam whistle, all the present wants of telegraphing at sea were supplied.

The paper was illustrated by various diagrams and specimens of apparatus actually in use, one of the most important being a flashing light, known as the Chatham light, of great power and simplicity, the light being produced by jets of diluted magnesium powder into the flame of a spirit.

It was shown that all telegraphy was reducible to a system of visible or audible signs following in certain succession. The means of distinction in visible signs were difference of form, color, and motion; in audible signs, differences of tone and motion (or time), while semaphores represented form, and flags, color and form; the most powerful distinction of all, motion, was more practically employed until the flashing system made its appearance, and it not only threw open the hours of darkness to the purposes of telegraphy at sea, but it made the transmission of messages more rapid, while enormously extending their range. Instances were given of messages sent thirty miles from mid channel to the coast of England at night, and of messages read by the naked eye in the day time, when flags could not be read with the most powerful telescope.

Javelle Water.

Old engravings, wood cuts, and all kinds of printed matter, that has turned yellow, are completely restored by being immersed in this preparation for only one minute, without the least injury to the paper, if the precaution is taken to thoroughly wash the article in water containing a little hyposulphite of soda. Undyed linen and cotton goods of all kinds, however soiled or dirty, are rendered snowy white in a very short time by merely placing them in the liquid mentioned. For the preparation of Javelle water, take four pounds of bicarbonate of soda, one pound of chloride of lime; put the soda into a kettle over the fire, add one gallon of boiling water, let it boil from ten to fifteen minutes, then stir in the chloride of lime, avoiding lumps. When cold, the liquid can be kept in a jug ready for use.

To allow the clothing to dry upon you, unless by keeping up a vigorous exercise until you are thoroughly dried, is suicidal.

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW (PARK BUILDING) NEW YORK.

O. D. MUNN. A. E. BEACH.

☞ "The American News Co.," Agents, 121 Nassau street, New York.

☞ "The New York News Co.," 8 Spruce street, New York.

☞ A. Asher & Co., 20 Unter den Linden, Berlin Prussia, are Agents for the German States.

☞ Messrs. Sampson Low, Son & Marston, Crown Building, 188 Fleet street, Trubner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill, London, are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.

VOL. XXVI., No. 18. [NEW SERIES.] *Twenty-seventh Year.*

NEW YORK, SATURDAY, APRIL 27, 1872.

Contents:

(Illustrated articles are marked with an asterisk.)

A Lost Art—Grass Cloth 276
Another Atlantic Cable 278
Answers to Correspondents 281
A Very Good Compost 277
Belting and Pulleys 277
Bone Felon Arrested by Congelation 273
Business and Personal 280
Carpets and Knitted Manufactures of Amsterdam, New York 272
Double Plows 279
Folding Chair, Lounge, and Bed 280
*Frictional Gearing—No. 4 275
Green Corn Fodder 275
Hoop Iron 278
Human Hair and its Substitutes 276
*Improved Baling Press 278
*Improved Brick Kiln 271
*Improved Hot Air Furnace 278
Inventions Patented in England by Americans 281
Javelle Water 278
Machine for Cleaning Carpets 277
Manufacture of Horse Shoes by Machinery 273
Maple Sugar 278
*Müller's Rope Railway 275
New Books and Publications 281
*Noiseless Pump Valve 275
Notes and Queries 281
Official List of Patents, Extensions, Designs, etc 284
On Cotton Seeds 273
On the Heating of Water and Boilers 272
On the Reasons which have caused the Adoption of the New Atomic Weights 280
Origin of Microscopic Living Forms 273
Perkins' Steam Gun 276
Photographic Toilet and Hat Rack 280
Portland Cement 276
Recent American and Foreign Patents 282
Reimplantation 277
Submarine Telegraph Cables 275
Telegraphing at Sea 278
The Air Filter 279
The Chili Saltpeter Deposits of Peru 277
The Iron Interest 272
The Odor of Plants 273
The Utilization of Water in its Relation to Public Health 279
Xylol as a Remedy for Small Pox 277

DOUBLE PLOWS.

Considerable attention has been recently given in England to the use of double plows, the advantages gained being claimed to be considerable as compared with those of single plows. As inventors are ever on the alert to improve agricultural implements, it may not be amiss to place before them some facts connected with this subject, from which they may possibly derive useful hints.

The idea of using double plows is not new. In a lecture delivered before the Framlingham Farmers' Club (England), Mr. J. E. Ransome stated that he had found in a book entitled "England's Improvement," written by Captain Walter Blith in the time of Cromwell, the first account of such a plow. In Arthur Young's "Tour to the North," published in 1771, is also found the account of a double plow fitted with two wheels, then in use in Worcestershire; this plow was afterwards improved by Mr. Berney, of Bracon Ash, Norfolk. Mr. Ransome referred to the plow patented by Lord Somerville in 1802, and also to the first adjustable double plow made by a Leicestershire plow wright, Mr. Handford, of Hathern; and to show what was actually accomplished at that early date with double furrow plows, he quoted from an article on the subject, given in Rees's "Encyclopædia," in which it is stated that at a trial which took place on the Royal farm at Windsor, 17¼ acres of unstirred land were plowed with four Devon oxen, one man and a boy, in six days and a few hours, and that the oxen were in better condition after the trial than at the beginning. This is close upon 3 acres a day, which Mr. Ransome thought was not bad work. In the same article, a letter from an Essex farmer occurred, in which it was stated that Lord Somerville's double plow effected a saving of 5s. a day while in use. Various trials of double plows were conducted by the Bath and West of England Agricultural Society at the beginning of this century, and so thoroughly did they then consider it a standard implement that it was engraved at the head of their printed forms used when giving diplomas in connection with the Society.

Various reasons may be assigned why, notwithstanding these attempts, the single plows still retained their supremacy in popular esteem. They were lighter, easier to handle, and did not require so much power to draw them; while the double plows were so constructed as not to offer the advantages claimed for the new double plow known as the Pirie plow, and improved by the Messrs. Fowler, of Leeds. This plow may be described as follows:

It consists of two plow bodies, carried on a wrought iron frame work, entirely supported on wheels, two of which run in the furrows, one in front, the other behind, and a third wheel runs on the land a considerable distance from the furrow, about midway between the other two, so that the plow is supported on three points at the corners of a triangle. The leading furrow wheel is steered by a lever leading to the back part of the plow, and handles are dispensed with. The plow is turned at the headlands by depressing the land wheel and steering the leading furrow wheel. An improvement made by Mr. Jeffries enables the plow to be lifted bodily, its weight resting upon two wheels in turning the headlands.

Instead of the ordinary slade or land slide, these plows are each fitted with a friction wheel which runs along the cut edge of the plowed land and greatly reduces the friction. In this way, a saving of fifty per cent of the power is claimed to be made in moist land, in which the friction against the slade is very great. In very dry clay land, the saving is not so great. It is maintained that in moist land a team of horses will do one third more plowing per day, with the same labor, with this plow than with the ordinary single plow, a claim which challenges attention and which, if demonstrated to be founded in fact, ought to revolutionize the present system of plowing. We are not prepared to admit so much, but there are still other advantages worthy of consideration. The double plow is as easily managed by one man as the single plow, so that if three or four horses were required to draw the former, the wages of one plowman would still be saved. It is also claimed that the work is done better, the plow working steadily and turning its furrows better than the single plow. The pan or furrow will evidently not be so much trodden if two horses can do the work of three. The bottom and the land side of the furrow are not glazed by the friction of the bottom and slade, as with ordinary plows. The double plow is also claimed to possess peculiar advantages for subsoiling and hillside plowing. Without conceding all these claims, they are sufficient to awaken thought, and perhaps to suggest some improvements upon the present system of plowing in this country, which constitutes so large a portion of agricultural labor. To reduce this one third is a result worthy the efforts of any inventor, and one that would bring a sure reward.

THE UTILIZATION OF WATER IN ITS RELATION TO PUBLIC HEALTH.

It is needless to say that in regions the products of which are largely increased in value by manufacturing them into articles of utility or luxury, the possession of unlimited water power is an advantage scarcely to be overrated. Yet it seems undeniable that the utilization of water power is attended with certain disadvantages. The latter, while not sufficient to induce the public to neglect such natural resources, are still of enough importance to render their possible diminution a subject of consideration.

Our attention has been specially called to this by an article on mill dams and other water obstructions, and their relations to public health, published in the report of the Massachusetts Board of Health.

This article, prepared by Mr. George Derby, the Secretary of the Board, contains many interesting facts, some of which we must pass over entirely, but one of which is of great significance. This is stated as follows:

"There is reason to believe that the territorial line of division (always ill defined) between fevers of a continued and of a periodic type is extending northward, and that our immunity from remittents and intermittents is far less complete than in previous generations. Thirty-four years ago, Dr. Oliver Wendell Holmes instituted an inquiry, among the most experienced physicians of the time in New England, with the purpose of learning what they themselves knew and whatever had come down from their predecessors concerning intermittent fever originating within the field of their practice. The materials thus collected were made the basis of an essay of singular interest, which was published in 1838 as a Boylston prize dissertation. It appeared from all the evidence collected by Dr. Holmes that the traces of indigenous intermittents in Massachusetts were, except in a very few places, but scanty.

About the year 1828, a dam was built for obtaining water power for mechanical purposes on the Housatonic, two or three miles south of the Massachusetts line. It affected the hight of water on that sluggish stream for a distance of ten miles, and was followed by such increase of intermittent fever that the people sought and obtained legal authority for the removal of the dam on the ground that its effects on public health were such as to constitute it a public nuisance.

Twenty-five years ago, it was taught in our medical schools that intermittent fever was a disease almost unknown in Massachusetts, except when contracted in other places.

The exemption of the people of this State from periodic fever seems to be far less complete at the present time."

The gradual enlargement of the area of malarious influence from the latitude of Long Island toward the southern border of Massachusetts is a fact, to which earnest attention is called. There have been during the past eight years, as near as can be estimated, 6,700 cases of periodic fevers in and about New Haven, Conn. According to Dr. E. W. Blake, who furnishes these statistics, these cases "have been of every form and type, regular, irregular and defective; the latter covering cases of dumb ague which are very common in the old fever and ague localities. Cases of remittent have also been quite numerous. In many localities, whole families have been prostrated with the various forms of this malarious disease; old and young have alike suffered. There have been instances of the closing of factories by their proprietors from this cause."

While this increase of malarial disease is not attributed by Mr. Derby entirely to the increase of mill dams and other water obstructions, there can be no doubt that these are in many cases fruitful sources of fevers. Tide mills in crowded neighborhoods are particularly named as objectionable in this respect. Probably any of our readers are cognizant of many dams in which the water becomes stagnant and offensive in hot weather. Such are undoubtedly productive of disease. The tide mills mentioned have, it is stated, not been found profitable, but their dams remain to poison the air and injure the general health. All along the Massachusetts coast are to be found old dams likely to become similar nuisances.

No dam ought ever to be abandoned and left undrained; yet these may be met with in many parts of the country, stagnant pestiferous pools of corruption.

While there can be no doubt that water obstructions tend to promote fevers of various types, we believe that other causes have a more direct relation to the increase of malarious disease in the New England States. There has been, in these States, an enormous reduction of standing timber during the past decade. Wood working of all kinds has been making inroads upon the wooded districts, scarcely credible except to those who are well acquainted with the magnitude of this class of manufactures. The depletion of the timber sets in motion a train of causes which has been well recognized as a fruitful source of malaria in new countries. The increased evaporation of water, through the action of heat upon the newly exposed soil covered with decaying vegetable matter, at once engenders malaria, while the lessened flow of water in the streams exposes marshes and bogs, previously covered with water, and the moist stagnant mud thus denuded ferments and pours forth streams of fetid and poisonous gases and vapors. It is well known that of late the streams in Massachusetts and Connecticut have run very low in the summer season, leaving, in many places, wide flats of ooze directly exposed to solar heat.

It has been well said that civilization has its penalties, and this spread of malaria is probably unavoidable. Certain compensations will take place in time. Bogs will gradually fill up and become drier. The newly cleaned lands will gradually cease to emanate malaria, and the country will probably resume its original healthy condition.

In building dams, much might be done to prevent their ill effect upon the general health. The construction of cheap dykes will often prevent the shallow overflow of acres of ground without materially limiting the useful capacity of the dams. In many instances, the value of the land reclaimed would more than pay the cost of the dykes. This method of protection could undoubtedly be enforced, without oppressive restrictions and to great advantage. In building dams, a little plowing and scraping will also often change the contour of the surface so as to obviate shallow margins without at all lessening the amount of water the dams will hold. In short, there are few instances where a little cost and pains might not remove the objectionable features of dams as many of them are now constructed.

The report of the Massachusetts State Health Board is full of interesting information, but we have not space to review it more extensively. We close with its following extract:

If the cycle of malarious influence should again come round, if intermittents and remittents should prevail in Massachusetts as they do now in Connecticut, they need not be looked for on the dry pine plains or on the hillsides, but will surely be found by the sluggish water courses, in the salt water marshes, by the side of obstructed streams and reservoirs, and wherever the natural flow of water is so hindered by man's contrivances that the result is stagnation.

THE AIR FILTER.

Professor Tyndall, after a long series of experiments with atmospheric air, concluded that many of our most formidable diseases, such, for example, as small pox, cholera, and typhoid were propagated by the flotation of invisible particles in the atmosphere, and that, by the use of a suitable breath filter, it would be practicable for any person to enter an infected apartment without danger. The same apparatus, he stated, might be used by firemen, enabling them to enter buildings filled with dense smoke without injury, as the filter would arrest the particles of carbon, of which smoke is composed, allowing only the air to pass into the lungs. A further use of the breath filter is to facilitate miners in exploring and working in mines where carbonic acid gas is present in noxious proportions.

A recent trial of filters, made substantially as suggested by Professor Tyndall, has lately taken place in England, and we will describe some of the results. The filter itself consists of a cylinder, four or five inches long and two inches or more in diameter. Its interior contains, at the top, a layer of cotton wool which has been moistened with glycerin, then a layer of dry cotton wool, then a layer of charcoal, then cotton wool, with wire gauze covers at both ends, and at the upper end a mouth piece so shaped as to fit closely over the mouth of the wearer. By drawing the breath through this instrument, the most dense smoke may be entered with impunity. This filter has been tested by the London Fire Department with such success that the firemen of that city are to be provided with it for regular use. When places are to be entered, such as mines or wells, where carbonic acid gas is present, it is necessary to add another layer of cotton wool, and to place a layer of slaked lime between the two bottom layers of cotton. The object of the lime is to arrest the carbonic acid and oxide gases.

A recent test consisted in placing the experimenter, who had one of the instruments secured over his mouth, within a small closet, with a rabbit and two birds for companions. Carbonic acid gas and carbonic oxide were then injected until the atmosphere of the closet was rendered highly poisonous. In 23 minutes, the animals were dead, but the experimenter came out at the end of 30 minutes, having suffered no inconvenience from the noxious gases; but the work of breathing through the small instrument for so long a period and the heat of so small an apartment rendered him uncomfortable. Experiments are still in progress to determine the best sizes and forms for the instrument, and ere long we may expect that the air filter will be an instrument of common use.

THE shortening of puddling furnaces, by leaving out the neck almost entirely, is now being done after trial by some mills. The improvement contracts the entire furnace about thirty inches. The fire chamber and working chamber are the same as usual. Some half dozen of the Pittsburgh mills have adopted the change; the saving is obvious.

FOLDING CHAIR, LOUNGE, AND BED.

Mr. Henry James, of North Adams, Mass., has recently patented, through the Scientific American Patent Agency, a folding and extension chair, which has many points of utility worthy of special mention. Its first office is that of an easy chair, in which capacity it is really luxurious, being capable of any style of comfortable and ornamental upholstering, which may be desired, as well as of being upholstered as cheaply as any other chairs in market. Very simple adjustments convert it successively into an invalid's lounging chair, child's crib, a complete iron bed, an ottoman or table, in all of which capacities it is a serviceable and comely piece of furniture. For those occupying small furnished apartments, nothing could be more admirably adapted, as it economizes the room usually occupied by a bed, besides doing duty through the day as an easy or lounging chair. For druggists' clerks and night clerks who sleep in stores, it will also prove serviceable, as besides the merit of utility, it has that of cheapness. The frame work, being of iron, does not harbor vermin, and is very strong; and being placed upon castors, it is easy to handle.

PHOTOGRAPHIC TOILET AND HAT RACK.

A unique and ornamental design for a hat rack has been devised by Mr. William McEntyre, of North East (Erie Co.), Pennsylvania. It consists of a hat rack, which can either be suspended from the side of a wall or supplied with a suitable stand. In the center is a circular or oval mirror. At the sides are brackets for the support of vases or toilet bottles. But the most novel feature of the design is that each of the pegs or supports for hats, coats, etc., has a place provided in the end, for the reception of a circular photograph, about two and one half inches in diameter. A family picture gallery may thus be placed in the rack, or the vacancies may be supplied with views of public places or other objects of interest.

Mr. Josiah Partridge, of 368 Pearl street, is the sole agent for New York.

ON THE REASONS WHICH HAVE CAUSED THE ADOPTION OF THE NEW ATOMIC WEIGHTS.

We mentioned, at the close of an article on the modern status of organic chemistry, in a former number (page 232), that there were different reasons for the adoption of new chemical equivalents, or rather for the correction of many of the thus far accepted atomic weights. We will now explain one of these reasons.

Gay Lussac discovered the law that the ratio in which gases and vapors combine by volume is always a very simple one, and that the volume of the resulting gaseous product bears also a simple ratio to the original volumes. So one volume of oxygen will combine with two volumes of hydrogen, and condense to two volumes of water vapor; one volume of chlorine will combine with one volume of hydrogen, and form two volumes of hydrochloric acid gas; one volume of nitrogen will combine with three volumes of hydrogen, and condense to exactly two volumes of ammonia gas, etc. It is seen that the compound has sometimes a volume equal to the sum of the component gases, and sometimes is condensed to a less bulk; but this less bulk will be always exactly one half, two thirds, three quarters, etc., of the original bulk, that is, it will bear a simple ratio to the same, as stated above. Ampère assumed that equal volumes of elementary gases contained the same number of atoms, that thus the numbers representing the specific gravity of the gases, when accepting the lightest, or hydrogen, as unit, also represented the atomic weights. Let us test this:

TABLE OF THE SPECIFIC GRAVITY OF SOME ELEMENTARY GASES AND VAPORS.

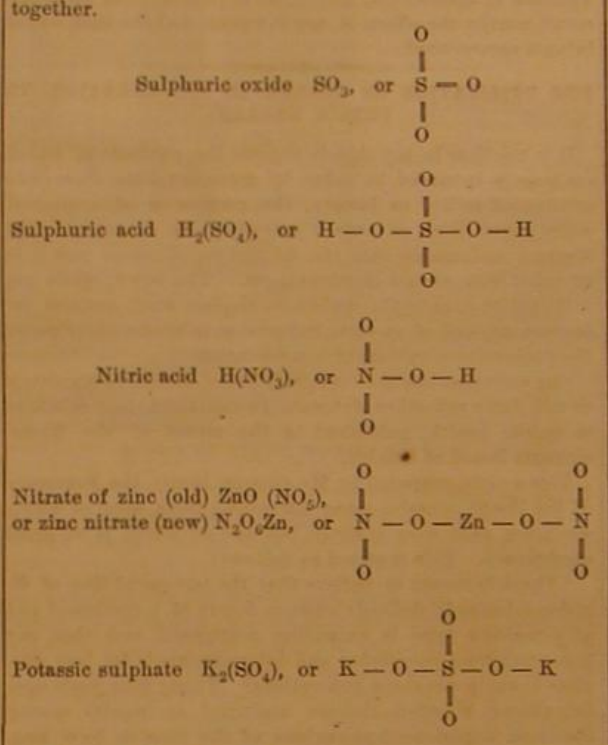
Hydrogen	H	=	1
Oxygen	O	=	16
Nitrogen	N	=	14
Chlorine	Cl	=	36
Bromine vapor	Br	=	80
Iodine vapor	I	=	127
Phosphorus vapor	P	=	31
Sulphur vapor	S	=	32
Zinc vapor	Zn	=	65
Potassium vapor	K	=	39

It is seen that the numbers for N, Cl, Br, I, P, and K correspond with the accepted atomic weights, while those of O, Zn, and S, are twice as large. If, therefore, the latter are adopted as representing the corrected atomic weights, we have also to correct some of the chemical formulæ in which they appear, as these formulæ are founded on the actual ratio of the constituents of bodies and the assumed value of the atomic weights. So water, which contains 8 parts by weight of oxygen with 1 of hydrogen, was expressed, after the old assumption of O = 8, by the formula HO; while, after the new assumption of O = 16, it must be written H_2O, in order to preserve the ratio, of its constituents, of 1 : 8. Ammonia, NH_3, hydrochloric acid, HCl, oxide of zinc, ZnO, and all those compounds of which the value of both constituents has not been changed, and also those of which the value of both has been doubled, remain the same. Thus sulphuric oxide, which consists of 2 parts of sulphur and 3 of oxygen, was written SO_3, which for the assumption of S = 16 and O = 8 is correct; but, for the new assumption of O = 16 and S = 32, it is equally correct. Sulphuric acid, however, which consists of the oxide SO_3 and an atom of water, which formerly was written SO_3HO, is now written SO_3H_2O, or $H_2(SO_4)$. Nitric oxide, which was written NO_5, becomes, by giving O the double value, N_2O_5; and, on combining it with an atom of water, it forms nitric acid, formerly NO_5HO, now $N_2O_5 + H_2O$, or $2(HNO_3)$. Phosphoric acid, formerly $PO_5 + 3HO$, is now, for the same reason, $2(H_3PO_4)$. Zinc oxide, ZnO, is the same, but potash, formerly KO, is now K_2O. Sulphate of potash, or potassic sulphate, according to the new system of naming, is $K_2(SO_4)$ in place of $KOSO_3$.

Since Claudius has shown that the law, which Gay Lussac found in a purely empirical manner, was a direct result of the theoretical assumption of Ampère, the new numbers have been adopted by the advanced chemists of the day; but it is to be deplored that a temporary confusion results, which is especially trying for beginners, chiefly because the existing books are almost all founded on the old formulæ, so that students trained only in the new style cannot understand them; and, in order to understand all, one must, now-a-days, be familiar with both styles of formulæ.

We will still add here the remark that the atomic weights for the alkaloid metals, lithium, sodium, potassium, rubidium and cæsium, are the same as before; those of the metals of the alkaline earths, magnesium, calcium, strontium and barium, have been doubled, as well as the earthy metals, and all the heavy metals, as well as carbon and silicon; but boron and arsenic are the same as before.

We close this article with a few of the modern methods of representing the manner in which the atoms in the compounds mentioned may be considered to be connected together.



It is not asserted that these combinations represent the actual position of the atoms in the compounds, as they are here spread out over a flat surface, while in reality they are combined in all directions in space; but this way of presenting the combinations to the eye is a powerful aid to the imagination, chiefly in connection with the atomicity explained on page 232, above mentioned.

THE experiments of Dr. H. Vohl, of Cologne, appear to prove that the carbonic acid obtained by heating charcoal is not derived from the coal itself, but has been absorbed from the atmosphere. This view is confirmed by the fact that when charcoal is freed from its carbonic acid and saturated with pure oxygen, no further trace of carbonic acid is discoverable, even when heated to 680° Fahrenheit.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

Nickel in Solution, fit for plating by applying the same with a brush, for sale by W. F. Wuterich & Co., Harlem R. R. Depot, White St., New York. Invention for sale.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4 00 a year. Advertisements 17c. a line.

Over 800 different style Pumps for Tanners, Paper Makers, Fire Purposes, etc. Send for Catalogue. Rumsey & Co., Seneca Falls, N. Y.

Portable Mulay Saw Mill, that may be run profitably by the power of a Thrashing Engine. Manufactured by Chandler & Taylor, Indianapolis, Ind. Send for circular.

For Diamond Turning Tools for Truing Emery Wheels and Grindstones, address Sullivan Machine Co., Claremont, N. Hamp.

Billiard Cushions—Manufacturers of Billiard Tables, use Murphy's Patent Cushions. The finest made. Send for sample set. Gutta Percha and Rubber Manufacturing Company, 9 & 11 Park Place, New York.

For the best Recording Steam and Indicating Gauges, address The Recording Steam Gauge Co., 91 Liberty Street, New York.

Patent Steel Measuring Tapes, manufactured by W. H. Paine (send for Circular), Greenpoint, N. Y.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

The most economical Engine, from 2 to 10 H.P., is the Baxter.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N. Y.

In the Wakefield Earth Closet are combined Health, Cleanliness and Comfort. Send to 36 Dey St., New York, for descriptive pamphlet.

Presses, Dies & all can tools. Ferracute Mch Wks, Bridgeton, N. J.

Hoisting and Pumping Engines (Locomotive principle); best and simplest, from 6 to 40 H.P. J. S. Mundy, 7 R. R. Av., Newark, N. J.

L. & J. W. Feuchtwanger, 55 Cedar St., New York, Manufacturers of Silicates, Soda and Potash, Soluble Glass, Importers of Chemicals and Drugs for Manufacturers' use.

To Ascertain where there will be a demand for new Machinery, mechanics, or manufacturers' supplies, see Manufacturing News of United States in Boston Commercial Bulletin. Terms $4.00 a year.

"Best protection against Fire," Babcock Extinguisher, 407 Broadway, New York.

Rights for sale of a great improvement in Metallic Roofing. Wanted, Agents to Sell on commission. C. G. Van Pappelendam, Charleston, Iowa.

Wanted—A first class Engineer and Machinist, one who has had experience in the manufacture and running of Steam Engines and their appurtenances. Address, with references, P. O. Box 1926, New York.

File Grinder's Grindstones, coarse grit—J. E. Mitchell, Phila.

Saw Maker's Grindstones, soft grit—J. E. Mitchell, Phila., Pa.

Massillon and Independence Stone for Plow Makers. Worthington & Sons, North Amherst, Ohio.

Manufacturers of Machinists' Tools—A practical Machinist, with 12 years' experience as Foreman, desires a similar position—best of reference. Address B., care C. Myers, Jr., Philadelphia Post Office.

The best Wrought Iron Sectional Boiler made, one-half, one and two horse power, cheap. No danger of explosion. Can be taken apart and cleaned. Samuel Harris, Washington, D. C.

Lord's Patent Separator for Ores, or any dry material, built to order. State rights for Sale. 232 Arch St., Philadelphia, Pa.

Important.—Scale in Steam Boilers—We will Remove and vent Scale in any Steam Boiler or make no charge. Geo. W. Lord, 232 Arch Street, Philadelphia, Pa.

For Sale—Twenty and thirty horse power Portable Engine of superior quality. Poole & Hunt, Baltimore.

Wanted—Boring Mill—new or second hand—to bore and turn not less than 12 feet. Address Lane & Bodley, Cincinnati, Ohio.

"Anti Lamina" will clean and keep clean Steam Boilers. No injury to iron. Five years' use. J. J. Allen, Philadelphia, Pa.

Iron Roofing—Made and Sold by C. A. Scott, Cincinnati, Ohio.

For Sale—A Patent for forming letters upon hand stamp and telegraph type wheels. Address, by letter, S. M. Ott, Newark, N. J. or G. Hanschel, No. 3 Chambers St., New York.

Any party having old 36 inch boilers for Sale will address J. C. Shay, Box 28, Hackettstown, N. J.

If you want an easy bed, try the Champion. Send for circular to F. C. Beach & Co., 131 Duane Street, New York.

Sign Painter's Guide. Send stamp for Circular. Gardiner & Co., Cincinnati, Ohio.

If you want a perfect motor, buy the Baxter Steam Engine.

For the best and cheapest Water Wheel Regulator "in all creation," address Sullivan Machine Co., Claremont, N. H.

Wanted—The best machine in the market for making Boiler Rivets. Address, giving full particulars, P. O. Box 169, Milton, Pa.

Painters, attention—New Pat. Quick, Clean, Easy, and Cheap Way of Graining, first class Imitations of Oak, Walnut, Rosewood, etc. Send Stamp for Circular. J. J. Callow, Cleveland, Ohio.

Williamson's Road Steamer and Steam Plow, with Rubber Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1899.

Improved Foot Lathes, Hand Planers, etc. Many a reader of this paper has one of them. Selling in all parts of the country, Canada, Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

Drawings and tracings made of Machinery, Models, etc. C. Delafield, C. E., 26 Broad Street, New York.

Best protection against Fire and Burglars—Hall's Safe and Lock Co., Cincinnati, Ohio, and 251 Broadway, New York.

If you want an easy bed, try the Champion. Send for circular to F. C. Beach & Co., 131 Duane Street, New York.

Wanted—Peck's Patent Lifter, medium size, second hand, in good order, at reasonable price. Kittredge, Clark & Co., M'fr's Sheet Metal Architectural work, Salem, Ohio.

For Circulars of Miter Dovetailing Machines, with or without the Angular Attachment, patented Nov. 28, 1871, address, for price and particulars, Asahel Davis, Lowell, Mass.

Tested Machinery Oils—Kelley's Patent Sperm Oil, $1 gallon; Engine Oil, 75 cts.; Filtered Rock Lubricating Oil, 75 cts. Send for certificates. 116 Maiden Lane, New York.

Kelley's Chemical Metallic Paints, $1, $1·50, $2 per gallon, mixed ready for use. Send for cards of colors, &c., 116 Maiden Lane, N. Y.

Kelley's Pat. Petroleum Linseed Oil 50c. gal., 116 Maiden Lane.

If you want to know all about the Baxter Engine, address Wm. D. Russell, office of the Baxter Steam Engine Co., 18 Park Place, N. Y.

Shive's Patent Watchman's Clock and Time Detector—the best ever made. Price $15. Shive Governor Company, Philadelphia, Pa.

Farm Implements & Machines. R. H. Allen & Co., New York.

Boiler and Pipe Covering manufactured by the Chalmers Spence Non-Conductor Co. In use in the principal mills and factories. Claims—Economy, Safety, and Durability. Offices and Manufactories, foot E. 9th street, New York, and 1202 N. 2d street, St. Louis, Mo.

Diamonds and Carbon turned and shaped for Philosophical and Mechanical purposes, also Glazier's Diamonds, manufactured and reset by J. Dickinson, 64 Nassau st., New York.

The Greenleaf Grate Bar saves fuel, and lasts much longer than the ordinary bar. Address Greenleaf Machine Works, Indianapolis, Ind.

Everything for Cider Mills and Vinegar Factories. Address J. W. Mount, Medina, N. Y.

For 2 & 4 Horse Engines, address Twiss Bros., New Haven, Ct.

Peck's Patent Drop Press. Milo Peck & Co., New Haven, Ct.

Enameled and Tinned Hollow-Ware and job work of all kinds. Warranted to give satisfaction, by A. G. Patton, Troy, N. Y.

Best and Cheapest—The Jones Scale Works, Binghamton, N. Y.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Belting as is Belting—Best Philadelphia Oak Tanned. C. W. Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

Boynton's Lightning Saws. The genuine $500 challenge. Will cut five times as fast as an ax. A 6 foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

Over 1,000 Tanners, Paper-makers, Contractors, &c., use the Pumps of Heald, Sisco & Co. See advertisement.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro., 414 Water st., N. Y.

Hydraulic Jacks and Presses, New or Second Hand, Bought and sold, send for circular to E. Lyon, 470 Grand Street, New York.

Watch No. 1006, Stem Winder—bearing Trade Mark "Frederic Atherton & Co., Marion, N. J."—manufactured by the United States Watch Co., (Giles, Wales & Co.,) has been carried by me three and one half months; total variation thirty seconds.—GEO. G. ROCKWOOD, 845 Broadway, New York.

Barbers.—Honest and intelligent ones recommend Burnett's Cocoaine.

Examples for the Ladies.

Mrs. T. M. Scullin, Troy, N. Y., has used her "dear friend," a Wheeler & Wilson Machine, since 1858, in dress and cloak making. The last six months she earned $332, and the year before, $417.

Mrs. Mary Hacher, Muscatine, Iowa, has used her Wheeler & Wilson Machine since September, 1857, and earned from $10 to $30 a week, making dresses and cloaks, from the finest to the heaviest, and her machine is now in as good order as when she bought it.

Mrs. C. D. Goodman, Cleveland, Ohio, has used her Wheeler & Wilson Machine 4½ years with the same No. 2 needle that came in it without breaking or blunting it.

Mrs. J. R. Bowen, Wellsboro, Pa., has used her Wheeler & Wilson Machine almost constantly since 1859 on all kinds of material, without any repairs or personal instruction.

Notes & Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—SEPARATION OF MERCURY IN A THERMOMETER.—How can I cause the mercury which has been broken or separated in a thermometer or barometer tube to unite?—F. D. H.

2.—QUESTION IN ACOUSTICS.—Is there any instrument for measuring the force of sound, and how is it constructed? To what degree is it sensible, and does it record the force of each vibration, or only that of the maximum?—W. M. K.

3.—COATING IRON WITH EMERY.—How can I cover a sheet iron cylinder inside with emery, so that it will form a covering as hard and tenacious as if on wood?—J. M.

4.—TEMPERING PLOW SHARES.—How can slabs of steel, such as plow shares, be hardened without their springing or changing their shape?—P. A. H.

5.—GALVANIZING.—What is used, on the top of the pot of zinc, in galvanizing? I have heard of several things, and would like to know what is best.—J. T. B.

6.—PAINT FOR GALVANIZED IRON.—I want a durable paint for galvanized iron roofing, and also for water tanks, bath tubs, etc., made of the same material.—W.

7.—OVERSHOT WATER WHEEL.—What is the most economical motion for a 20 foot overshot water wheel, to gain the largest per cent of power for the water used?—M. H.

8.—BATS.—How can I banish bats from an *old* house? It is impossible to fasten the house up so as to exclude them, as they eat through and re-enter.—J. E. P.

9.—CLEANING COTTON WASTE.—Would some of your correspondents kindly give me a simple and economical method of cleaning cotton waste, saturated principally with earth oil, to render it a second time usable?—S. R. F.

10.—REMOVING SALT WATER RUST.—Is there any simple method of removing salt water rust from sheet iron, where the rust is on in spots? Are there any acids or liquids, into which the sheets could be immersed, which will dissolve and effectually remove the rust without eating or injuring the clean parts of the iron exposed?—S. R. F.

11.—CEMENT FOR GLASS GAGE TUBES.—What cement other than rubber can I use to cement a glass gage tube to its mountings, which will resist the action of the hot water and steam?—F. D. H.

12.—WORKING CORUNDUM.—Will some one of your many readers inform me how corundum wheels are made, and if corundum can be molded and worked on an iron base? If it can, where can the pulverized corundum be procured?—A. D. C.

13.—DYEING SKINS.—I wish to know the process and ingredients used in producing different colors on the grain of sheep, dog, deer, and other skins used for gloves. I find no trouble in coloring after the grain is off, but cannot color with it on.—A. B. S.

14.—PAINTING CANVAS COVER.—What can I paint a wagon cover with, to render it waterproof? The material is heavy ducking; the color is to be dark. I want something that will stand hot and cold weather, and neither crack nor peel off.—F. A. K.

15.—EXPANDING THE ENDS OF BOILER TUBES.—What is the best mode of expanding the tubes of a steam fire engine boiler, so as to prevent leakage? There are 152 solid drawn composition tubes, which were put in with a dudgeon expander; and frequently the leakage of steam and water around the upper end of tube would be so great as to extinguish the fire. After several times expanding, I had the upper end of tubes feruled with taper iron ferules, which give entire satisfaction at that end, but now the lower ends weep, around each tube, so as to keep the wood in furnace perfectly wet, after six hours standing in house, with water cold.—A.

16.—TELESCOPE.—Will some one please inform me how to make a telescope? I have an achromatic lens of about 34 inches focus, and two inches diameter. I have made a tube, of sufficient length, of brass. The eye piece is one taken from a smaller instrument. It contains four lenses. The first one, nearest the eye, is seven sixteenths diameter, the second five eighths, (these two are one and three eighths apart) the third lens is three eighths diameter, and the fourth, one half inch. These two latter are one and one half inches apart, so that the eye piece is four and five eighths long. Now when I put it together, and get it to the focus, the image is quite dim, so much so that the instrument is useless. Also: How can I grind a speculum, about four inches or five inches diameter, forty-eight inches focus, for a reflecting telescope? What kind, and what proportion, of metal would be best?—T. J.

17.—TELEGRAPH SOUNDER QUERIES.—I have a telegraph sounder and key, of my own construction, worked by a Daniell battery. The magnet on my sounder was wrapped with cotton insulated wire, of the size known to operators as "office wire." This instrument works well, giving a clear distinct sound, as long as it is not in connection with an instrument such as is used in offices; but on connecting it with such an instrument it failed to operate, although the other instrument responded promptly to the manipulation of the key attached to my sounder, and the office sounder worked readily from its own key, without altering the connections. By cutting off from the office sounder, and attaching my sounder directly to the battery, it worked well; but it seemed that, after the current passed through the coil on the other instrument, it had no effect on mine. Is this due to the size of the wire, making a difference in the number of coils on the two magnets? If my magnet is wound with regular "magnet wire," will it operate in connection with the other instrument?—C. P. P.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 1 00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

POWER OF WINDMILL.—Query 10, page 217.—For three horse power, in a gentle breeze, say at 22 feet per second, 334 superficial feet of sail will be required.—S.

TANNING BUFFALO ROBES.—O. A. R. will find an answer, to his query, on page 266, current volume of the SCIENTIFIC AMERICAN.

POLISHING GUN BARRELS.—E. O. McC. will find full directions for this process on pages 217 and 266 of the current volume of the SCIENTIFIC AMERICAN.

WELDING COPPER.—F. E. R., of Cal., is informed that we had the directions for this from a first class European authority on the subject. We shall be glad to have the experience of other readers, if there are any who have tried the process.

RATTLESNAKES.—A correspondent, C. F. Gerald, of Camden, Ala., disputes the currently accepted theories about rattlesnakes, and asserts that they will bite when in any position, and in the daylight as well as at night; and he states that he can shoot them in the head with a rifle, hitting every time.

VIOLIN VARNISH.—Query 7, page 233.—Take two ounces gum shellac, half an ounce gum copal, one ounce sweet spirits of niter, one pint alcohol. Dissolve the gums in the alcohol, then add the niter.—F. D. H., of N. Y.

CLEANING GLASS.—Let W. G. E., query 16, March 16, rub his glass with rotten stone and alcohol. This method is used by photographers for cleaning glass.—C. H., of Ky.

FUSIBLE METALS.—To O. E., March 23, page 200.—An alloy of 8 parts of bismuth, 5 of lead, and 3 of tin melts at 212° Fah. Bismuth 2 parts, lead 1, tin 1, melts at 201°. Bismuth 5 parts, lead 3, tin 2, melts at 199°. By the addition of a little mercury, it becomes more fusible.—W. H. B., of Conn.

BRASS CASTINGS.—Query 27, March 30.—Make your sand as dry as it can be worked; do not pack it hard. Run your metal at a medium heat, give what vent you can, pour your metal in one hole, and allow it to rise out of another.—O. K., of ——.

SHAVING WITH PUMICE STONE.—If G. P. and H. E. M. will first shave their faces clean, but not so close as to leave a sore face, then get a piece of very small pored pumice stone, and use it frequently never allowing the beard to grow out, they will soon find it delightful shaving, keeping the beard always under the skin. This method of shaving has been in use in London for more than forty years.—A. D. C.

FUSIBLE ALLOY.—Rose's fusible metal contains lead 1 ounce, tin 1 ounce, bismuth 2 ounces, and melts at 200° Fah. Lippowitz's fusible metal is more expensive, and melts at 149° Fah. It is composed of cadmium, 3 ounces, tin 4 ounces, lead 8 ounces, bismuth 15 ounces.—J. S. of N. Y.

DRIVING ELEVATOR.—To C. W. W., query 9, page 233.—I have repeatedly driven elevators from the bottom with perfect success, having elevated 3,000 bushels per hour. I place the upper pulley in a yoke raised by weights to give the necessary tension.—G. W. P., of N. Y.

FRUIT JELLIES.—To M., query 27, March 9.—Fruit jellies are made of sweet unfermented cider boiled in sugar to the consistency of jelly, flavored and colored to taste. The boiling point can be ascertained by frequently taking out a few drops of the article and cooling in a saucer or tin plate. Grind or crush your apples and press out the juice, add 3½ pounds of sugar to each gallon of cider, boil and strain through jelly bags. Flavor with the fruit the jelly of which you wish to imitate.—J. D. T., of Cal.

TEST FOR NITRIC ACID.—To P. C. H., query 19, March 9.—The best test for nitric acid is as follows: Put a few copper filings into the suspected article, and boil it; if it contains any nitric acid, it will give off red fumes.—J. D. T., of Cal.

TEST FOR LEAD IN WATER.—To F. C., query 24, March 9.—On adding a solution of sulphuretted hydrogen gas to water containing lead in solution, the water turns brown or black according to the quantity of lead in the water.—J. D. T., of Cal.

TO PREVENT CIDER FROM FREEZING.—To J. D. R., query 15, March 9.—There is nothing which you can put into cider to prevent it from freezing but alcohol; and a sufficient quantity of this would render your cider too intoxicating and unpalatable to be drinkable. The best way to prevent its freezing is to keep it in a cellar or bury it.—J. D. T., of Cal.

PRESERVING NATURAL FLOWERS.—Take some fine sand, wash it well and sift; mix thoroughly with a little stearin. Dry the flowers thoroughly from rain and dew; put them in a vessel and sift the sand all over them, so lightly that the leaves will not be injured, till they are completely imbedded. Expose the vessel and its contents to a gentle heat until they are dried; they will then retain their shape and color. This method is not so successful with flowers of which the petals are thick and contain much fatty matter as it is with the more delicate species.—G. H., of Me.

VACUUM IN CASKS.—To J. A. P., query 6, page 233.—The weight of the atmosphere is more than sufficient to keep the liquid in a cask, but the cohesion of the particles of fluid, when presenting considerable area, is not sufficient to overcome their own weight as against the effort of the air to enter. Fill a goblet with water, and place carefully over it a piece of the finest tissue paper, and then invert and you will find that the pressure of the atmosphere will keep the water in. The cohesion of the particles of the paper seems to be enough to aid the particles of the water to maintain theirs.—E. H. H., of Mass.

VARNISH FOR VIOLINS.—J. D., query 7, page 233, may use shellac dissolved in alcohol, and add a little gum elemi to toughen it.—E. H. H., of Mass.

GOLD SOLUTION.—F. M., query 10, page 233.—To a dram of solution of terchloride of gold add two ounces of ether and shake together. Polished steel articles immersed in this clear liquor will become covered with a fine film of gold.—E. H. H., of Mass.

PREPARATION OF INDIGO.—To D. C., query 11, page 233.—Sulphate of indigo or chemic is prepared in the following way: The indigo is reduced to an impalpable powder and completely dried by a heat of 140° or 150° Fah. For each pound of indigo, six pounds of highly concentrated sulphuric acid are put into a large jar or earthen pot furnished with a cover. This is kept as dry as possible, and the indigo is added gradually in small quantities. The vessel is kept closely covered, and care taken that the heat of the solution does not exceed 212° Fah., but the heat must be kept at about 150° Fah., and allowed to stand, stirring it occasionally for forty-eight hours. If neutralized extract is wanted, the extract is put in hot water and well stirred, and a quantity of powdered chalk added until the acid is exactly neutralized; this is a nice operation and requires great care. Some dyers use carbonated alkalies to neutralize their acid. The sulphate of indigo of commerce is much better than that prepared by the dyer.—S. W. S., of N. Y.

DYEING PRUSSIAN BLUE.—To S. W. O., query 15, page 249.—Nitrate of iron is used as a mordant on cotton, and is prepared as follows: Ten pounds nitric acid of 36° Baumé, two pounds muriatic acid of 22° Baumé, and five pounds water in a stone pot; hoop iron or wrought iron chips are added slowly. When all the iron is dissolved, add slowly five pounds copperas. Old undissolved iron ought never to be left in. Fifty pounds of well boiled cotton are passed through a cold solution of four pounds nitrate of iron and six ounces of tin crystals. Give five turns, then take it to another bath of three pounds yellow prussiate of potash and one pound sulphuric acid; give it five turns in this, take it out again, pass back into the iron bath, and thence back into the prussiate bath, and so on until the required shade is reached. Rinse well before drying.—S. W. S., of N. Y.

DYEING GREEN ON COTTON.—Color twenty-five pounds of yarn with Prussian blue as above, but use more tin crystals. Rinse well, then boil ten pounds citron bark, strain it into a suitable tub, and add five pounds of alum. Enter at about 170° Fah., and handle for half an hour. Boiling will spoil it.—S. W. S., of N. Y.

PREPARING SKELETON.—If G. L. F., query 10, page 200, will cut all the soft parts from his subject, remove the sternum at its junction with the ribs, and dislocate the large joints, put all in a watertight barrel (changing the water every week in summer) with the sternum so that he can watch it lest the cartilage be destroyed, or place his barrel in a running brook for two or three months in summer, he will have as nice and clean a skeleton as he can desire. If he uses any chemicals other than ether, he will certainly destroy his skeleton.—EX., of Mo.

WORCESTERSHIRE SAUCE.—Take the walnuts when you can stick a pin through them and rinse them well; put a layer of them in a stone jar free from grease. Sprinkle each layer with salt until the jar is filled, cover, and let it stand five days. Strain off the juice after pounding the walnuts. To every gallon of juice add one pint of onions and one clove of garlic, each chopped fine, one ounce each of allspice, ginger, cloves, black pepper (all to be ground), a nutmeg grated, two ounces best cayenne pepper, and two quarts of the best cider vinegar. Put the mixtuse in a preserve kettle and set it on the fire; let it boil until reduced one third. When cool, bottle and cork tight. Age improves it.—S. E. M.

BREAKING OF CAST IRON PULLEYS.—.—, page 185, is altogether in the dark, and so was C. M. R. in supposing the piece, broken from his pulley, was too long to allow of its being replaced. The rim of the pulley was thinner than the arms and center; hence, when cast, the rim cooled first and set, while the arms and center continued to cool and contract, which caused the arms, being curved, to spring outwards with a tendency to draw the rim inwards at the points of their connection; and when the arch of the circle was broken, the strain was relieved and all parts assumed their natural position; which movement shortened the diameter of the pulley equal to the former spring of the arms, and lengthened the whole rim in proportion to its divergence from the true before it was broken. Hence the opening from whence the piece was taken was made shorter.—C. H. J., of N. Y.

FUSIBLE METAL.—To O. E., query 14, page 200.—An alloy of bismuth 2 parts, lead 1 part, tin 1 part, melts at 201° Fah. The addition of a little mercury will cause it to melt at a lower temperature; and with more lead and tin, it will resist a higher temperature. I have found that the same alloy under the same tension would part at different temperatures, a fact which is unaccountable to me. The metal is very unreliable, under tension, torsion, or compression. If your correspondent O. E., in his experiments, produces any satisfactory results, I should be pleased to know it, as it might be for his advantage as well as mine.—G. M. H. of N. Y.

BALANCING GANG SAW MILLS.—To E. F. J., query No. 18, page 154.—Attach two cylinders, with heads in the upper ends, sixteen inches in diameter, one to each side of the gang saw frame, so that the pressure of the atmosphere on the under side of the piston heads would sustain all the weight of the saw frame and its attachments. A vacuum will be formed above them by the descent of the heads, and a small valve should be made on the top of each cylinder head to permit the air that might get into it to escape.—J. C., of O.

PACKING RINGS.—Query 31, page 169.—D. & N. are informed that brass is one of the best packings in use. The rings should be all fastened together with a pin, made tight in the inside ring and between the outside ones. This is to prevent the rings from moving round so as to bring the open spaces together.—J. C., of O.

NEW BOOKS AND PUBLICATIONS.

THE RIVAL COLLECTION. J. W. Schermerhorn & Co., New York.

This is a handsome volume of 500 pages, containing pieces, serious and amusing, from our best writers. The selections are judiciously made by the editor, Martin Larkin, and consist of extracts from the choicest writings of the best authors. It is a book that should have extensive sale.

THE AMERICAN HISTORICAL RECORD. Edited by Benjamin J. Lossing. Published by Chase & Town, Philadelphia. $3 a year.

The April number is full of interest. Among other entertaining things, we find a variety of autograph letters from Lafayette, Cornwallis, Dartmouth, Rochambeau, General Pigot, and others. A chapter on the "Early History of American Wood Engraving" is given, with a *fac simile* of one of the earliest engravings—a portrait of Washington. It was a rough picture. We regard "The Historical Record" as one of the most useful periodicals of the day. Its pages abound with entertaining facts and curious details. Concerning the early condition of our country and the personages who figured in its history, it supplies very valuable information. Standard histories are necessarily confined to general statements; but the peculiar mission of "The Historical Record" is to give us the particulars, and this it does in the most interesting manner. It is ably edited.

APPENDIX TO THE FIFTH EDITION OF DANA'S MINERALOGY. By George J. Brush, Professor of Mineralogy in the Sheffield Scientific School of Yale College. New York: John Wiley & Son, 15 Astor Place.

This is one of a series of appendices to be published from time to time to supplement the original work. The present one includes descriptions of eighty-seven minerals announced as new, and some important facts relative to others, the whole being arranged in alphabetical order for easy reference.

We are in receipt, from Mr. Francis A. Walker, Superintendent of the Census, of a copy of STATISTICS OF THE POPULATION OF THE UNITED STATES, as determined by the Ninth Census, and also of the STATISTICS OF WEALTH, TAXATION, AND PUBLIC INDEBTEDNESS.

Inventions Patented in England by Americans.

(Compiled from the Commissioners of Patents' Journal.)

From March 22 to March 26, 1872, inclusive.

AIR BRAKE.—G. Westinghouse, Jr. of Pittsburgh, Pa.), London, England.
ARTIFICIAL STONE.—F. Ransome, London, England, E. L. Ransome, San Francisco, Cal.
COMBINATION LOCK, ETC.—T. J. Sullivan, Albany, N. Y.
COMPOSITION BEARING.—S. Croll, R. T. Barrett, E. T. Plush, Philadelphia, Pa.
CONVERTING MOTION.—H. M. Fryer, Nashville, Tenn.
ELEVATOR.—A. M. Patrick, Long Lane, Mo.
FIRE EXTINGUISHER.—W. L. Ellsworth, Brooklyn, N. Y.
FREEZER.—J. Tingley, Philadelphia, Pa.
LOOM.—J. Shinn, Philadelphia, Pa.
MECHANICAL MOVEMENT.—A. B. Hendry, A. W. Webster, Ansonia, Conn.
PREVENTING CORROSION.—G. H. Smith (of New York city), London, Eng.
RETORT JOINT.—J. R. Floyd, C. F. Dieterich, A. Schüssler, New York city
STEAM STREET CAR.—E. Lamm, New Orleans, La.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

EXTENSION LATHE CARRIER.—William A. Lorenz, of Newark, N. J.—This improved extension carrier for securing work to the face plate of a lathe for turning, boring, or other purposes, consists in the construction and combination of two bars, one of which has two holes formed through it to receive the bodies of two screws, which screw into screw holes in the other bar to hold the work. The bars are arranged with their longer ends projecting in opposite directions. In the longer ends of the bars are formed screw holes at right angles with the holes above named, to receive the screws by which the carrier is secured to the face plate of the lathe. These screws pass through slots in the opposite sides of the face plate of the lathe, and which are in line with each other and with the lathe center. When the carrier is used as a common extension carrier, a tail is used, which is made with a long head to enter one of the slots in the face plate, and thus carry the work. When the carrier is used as an extension carrier on line lathe center, long screws are used, which are passed through the slots in the face plate, and are screwed into the holes therein, so as to hold the work back to the said face plate. With this construction these screw holes, as the carrier is expanded and contracted, will always be in line with the lathe center. The first and most important object of the carrier is its use as a tool for holding shafting and back to face plate of lathe by means of long screws passing through slots of face plate, the shaft meanwhile resting on a steady rest at one end, and on the live center of lathe at the other. The lathe center is the governing center point. The screws are screwed up until they just tighten the shaft on its center point. It is claimed to never spring out of center when held in this manner. In this position the screws act as tails to carry the shaft around. Drills or tools of suitable shape can then be brought to bear upon end of shaft. In ordinary machine shop practice, the common dog is tied with a string or belt lace back to the face plate, or a clamp with bolts (such as is used for holding wheels in boring lathes) is put before the dog, and fastened back to face plate against the dog by bolts. This extension carrier dispenses with these methods, and does its part quickly and in a workmanlike manner.

BRIDGE.—John H. Diedrichs, of Richmond, Va.—The object of this invention is to produce a practical suspension truss for bridges, which shall be economical in construction, durable, though light, and of graceful appearance, and in which a greater proportion of strength may be derived from a given quantity of material than in any other truss system now in use. The invention consists principally in a novel judicious distribution of the tie rods that connect the lower ends of the pendent posts with the top chord of the bridge. These tie rods are applied in the following manner: From the lower end of each post project two tie rods in opposite directions, but at equal angles, one to the nearest buttress, the other to the top chord. This will cause every post to be connected with but one buttress, except the middle post, which is united to both. At the upper ends only every alternate post is braced, provided the posts are all at equal distances apart from each other, which is preferable. The top chord and posts may as well be made of wood as of metal. In the first case, the upper ends of the tie rods are secured, where they join, to boxes placed upon the top chord. In the other case, the connecting bolts may pass directly through the metallic top chord. Contraction and expansion by cold and heat cannot injure or strain the parts of this bridge, as the tie rods projecting from each post are of equal length. A lateral shifting of the connecting pins is thereby made impossible from the above causes, which is an item of great importance, and an advantage of this system over most others now in use. The system recommends itself further on account of the equal thickness of the rods throughout for bridges of a considerable length, only the rods projecting from the posts nearest the middle may be made somewhat stronger. Other advantages are that by the proper distribution of tie rods the top chord is relieved from excessive strain, and will, therefore, be more durable; that special bracing of panels, etc., is unnecessary; and that the general appearance is harmonious and graceful.

PUMP.—Samuel M. Young and Philipp Brand, of Jacksonville, Ill.—A glass lining with tapered ends is inserted from the lower end of the barrel or stock, which is bored enough larger thereat than at the upper part, and a tubular plug of wood or other suitable substance is inserted below, which fits in snugly, and is flared at the upper end to wedge in tight between the stock and the barrel and the said tapered end. The upper ends of the barrel wedges are similarly fitted with the flaring shoulder of the bore. The plug may be tapered, if preferred. The bore of the lining and the wedge is the same size as that of the barrel above the lining. This lining is employed for its superior wearing qualities, and for the same reason a cylindrical glass valve seat is used in the top of the joint of a pipe which connects with the lower end of the barrel by being insulated in it. The pivot of the lever or handle is made square or of other angular shape in the part which fits in the lever, and round at the ends which are fitted in bearings to turn instead of having the lever turn on it, which makes a very much more durable arrangement, for the boxes and journals do not wear as fast as the lever when working on the pivot, and the lever is prevented from vibrating laterally as much as when turning on the pivot. The claim is for a glass lining for pumps, edge beveled and fastened by wedges.

STENCIL PLATE.—John McCullagh, of New York city.—This invention furnishes an improved stencil plate, so constructed that the letters or figures can be conveniently and quickly changed as may be desired. A top and bottom plate are hinged together. The bottom plate has cut therein as many square holes as it is desired to have letters or figures. Around this plate, at such a distance from the edges of the holes as will leave a margin wide enough to fully support the edges of the letter plates, is formed a rib. The letter plates each contain a single letter or figure, and they are laid side by side. Upon the inner side of the side, ribs are formed, or to them are attached, at the ends of the division bars between the letter holes, projections or stops to prevent the lateral movements of the letter plates. The corners of the letter plates are notched to fit upon the stops. The top plate, which is hinged at one of its side edges to the side edge of the bottom plate, is slotted longitudinally, the width of said slot corresponding with the width of the holes in the bottom plate, and its length being equal to the length of the series of holes in the said plate. To the under side of this plate is attached, or upon it is formed, a rib at such a distance from its edges that the rib will fit within the rib on the bottom and rest upon the edges of the letter plates, locking them securely in place. To the side ribs, at their lower inner edges, are attached, or upon them are formed, bars, the lower surface of which is flush with the lower surface of the ribs, and which are so placed as to overlap and fit closely upon the adjacent edges of the letter plates. The two parts of the stencil plate are locked, when shut down upon each other, by buttons or other suitable fastenings. The two parts of the stencil plate may be struck up out of sheet metal, or they may be cast, as may be desired or convenient. This is, we think, a very good and practical invention, as it will often save the use of many different stencil plates.

TUG CLIP.—John B. Welpton, of Tabor, Iowa.—This improved hame tug clip is so constructed as to allow it to be conveniently detached when desired for changing the hames or other purposes. The body or loop of the clip, which is bent or twisted to bring the loop that receives the hame staple at right angles with a bolt, passes through the eyes of the loop. The bolt is made with a head upon each end. The head upon the forward end is made oblong, and flaring upon two sides, and has a rabbet or shoulder formed upon the third side to receive the end of a small spring attached to the arm or loop. Both the holes or eyes of the body or loop are made oblong, so that the oblong head of the bolt may pass through them, and the forward hole is made flaring on its sides to correspond with the forward head, so that the bolt cannot come out when in use. In the other head of the bolt is formed a slot or groove to receive a screw driver for turning the bolt in inserting it and removing it. To remove the bolt, the point of some sharp pointed instrument is inserted beneath the free end of the spring, which is raised slightly, and, at the same time, the bolt is turned one quarter around, the head of the bolt passing beneath the end of the spring, and thus passing out freely. In inserting the bolt, the forward head of the bolt is passed through the holes or eyes of the loop or body until it rests against the spring, when a slight pressure and a one quarter turn with a screw driver brings it to its place. The spring does not require to be very strong as there is no strain upon it, its only office, when the clip is in use, being to keep the bolt from turning.

LOOM SHUTTLE ACTUATING MECHANISM.—George V. Sheffield and Walter S. Horton, Providence, R. I.—This invention consists of the application of steam or air or otherwise actuated pistons, with long projecting rods, to the lathe of a loom, for carrying the bobbin through the shed, a carrier for the bobbin being used that is adapted to be carried on the end of the piston rods when moved through the shed, and delivered to a holder or receiver ready for the rod on the other side, and the ends of the rods being magnetized to insure the holding of the carrier as they move backward with it through the shed. The two steam or air cylinders are mounted on the lathe, one at each end, in the place of the ordinary shuttle boxes, each of which has a piston with a long rod projecting in the crosswise direction of the loom, and capable of reaching through the shed, and withdrawing from the warp far enough to leave space for the bobbin carrier to clear the warp. Each cylinder is also provided with a steam or air chest, induction and exhaust ports, and a valve, by which to work the piston in the manner of ordinary steam or air engines; and it is also provided with springs for cushioning the piston at each end of the stroke. The valve will be shifted by any suitable moving part of the looms coming against arms or projections of any kind, on said valve, or connected with it in any way; or, the engines being moved with the lathe, the movement of the valve may be effected by the said projections coming against any fixed part of the loom. At each side of the warp threads, and under the positions where the carrier stops, is a block rising slightly above the top of the lathe, with the upper surface slightly descending toward the center of the loom, with two wings rising vertically from the upper surface and slightly converging toward the cylinders. The bobbin carrier is received upon these blocks between the wings at the return of each rod, and the rod withdraws lightly, leaving the carrier ready to be taken by the opposite rod after the beat and a new shed has been formed, when said opposite rod comes through, enters the tube, secures the carrier by the action of its magnetized end, and carries it back to the opposite side and leaves it, in like manner, ready for the next operation. Any kind of friction devices may be used to retain the carrier between the wings after the rod has been disconnected and while the lathe is beating up; or the magnetic attraction of the rod may be utilized for the purpose, the separation of the rod from the carrier not being so great but that the magnetic influence will be strong enough to retain the carrier; but the rod must not be so near that it will cause the opposite rod to fail of taking the carrier.

FASTENING KEY FOR COFFINS.—John Homrighous, Royalton, Ohio.—The object of this invention is to provide a substitute for screws, used in fastening the lids of coffins and for all similar purposes, whereby much time and annoyance may be saved. It consists in a key, ordinarily constructed so that it can be turned like a thumb screw. The shank of the key (see accompanying engraving) passes through the cover and enters the side or end of the coffin, the same as a common wood screw. One or more spurs project from the side of the shank near its end. These spurs are preferably flat and sharp on one edge, and placed spirally on the shank, or like the thread of a screw, so that when the key is turned the spurs will draw the key down and tighten the cover to the side, the same as would be done by turning down a screw, a shoulder on the shank of the key giving the desired hold on the cover. To apply the key, a hole is bored through the top or cover and in the side or end, and then a channel is cut in one side of the hole of sufficient size to admit the spurs. With the hole thus prepared, the key may be dropped into it, and when it is turned, the spur or spurs will penetrate the wood and act the same as a screw thread to draw the parts of the coffin, box, or other article, together. The lower edge of the obliquely placed spur is sharpened or made thin, so that it will readily penetrate the wood. Ordinarily, the spur or spurs will be placed so that the key would be turned to the right to fasten, and to the left to unfasten. One fourth of a revolution will do either. A great saving of time is thus effected, as compared with the time required for driving screws with a screw driver. The same device is claimed to be equally valuable on harrow teeth, gate hinge bolts, and other purposes. Those wishing to negotiate for the purchase of this patent may address the inventor as above.

CARBURETER.—Horace Holton, of St. Louis, Mo.—The cylindrical shell of this apparatus, which is divided into an air compressing chamber, gas chamber, and the gasoline chamber. The air is to be forced into the gasoline chamber and the mixers therein through a pipe by a water wheel consisting of cycloidal buckets and an air chamber at one end, into the top of which the air is forced, and into which the pipe extends above the level of the water to receive the air when so pressed in. The invention in this wheel consists in the cycloidal spiral buckets, which are claimed to be better adapted, by reason of their peculiar form and arrangement and the number used, say about eight, more or less, to produce a regular and continuous pressure and flow of air, which has heretofore been irregular in these machines by reason of the use of square shaped buckets of large capacity and few in number, which cause the air to flow in gusts. By peculiar mechanism the air is driven into a thin hollow cylindrical column, surrounding the float and enters the gasoline in a diffused condition very favorable to the necessary union. An agitating wheel is constructed in the form of an overshot wheel and driven in the direction to carry the fluid over and let it fall again in such manner as to agitate it very thoroughly. A combination of an agitating wheel with a gasoline chamber, as and for the purpose described, and a perforated cylinder and pistoned gas holder, arranged respectively in two adjacent chambers, constitute the claims allowed. The machine is driven by a weight and a train of clock work.

SAWING MACHINE.—Safaryne W. Nyce, Blooming Grove, Pa.—The several devices and arrangements, which are claimed to constitute a very efficient and desirable machine, are a combination of saw shafts, provided with driving pulleys, and having foot power apparatus, and a hand crank pin designed as a sawing machine for small shops, etc., where saws driven by steam, animal, or water power, are not available.

HUB FOR CARRIAGE WHEEL.—Isaac E. Bower, Bainbridge, Ga.—The box and principal portion of the hub is bored out to receive the nut and axle and the nut and washer and axle, as is usual in pipe boxes. There is a flange around this part, against which an inner spoke plate bears. The main spoke plate is bored, or an opening is made in it to allow it to slip on to the principal part, where it is securely held by a screw nut. The inner spoke plate is securely fastened to the main spoke plate by bolts, and confined between the principal part of the hub and the inner spoke plate thereby forming mortises for the spokes. The inner plate rests against the flange, through which the fastening bolts pass. A nut of sufficient size to cover the opening in the main spoke plate laps out on to it so as to hold it firmly to the main body of the hub.

PIPE TONGS.—James E. Roache, New York city.—This pipe tongs or wrench is of very simple construction, its moving jaw being arranged to slide, and actuated by a lever and spring, while the fixed jaw is adjustable by means of a screw. The main handle carries at its outer end a hook shaped block, in which the stationary jaw of the pipe wrench is held by a screw. The movable jaw of the wrench is fitted in a recess provided at the elbow junction of the handle and block. A lever, pivoted to the block directly behind the jaw, has a projecting lug that bears against the back of the jaw. A spring is concealed within a cavity of the block, and bears against the face of a stud which projects from the jaw. The spring has the tendency to crowd the jaw against the lever and to open the tongs, while the lever is used to bring the jaws together for clamping the pipe between them.

WASHING MACHINE.—John Eckerson, Spring Valley, N. Y.—This invention has for its object to furnish an improved washing machine, is designed to wash the clothes thoroughly and quickly, so that there will be no necessity for rubbing any part of them. It consists in a combination of a frame, legs, tub (corrugated vertically upon its inner sides), disk, shaft, detachable cross bar, cross bars, corrugated rollers, springs, guide pins, crank and cover with each other, the combination being peculiarly made to effect the purpose named.

FIREPROOF BUILDING.—Joseph J. Bartlett New York city.—This invention consists, principally, in the use, for building purposes, of paper or composition containing asbestos when applied to a metallic framework in sheets or sections of suitable extent. The invention also consists in the peculiar arrangement of the metallic framework, although the inventor does not confine himself to any peculiar form and arrangement of parts. The main invention is the construction of a fireproof building of metal and asbestos fabric. These substances are fireproof, durable, strong, and waterproof to all practical intents, and, therefore, it is claimed, best adapted, when in combination, to the purposes specified.

HOE.—John S. Carroll, Covington, Ga., assignor to himself and J. W. Rogers, same place.—This invention furnishes a hoe, for the cultivation of cotton and for other purposes, claimed to be better adapted to the purpose than hoes of ordinary construction. It consists in the construction of the blade, and in a detachable shank and parts connected therewith. The blade has four cutting edges, and is otherwise peculiarly formed. The handle is fastened to the blade by a ring and key in a very novel manner. The invention is in every way unique, and is one which a thorough practical trial may prove valuable.

CLIPPING MACHINE.—James W. Moyer, Cooperstown, N. Y.—This is an improvement upon that class of horse clippers in which air power is employed, either upon the compressive or exhaustive principle. Pumps of any suitable kind, or any equivalent thereof, for impelling the air, with conducting tubes of flexible character, air chambers, and flexible diaphragms for actuating the movable cutter bar are used, said bar being connected to the said diaphragm in any suitable way to be moved by them as they are moved by the air, the said apparatus being either double or single acting, according to preference. The diaphragms, which are caused to vibrate by the alternate action of air forced against one side, and the action of the external air on the other side when the first side is relieved from pressure are arranged in the handle employed for moving the clippers around the body of the animal, while the pumps or other impelling apparatus may be affixed to the side of the stall or to a portable support for moving about from one stall to another.

BELT TIGHTENER.—Homer C. Allyn, Fall Village, Ct.—The invention consists in providing the single bearing which holds the fly wheel shaft of a sewing or other small machine with means for quick and easy adjustment, whereby the belt which drives the mechanism may be tightened when it is desired to start the machine and *vice versa*.

APPARATUS FOR TRANSPORTING VESSELS OVER BARS.—John E. Worthman, Mobile, Ala.—This invention relates to a floating apparatus designed for taking in vessels, without unloading, and transporting them over bars, shallows, etc., where there is not sufficient depth of water to allow the vessel to pass when loaded.

BORING MACHINE.—Jacob Gardner, Bigler, Pa.—The invention consists in a boring machine in which posts or rake heads, having different intervals between their mortised holes, may be readily and successively bored without any but a single and momentary change. In miscellaneous work, it must necessarily be a great saver of labor.

MACHINE FOR BORING HUBS AND TENONING SPOKES.—Jacob Gardner, Bigler, Pa.—This invention relates in part to a machine for boring into wheel hubs the radial holes necessary for the making of the mortises which receive the butts of the spokes, the invention comprising, under this head, a device for placing the hubs at such an inclination from the perpendicular while they are being bored as may serve to produce holes sufficiently inclined to the axes of the hubs to give the spokes, when placed in such holes, the requisite "dish" or slant. The invention also relates to a machine for tenoning the outer ends of spokes, and includes under this head a device for clamping the spokes while the tenons are being formed on them.

COTTON CHOPPER AND CULTIVATOR.—James M. Harcrow, Marshall, Texas.—This invention relates to a machine by which a row of cotton plants is barred off on both sides, chopped, and dirted all at the same operation, the machine being provided with a shield to cover the chopper and prevent it from injuring the limbs of the operator.

CORN PLANTER.—Morriss Schnapp and Wm. J. Hollis, Dewitt, Mo.—This invention consists in an improved construction of devices for planting and dropping corn which are specially adapted for attachment to the beam of an ordinary shovel plow or cultivator from which they can be readily detached when desired.

WASHING MACHINE.—Mrs. Sarah Mundy, (administratrix of James H. Mundy, deceased) and Robert P. McConaughy, of Washington, Iowa.—This improved washing machine is claimed to do its work quickly and thoroughly, whether few or many clothes be operated upon, and not to injure the most delicate fabric. It consists in the construction and combination of various parts by which stationary and movable rubbers act upon the clothes so that they will be completely turned over as they pass from the higher to the lower parts of the rubbers, and all their parts will be completely cleaned.

COMBINED LATCH AND LOCK FOR SLIDING DOORS.—Charles W. Chappell, of Watertown, Wisconsin.—This invention relates to an improved lock for folding or sliding doors; and consists in a new arrangement of swinging latch and mechanism for locking the same by a spring bolt, and unlocking it from the outside by means of an eccentric and from the inside by a lever. A swinging latch arranged in combination with a spring bolt, rib, lever and eccentric, arranged to operate in a peculiar manner, are claimed, the combination evidently making a good and neat lock for the purpose set forth.

COMBINED SPLICE AND SAFETY HOOK FOR LADDERS.—John Edmunds, of South Adams, Mass.—This is a device for splicing ladders, and for adapting an ordinary ladder for use as a roof ladder. Two or more ordinary ladders about the construction of which there is nothing new, may be used. A bar of iron, the upper end of which is bent forward to form a hook, is employed to catch upon the ridge of a building when the ladder is to be used as a roof ladder. The lower end of the bar is bent forward to form a hook to catch upon a round of the ladder. The middle part of the bar is slotted longitudinally, to receive the shank of a second hook so that the latter can be moved toward or from the first hook, according as the rounds of the ladder may be further apart or closer together. The second hook, when adjusted, is tightened upon the round of the ladder by a hand nut, screwed upon its shank upon the other side of the bar. Upon the other side of the lower part of the bar is formed, or to it is securely attached, a third hook, to receive a round of the upper ladder. Still a fourth hook takes hold of another round of the upper ladder. The shank of this hook passes through the slot in the bar, and is secured in place, when adjusted, by a hand nut, according as the rounds of the ladder may be further apart or closer together.

MONEY POCKET FOR GARMENTS.—Ernest Schnopp, of East New York, N. Y.—This is a new combination of pocket books with articles of wearing apparel, consisting in the direct application of such books to the garments as pockets, thereby providing the necessary divisions, etc., without requiring the carrying of a separate receptacle. The pocket book is applied as pocket to an article of wearing apparel for either ladies or gentlemen, it being applied under the outer fabric of the garment like any ordinary pocket, and closed by a flap, which is also covered with the fabric constituting the garment. The interior of the pocket book is of suitable construction, also the snap or lock whereby the same is closed.

PLOW.—Samuel A. Fanning, Jacksonville, Ill.—This invention furnishes an improved riding plow, claimed to be simple, convenient, and effective. The features of the invention embraced in the patent are a roller, arranged in a peculiar manner in the rear and to one side of the turn plow, so as to pulverize the furrow slice as soon as turned over, also a bar pivoted to the heel of plow, and notched so as to fasten over a bar on the rear of the plow frame, to give steadiness and firmness to the plow, and to aid it in resisting side draft.

SASH HOLDER.—William W. Amos, Olathe, Kansas.—This invention furnishes an improved device for holding and locking window sashes, simple and not liable to get out of order, and which will hold the sash securely at any desired point, lock it when up or when down, and which may be readily applied to any sash, and will not disfigure the window. A combination of a box, rubber rollers, ratchet wheels, spring pawl bar, and spring or springs, also a combination, with the spring box, of an extension or flange, carrying the spring and fastening bolt, constitute the claims embraced in the patent.

WASHING MACHINE.—Grove M. Hall and Lawrence White, of Orford, Iowa.—This invention has for its object to improve the construction of a washing machine for which letters patent were granted February 21, 1871. By this new arrangement of the parts of the machine, the space for the clothes is brought forward into a much more convenient position, and, at the same time, the machine is adapted to receive a wringer, so that the clothes may be wrung directly from the box. The power is also applied to the beater more directly and more advantageously. The clothes are pressed and slightly rubbed, and, as they are released by the rearward movement of the beater, fall back into the water, turn partly over, and change their places, so as to always present different parts to the faces of the beater and washboard.

FURNACE GRATE BAR.—William Mellor, of Paterson, N. J.—The main or upper portion of this grate bar is an open tube from end to end. A rib is attached to the under side of this tube. There are openings from the top of the bar into the tubular opening, also openings on the under side on each side of the rib into the tubular opening. Recesses in the sides of the bar form full openings through the grate when the bars are placed side by side to form the grate of the furnace. These grate bars are so placed or arranged on their bearers at each end that the air has a free circulation from one one end to the other, and they may be connected with an air chamber at their front ends, so that, when a blower is used, air may be forced into the chamber and grate bars and distributed through the side openings, not only to increase the combustion of the fuel, but to preserve the bar from the effects of intense heat. The ordinary or natural draught of the furnace operates in the same manner, but is modified in degree according to the power of the draught.

EXTENSION TABLE SLIDE.—Samuel R. Garner, of Independence, Iowa.—The object of this invention is to simplify and render more strong and durable the slides or adjustable rails of extension tables. In an extension rail composed of three or more sections, the two outside sections are provided with diagonal or angular grooves, and the middle section has the same description of grooves in both its sides. The grooves are made in pairs, and are uniform as regards their depth, angle, and distance from each other. Lips of clasps enter the grooves and slide therein, and thus form the connection between the sections. The outer sections of the rail are connected with the legs of the table by tenons. Loose strips in the grooves limit the movement of the sliding sections. The clasps at the ends of the sections serve to strengthen those parts and prevent the ends from splitting. The center or middle section is stationary, and while the parts are securely held held together by the clasps, the other sections are drawn out and the table extended, as may be desired.

PLOW.—James M. and Geo. W. Moyers, Gordonsville, Va.—This invention relates to certain improvements in the construction of the moldboard, land side, slide or wheel, point and share of a plow, all tending toward increased simplicity and strength in the machine.

[OFFICIAL.]

Index of Inventions

For which Letters Patent of the United States were granted

FOR THE WEEK ENDING APRIL 16, 1872, AND EACH BEARING THAT DATE.

Animal matters, apparatus for rendering, M. J. Stein 125,853
Animal matters and burning the gases, apparatus for drying, J. Stein 125,854
Axle skein, reversible, A. F. Smith 125,762
Bag tie, J. W. H. Doubler 125,795
Baling cotton, etc., B. W. Collier 125,721
Baling short cut hay or straw, C. Brown 125,786
Barges, construction of, A. Snyder 125,700
Barrel head, C. W. Saladee 125,694
Basket, reticule wicker, J. Venet 125,706
Bayonet, spade, Chillingworth and Merrill 125,720
Bed bottom, D. E. Bishop 125,783
Bedstead fastening, Finley and Martin 125,801
Bee hive, H. K. Wilson 125,776
Bee hive, C. S. Newsom 125,837
Bell, alarm door, Gerhardt and Lander 125,731
Belt tightener, H. C. Allyn 125,780
Berth, ship's, J. Evans 125,729
Bit, center, W. H. Richards 125,759
Boats, etc., steering device for canal, E. and J. McCreary 125,684
Bobbin winder, E. Wilder 125,869
Boiler, horizontal flue steam, B. G. Wood 125,871
Boilers, safety plug for steam, J. R. Robinson 125,692
Boiler tubes, plug for leaky, J. M. Splegle 125,764
Boot, lady's, D. H. Murphy 125,834
Boot and shoe, T. W. Brown 125,717
Boring machine, J. Gardner 125,803
Boring machine, J. L. Metcalfe 125,828
Boring hubs and tenoning spokes, machine for, J. Gardner 125,803
Bottle fastenings, band for securing, E. D. Weatherbee 125,866
Bricks, etc., kiln for burning, A. Morand 125,832
Buggy body, C. P. Kimball 125,817
Burner, regulator for gas, L. and A. Herzberg 125,679
Button hole cutter, gage for, G. Stackpole 125,702
Caps, machine for lining percussion, A. J. French 125,875
Car, brake, J. Darling 125,665
Car coupling, J. B. Shelly 125,698
Car ventilator, W. C. Stickney 125,855
Cars, door latch for railroad, C. Graham 125,808
Carpet beater, J. Hothersall 125,815
Carriage wheel, J. O'Connor 125,846
Carriage wheels, hub for, Dump and Moore 125,727
Carriage, top prop for, D. M. Valentine 125,772
Carriages, top prop for, . A. Bradley, (reissue) 4,869
Cartridge, metallic, L. M. Milbank 125,830
Chair, rocking, C. Streit 125,767
Chair, spittoon, A. Quirolo 125,757
Churn, R. Carmack 125,660
Cigar machine, J. L. Weatherhead 125,709
Clamp, rope, T. J. and G. M. Clark 125,789
Clod fender, R. T. Gillespie 125,732
Cloth shearing machines, guiding apparatus for, L. M. Collins 125,722
Clothes beater, A. Jameson 125,738
Cock, lock, H. Essex 125,799
Cock and faucet, valve, A. Crossley 125,792
Collar and muff combined, M. Wannagat 125,862
Collar and cuff, paper, H. Parmenter 125, 43
Cooler, beer, R. Dreher 125,6 8
Cotton chopper and cultivator, J. M. Harcrow 125,811
Cultivator, R. M. Melton, (reissue) 4,875
Cultivator, J. Wood 125,872
Cultivator, G. E. Hutchinson 125,681
Cultivator, G. E. Hutchinson 125,814
Curbing for streets, D. Herr 125,
Curtain fixture, J. F. Wolfensak 125,712, 125,7 3
Cutter heads, molding, D. Stanley 125,765
Dryer, clothes, G. W. Ainsworth 125,718
Dryer, fruit, Stevens and Gray 125,703
Earth closet, J. A. August 125,781
Electrical safe protector, Rowell and Duncan 125,699
Embalming birds, S. A. Morey 125,685
Engine, compound, A. Hartupee 125,812
Engine, oscillating, J. W. Van Sant 125,773
Engine, rotary, G. B. Massey 125,748
Engine, steam, A. T. Nichols 125,838
Engine operated by heated liquids, J. S. Baldwin, (reissue) 4,868
Engines, valve gear for steam, Tifft and Love 125,769
Envelope, C. Crowell 125,664
Extractive matters, separating, G. W. Sylvester 125,856
Fare box, C. Newman 125,836
Felly plates, die for forming, F. B. Morse 125,751
Fence, W. P. Rollo 125,761
Fence, J. H. Ruckman 125,845
Fence, E. Fales 125,800
Fire arrester, G. W. Cook 125,663
Fire arms, breech loading, A. E. Whitmore 125,77
Fire arm, breech loading, I. M. Milbank 125,829
Fire arms, stand for testing, J. Lehnert 125,743
Flour bolt, I. B. Lewis 125,819
Fuel, manufacture of, D. E. Breinig 125,656
Furnace door way, steam boiler, W. S. Wood 125,777
Game, J. M. Fletcher 125,671
Gas works, dip pipes in hydraulic mains for, J. Hannan 125,733
Gage, J. A. Marden 125,823
Glass articles, preparing surfaces of, W. A. Fischer 125,670
Glass bottles, tool for forming threads in the necks of, G. M. Keeffer 125,739
Gold and other metals from ores, reducing and separating, C. M. Nes 125,835
Glue pot, T. C. Howes 125,680
Hame, C. D. and R. Hazard 125,675
Harness, spring loop for, A. M. Osborn, (reissue) 4,871
Harvester, H. Wells 125,711
Harvester, J. P. Manny 125,746
Harvester, J. P. Humphreys 125,816
Harvester rake, J. Seibel 125,696
Harvester rake, H. Wells 125,710
Harvester rake, J. P. Manny 125,747
Harvester, steam, R. C. Parvin 125,843
Hats, ventilator for, W. Dale 125,725
Heater, gas, G. Smith 125,850
Hinge for tables, M. C. Brinser 125,657
Horn, apparatus for molding and clarifying, E. F. Coffin, (reissue) .. 4,873
Horses, mode of harnessing, J. Murray, Jr 125,752
House, ice, C. Liebmann 125,820
Jack, lifting, J. S. Bodge 125,784
Ladder, step, M. N. Lovell 125,683
Ladder, step, W. J. Emens 125,728
Lamp, W. Staehlen 125,853
Lamp burner, S. W. Fowler 125,672
Lamp bracket and reflector, E. Boesch 125,785
Lamps, glass globe or reservoir for, A. Otto 125,754
Lanterns and lamps, glass for, M. V. B. Shaver 125,849
Latch, locking knob, F. Hegner 125,734
Lock, seal for, F. W. Brooks, (reissue) 4,872
Lock, permutation, J. Farrel 125,669
Lubricating car axle, W. Painter 125,841
Lubricator for steam engines, J. S. Stewart 125,704
Match, parlor, F. Zaiss 125,874
Mattress, life preserving, J. Adams 125,779
Meat cutter, I. Siegrist 125,699
Medical compound, M. Connell 125,723
Medical compound, C. S. Allen 125,714
Meter, fluid, J. H. A. Gericke 125,805
Meter, liquid, H. C. Sergeant 125,848
Meter, liquid, De Navarro and Sergeant 125,794
Meter, water, De Navarro and Sergeant 125,793
Mill, grinding, A. Crease 125,791
Millstones, mode of dressing, T. Rogers 125,760
Mirror, hand, W. M. Welling 125,867
Mirror, etc., ornamental, W. M. Davis 125,726
Mitering machine, H., G., W., and A. D. Malin 125,745
Moldings, machine for making metallic, B. K. Price 125,691
Motion, machine for transmitting, C. P. Grout 125,809
Nail, picture, J. Uster 125,859
Net, fly, Cantner and Zeigler 125,659
Oil can, portable, C. J. Hauck 125,813
Organ, G. Woods 125,778
Ores, reducing and separating gold and other metal from, C. M. Nes. 125,835
Oven, baker's, C. F. Holmes 125,735
Packing, piston, J. H. Teal 125,857
Pail, C. W. Bartlett 125,715
Pail, garbage and slop, C. T. Voss 125,860
Paper fastener, J. C. Jensen 125,682
Paper pulp, process for bleaching, J. Campbell 125,658
Paper pulp, molding hollow articles from, Kendall and Trested 125,740
Pavements and foundation for same, composition, G. H. Moore 125,831
Pavements, forming blocks for, G. L. Eagan 125,798
Pillow and bolster, T. S. Sperry 125,851
Planter, corn, Schnapp and Hollis 125,847
Planter, potato, J. L. True 125,705
Plastering, corner bead for, E. F. Rice 125,844
Plated articles, nickel, Whitman and Neal 125,868
Press, baling, W. R. King 125,741
Printing press, W. Heckert 125,678
Printing, inking apparatus for color, L. Biddle 125,655
Pump, hand, T. J. Mayall 125,824
Pump, steam, L. Griscom, (reissue) 4,874
Pump, vacuum, C. F. Leopold 125,818
Rag washing cylinder, Hammond and Foster 125,810
Railway rail splice, W. C. Gould 125,673
Roofs, fastening sheet metals to, A. Johnson, (reissue) 4,870
Rubber, vulcanizing, Walker and McBurney 125,707
Rubber rolls, manufacture of India, W. Cable 125,787
Saddle, harness, S. E. Tompkins 125,770
Sail hank, D. G. Low 125,744
Salt brine, evaporating, G. E. Sellers 125,697
Sash holder, P. Conver 125,790
Sawmill, Reinhart and Houghton 125,758
Sawmills, head block for, H. C. McEwen 125,750
Sawing staves, machine for, N. J. Templeton 125,768
Separator for ores, grain, etc., L. Duvall 125,797
Sewing machine, Gordon and Kinert 125,807
Sewing machine, E. Waterbury 125,708
Sewing machine, E. A. Weeks 125,774
Sewing machine attachment, support for, P. Grosfeld 125,674
Sewing machines, hemmer for, A. Moorehouse 125,833
Sewing machines, tuck creasing attachment for, S. P. Babcock 125,782
Shaft rollers, tool for adjusting balance, J. Ingram 125,737
Shot pouches, charger for, J. T. Capewell 125,719
Slates, implement for ruling, F. Sochner 125,763
Sleigh runner, B. F. Watson 125,865
Sleigh runners, attaching shoes to, Budd and Daved 125,7 8
Soap, apparatus for mixing, H. N. Humiston 125,736
Solder, manufacture of rod, F. Deming 125,666
Speed in machinery, device for changing, W. Heckert 125,677
Speed and reversing motion, device for changing, W. Heckert 125,676
Spindle bearing, etc., for spinning machines, F. H. Perry 125,687
Spinning machines, drawing and twisting head for, T. Nutting 125,686
Spinning machines, adjusting roller stands in, W. T. Carroll 125,661
Spring, pneumatic, M. F. Maury 125,749
Square, try, J. A. Traut 125,858
Stamp, hand, E. D. Chamberlain 125,788
Stone, mode of cutting, A. S. Gear 125,804
Strap machine, A. F. Stowe 125,766
Straw cutter, T. E. Marable 125,822
Sugar, centrifugal machine for draining, J. Cottle 125,734
Table, revolving extension, F. Menzer 125,827
Telegraph sounder, M. W. Goodyear 125,806
Telegraph pole, A. H. Trego 125,771
Telegraph pole, metallic, F. Boyd 125,716
Thill coupling, C. S. Sanford 125,846
Tongue support, B. Nunamacker 125,839
Trunk guard, F. Peterson 125,756
Tweers, A. Warren 125,863
Vehicles, spring for, R. Dudley 125,796
Vehicles, umbrella holder for, H. W. Pettibone 125,690
Ventilator for windows, G. W. Pell 125,755
Vessels, lighter for, J. E. Worthman 125,873
Wagon body, Sommer and Whitmire 125,701
Warping machines, stop motion for, F. H. Perry 125,689
Washing machines, cylinder for, W. J. Dodge 125,667
Watches, implement for regulating, L. Waldoert 125,861
Water closet, W. J. Warren 125,864
Water wheel, J. A. Fairbanks 125,730
Water wheel, J. C. Cilme 125,662
Water cut off, rain, T. Lee 125,742
Windmill, E. C. and E. D. Little 125,821
Window frame, F. McStocker 125,826
Wrench, R. S. Sanborn 125,695
Wrench, wagon, R. J. North 125,753
Yarns, machine for doubling and twisting, F. H. Perry 125,688

DESIGNS PATENTED.

5,767.—CARPET.—T. Barclay, Lowell, Mass.
5,768.—CARPET.—M. Blatchford, Halifax, England.
5,769.—BREASTPIN.—A. V. Bock, Chicago, Ill.
5,770.—CARPET.—J. H. Bromley, Philadelphia, Pa.
5,771.—CARPET.—R. R. Campbell, Lowell, Mass.
5,772 to 5,774.—CARPETS.—J. M. Christie, Lowell, Mass.
5,775.—CARPET.—P. Chorier, Paris, France.
5,776.—STEAM ENGINE.—C. M. Farrar, Buffalo, N. Y.
5,777.—BADGE.—M. Feely, Providence, R. I.
5,778 to 5,781.—CARPETS.—J. Fisher, Enfield, Conn.
5,782.—CARPET.—O. Heinigke, New York city.
5,783.—SHAWL FABRIC.—J. Hodgson, Philadelphia, Pa.
5,784 to 5,786.—CARPETS.—H. Horan, Newark, N. J.
5,787.—CARPET.—L. Juillen, Passy, France.
5,788.—CARPET.—L. G. Malkin, New York city.
5,789 to 5,791.—CARPETS.—W. Mallinson, Halifax, England.
5,792 and 5,793.—CARPETS.—A. McCallum, Halifax, England.
5,794.—CARPET.—D. McNair, Lowell, Mass.
5,795 and 5,796.—CARPETS.—E. J. Ney, New York city.
5,797.—CARPET.—J. J. Patchett, Halifax, England.
5,798 to 5,802.—CARPETS.—E. Poole, Halifax, England.
5,803.—CARPET.—H. Robinson, Halifax, England.
5,804.—CARPET.—J. H. Smith, Enfield, Conn.
5,805.—INKSTAND.—L. L. Tower, Somerville, Mass.
5,806.—FLOWER POT.—G. P. Palmer, Boston, Mass.

TRADE MARKS REGISTERED.

765.—Suspended.
766.—BOOT TOPS.—C. H. Colburn, Milford, Mass.
767.—CHEWING TOBACCO.—A. Gillender & Co., New York city.
768.—STARCH.—T. Kingsford & Son, Oswego, N. Y.
769.—WHITE LEAD.—R. Lewenthal & Co., New York city.
770.—SOAP.—J. Oakley, New York city.
771.—AXLE OIL.—C. C. Richmond, Boston, Mass.
772.—LUBRICATING OIL.—The Galena Oil Works, Franklin, Pa.
773.—MOWING, REAPING, AND HARVESTING TOOLS.—The Greenwoods Scythe Company, New Hartford, Conn.
774.—CORN KNIFE.—The Greenwoods Scythe Co., New Hartford, Conn.
775.—PERFUMERY, DRUGS, AND MEDICINES.—W. A. Weed & Co., Chicago Ill.

SCHEDULE OF PATENT FEES:

On each Caveat $10
On each Trade-Mark $25
On filing each application for a Patent, (seventeen years) $15
On issuing each original Patent $20
On appeal to Examiners-in-Chief $10
On appeal to Commissioner of Patents $20
On application for Reissue $30
On application for Extension of Patent $50
On granting the Extension $50
On filing a Disclaimer $10
On an application for Design (three and a half years) $10
On an application for Design (seven years) $15
On an application for Design (fourteen years) $30

For Copy of Claim of any Patent issued within 30 years $1
A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from $1
upward, but usually at the price above-named.
The full Specification of any patent issued since NOV. 20, 1866 *at which time the Patent Office commenced printing them* ..... $1·25
Official Copies of Drawings of any patent issued since 1836, *we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.*
Full information as to price of drawings in each case, may be had by addressing

MUNN & CO.,
Patent Solicitors, 37 Park Row, New York.

APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending, for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

30,775.—SEWING MACHINE.—R. Blake. June 19, 1872.
20,923.—MACHINE FOR CLEANING GRAIN.—W. H. Orr. June 26, 1872.
21,004.—MACHINE FOR FILING PAPER.—J. C. Kneeland. July 10, 1872

EXTENSIONS GRANTED.

19,855.—ICE PITCHER.—E. Kaufmann.
19,824.—SIRUP APPARATUS FOR SODA WATER.—E. Bigelow.

Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing

MUNN & CO., 37 Park Row.

FOREIGN PATENTS--A HINT TO PATENTEES.

It is generally much better to apply for foreign patents simultaneously with the application in the United States. If this cannot be conveniently done, as little time as possible should be lost after the patent is issued the laws in some foreign countries allow patents to any who first makes the application, and in this way many inventors are deprived of valid patents for their own inventions. It should also be borne in mind that a patent issued in England to the first *introducer*, without regard to the rights of the *real* inventor; therefore, it is important that all applications should be entrusted to responsible agents in this country, who can assure parties that their valuable inventions will not be misappropriated. The population of Great Britain is 31,000,000; of France, 37,000,000; Belgium, 5,000,000; Austria 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address

MUNN & CO.,
37 Park Row, N. Y.

☞ Circulars, with full information on foreign patents, furnished free.

Practical Hints to Inventors.

MUNN & CO., Publishers of the Scientific American have devoted the past twenty-five years to the procuring of Letters Patent in this and foreign countries. More than 50,000 inventors have availed themselves of their services in procuring patents, and many millions of dollars have accrued to the patentees whose specifications and claims they have prepared. No discrimination against foreigners; subjects of all countries obtain patents on the same terms as citizens.

How Can I Obtain a Patent?

is the closing inquiry in nearly every letter, describing some invention comes to this office. A *positive* answer can only be had by presenting complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them; they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to Munn & Co., 37 Park Row New York, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible, and send by mail. An answer as to the prospect of a patent will be received, usually by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these with the fee of $5, by mail, addressed to Munn & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention, if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of Munn & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

Caveats.

Persons desiring to file a caveat can have the papers prepared in the shortest time, by sending a sketch and description of the invention. The Government fee for a caveat is $10. A pamphlet of advice regarding applications for patents and caveats is furnished gratis, on application by mail. Address Munn & Co., 37 Park Row, New York.

Reissues.

A reissue is granted to the original patentee, his heirs, or the assignees of the entire interest, when, by reason of an insufficient or defective specification, the original patent is invalid, provided the error has arisen from inadvertence, accident, or mistake without any fraudulent or deceptive intention.

A patentee may, at his option, have in his reissue a separate patent for each distinct part of the invention comprehended in his original application by paying the required fee in each case, and complying with the other requirements of the law, as in original applications. Address Munn & Co. 37 Park Row, for full particulars.

Trademarks.

Any person or firm domiciled in the United States, or any firm or corporation residing in any foreign country where similar privileges are extended to citizens of the United States, may register their designs and obtain protection. This is very important to manufacturers in this country, and equally so to foreigners. For full particulars address Munn & Co., 37 Park Row New York.

Design Patents.

Foreign designers and manufacturers, who send goods to this country, may secure patents here upon their new patterns, and thus prevent others from fabricating or selling the same goods in this market.

A patent for a design may be granted to any person, whether citizen or alien, for any new and original design for a manufacture, bust, statue, bas-relievo, or bas relief; any new and original design for the printing of woolen, silk, cotton, or other fabrics; any new and original impression, ornament, pattern, print, or picture, to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture.

Design patents are equally as important to citizens as to foreigners. For full particulars send for pamphlet to Munn & Co., 37 Park Row, New York.

Munn & Co. will be happy to see inventors in person, at their office, or to advise them by letter. In all cases, they may expect an *honest opinion*. For such consultations, opinion, and advice, *no charge is made*. Write plain; do not use pencil, nor pale ink; be brief.

All business committed to our care, and all consultations, are kept *secret and strictly confidential*.

In all matters pertaining to patents, such as conducting interferences procuring extensions, drawing assignments, examinations into the validity of patents, etc., special care and attention is given. For information, and for pamphlets of instruction and advice,

Address

MUNN & CO.,
PUBLISHERS SCIENTIFIC AMERICAN,
37 Park Row, New York.

OFFICE IN WASHINGTON—**Corner F and 7th streets**, opposit Patent Office.

A New and Valuable Book.

THE

SCIENCE RECORD

FOR

1872

Being a Compendium of the Scientific Progress and Discovery of the Past Year. 400 pages, octavo. 100 Engravings, Steel Plate and Wood. Handsomely bound in muslin, $1.50; extra binding, half calf, $2. Postage 24 cts. Munn & Co., Publishers, 37 Park Row, New York, Office of the Scientific American.

This new and elegant work presents, in convenient form, notices of the leading subjects and events, pertaining to science, that have occupied public attention, during the past year. The progress of the more important public works is duly chronicled, with illustrative engravings. The Alabama discoveries, facts, and improvements in Chemistry, Mechanics, Engineering, Natural History, and the various Arts and Sciences, are recorded and illustrated. Sketches of prominent scientific men, with illustrations, are given, and among the portraits are those of Faraday, Murchison, Darwin, Agassiz, Huxley, and Herschel. The Mont Cenis Tunnel, the Hell Gate works, the Brooklyn Suspension Bridge, the Hoosac Tunnel, the St. Louis Bridge, the United States Patent Office, and other works are illustrated. A large amount of useful information, tables, descriptions of improvements, with engravings, are likewise presented. The book is one of much interest and value, and should have a place in every library. Sent by mail to all parts of the world, on receipt of price as above, with the postage. Address

MUNN & CO.,
Office of Scientific American,
No. 37 Park Row, New York.

Advertisements.

RATES OF ADVERTISING.

Back Page - - - - - - $1·00 a line,
Inside Page - - - - - - 75 cents a line
for each insertion.
Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

BLAKE'S PATENT STEAM PUMP.

SEND FOR CIRCULAR.

51 CHARDON ST., Boston, Mass.
79 LIBERTY ST., New York.

FOOT LATHES, Back Geared and Plane Chucks, Slide Rest, &c. Just the article for Sewing Machines and Shoe Factories. T. SHANKS, Baltimore, Md.

Mechanical Drawing Book for Self-Instruction.

By WILLIAM MINIFIE, Architect.

Containing Definitions and Rules of Geometry familiarly explained, with the Practical Problems arranged from the most simple to the more complex, and their descriptive technicalities avoided as much as possible. Illustrated with 56 Steel Plates Plans, Sections, and Elevations of Buildings and Machinery for drawing, with an Introduction to Isometrical Drawing, a Course of Linear Perspective and Shadows, an Essay on the Theory of Color, and its Application to Architectural and Mechanical Drawings—the whole forming the most complete Text Book of Mechanical and Geometrical Drawing, for Mechanics and Schools, now in use.

Eight Thousand, revised by the author, now ready. One volume, large octavo, cloth. Price $4. Sent, postpaid, by mail, upon receipt of price.

D. VAN NOSTRAND, Publisher,
23 Murray St. and 27 Warren St., New York.

E. M. MAYO'S BOLT CUTTER—Patented in 1867—Revised and improved in 1871 and 1872. Send for Illustrated Circular Cincinnati, Ohio.

MACHINERY, NEW and 2d-HAND.—Send for Circular. Chas. Place & Co., 60 Vesey st., New York.

IMPROVED FOURNEYRON TURBINES. These celebrated Turbine Wheels constructed on scientific principles by Wm. J. Valentine, Fort Edward, N. Y. No fancy prices.

PROPELLER PUMPS
Of any capacity and elevation, without Valves. For clean water, sand, sawdust, &c. W. B. Buck, Sec., 67 N. Front St., Philadelphia, Pa.

THE ONLY MODE of Disposing of Patents. See Patent Right Gazette. Address U. S. Patent Right Association, 94 Chambers Street, P. O. Box 4544, New York.

ENGINES AND BOILERS FOR SALE, by Brady & Logan, Tideoute, Pa. Put on cars at prices stated:

1 Locomotive Boiler, 50 horse power		$400
1 do	do	$300
2 Stationary, 2 flues, 20 ft. x42 in., both for		$200
1 do	41 Tubes 3 inch, 12 ft. x44 inch	$200
1 Engine, 10x20, nearly new		$400
1 do	10x16, do	$350
1 Wood and Mann Portable Boiler and Engine		$350
Several small Portables, from		$100 to $300

PLATINA FRENCH PLATE & WIRE of all sizes, imported by SAMUEL S. WHITE, 707 & 709 Broadway, N.Y.

HAND AND POWER MILLS, for grinding all kinds of wet, oily, or dry substances. D. H. THICKSTUN, Plainfield, N. J.

Moseley Iron Bridge and Roof Co.,
Wro't-Iron Bridges, Wro't-Iron Houses,
CORRUGATED IRON,
Corrugated Iron Shutters, Doors, Partitions, &c.
Office, 5 Dey Street, New York.

500 HOUSE LOTS will be given away to the first who apply; no restrictions. Object: to encourage immigration. Situated in towns, villages and cities, in the State of Nebraska. For full particulars, address Messrs. Pattee & Co., Real Estate Dealers, No. 114 Broadway, New York, or Nebraska Land Co., Omaha, Neb. Tickets to the Grand Concert in aid of Mercy Hospital, May 30, at Omaha, are $3 each, or two for $5. For full particulars, address PATTEE & GARDINER, Omaha, Nebraska.

FOR SALE OR TO RENT—Rent low.—A full assortment of first class tools—with brick shop, suitable for any kind of machine or tool work. Plenty of paying orders now on hand.
Iron, Brass, and Steel Castings made on the premises.
Freight to New York, $1.50 per ton.
VAN ZANDT BRO'S,
4 Dey St., New York.

VILLE'S LECTURES on Chemical Fertilizers.—This admirable work, translated by Miss E. L. Howard, of Georgia, recently reviewed in the columns of "The Scientific American," will be sent prepaid to applicants at 50 cts. per copy. Address The Plantation Publishing Co., Atlanta, Ga.

South Haven, Mich., Dec. 8, 1870.
Messrs. T. R. Bailey & Vail, Lockport, N.Y.
Gentlemen: We are now using two of your 7½-ft. Lathes, and we take pleasure in expressing to you our satisfaction in their working. We have used them for turning Rake, Fork, Hoe, Shovel and Broom Handles, with entire satisfaction. We have turned 2500 broom handles in ten hours, and so smooth that they were ready for market as they came from the Lathe. We do not hesitate to say, in our judgment, they are the best Lathe in use. Yours Truly,
R. B. THOMPSON & CO.

MANUFACTURING SITES—Cheap. Water and Rail Facilities. Address JAMES STRATTON, Secretary Board Trade, Bordentown, N. J.

AGENTS WANTED to sell articles needed by every one. Address PLUMB & CO., Phila., Pa.

THE ROLLING MILLS, known as
THE CALVERT IRON & NAIL WORKS,
Situated in the city of Baltimore, upon the line of the Baltimore and Ohio Rail Road, and near the European wharves, will be sold at
PUBLIC AUCTION,
On the premises, on May 16, 1872, at 12, noon.
These mills are nearly new, built in the best manner, and in order for immediate operation, making bars from ¼ in. to 4 in. diameter. Besides the Rolling Mills are two large Brick Buildings, with 80 H. P. Engine and Shafting, and ample accommodations for the manufacture of nails. Since the destruction by flood of the Avalon Works, there has been no nail factory in Maryland, and one is greatly needed. The property will be offered in one lot, land, buildings and machinery; and if not sold in this way, will be sold in detail, by catalogue.
For circulars, containing full information, address
ALEXANDER BROWN & SONS,
or
MARSHALL P. SMITH,
Baltimore, Md.

ENGINES & BOILERS
30 PER CENT UNDER COST, AND GUARANTEED. What do you need? E. E. ROBERTS & CO., Consulting Engineers, 15 Wall Street, New York.

LIGHTNING ROD POINTS AND NUTS, in every style. Samples free.
J. R. GILCHRIST, Mt. Pleasant, Iowa.

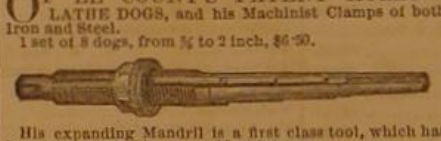
AUSTRALIAN COLONIES.
BENCRAFT & SMITH, Solicitors and Patent Agents, Melbourne, Victoria. Agencies in all the Colonies.
References—New York: John Stephenson & Sons.
Melbourne: United States Consul.
Powers of attorney to Charles Chichester Bencraft.

$10 To $20 Daily Paid Canvassing Agents. Exclusive territory. New monopoly. Sells in every family to entire satisfaction. **Agents wanted.**
MYERS M'F'G CO., 191 John St., New York.

PATENTEES,
WHO WISH TO REALIZE PECUNIARY benefit from their inventions, either by sale of their rights, or partnership with capitalists, are invited to send for our explanatory circular. Many valuable labor saving inventions are lying dormant which might realize a fortune for their owners, if brought properly before the public. E. E. ROBERTS & CO., Consulting Engineers, 15 Wall Street, New York

STEAM PUMPS WRIGHT'S Bucket Plungers are the best. Send for circular. Valley Machine Co., Easthampton, Mass.

GREAT REDUCTION IN PRICES
OF LE COUNT'S PATENT HOLLOW LATHE DOGS, and his Machinist Clamps of both Iron and Steel.
1 set of 8 dogs, from ⅜ to 2 inch, $6·50.



His expanding Mandril is a first class tool, which has long been needed by every Machinist.
Send for latest circular.
C. W. LE COUNT, South Norwalk, Conn.

NEW PATTERNS.
MACHINISTS' TOOLS—all sizes—at low prices. E. & R. J. GOULD, 97 to 113 N. J. R. R. Ave., Newark, N. J.

PORTABLE STEAM ENGINES, COMBINing the maximum of efficiency, durability and economy, with the minimum of weight and price. They are widely and favorably known, more than **900** being in use. All warranted satisfactory or no sale. Descriptive circulars sent on application. Address
J. C. HOADLEY & CO., Lawrence, Mass.
46 Cortlandt st. New York.

Niagara Steam Pump.
CHAS. B. HARDICK,
23 Adams st., Brooklyn, N. Y.

STAVE MACHINERY
And WOODWORTH PLANERS for 12 years a specialty.
T. H. RICKER & SONS, Harrison, Me.

OTIS' SAFETY HOISTING **Machinery.**
OTIS, BROS. & CO.
No. 348 BROADWAY, NEW YORK.

PATENT BAND
SAWING MACHINES

Of the most approved kinds to saw bevel as well as square without inclining the fabic, by First & Prymbl, heretofore at 432 10th avenue—now removed to a more spacious place, 461 to 467 West 40th street, cor. 10th avenue, New York, where we manufacture various sizes of our well known sawing, moulding, double spindle boring and mortising Machines, general and oval turning Lathes, Shafting, Pulleys, &c. &c.
Prices for Band Saw Machines (of which at the present time, April 1st, 136 of our make operate in New York City alone), are $250, $275, $350, and $400. To the largest a feed can be attached to resilt boards. A machine to reslit heavy timber is in construction. Have on hand a large stock of best French Band Saw Blades.

CINCINNATI BRASS WORKS.—Engineers and Steam Fitters' Brass Work, Best Quality at lowest Prices. F. LUNKENHEIMER, Prop'r.

PATENTS.—Send for our Descriptive List of Patents for Sale or Exchange. Parties desiring to dispose of meritorious Inventions should consult us. More Agents wanted. E. H. GIBBS & CO., 11 Wall St., N.Y.

NEW YORK STENCIL WORKS,
87 NASSAU ST., NEW YORK.
Stencils of all kinds; Brass Labels for Manufacturers; Steel Stamps and Dies, and Stencil materials.
Terms reasonable, and good work guaranteed.

ROPER HOT AIR
ENGINE COMPANY, 124 Chambers St., New York.

Canadian Inventors,
Under the new Patent Law can obtain patents on the same terms as citizens.
For full particulars address
MUNN & CO.,
37 Park Row, New York.

ALCOTT'S LATHES for Broom, Fork, Hoe, and Rake Handles, Chair Rounds, &c.
HILLS & HOAG, 32 Court and St., New York.

LATHE CHUCKS—HORTON'S PATENT from 4 to 36 inches. Also for car wheels. Address E. HORTON & SON, Windsor Locks, Conn.

STEEL CASTINGS,
UNDER HAINSWORTH'S PATENT.
We are making **Steel Castings, Smooth, True, Free from Porosity**, capable of receiving **Very High Polish.** Can be **Forged** or **Welded** easily as **Bar Steel**, and **Strong as Forged Steel.** Send for Circular.
PITTSBURGH STEEL CASTING CO. Pittsburgh, Pa.

Trade-Mark Patents.

MUNN & CO. desire to call the attention of manufacturers and business men generally, to the importance of the law of patents, as applied to trade-marks for business purposes.

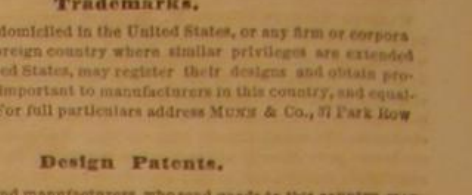
Any person, firm, or corporation, domiciled in the United States, or in any foreign country affording similar privileges to citizens of the United States, can obtain the right to the exclusive use, for THIRTY YEARS, of any new word, or new combination of words, letters, or figures upon their manufactures.

This protection extends to trade-marks already in use or any length of time, or about to be adopted.

Full information on this important subject can be obtained by addressing

MUNN & CO.
37 Park Row, New York.

SCIENTIFIC AMERICAN



For 1872.

A year's numbers contains over 800 pages and makes two volumes, worth as a book references, ten times the subscription price

ENGRAVINGS

by our own artists, will not only be given, of all the be Inventions of the day, but especial attention will al be directed to the description and illustration of

LEADING MANUFACTURING ESTABLISHMENTS, MACHINES, TOOLS AND PROCESSES.

Inventors and Patentees

will find in each number an official List of Patents, gether with descriptions of the more important Inventions. We shall also publish reports of decisions in Patent Cases and points of law affecting the rights and interests of Patentees.

SCIENTIFIC AMERICAN

THE BEST PAPER! TRY IT!

The Scientific American has been published twenty-five years and stands at the head of all industrial papers.

It contains Engravings of New Inventions, patented Machines of all kinds, including the most improved Agricultural Implements and Household Utensils, Bridges, Architecture and Engineering. Every thing new in Chemistry, Science, Invention and Discovery abroad, is republished in the Scientific American. It also contains an official record of all patents granted in the United States, and a description of the most important inventions. An able corps of writers on Engineering, Mechanics, Chemistry are employed on this paper. It has a larger circulation than any paper of its class ever published. It is indispensable to every Inventor, Manufacturer, Mechanic, Engineer, Chemist and Farmer. Specimen copies sent free. Terms, $3.00 a year in advance; $1.50 for six months.
Address
MUNN & CO.,
Patent Solicitors,
37 Park Row, N. Y.

BAIRD'S BOOKS

FOR PRACTICAL MEN.

My new revised and enlarged Catalogue of PRACTICAL AND SCIENTIFIC BOOKS, complete to April 1, 1872, 96 pages, 8vo., will be sent, free of postage, to any one who will favor me with his address.

HENRY CAREY BAIRD,
INDUSTRIAL PUBLISHER,
406 WALNUT STREET, Philadelphia.

Peteler Portable Railroad Company,

OFFICE, 42 BROADWAY, NEW YORK.

TO CONTRACTORS, MINERS, etc.

By this invention one horse does the work of ten, and one man the work of eight.
The great labor-saving invention of the age.
CARS AND TRACKS FOR SALE.
Samples at the office. New Illustrated Circulars free. State Rights for sale.

WORCESTER FREE INSTITUTE.—This institution offers theoretical and practical instruction in those branches of knowledge that underlie the industrial arts. Each student devotes ten hours a week and the month of July to practice in the line of his chosen profession. For catalogues, address
PROF. C. O. THOMPSON, Worcester, Mass.

STEEL CASTINGS

TO PATTERN; tensile strength equal to wrought iron; will rivet over, bend, or case harden. Heavy work at low prices. PHILIP S. JUSTICE,
14 North 5 st., Phila.; 42 Cliff st., New York.

THE WOODWARD
STEAM PUMP.

Woodward Pat. Improved Safety Steam Pump and Fire Engine, Steam, Water, and Gas Fittings of all kinds. Dealers in Wro't-iron Pipe, Boiler Tubes, etc. Hotels, Churches, Factories, and Public Buildings heated by Steam, Low Pressure. Woodward Co., 76 and 78 Center st., N. Y.

AGENTS, LOOK! Genteel Business. Most attractive little article. Everybody wants one. Our agents are surely making $3 to $20 daily. Send Stamp for Circulars to CHURCHILL & TEMPLETON, 74 B'dw'y, NY

Wood and Iron Working Machinery,

Gauge Lathes for all kinds of handles and Cabinet Maker's work. Chair Machinery, etc.; Upright Drills; Key Seat Machines; Stave and Shingle Machinery, etc. etc
Address, for catalogue,
T. R. BAILEY & VAIL, Lockport, N. Y

Machinery,

Wood and Iron Working of every kind. Leather and Rubber Belting, Emery Wheels, Babbitt Metal, &c.
GEO. PLACE & CO., 121 Chambers & 105 Reade Sts. N.Y.

Machinists' Tools.

The largest and most complete assortment in this country, manufactured by
NEW YORK STEAM ENGINE COMPANY,
121 Chambers & 103 Reade Streets, New York.

Cold Rolled Shafting.

Best and most perfect Shafting ever made, constantly on hand in large quantities, furnished in any lengths up to 24 ft. Also, Pat. Coupling and Self-oiling adjustable Hangers. GEORGE PLACE & CO.,
121 Chambers & 103 Reade Streets, New York.

Sturtevant Blowers

Of every size and description, constantly on hand.
GEORGE PLACE & CO.,
121 Chambers & 103 Reade Streets, New York.

WOODBURY'S PATENT
Planing and Matching

and Molding Machines, Gray & Wood's Planers, Self-oiling Saw Arbors, and other wood working machinery.
S. A. WOODS, {91 Liberty street, N. Y.; 67 Sudbury street, Boston
Send for Circulars.

Good 2d Hand Machinery for Sale.

One 28 in. 6 Roll Cincinnati Double Surfacer and Matcher	$1,000
One 24 in. 4 Roll Rogers' Surfacer	250
One 26 in. Endless Bed Planer	250
One 24 in. 4 Roll Ball Surfacer	225
One Good Rogers' Power Mortising Machine with Boring Shaft	200

POWER, PAINTER & CO.,
503 Chestnut St., Philadelphia, Pa.

Whalen Turbine. No risks to purchaser. Send for Pamphlet, free. SETH WHALEN & BRO., Ballston Spa, N. Y.

WROUGHT IRON BEAMS & GIRDERS

THE Union Iron Mills, Pittsburgh, Pa. The attention of Engineers and Architects is called to our improved Wrought-iron Beams and Girders (patented), in which the compound welds between the stem and flanges, which have proved so objectionable in the old mode of manufacturing, are entirely avoided, we are prepared to furnish all sizes at terms as favorable as can be obtained elsewhere. For descriptive lithograph address Carnegie, Kloman & Co. Union Iron Mills, Pittsburgh Pa.

MAGIC For the Parlor. Send a Stamp for a price list. HARTZ CONJURING REPOSITORY, No. 743 Broadway, New York.

You ask WHY we can sell First Class 7 Octave Pianos for $290? We answer—It costs less than $300 to make any $600 Piano sold through Agents, all of whom make 100 per ct. profit. We have no Agents, but ship direct to families at Factory price, and warrant Five Years. Send for illustrated circular, in which we refer to 200 Bankers, Merchants, &c. (some of whom you may know) using our Pianos in 40 States and Territories.
U. S. Piano Co., 865 Broadway, New York.

Reynolds'
TURBINE WATER WHEELS.

The Oldest and Newest. All others, only Imitations of each other in their strife after complications to confuse the public. We do not boast but quietly excel them all in staunch, reliable, economical power. Beautiful pamphlet free. GEO. TALLCOT, 96 Liberty st., New York.
Gearing, Shafting.

THE HYDRAULIC ROTARY GOVERNOR gives to turbine wheels, under any per cent of variation, speed equal to steam power. Warranty unlimited. Address J. S. ROGERS, Tr., 19 John st., Boston, Mass.

5000 AGENTS WANTED.—Samples sent free by mail, with terms to clear from $5 to $10 per day. Two entirely new articles, saleable as flour. Address S. H. WHITE, Newark, New Jersey.

ARTIFICIAL STONE,
CHEAPER FOR ANY PURPOSE than any other. State Rights, $250—ten States, $1,500—California and New York, $1,000 each. Send stamp for Circular.
THOS. HODGSON, 17 Beach Place, Brooklyn, N. Y.

DAVIS' PATENT
RECORDING GAUGE.

Adopted by the Board of U. S. Supervising Steamboat Inspectors. Simple and Cheap. NEW YORK STEAM GAGE COMPANY, 46 Cortlandt Street, New York.

WASHOE TOOL MANUFACTURING CO.,

Cor. of Park and College Places, New York.

☞ Manufacturers of the CELEBRATED "WASHOE" ADZE EYE PICKS, adapted for RAILROAD, COAL, and MINING COMPANIES.

☞ AWARDED THE FIRST PREMIUM, AT THE FAIR OF THE AMERICAN INSTITUTE IN 1868, OVER ALL COMPETITORS. Comparison invited. Competition challenged. Send for circulars.

YOU WANT THE CHOICEST
ORNAMENTAL FOLIAGE PLANTS
Ever Offered in this Country.

☞ See our Illustrated Catalogue of new and rare plants. Send Stamp. Address
OLM BRO'S, Springfield, Mass.

40 LB. FORGE HAMMER—For light and heavy work. Good machine, at low price.
EDWARD HARRISON,
New Haven, Conn.

BUY BARBER'S BIT BRACE.

BUERK'S WATCHMAN'S TIME DETECTOR.—Important for all large Corporations and Manufacturing concerns—capable of controlling with the utmost accuracy the motion of a watchman or patrolman, as the same reaches different stations of his beat. Send for a Circular.
J. E. BUERK,
P. O. Box 1,057 Boston, Mass.
N. B.—This detector is covered by two U. S. Patents. Parties using or selling these instruments without authority from me will be dealt with according to law.

TO INDIA RUBBER MANUFACTURERS
For Sale—One four Roll Calender and three Grinders. They are nearly new, and in complete order.
Address, T. SAULT, Consulting Engineer,
New Haven, Conn.

MARION

United States Watch Co., (Marion, N. J.) Watches.

Watch No. 1635, U. S. Watch Co., Stem-Winder—carried 2 years—variation hardly perceptible.
S. M. MOORE, *firm of S. M. Moore & Co., Chicago.*

Watch No. 2798, U. S. Watch Co.—variation, 6 seconds in six months.
JOHN M. WOOLHAUSE, *Conductor C. & N. W. Railway, Chicago.*

Watch No. 1320, U. S. Watch Co., Stem-Winder—carried two years—proved a perfect timekeeper.
W. H. HAWKINS, *Chicago, Burlington & Quincy R. R.*

Watch No. 21,767, U. S. Watch Co., Stem-Winder—variation scarcely perceptible.
SAM'L MERRILL, *Gov. of Iowa*

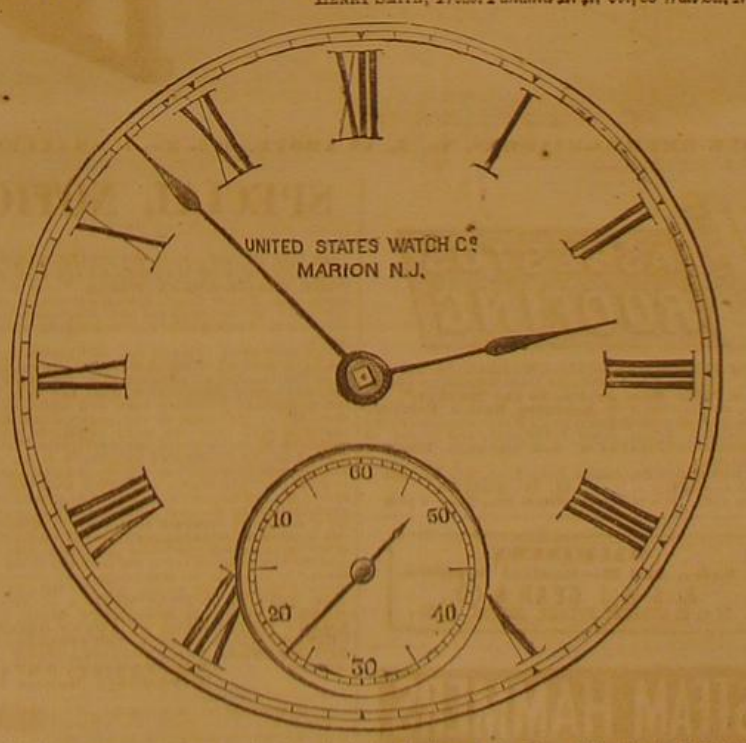
Watch No. 1089, U. S. Watch Co., Stem-Winder—variation, 2 *Seconds* in *14 Months.*
L. E. CHITTENDEN, *late Reg. U. S. Treas.*

Watch No. 21,039, U. S. Watch Co., Stem Winder—variation, 7 seconds in four months.
S. M. BEARD, *firm Beards & Cummings, 123 Front Street, N. Y.*

Watch No. 10,548, U. S. Watch Co., Stem-Winder—variation, 5 seconds per month.
Z. C. PRIEST, *Ass't Sup't N. Y. C. & H. R. R.*

Watch No. 24,008, U. S. Watch Co., Stem Winder—variation, 6 seconds in five months.
CHAS. H. WOLF, *firm Chas. H. Wolf & Co., Pearl St., Cincinnati, Ohio.*

Watch No. 1037, U. S. Watch Co., Stem Winder—variation, only 5 seconds per month.
HENRY SMITH, *Treas. Panama R. R. Co., 88 Wall St., N. Y.*



Price Lists furnished the trade on application, inclosing business card. For sale by the trade generally.
Ask your Jeweler to see the MARION

WATCHES.

BEWARE of worthless imitations with which the country is flooded. To avoid imposition, see that the words MARION, N. J., are engraved on the plate over the Main-Spring Barrel. All others are spurious.

WHOLESALE ROOMS OF THE **United States Watch Co.,**
GILES, BRO. & CO., *83 & 85 State St., Chicago, Ill.*
GILES, WALES & CO., *No. 13 Maiden Lane, New York.*

1832. SCHENCK'S PATENT. 1871.
WOODWORTH PLANERS

And Re-Sawing Machines, Wood and Iron Working Machinery, Engines, Boilers, etc. JOHN B. SCHENCK'S SONS, Matteawan, N. Y. and 118 Liberty st., New York.

UNIVERSAL WOOD WORKER,
HORIZONTAL AND UPRIGHT BORING MACHINES.
McBETH, BENTEL & MARGEDANT, Hamilton, O.

LOADSTONE, Bloodstone, Fluoric Acid, Asbestos, Bismuth, Cadmium, Platina, Antimony & Nickel Metals—Oxide of Manganese, Tungsten or Wolfram Ore, Black Lead, Zaffre, etc., etc., for Sale in any quantity, by L. & J. W. FEUCHTWANGER, 55 Cedar Street, New York.

WOOD-WORKING MACHINERY GENERALLY. Specialties, Woodworth Planers and Richardson's Patent Improved Tenon Machines. Nos. 24 and 26 Central, corner Union st., Worcester, Mass.
WITHERBY RUGG & RICHARDSON.

MACHINISTS.

Illustrated Catalogue and Price List of all kinds of small Tools and Materials sent free to any address. GOODNOW & WIGHTMAN, 23 Cornhill Boston, Mass.

Milling Machines.

STANDARD, UNIVERSAL, INDEX AND PLAIN, in every variety, of unequalled design and first class workmanship. Send for illustrated catalogue to the BRAINARD MILLING MACHINE COMPANY, 80 Milk Street, Boston. Works at Hyde Park.

AGENTS WANTED. Agents make more money at work for us than at anything else. Particulars free. G. STINSON & Co., Fine Art Publishers, Portland, Me.

RICHARDSON, MERIAM & CO.
Manufacturers of the latest improved Patent Daniels' and Woodworth Planing Machines, Matching, Sash and molding, Tenoning, Mortising, Boring, Shaping, Vertical, and Circular Re-sawing Machines, Saw Mills, Saw Arbors, Scrol. Saws, Railway, Cut-off, and Rip-saw Machines, Spoke and Wood Turning Lathes, and various other kinds of Wood-working Machinery. Catalogues and price lists sent on application. Manufactory, Worcester, Mass. Warehouse, 107 Liberty st. New York. 17 1

SHINGLE AND BARREL MACHINERY.—Improved Law's Patent Shingle and Heading Machine, simplest and best in use. Also, Shingle Heading and Stave Jointers, Stave Equalizers, Heading Planers Turners, etc. Address TREVOR & Co., Lockport, N. Y.

PUMPS.—For Description, Price Lists etc., of the Best Centrifugal Pump ever invented, with Overwhelming Testimony in its favor, send for new illustrated pamphlet (48 pp.) to Messrs. HEALD, SISCO & CO. Baldwinsville, N. Y.

MODELS FOR THE PATENT OFFICE, and experimental machinery of all kinds. HOLSKE MACHINE CO., 279 Cherry St., New York, near Jefferson St. A special shop for Patent Models. Many years experience. Refer to Scientific American Office.

PATENT IMPROVED
VARIETY MOLDING MACHINERY
And Adjustable
CIRCULAR SAW BENCHES.

For Machines and information, address
J. P. GROSVENOR, Lowell, Mass.

WOOD WORKING MACHINERY

MOLDING, MORTISING, TENONING & SHAPING MACHINES;
BAND SAWS, SCROLL SAWS
Planing & Matching MACHINES, &c.,
For RAILROAD, CAR, and AGRICULTURAL SHOPS, &c., &c.
☞ Superior to any in use.
J. A. FAY & CO.,
CINCINNATI, OHIO.

Andrew's Patents.

Noiseless, Friction Grooved, or Geared Hoisters, suited to every want.
Safety Store Elevators. Prevent Accident, if Rope, Belt, and Engine break.
Smoke-Burning Safety Boilers.
Oscillating Engines, Double and Single, 1-2 to 100-Horse power.
Centrifugal Pumps, 100 to 100,000 Gallons per Minute, Best Pumps in the World, pass Mud, Sand, Gravel, Coal, Grain, etc., without injury.
All Light, Simple, Durable, and Economical.
Send for Circulars.
WM. D. ANDREWS & BRO.,
414 Water street, New York.

RIVERVIEW Military Academy, Poughkeepsie, N. Y. A thorough-going school for boys.

SOLUBLE GLASS

SILICATES OF SODA AND POTASH. FIRE, WATER and MILDEW PROOF. Manufactured by
L. & J. W. FEUCHTWANGER, 55 Cedar St., N. Y.

P. BLAISDELL & Co.,

MANUFACTURERS OF FIRST CLASS MACHINISTS' TOOLS. Send for Circulars. Jackson st., Worcester, Mass.

EDWARD H. ROSKIN,
CONSULTING AND ANALYTICAL CHEMIST,
Lowell, Mass.

LIGHT GREY IRON CASTINGS—all kinds made to order promptly. Light Cast Goods a specialty. LIVINGSTON & CO., Pittsburgh, Pa.

ELECTRIC APPARATUS for BLASTING and Submarine Work, manufactured solely by GEORGE E. LINCOLN & CO., Room 9, 32 Summer St. Boston, Mass.
Consisting of:
Electric Batteries of various sizes,
Electric Fuses of any required length
Electric Fuse Heads, detached,
Connecting Wire, Leading Wire, &c., &c.
Send for Circular.

SCHENCK'S
WATERPROOF SHIPPING TAG.
CHEAPEST and BEST.
99 Ann Street, New York.
P. O. Box 2584.
Send for prices and samples. Superior for cotton.

WE warrant every Steam Gauge bearing our name and numbered above 12,000 FOR TWO YEARS.
☞ See Circulars.
UTICA STEAM GAUGE CO., Utica, N. Y.

Advertisements.

Advertisements will be admitted on this page at the rate of **$1·00** *per line for each insertion. Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.*

The value of the SCIENTIFIC AMERICAN *as an advertising medium cannot be over-estimated. Its circulation is ten times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading-rooms of the world. We invite the attention of those who wish to make their business known to the annexed rates. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. If it is worth 25 cents per line to advertise in a paper of three thousand circulation, it is worth $2.50 per line to advertise in one of thirty thousand.*

VULCANIZED RUBBER

Adapted to Mechanical Purposes. New York Belting and Packing Co., 37 & 38 Park Row.

ASPHALTE ROOFING FELT.

A WELL tested article of good thickness and durability, suitable for steep or flat roofs; can be applied by an ordinary mechanic or handy laborer. Send for circular and samples to E. H. MARTIN, 70 Maiden Lane and 9 Liberty Street, N.Y.,

MORRIS, TASKER & CO.,
MANUFACTURERS OF
American Charcoal Iron Boiler Tubes.
Wrought-Iron Tubes and Fittings,
FOR GAS, STEAM, WATER AND OIL.
☞ Steam and Gas Fitters' Supplies, Machinery for Coal Gas Works, &c. &c.
NO. 15 GOLD ST., NEW YORK.

MICROSCOPES,
For Scientific Investigations and the Entertainment of the Family Circle. Illustrated Price List sent free on application. McALLISTER, Optician, 49 Nassau St., N.Y.

The Union Stone Co.,
Patentees and Manufacturers of
EMERY WHEELS & EMERY BLOCKS,
In Size and Form to Suit various Mechanical Uses:
GRINDERS, SAW GUMMERS, DIAMOND TOOLS, and WOOD'S PATENT KNIFE-GRINDER,
For Planing, Paper Cutting, Leather Splitting, and other Long Knives.
OFFICE, 29 KILBY STREET, Boston, Mass.
BRANCH OFFICES { 96 Liberty Street, New York. 502 Commerce Street, Philadelphia.
☞ Send for circular.

Steam Super-Heaters.
For latest improvements,
Address HENRY W. BULKLEY, ENGINEER,
98 Liberty Street, New York.

BUSINESS WANTED.
PARTIES WITH CAPITAL and Manufacturing facilities would like to arrange with some party who has first class Sewing Machine with late improvements (or any other invention of real utility) for the manufacturing and introducing the same. Address BUSINESS, Newburyport, Mass.

Diamonds ⁄// Carbon
Shaped or crude, furnished and set for boring rocks, dressing mill burs, emery wheels, grindstones, hardened steel and paper calender rollers, and for sawing, turning or working stone. Also, GLAZIERS' DIAMONDS.
JOHN DICKINSON, 64 Nassau Street, New York.

Diamond Pointed STEAM DRILLS.

THE adoption of new and improved applications to the celebrated Leschot's patent, have made these drills more fully adaptable to every variety of ROCK DRILLING. Their unequalled efficiency and economy are acknowledged, both in this country and Europe. The Drills are built of various sizes and patterns; WITH AND WITHOUT BOILERS, and bore at a uniform rate, of THREE TO FIVE INCHES PER MINUTE in hard rock. They are adapted to CHANNELLING GADDING, SHAFTING, TUNNELLING, and open cut work; also, to DEEP BORING FOR TESTING THE VALUE OF MINES AND QUARRIES. TEST CORES taken out, showing the character of mines at any depth. Used either with steam or compressed air. Simple and durable in construction. Never need sharpening. Manufactured by
THE AMERICAN DIAMOND DRILL CO.,
No. 61 Liberty St., New York

IMPORTANT IMPROVEMENT on the Diamond Pointed Steam Drill:—Stevenson's Spring Core Retainer, patented Dec. 12, 1871, which prevents all choking of the drill and secures a perfect core, can be applied to the Diamond Pointed Steam Drill at small expense. Rights to use may be had on application to HARDING, HAYDEN & CO., 225 Washington Street, New York.

REYNOLDS & CO.
MANUFACTURE
Screws & Bolts
For Machinery of every variety.
ALSO
Bridge and Roof Bolts,
STEEL & IRON SET SCREWS
A specialty. Also, Small Articles for Patentees, in great numbers, at
No. 145 East st., New Haven Conn

Leffel Improved Turbine
WATER WHEEL.
6000 IN USE.
NEW PAMPHLET SENT FREE.
JAS. LEFFEL & CO.
SPRINGFIELD, O. NEW HAVEN, CONN

PYROMETERS, for Ovens, Boilers, steam pipes, Oil stills, Superheated Steam, &c.
Address HENRY W. BULKLEY,
98 Liberty Street, New York.

PAT. SOLID EMERY WHEELS AND OIL STONES, for Brass and Iron Work, Saw Mills, and Edge Tools. Northampton Emery Wheel Co. Leeds, Mass.

Swain Turbine.

"Our Low-Water Wheel from this on"

WILL DO TEN PER CENT MORE WORK on small streams, in a dry season, than any wheel ever invented. Gave the best results, in every respect, the Lowell Tests.
For Report of tests at Lowell, with Diagrams and oles of Power address
THE SWAIN TURBINE CO.,
North Chelmsford, Mass.

Working Models
And Experimental Machinery, Metal, or Wood, made to order by J. F. WERNER, 62 Center st. N.Y.

RISDON'S IMPROVED
Turbine Water Wheel.

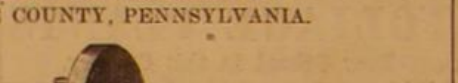
There are now several hundreds of these in successful operation. Their simple and tight gate, and their economical use of water at all stages of the gate, makes them every where liked. One of these was tested by James Emerson, of Lowell, and gave
EIGHTY-FOUR AND SIX ONE-HUNDREDTHS PER CENT.
Send for a circular.
T. H. RISDON & CO.,
Mount Holly, New Jersey.
Manufacturers of all kinds of Mill Machinery, and Circular Saw Mills

RANSOM SYPHON CONDENSER perfects and maintains vacuum on Steam Engines at cost of one per cent its value, and by its use Vacuum Pans are run with full vacuum without Air Pump. Send to G. S. WILSON, 51 Chardon St., Boston, for a personal call, or the Company, at Buffalo, N. Y., for a circular.

PATENT COLD ROLLED SHAFTING.

The fact that this Shafting has 75 per cent greater strength, a finer finish, and is truer to gage, than any other in use, renders it undoubtedly the most economical. We are also the sole manufacturers of the CELEBRATED COLLINS PAT. COUPLING, and furnish Pulleys, Hangers, etc., of the most approved styles. Price lists mailed on application to
JONES & LAUGHLINS,
120 Water street, Pittsburgh, Pa.
☞ Stocks of this Shafting in store and for sale by FULLER, DANA & FITZ, Boston, Mass.
GEO. PLACE & CO., 126 Chambers street, N. Y.

Damper Reg. Pat. Gage Cocks. Water Feed Reg's.



Send for circulars. MURRILL & KEIZER, Balt., Md.

IRON PLANERS, ENGINE LATHES, Drills, and other Machinists' Tools, of superior quality, on hand, and finishing. For sale low. For Description and Price address NEW HAVEN MANUFACTURING CO., New Haven, Conn.

STANDARD AMERICAN BILLIARD TABLES
NEW DESIGN

H. W. COLLENDER PHELAN & COLLENDER.
738 Broadway, New York.
ILLUSTRATED PRICE-LIST SENT BY MAIL.

THE TANITE COMPANY.
STROUDSBURG, MONROE COUNTY, PENNSYLVANIA.

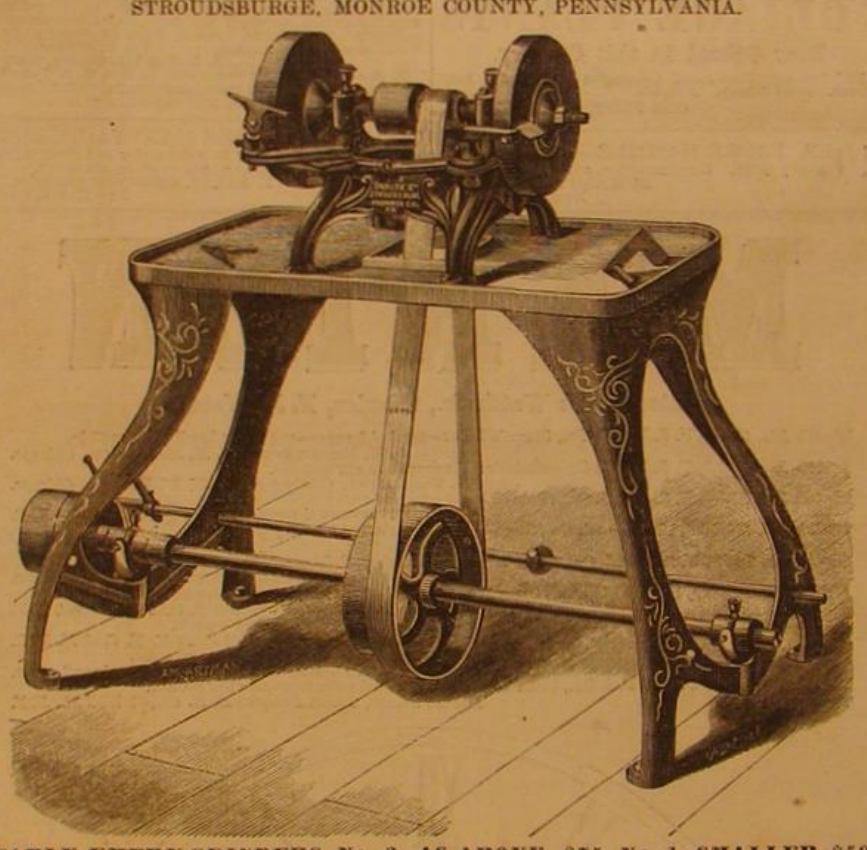


TABLE EMERY GRINDERS, No. 2, AS ABOVE. $75. No. 1, SMALLER, $50.

ASBESTOS ROOFING

FIRST PREMIUM (MEDAL) AWARDED IN 1870 AND IN 1871. Endorsed by Certificate from AMERICAN INSTITUTE as "The Best Article in the Market."
Also, manufacturer of Asbestos Boiler Felting, Roofing and Sheathing Felts, Acid, Water and Fire Proof Compositions, Boiler Scale Preventive, and dealer in ASBESTOS, ASPHALTUM and GENERAL ROOFING MATERIALS.
☞ Descriptive Pamphlets, Price Lists, &c., by mail.
{ Established in 1858. } H. W. JOHNS,
78 William St., New York

MACHINERY,
Safes, and Mechanical Supplies,
A. S. & J. GEAR & CO.,
56 to 62 SUDBURY STREET, BOSTON, MASS.

STEAM HAMMERS
FERRIS & MILES
24TH & WOOD STS PHILA

VENEERS
AND
HARDWOOD LUMBER.
BUTTERNUT, FRENCH AND AMERICAN WALNUT, ASH AND CHERRY BURLS; HUNGARIAN ASH, BIRDSEYE & BLISTER MAPLE, etc. etc.
☞ Mahogany, Rosewood, Cedar, etc., in boards, plank, and logs. Large and choice stock at low prices.
GEORGE W. READ & CO.,
139 & 142 Center St., New York.
Mill and Yard, 186 to 200 Lewis, bet. 5th & 6th Sts. E.R.

SPECIAL NOTICE.

ON THE 15th OF APRIL WE SHALL MAKE A GENERAL ADVANCE OF 15 PER CENT ON THE PRICE OF "THE TANITE EMERY WHEEL." *On and after the above date Tanite Emery Wheels will be sold at the* NETT LIST *price, instead of* 15 *per cent Discount from same, as heretofore. There will be a corresponding advance in the trade.*

The increasing demand for, and reputation of, THE TANITE EMERY WHEEL warrants its manufacturers in at last making an advance from the price list which they have held rigidly fixed from the very infancy of the Company. Constant care and unremitting attention, the employment of the greatest mechanical and chemical skill, and the most assiduous study of the want of Mechanics and Manufacturers, have enabled THE TANITE COMPANY to bring their *specialty* to the *highest point of perfection.* Constant outlays are required to meet the novel wants connected with this branch of industry; and this, with the necessity of maintaining and even increasing the high reputation of these goods, calls for a moderate increase in price. COMMON GOODS *can be made for ordinary prices, but* STANDARD GOODS, *of uniform quality; on whose perfection, both chemically and mechanically, not only the economy of the buyer, but the bodily safety of his hands depends; can only be furnished at full or high prices.* IT IS CHEAPER, SAFER, AND BETTER TO DEAL WITH A COMPANY WHO MAKE A DISTINCT SPECIALTY BOTH OF SOLID EMERY WHEELS AND OF EMERY GRINDING MACHINERY, THAN TO RISK THE POOR ECONOMY OF BUYING CHEAP AND UNSATISFACTORY GOODS.
Address THE TANITE COMPANY,
Stroudsburg, Monroe Co., Pa.

STROUDSBURG, MONROE CO., PA., March 18, 1872.
The Prices of the Tanite Co.'s Emery Grinding Machinery are this day advanced, as follows:

The Tanite Co.'s Saw Gummer			$15
" " "	No. 1 Emery Grinder		30
" " "	" "	on Table	30
" " "	No. 2 "		50
" " "	" "	on Table	75
" " "	No. 3 "		110
" " "	Diamond Tools		15

The general and great advance in the price of Metals and Supplies, together with recent improvements in and additions to these Machines, necessitates the above advance. Notwithstanding this advance, the above Machines are the cheapest in the market. Take notice, that ☞ we make no charges for boxing and shipping, and no charges for Extra Rests. ☞ Each Emery Grinder is supplied (in addition to the two ordinary Rests) with one of our improved adjustable Face Rests, and one of our improved adjustable Side Rests. These Rests can be set at any angle.
Address, THE TANITE CO.,
Stroudsburg, Monroe Co., Pa.

THE TANITE CO.'S GOODS are kept in Stock, and sold at *Factory Prices*, by CHAMPLIN & ROGERS, 214½ *East Madison St., Chicago*, who are also Exclusive Western Agents for the New York Tap and Die Co.'s goods, and Dealers in Railway, Mill, and Machinists' Supplies.

☞ T. V. Carpenter, Advertising Agent. Address hereafter, Box 775, New York city.

A. S. CAMERON & CO.,
ENGINEERS,

Works, foot of East 23d street, New York city.
Steam Pumps,
Adapted to every possible duty.
Send for a Price List.

L. W. Pond---New Tools.
EXTRA HEAVY AND IMPROVED PATTERNS.
LATHES, PLANERS, DRILLS, of all sizes; Vertical Boring Mills, ten feet swing, and under. Milling Machines, Gear and Bolt Cutters; Hand Punches and Shears for Iron.
Office and Warerooms, 98 Liberty st., New York; Works at Worcester, Mass.
A. C. STEBBINS, New York, Agent.

American Saw Co., Manufacturers of

And Perforated Circular and Long Saws. Also Solid Saws of all kinds. No. 1 Ferry st., corner Gold street New York. Branch Office for Pacific Coast, No. 606 Front street, San Francisco, Cal.

BUILDING PAPER
FOR
SHEATHING,
PLASTERING,
ROOFING,
DEAFENING,
AND
CARPET LINING.
Samples & circulars sent free, by
ROCK RIVER PAPER CO.,
Chicago; or,
B. E. HALE & CO.,
22 & 24 Frankfort St., N.Y.
Sole Agents for Eastern States.

COLT'S ARMORY TESTING MACHINE—Strength of Materials.—The Colt's Arms Company, of Hartford, Conn., is prepared to measure the strength of all materials by its testing machine, which is capable of determining strains from 1 oz. to 100,000 lbs., in specimens from 7 inches to 8 feet in length, and with cross-sections up to 1 square inch in area. The price of testing half a dozen specimens of the same material, $25. See Scientific American, March 1c, 1872. For further information, apply direct to the Company.

TODD & RAFFERTY, Manufacturers of Steam Engines, Boilers, Flax, Hemp, Tow Bagging, Rope and Oakum Machinery, Steam Pumps and Governors always on hand. Also Agents for the New Haven Manufacturing Co.'s Machinists' Tools. ☞ We invite especial attention to our new, improved, Portable Steam Engines. Warerooms, 19 Barclay st. Works Paterson, N.J.

Agents Wanted—$75 to $250 per month everywhere male and female, to introduce the GENUINE IMPROVED COMMON SENSE FAMILY SEWING MACHINE. This Machine will stitch, hem, fell, tuck, quilt, cord, bind, braid and embroider in a most superior manner. Price only $15. Fully licensed and warranted for five years. We will pay $1000 for any machine that will sew a stronger, more beautiful, or more elastic seam than ours. It makes the "Elastic Lock Stitch." Every second stitch can be cut, and still the cloth cannot be pulled apart without tearing it. We pay Agents from $75 to $250 per month and expenses, or a commission from which twice that amount can be made. Address SECOMB & CO., *Boston, Mass.; Pittsburgh, Pa.; Chicago, Ill.; or St. Louis, Mo.*

IRON STEAMSHIP BUILDERS.
NEAFIE & LEVY,
PENN WORKS,
MARINE ENGINES, BOILERS, AND BUILDERS OF COMPOUND ENGINES,
PHILADELPHIA, PA.

SCHLENKER'S PATENT
BOLT CUTTER
NEW INVENTION. ADDRESS,
HOWARD IRON WORKS, BUFFALO, N.Y.

PORTLAND CEMENT,
OF the well known manufacture of John Bazley White & Brothers, London, for sale by
JAMES BRAND, 55 Cliff St., N.Y.

Brass & Copper
SEAMLESS TUBING
FOR LOCOMOTIVE, MARINE, AND STATIONARY BOILERS.
Merchant & Co.,
507 Market Street, Philadelphia

KEUFFEL & ESSER,
NO. 116 FULTON STREET, NEW YORK,
Importers and Manufacturers of only first class
DRAWING MATERIALS, viz:
Mathematical Instruments, Drawing Papers, Profile Paper, Tracing Cloth, Chesterman's Tapes, Chains, Leveling Rods, Hard Rubber Triangles and Curves, Water-colors, Brushes, etc. A new illustrated Catalogue and Samples of Drawing Paper will be sent on receipt of 25 cts.

WIRE ROPE.
JOHN A. ROEBLING'S SONS,
MANUFACTURERS, TRENTON, N. J.
FOR Inclined Planes, Standing Ship Rigging Bridges, Ferries, Stays, or Guys on Derricks & Cranes, Tiller Ropes, Sash Cords of Copper and Iron, Lightning Conductors of Copper. Special attention given to hoisting rope of all kinds for Mines and Elevators. Apply for circular, giving price and other information. Send for pamphlet on Transmission of Power by Wire Ropes. A large stock constantly on hand at New York Warehouse No. 117 Liberty street.

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard sts. Philadelphia and 59 Gold st. New York.

SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE. MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXVI.—No. 19. [NEW SERIES.] NEW YORK. MAY 4, 1872. $3 per Annum [IN ADVANCE.]

Improved Punching and Drop Press.

The above named firm have long been known to the mechanical public through their excellent drop presses and punching presses, which have been widely used in the manufacture of silver and plated ware, spoons, watches, silver and brass ornaments, lamps, tin ware, copper bottoms, metallic kegs, and the endless variety of goods made of sheet metal, and in forging for general machine purposes, carriage parts and clips, lock work, gun parts, plane irons, table cutlery, agricultural implements, carriage spring heads, steel traps, tinmen's tools and machines, bolt headings, etc.

Recent improvements upon these tools have features which warrant us in directing the attention of manufacturers to them, as probably yet unexcelled specimens of machines of their class.

Fig. 1.

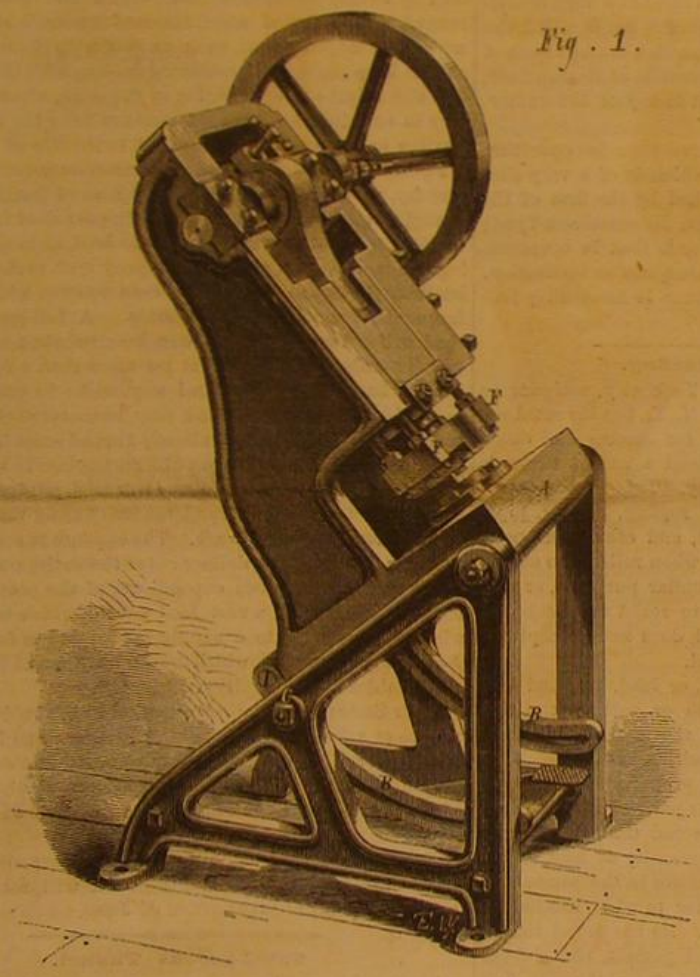
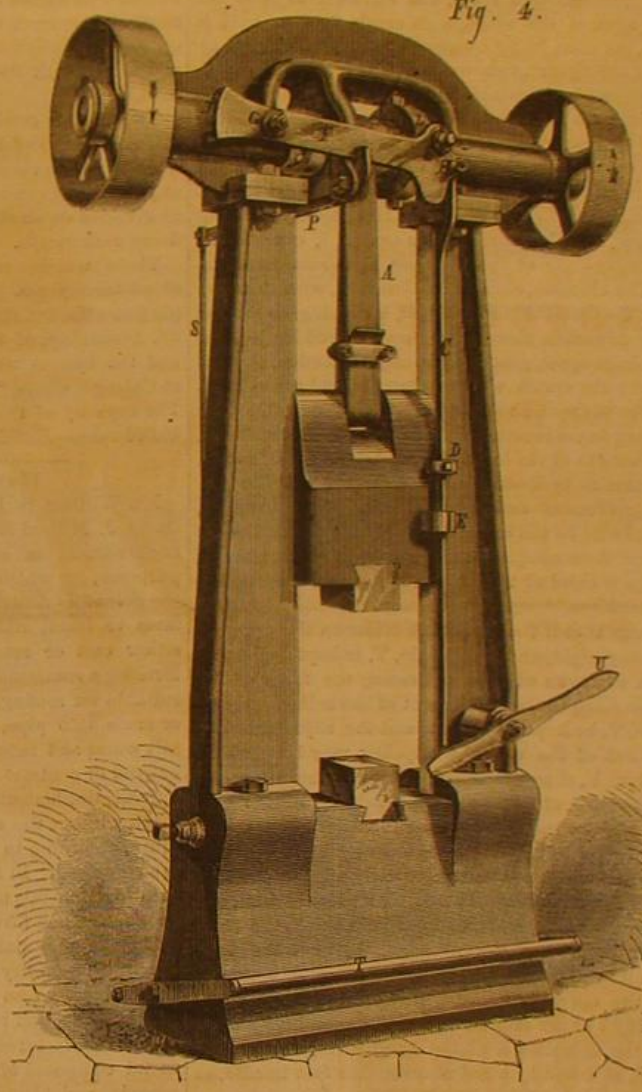


Fig. 4.



THE STILES AND PARKER PRESS COMPANY'S PUNCHING PRESS AND DROP PRESS.

The punching press, Fig. 1, has two novel features, the other parts being the same as is usual with this kind of press.

The first novelty is the pivoted bed, A, and the slotted arcs, B, by which the bed may be set either inclined, as shown, or horizontal for work in which the latter position is most convenient. Presses have hitherto been made with inclined beds or horizontal beds. The present improvement embodies the peculiar advantages of both styles. The arcs, B, are firmly held by the bolts, C, so that the bed may set inclined for work in which the punched pieces are desired to slide out by their own gravity, or adjusted to the horizontal position.

The second novelty is shown in detail in Figs. 2 and 3, which respectively represent a plan and a side elevation of the stripper. The principle of the gimball, or universal joint, is applied to this, it being made in two parts, D and E. The part, D, is pivoted to the blocks, F, Figs. 1 and 2, and the part, E, is pivoted to D, at right angles with the first mentioned pivots, so that a universal motion is secured, which, no matter what may be the unevennesses of the punched piece, insures its being stripped straight off the punch without breaking, straining, or bending the latter so as to force it out of adjustment with the die. For many kinds of work this will prove a valuable addition, as in delicate punching a slight bending of the punch causes it to conflict with the die, destroying its edge or breaking it altogether.

The drop press is shown in perspective in Fig. 4. Details are represented in Figs. 5, 6, and 7, and a perspective view of the new features, applied to hangers so as to be readily adapted to any drop press now in use, is shown in Fig. 8. By the use of this latter, the advantage of the improvement will be secured at small expense to those having other drop presses.

The anvil, drop, bed, and guides are not essentially different from the presses already familiar to the mechanical public. The peculiarity consists in an arrangement of devices whereby the drop may be arrested in its ascent at any point while the machine is at work, and held there at the will of the operator, or dropped as may be desired, thus enabling the attendant to regulate the force of the blow to any extent. By this means, also, in adjusting dies for any kind of work, the drop may be lowered as gradually as desired, thus obviating the necessity of a tackle for that purpose, now generally required on other drop presses. A collateral advantage of economy of power is also secured, which, with other advantages, will appear as we proceed to examine the construction of the machine.

The drop is elevated by a strap, A, Figs. 4, 5, and 8, which strap is wound up on a spool, O, Figs. 6 and 7, which plays loosely on the main shaft, except when engaged with one or the other of the clutches, B, Fig. 5. These clutches are made to engage the spool alternately by an extremely ingenious combination of devices which is, so to speak, the soul of the invention, and the parts of which, shown in Figs. 4, 5, 6, 7, and 8, are the tripping rod, C, with the adjustable collar, D, the sliding collar, E, attached to the drop, the latch

Fig. 2

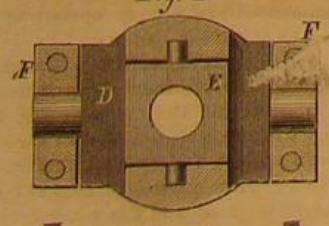


Fig. 3

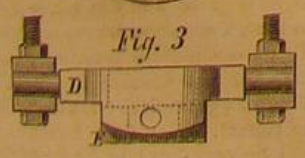


Fig. 5

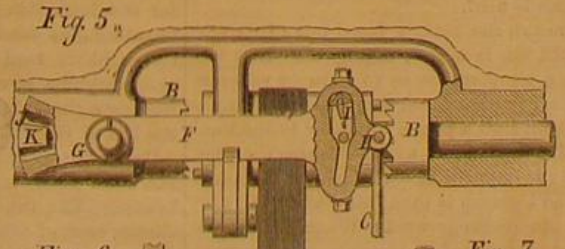


Fig. 6

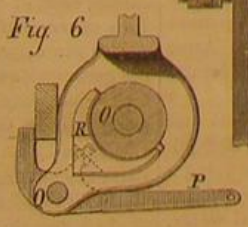


Fig. 7

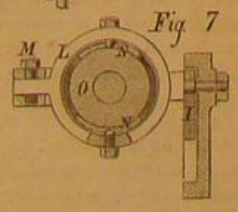
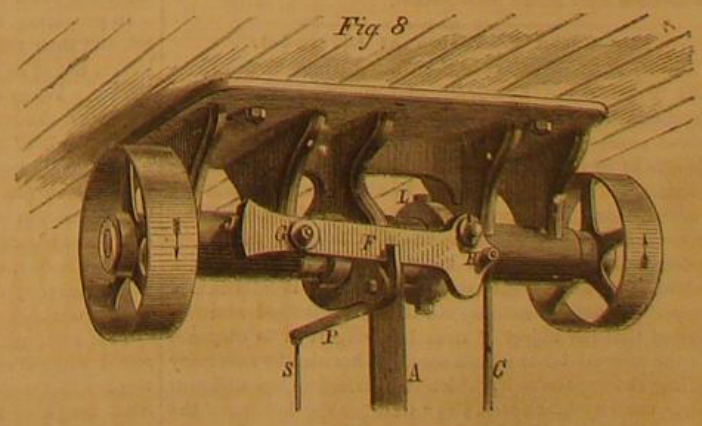


Fig. 8



bar, F, pivoted to the frame at G, and to the tripping rod at H, the switch, I, Figs. 5 and 7, which is attached to the latch bar, F, and is moved with the latter in a manner described below, the crotch, J, in the latch bar, Figs. 4 and 5, acting in conjunction with the lug, K, on the frame, the collar, L, Fig. 7, pivoted at M, and actuating the pivoted shoes, N, which play in a groove of the spool, O, and which is actuated by the switch, I, so as to alternately move the spool into engagement with the clutches, B, Fig. 5, the brake lever, P, pivoted at Q, Fig. 6, and actuating the brake shoe, R, shown in Fig. 6—this shoe acting against the spool, O, when it is desired to arrest the drop and to hold it or to lower it slowly—the connecting rod, S, which connects the brake lever with the treadle, T, and the hand lever, U.

The action of these various parts is as follows: The hight to which the hammer will be raised is regulated by the adjustable collar, D, on the tripping rod, C, which may be set anywhere on the rod, to limit the distance through which the hammer will fall and the consequent force of the blow. For as the hammer rises, the sliding collar, E, engages the adjustable collar, D, lifting the tripping rod and the end of the latch bar, F, pivoted to the tripping rod, which, through the action of the switch, I, releases the spool, O, from its engagement with the spool clutches, B. At the same time, the latch bar, F, which, in the position shown in Fig. 1, engages the turned up end of the brake lever, P, preventing the latter from acting, releases this lever, and allows it to press the brake shoe against the spool with ample force to hold it from falling, the shoe being connected to the brake lever by a toggle joint arrangement shown in dotted outline in Fig. 6. This arrangement is adjustable to take up wear and always to keep the brake in order to act properly.

If now the operator presses with his foot on the treadle, T, he will raise the connecting rod, S, which actuates the brake lever, P, takes off the brake, and allows the hammer to fall. When the hammer falls, the latch bar falls, again engaging the brake lever, and also, through the switch, I, causing the spool, O, to engage one of the clutches, B, to raise the hammer again. The clutches, engaging alternately, wind the strap up always in the direction the spool, O, is turning, so that, as the hammer rebounds, there is no shock or sudden jerk on the strap, and the spool, gradually losing its motion, is slowly overtaken by the clutch which follows it, and the engagement is made without shock or jar. The crotch, J, of the latch bar acting in conjunction with the lug, K, on the frame, sustains the weight of the latch bar and tripping rod, so that these parts exert no brake-like action upon the spool to prevent its free movement and check the fall of the hammer, as would otherwise be the case. Everything runs as lightly as possible, and the consequence is a saving of power claimed to be at least one third of that required to drive the friction roller drop machines.

It will be seen that if the adjustable collar on the tripping rod be set at any hight, and the treadle, T, is kept depressed, a rapid series of blows will be delivered, the force of the blows corresponding to the adjustment of the collar. Again, if the treadle, T, be kept depressed, and the adjustable collar be set up out of the way, the tripping may be done by the hand lever, U, thus placing the force of the blows entirely under control of the operator, enabling him to give light or heavy blows and to vary their force according to the nature of the work in hand. These are very important features, which render the machine peculiarly adapted to many kinds of work. For instance, in forging a piece of iron, say one foot long, six inches wide, and one inch thick, the hammer will make its blow on the end, edge, or side of the piece, and go up to its original hight without any care or action on the part of the operator. Again, in welding, the hammer will deliver light blows at first, and follow with heavy ones, as required, through the use of the hand lever, which may be, if desired, attached by a rod to a suitable foot treadle, so as to leave both hands of the attendant free. We might enumerate many other kinds of work in which these features will be found advantageous, but what we have said will suffice.

The hammer can be run very rapidly: one hundred blows, from one foot hight per minute, can be obtained with ease.

Patents are pending through the office of the Scientific American Patent Agency, upon these improvements, which are the inventions of Mr. N. C. Stiles, of the Stiles and Parker Press Company, of Middletown, Conn., which company may be addressed for further information.

The Grain Elevators at Liverpool.

The only grain elevators in the United Kingdom are those of the Mersey Dock Board, situated on the Liverpool and Birkenhead sides of the river; and of these we have recently received some particulars. The scene of operations is a huge pile of warehouses, or granaries, covering several acres of ground, and reaching upwards to the hight of some six or eight floors. The grain ships arrive alongside these warehouses, and the cargo, whether in bulk or in bag, is emptied into what is called the "well" of the building, a depth of 22 feet below the level of the quay. It falls into a "hopper" capable of holding six tuns; and it need scarcely be stated that the object of thus lowering it is to dispense with the manual labor which would otherwise be necessary in filling the apparatus by which it is raised to the different floors. Corresponding with the "well" at the bottom of the building is a "tower" at the top, and the distance between the two is 145 feet. A bucket worked by a hydraulic ram travels between the two, and when a given quantity of grain has been emptied into the hopper the bucket descends, and by liberating a certain spring on its way to the bottom of the well, an arrangement is brought into play whereby the filling of the hopper is suspended, and the grain contained in the lower or sloping part, empties itself into the bucket. The hopper is made to hold six tuns, and the quantity discharged at each descent of the bucket is one tun, that being the quantity contained in the part of the hopper below which the filling process has been temporarily suspended by the action already described. A single stroke of the ram, and the bucket is raised from the bottom of the well to the top of the tower; the distance of 145 feet with a tun of grain being accomplished in forty-five seconds. On its upward journey, the bucket, which, it should have been stated, works on a sort of rails or guides, replaces the arrangement disturbed by its downward motion, and the process of filling the hopper is once more restored. Reaching the top, the bucket is acted upon by what is called the "tipping wheel," and thus made to empty itself into the tower, where the contents are weighed and got in readiness for distribution throughout the different floors and sections of the immense building. This subsequent process is even more novel and interesting than that just described. The upper floor of the warehouse is traversed in every direction by belts or bands revolving on pulleys, driven by small hydraulic engines. These bands, which are composed of india rubber and canvas amalgamated, are from fifteen inches to eighteen inches in width, and about one fourth of an inch in thickness. A sort of "mouthpiece" is fitted on to the bottom of the hopper containing the particular kind of grain to be distributed: and by this means it is thrown on the band revolving underneath, in an even and continuous stream, and in sufficient quantity to keep the bucket going regularly between the well and tower, with its load of a tun every three quarters of a minute.

The grain is carried forward on the band at a very considerable speed; and by the introduction of what is called the discharging or throwing-off apparatus, which can be attached at pleasure, it can be deposited in any section of the top floor, or diverted down shoots which carry it to any of the numer- floors underneath.

These warehouses in Liverpool have been in operation about three years. The machinery, which is of a very simple but effective character, was supplied by the firm of Sir W. Armstrong, of the Elswick Works, Newcastle-on-Tyne; and the system is stated to be superior to that in operation at Chicago, where "grain elevators" are quite an institution. The capacity of the Liverpool warehouse is something like 40,000 tuns.—*Builder.*

Hawley's Metal Roofing.

Mr. William S. Hawley, of New York city, assignor to David J. Millard & Co., of Clayville, N. Y., has invented an improvement in composition metal for roofing and other purposes, for which he has just obtained a patent through the Scientific American Patent Agency. This invention relates to metal which is adapted to roofing, linings, pipe, either cast or made from the sheet, and other purposes, forming a composition metal, which, when rolled into sheets suitable for roofing, linings, and all similar purposes, or cast or made into pipe, and is designed to resist the action of salt water and most of the acids, and does not perceptibly expand or contract from heat and cold.

Lead, tin, bismuth, and aluminum, or lead, tin, and bismuth without the aluminum, and with or without the bismuth, according to the use for which the metal is intended, are employed. In forming the composition metal, the above mentioned metals are used in various proportions, but never so much as one fifth part of tin to four parts of lead is used.

The inventor claims to have discovered that, by using a much less quantity of tin to a given quantity of lead, an article subject to no mechanical difficulties in the process of manufacture, and in every way superior to what has before been manufactured, can be produced. He has found that a metal composed of lead, one hundred pounds, tin, sixteen pounds, and bismuth, one ounce, with from three to five pounds of aluminum added, is best adapted for roofing and the other purposes for which it was intended. As the purposes are various, the proportions named may accordingly be varied, and the aluminum or the bismuth may be dispensed with where it is not desired to furnish a very fine quality of metal.

The metals used may vary from five pounds to twenty pounds of tin to one hundred pounds of lead, and from one ounce to two pounds of bismuth to the said quantity of tin and lead, when bismuth is used.

In preparing the metal, the lead is fused in an iron vessel, and then the block tin is added, taking care that the lead is not at so high a temperature as to burn or vaporize the tin. When the tin has been fused and thoroughly mingled with the lead, about half a pound of tallow to the hundred pounds of metal is introduced, which cleanses the combined metals from all the impurities, which may be skimmed from the surface. The bismuth is then introduced, and also the aluminum when aluminum is used. When the composition has been thoroughly stirred, it is ready to be poured into the molds, and thus formed into ingots or slabs. After being perfectly cooled, the ingots or slabs are ready for the rolling mill.

This composition metal can, it is claimed, be cast and rolled without cracking, and no mechanical or other difficulties are met with in rolling it to extreme thinness, making a most tough and tenacious sheet, admirably adapted for roofing, lining barrels for holding petroleum, mineral water, and all similar fluids, sheathing vessels, watertight floors, damp walls, and various other purposes. It is also averred that no acids affect it which will not destroy gold and silver.

The advantages and value to the public of such a metal will be apparent to all having a general knowledge of the many uses to which it can be put.

Shad Breeding.

In April, 1868, the Legislature of the State of New York passed a much needed act for the protection of fish. The Hudson river was at the moment practically closed by various nets of so small a mesh that mature shad could not ascend to the usual spawning beds.

This act specifies four and a half inches as the smallest mesh to be used in a shad net, and provides, under penalty, for the opening of all nets or traps from sundown on Saturday until sunrise of the following Monday. It also designates the season for shad fishery to be those days between the 15th of April and the 15th of June. Horatio Seymour, George G. Cooper, and R. B. Roosevelt were appointed Commissioners of Fisheries.

These gentlemen at once engaged the services of Mr. Seth Green, and set him at work to restock the Hudson river with shad, and save to the people a food source which bade fair to be presently exhausted.

Mr. Green selected for his work a location on the right bank of the Hudson, some four miles above the town of Coeymans. At this point, a low island affords protection from wind and the wash of passing steamboats. It is convenient to some of the best fishing grounds of the river. The fish are taken by seine at night. The ova is gently pressed from the female (if ready for spawning), into a pan of water kept in gentle motion. Care is taken not to injure the shad before spawning it. The male shad is made to evolve sufficient milt to impregnate the eggs, which seem instantly to lose their opacity, and become crystals of more than double their impregnated size. From the pans they go to the hatching boxes contrived by Mr. Green—a simple wooden box of fifteen by twenty two inches, fitted with a wire bottom, and arranged with strips of wood fastened on each side to float with the wire bottom at such an angle to the tidal current as will keep the eggs in continual motion, with the exception of a short time at the changing of the tides, when it is necessary to occasionally shake the boxes to keep the spawn from settling to the bottom, a thing fatal to the life of the ova.

From three to five days are necessary to hatch the spawn. The fry, at once capable of taking care of itself, is set free at night, when small fish with appetite for shad fry are close in-shore, and not swarming after the boat, as is the case during the daytime, when they accompany it on each visit to the hatching boxes to secure the dead spawn, which must be frequently removed from the boxes. A full grown female shad will spawn upward of one hundred thousand eggs, of which number it is said that no more than a few hundred will be hatched in the natural way, while by good handling upward of ninety thousand may be secured by artificial hatching. Mr. Green has already turned some hundreds of millions of shad fry loose at different points in the Hudson, and expresses a belief that three hundred millions of young shad may be hatched out and set free during the few weeks of time devoted to the work. The expense is comparatively small; a few hundred dollars cover the entire outlay. Certainly this is a judicious expenditure of the people's money, securing, as it does, a vast food source which would otherwise have dwindled to a supply inadequate to furnish more than a small quantity, which would have found its way only to the tables of the wealthy.

Other States are devoting attention to the subject of pisciculture as a food source, stocking streams and lakes which have for years been tenanted only by small and comparatively valueless fish. In this work Mr. Green gladly assists, his great knowledge of the subject rendering his advice invaluable.

This season's shad hatching will be commenced by Mr. Green as early as May 20, and the work will reach its most interesting point about the 20th of June.

Sub-Aqueous Tunnel.

A railway tunnel is now being constructed under the river Mersey at Liverpool, England, to connect that city with the opposite city of Birkenhead. It will be about three miles in length, about one third of which will be under the bed of the river, and it will connect nearly all the railways in England with the Birkenhead docks. The effect of this great undertaking, as well as of the fine river approaches—a sister scheme, and working in the same direction—cannot but be in the highest degree beneficial to local trade. The improvement has already commenced. The preliminary operations for the formation of the tunnel have been completed. A hoarding has been erected on the south reserve land, between Shore road and the river, close to Woodside Ferry, and workmen have commenced preliminary operations for sinking a shaft, in order to attain the depth of 70ft. below the bed of the river, at which point the cutting of the tunnel railway will be undertaken. The contractor for the work is Mr. John Dickson, of Whitby, and the engineer Mr. Mackenzie. The tunneling will be performed with two machines, each of which will make a cutting 15ft. in diameter. Two other shafts are to be sunk on the Birkenhead side, one on the upper side of Shore road, and the other between the gasworks and Green lane, Tranmere, where will be situated what may be called the Cheshire terminus, the line there joining the Birkenhead and Chester Railway. It is anticipated that unless serious geological "faults" are met with, the cutting of the tunnel, which is to accommodate a double line of rails, will be completed in two years. We are in hopes that, by that time, our capitalists will be moved to commence the construction of tunnels under the North and East rivers at New York.

One of the salts most sensitive to heat is the double iodide of silver and mercury. Its natural color is yellow, but it turns red if warmed, and returns to yellow again on cooling.

THE TALLOW TREE AND ITS USES.

BY D. J. MACGOWAN, M.D.

The botanical characters of this member of the *Euphorbiaceæ* are too well known to require description; but hitherto no accurate account has been published of its various uses. Although it has become a common tree in some parts of India and America, its value is appreciated only in China, where alone its products are properly elaborated.

Analytical chemistry shows animal tallow to consist of two proximate principles—stearine and elaine. Now, what renders the fruit of this tree peculiarly interesting is the fact that both these principles exist in it separately in nearly a pure state. Nor is the tree prized merely for the stearine and elaine it yields, though these products constitute its chief value; its leaves are employed as a black dye; its wood is hard and durable, and may be easily used for the blocks in printing Chinese books and various other articles; and, finally, the refuse of the nut serves for fuel and manure.

The *Stillingia Sabifera* or tallow tree is chiefly cultivated in the provinces of Kiang-se, Kiang-nau, and Chih-kiang. In some districts near Hang-chau the inhabitants defray all their taxes with its produce. It grows alike on low alluvial plains and on granite hills, on rich molds on the margin of canals, and on the sandy sea beach. The sandy estuary of Hang-chau yields little else. Some of the trees at this place are known to be several hundred years old, and, though prostrated, still send forth branches and bear fruit. Some are made to fall over rivulets, forming serviceable bridges. They are seldom planted where anything else can be conveniently cultivated, but generally in detached places, corners about houses, roads, canals, fields, etc.

In winter, when the nuts are ripe, they are cut off with the twigs by a sharp bill hook attached to the extremity of a long pole, which is held in the hand and pushed upwards against the twigs, removing at the same time such as are fruitless.

The harvesting accomplished, the capsules are taken and gently pounded in a mortar to loosen the seeds from their shells, from which they are separated by sifting. To facilitate the separation of the white sebaceous matter enveloping the seeds, they are steamed in tubs having convex, open wicker bottoms, and placed over caldrons of boiling water. When thoroughly heated they are mashed in the mortar and then transferred to bamboo sieves, kept at a uniform temperature over hot ashes.

As a single operation does not suffice to deprive them of all their tallow, the steaming and sifting is therefore repeated. The article thus procured becomes a solid mass on falling through the sieve, and, to purify it, is melted and then formed into cakes for the press. These receive their form from bamboo hoops, a foot in diameter and three inches deep, which are laid on the ground over a little straw. On being filled with the hot liquid, the ends of the straw underneath are drawn up and spread over the top, and, when of sufficient consistence, are placed with their rings in the press. This apparatus, which is of the rudest description, is constructed of two large beams placed horizontally so as to form a trough capable of containing about fifty of the rings, with their sebaceous cakes. At one end it is closed and at the other adapted for receiving wedges, which are successively driven into it by ponderous sledge hammers wielded by athletic men.

The tallow oozes in a melted state into a receptacle where it cools. It is again melted and poured into tubs smeared with mud to prevent adhering. It is now marketable in masses of about eighty pounds each, hard, brittle, white, and opaque, tasteless, and without the odor of animal tallow. Under high pressure it scarcely stains bibulous paper; it melts at 104° Fah. It may be regarded as nearly pure stearine; the slight difference is doubtless owing to the admixture of oil expressed from the seed in the process just described. The seeds yield about eight per cent of tallow, which sells for about five cents per pound.

The process for pressing the oil, which is carried on at the same time, remains to be noticed. It is contained in the kernel of the nut; the sebaceous matter which lies between the shell and the husk having been removed in the manner described, the kernel and the husk covering it are ground between two stones, which are heated to prevent clogging from the sebaceous matter still adhering. The mass is then placed in a winnowing machine precisely like those in use in Western countries. The chaff being separated, the white oleaginous kernels are exposed, and, after being steamed, are placed in a mill to be mashed.

This machine is formed of a circular stone groove twelve feet in diameter, tapering at the edge, and is made to revolve perpendicularly by an ox harnessed to the outer end of its axle, the receiver turning in a pivot in the center of the machine. Under this ponderous weight, the seeds are reduced to a mealy state, steamed in tubs, formed into cakes and pressed by wedges in the manner before described, the process of mashing, steaming, and pressing being likewise repeated with the kernels.

The kernels yield about thirty per cent of oil. It is called *tsing-yu*, and sells for about three cents per pound. It answers well for lamps, though inferior for this purpose to some other vegetable oils in use. It is also employed for various purposes in the arts, and has a place in the Chinese pharmacopœia because of its quality of changing gray hair to black, and other imaginary virtues. The husk which envelopes the kernels and the shell which encloses them, and their sebacious covering, are used to feed the furnaces; scarcely any other fuel is necessary for this purpose. The residuary tallow cakes are also employed for fuel; a small quantity of it remains ignited a whole day. It is in great demand for chafing dishes during the cold season.

Finally, the cakes which remain after the oil has been pressed out are much valued as a manure, particularly for tobacco fields, the soil of which is rapidly impoverished by that plant.

Burnt Iron and Burnt Steel.

Iron which has been damaged by reheating is designated "burnt iron" by the workman, who also gives the same name to iron which has been excessively heated and exposed in the puddling furnace after balling. No amount of heat applied to iron in the blast furnace or in the early stages of puddling produces burnt iron.

Burnt iron is brittle, its fracture is short, it displays the so called "crystalline" structure, and it has lost the fibrous structure and silky fracture of good iron.

When steel has been raised to a yellow or white heat and then suddenly cooled, it becomes brittle and no longer capable of tempering, is worthless for the ordinary uses of steel until again raised to a welding heat, and rolled or hammered and allowed to cool gradually. Burnt steel has a coarse granular fracture, the facets of the granules being, for the most part, either rounded or conchoidal. The conchoidal facets serve practically as a distinguishing characteristic.

I have examined many samples of burnt iron and find in all of them some particles of black oxide, more or less abundantly diffused throughout the mass of iron, suspended or entangled within it. I find no such particles of oxide in burnt steel, nor any other indication of internal oxidation of iron.

Important practical decisions often depend upon the determination of whether certain defects of particular samples of iron are due to burning or to other causes. I have devised a very simple means of answering this question. I take about a decigram of fresh borings or coarse fillings, put them into a dry narrow test tube, then pour upon them about three centimeters of nitric acid diluted to sp. gr. 1·20. If the iron is burnt, the particles of dark oxide become separated from the metallic iron as it dissolves, and are suspended in the liquid, rendering it dark and turbid. They ultimately disappear and are thus distinguishable from particles of carbon, etc. This action is easily recognized by treating equal quantities of borings of burnt and good iron simultaneously in the same manner, and comparing.

I find that ordinary sound wrought iron contains a small quantity of carbon, the most important function of which appears to be to prevent burning by its reducing agency. As soon as the carbon is removed, oxidation commences when the iron is heated, and this oxidation is not merely superficial but extends throughout the mass. The higher the temperature and the greater the amount of exposure to the atmosphere while heated, the greater is the quantity of carbon required for protecting the iron. This is, I believe, the reason why all attempts to make merchantable iron by the Bessemer process are a failure. The high temperature and the violent exposure of melted metal to the air forced through it causes oxidation of the iron to commence even in the presence of much carbon. This oxidation or burning of the iron commences in the Bessemer converter, when the proportion of carbon is brought down to about 0·25 per cent. 0·20 per cent, may be stated as the practical minimum to which it is possible to bring down the carbon of Bessemer metal without destroying malleability, but this is rarely reached. About 0·28 is the lowest ordinarily aimed at by the manufacturer.

I find that iron attains its maximum toughness, when it is otherwise pure, and its carbon is reduced to the lowest possible proportion without oxidation of the iron commencing.

Thus the success of the maker of armor plates, ship bolts, etc., depends upon his skill in exactly touching, without passing, the point at which the oxidation of carbon ceases, and that of the iron is about to begin. By skillfully conducting his last reheating processes by means of a reducing flame, he is able to work down to the lowest possible trace of combined protecting carbon, and thus obtain the maximum of toughness and extensibility.

I find, as a result of a large number of varied experiments, that whenever steel is raised to any temperature above the lowest visible red heat, and more or less exposed to the action of atmospheric air, its carbon is oxidized with a rapidity proportionate to the temperature and degree of exposure. These experiments have extended through a series of various conditions, from low heat and closed annealing furnaces to the great heat and excessive exposure of the Bessemer converter. This oxidation occurs not only at the surface, but proceeds inwards. It is now well known that certain gases can pass readily through heated iron, and thus the permeation of the oxygen and exclusion of the carbonic oxide no longer presents a difficulty. I, therefore, explain the structure and properties of "burnt steel" as the result of suddenly solidifying it, from the viscous condition which it attains at a welding heat, and thereby imprisoning the carbonic oxide evolved by the oxidation of the carbon. By slower cooling, the carbonic oxide would have become either occluded or expelled. This explanation accords with the fact that burnt steel may be cured, as above stated, by welding up the cavities or "toads' eyes," as the workmen call them, which are visible on the fracture of such steel. These, according to my explanation, are the minute bubbles formed by the carbonic oxide suddenly arrested in various stages of evolution or collapse.

According to the above, the workmen's term "burnt" is not incorrectly applied in either case, the rottenness of both the iron and the steel being caused by the presence of intermingled particles of combustion-products breaking the continuity of the metal. The carbon is burnt in the case of the "burnt steel," the iron itself in the "burnt iron."—*Journal of the Chemical Society.*

Light, Heat, and Electricity from Motion.

The celebrated Jacob Perkins when in London, in 1837, exhibited at the Adelaide Gallery the phenomena produced by the contact of soft iron with steel in motion, and which he described at the time as follows:

"The action of a soft iron disk upon hard steel, such as a file, is exhibited four times a day. This has been regularly kept up for three years, yet it has undergone very little wear. I am of opinion, in fact, that if the file had never been held upon it until it had attained its full velocity, there would not have been any loss of metal. I do not know to what extent the combustion of steel by soft iron may have been carried in the United States, but our experiments are so brilliant as to excite the highest admiration, and to induce numbers to repeat their visits to the Gallery. Our disk is a foot in diameter and an eighth of an inch thick. It requires about a three horse power to drive it, and revolves about 6,000 times in a minute. It is very accurately fitted up with friction wheels. The blaze of light, which rises about 12 inches, perpendicularly, from the point of contact, is so vivid that few persons can look steadily at it even at noon day. The stream of light is about an inch and a half thick at the distance of a few inches from the point of contact; and at the distance of 7 or 8 feet, it spreads out to about 10 inches. The sparks not unfrequently touch the ceiling, which is about 20 feet high; a ring of fire is seen all around the disk, appearing like a band of light about five eighths of an inch wide. Of what does this light consist? It is manifestly different from that of the sparks, which all fly off in a tangent. In operating with the disk, it never becomes warm; the file, however, has to be held at least two inches from the sharp end, as it becomes highly heated. The whole appearance, in fact, is very interesting, and when fully investigated, I am well convinced that some of the phenomena will be found to depend upon electricity."

Brandy from Wood Shavings.

C. G. Zetterlund has been making some experiments in the distillery at Hulta to make brandy out of shavings. For this purpose, they were boiled in an ordinary kettle under a pressure of 0·116 kilograms of steam to the square centimeter. There was then put into the kettle: Shavings (pine and fir, very wet), 9·0 cwt.; sulphuric acid, 1·18 sp. gr., 0·7 cwt.; water, 30·7 cwt.—Total, 40·4 cwt.

After boiling eight and a half hours, the mass of shavings contained 3·33 per cent grape sugar, and after eleven hours cooking, 4·38 per cent. A farther increase in the quantity of sugar could not be attained. There was obtained in all, from the 40·4 cwt., about 1·77 cwt. of grape sugar, or 19·67 per cent of the weight of the shavings. The acid was neutralized by lime, so that the cooled mash ready for fermentation contained one half degree of acid, according to Ludersdorff's acid tester. The mash had a temperature of 30°C. when the yeast prepared from only 20 pounds of malt was added. At the end of 96 hours, the mash had done fermenting, was then distilled and yielded 61 quarts of 50 per cent brandy at +15°C., perfectly free from all flavor or smell of turpentine, and of a very pure taste.

It is more than probable that the manufacture of brandy from shavings on a large scale would succeed if it were ascertained, by experiment, with how much water the acid must be diluted, and how long it must be boiled, for both of these circumstances exert a great influence over the production of sugar.

If it were possible to convert the whole of the cellulose in the shavings into sugar, each hundred weight of air dried shavings would yield about seven gallons of brandy of fifty per cent. The shavings of the leaf bearing trees would probably give the best results.—*Journal of Applied Chemistry.*

EFFECTS OF FROST ON PLANTS.—It has been a disputed question whether plants, killed by frost, die in freezing or in thawing. That the former is the case, at least in some cases, has been satisfactorily demonstrated by Professor Göppert, of Breslau. The flowers of certain orchids, as, for example, the milk white blossoms of *Calanthe veratrifolia*, produce indigo, but only by a chemical reaction that takes place upon the death of the parts. When they are crushed, or the vitality of the cells is otherwise destroyed, they turn blue at once. Now this change of color occurs immediately upon freezing, which proves that life then ceases. Certain other species are said to show the same thing.

A FRENCHMAN named Wilbaux has taken out a patent to use an elastic type for printing on glass, with fluor spar rendered adhesive by some such material as printing ink. Sulphuric acid of suitable temperature is then allowed to act on that portion of the glass. The hydrofluoric acid generated in this way would etch the glass on the places printed on. When completed, the whole is washed off with warm water or lye.

TO KEEP GUM ARABIC FROM MOLDING.—Solutions of gum arabic soon mold and sour, and finally lose their adhesive property. It is said that sulphate of quinine will prevent this, while it imparts no bad odor of its own. The addition of a solution of a few crystals of this salt to gum arabic will prevent the formation of mold quite as effectually as carbolic acid, and by analogy it is safe to suppose that the same salt could be used in writing ink, mucilage, and possibly glue.

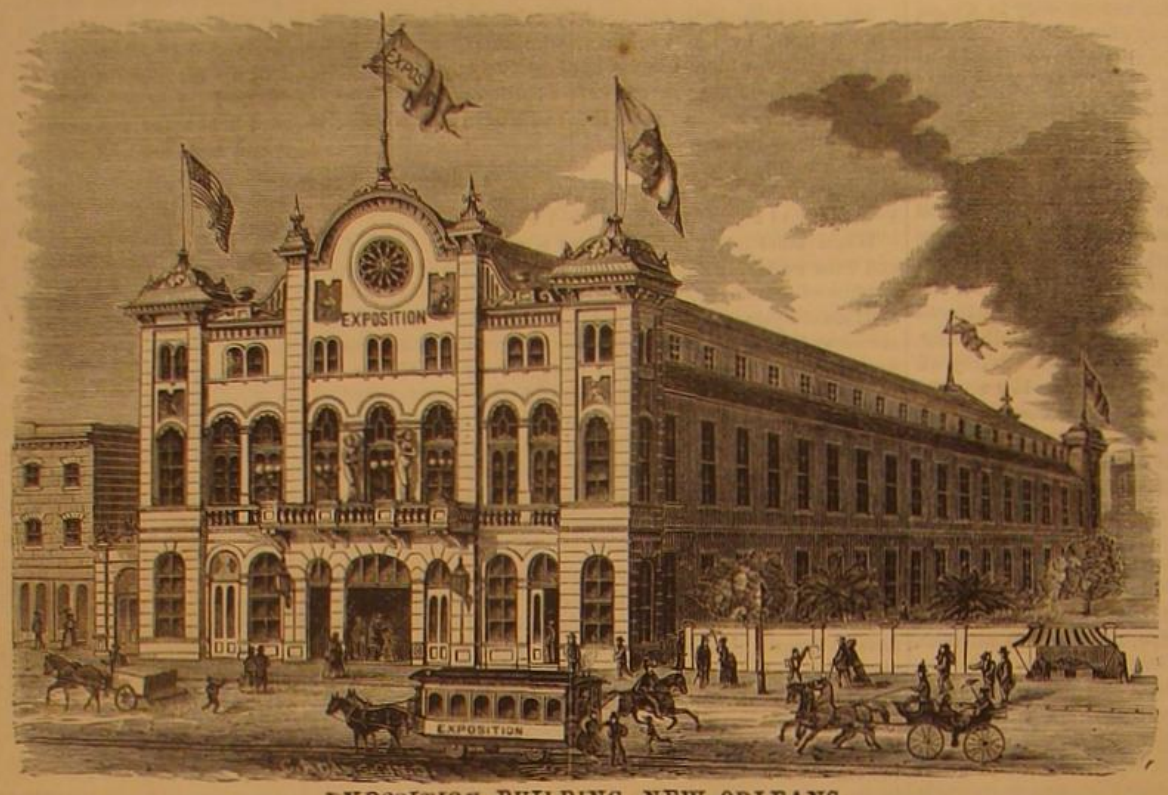
FIRST GRAND INDUSTRIAL EXPOSITION OF LOUISIANA.

The above exhibition will open on May 1st, in the new and convenient building situated at the junction of Carondelet and St. Charles streets, New Orleans, La., and will continue till May 23d. This preliminary exposition is intended as the opening of a permanent exposition. In the preliminary exposition, no charge will be made for space. When the building is opened on June 3d as a permanent exposition and salesroom, for manufacturers, artists, inventors, etc., a charge will be made to those who occupy space and avail themselves of the opportunities thus afforded. No premiums or diplomas are to be offered; the public will be the sole judge of the merits of the articles exhibited. By late advices, we are informed there is a good prospect of an interesting display.

We give on this page a view of the exposition building, which occupies an entire square.

The exhibition is held under the management of the Southwestern Exposition Association of New Orleans, La.

Northern manufacturers will probably find this a good introduction for their wares into the Southern market, more especially for agricultural and other labor-saving machinery.



EXPOSITION BUILDING, NEW ORLEANS.

Automatic Cattle Stanchion.

Fastening cattle in stables is accomplished by many different methods, the majority of which are inconvenient for the keeper and exceedingly uncomfortable for the animal. It has long been a conceded fact, among dairymen, that fastening cattle in stanchions is the only economical method where any considerable numbers are kept in one herd. A chain around the animal's neck, with a ring sliding upon an upright standard, has been used to a considerable extent. This, although easy for the animal, is a very inconvenient and oftentimes dangerous method of securing cattle. It requires more room and a much greater amount of lumber to fit up a stable.

For milch cows the use of chains and rope ties was long ago discarded, on account of the unavoidably filthy condition of the stable, the legitimate result of too much liberty. Box stalls have advocates, and for breeders of fancy cattle may have their advantages, but they occupy much room, are very expensive and, for the dairy, would be exceedingly inconvenient.

The custom of milking in the stable the entire year has become almost universal, and for the comfort of those engaged in milking, and also for the health and comfort of the cows, it is very essential that the circulation of air should not be obstructed by partitions (other than perhaps narrow hooking boards) either in the stable or manger. In most business transactions, we justly expect the best results from the employment of the best means. Why not in the management of farm stock? It is often the case that cows will back out of ordinary stanchions before they can be fastened, and seriously damage each other ere it can be prevented.

In the stanchion herewith presented to the public, it has been the object of the inventor to make such improvements as will do away with the many objections heretofore raised against fastening cattle in stanchions.

The superiority of a swinging over a stationary stanchion is at once apparent to the most casual observer. This stanchion the inventor styles the "Swinging, Self-Closing, Self-fastening Cattle Stanchion."

In the common stationary stanchion, it is very difficult for a majority of animals to rise without making several attempts, but in these the yielding of the stanchion allows the shoulders of the animal their natural forward movement, so that the animal can rise as easily as though it were not fastened. The stanchions are hung in such a manner as to allow a sliding or sidewise movement, if desired, by simply shortening the upper and lower transverse bars. The space for the animal's neck is adjustible to any desired width, the bars being slotted transversely where the bolts pass through them, allowing them to be moved either right or left. The stanchions are self-closing and self-fastening, thereby saving a vast amount of time, and any one of them can be instantly unhung without disturbing the remainder.

Fig. 1 is a view, from the stable side, of a section of a row of finished stanchions, one opened and one closed. It also shows the manner of hanging. Fig. 2 is a vertical section of Fig. showing the manner of hanging, also the means of preventing the animal from lifting the stanchion from its bearing, by the insertion of the loose pin, J. It also shows the construction of the feeding manger, devices for limiting the swing, stanchion, grain board, guide, etc. Fig. 3 shows the interior arrangement of the closing and latching devices, the device for adjusting the space for the animal's neck, and enlarged views of the arms, hook, button, etc.

To open the stanchion, the attendant presses down on the handle of the lever, A, until the upright bar, B, is raised and opened, the notch in the lever catches the pin, C, and holds it in the position as shown. The animal, in lowering its head for food, unlatches the lever from the pin, and the stanchion closes by its own weight. As the bar, B, descends, the inclined pin, D, strikes the pin, E, and latches the bar, B, in the notch, F. G is a guide to the bar, B, as it rises and falls. H, Fig. 2, is a loose grain board between the guides, I, rocking back and forth with the swing of the stanchion.

To unhang the stanchion, remove the pin, J, from the bar, K, and lift the stanchion from its place. L is a hook button made of hard wood, cut in the shape shown in Figs. 2 and 3, to allow the stanchion to swing forward. M, Fig. 3, is an arm made of half inch round iron, bent at right angles with the keyholes near the ends, the wrists of which pass through the bars, B and N, Fig. 1. O, Fig. 3, is another form of arm, made of one quarter by one inch bar iron, with holes near the ends for the reception of staples, by which it is hinged to the bars, B and N, as shown in Fig. 1. These arms operate to open and close the space for the animal's neck.

These stanchions are simple, cheap, and durable, requiring no iron hinges, and but four bolts in their construction.

This invention was patented through the Scientific American Patent Agency, May 10 and July 19, 1871, and May 30, 1872. For purchase of territory or other information, address Gifford and Robertson, Jamestown, N. Y.

Fig. 1

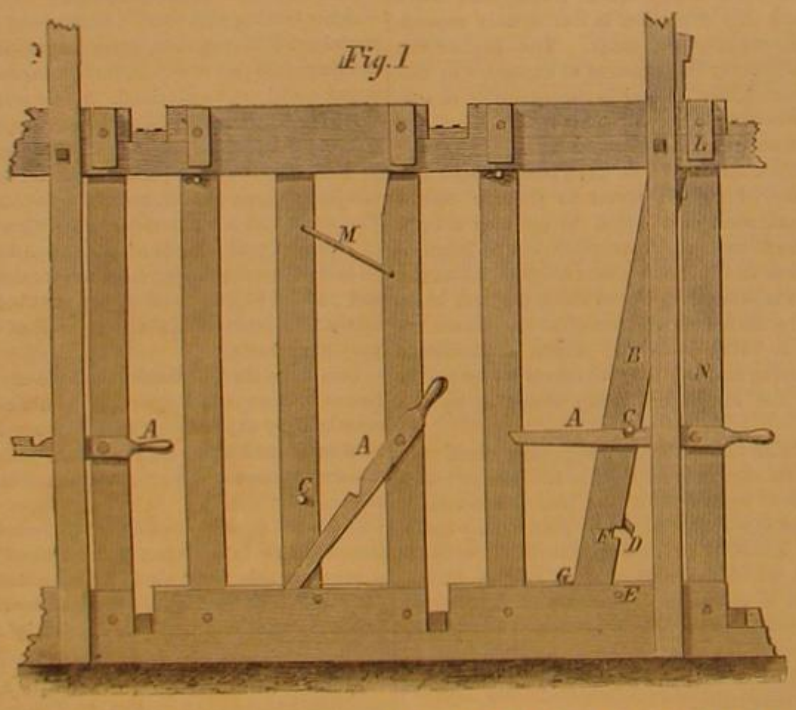
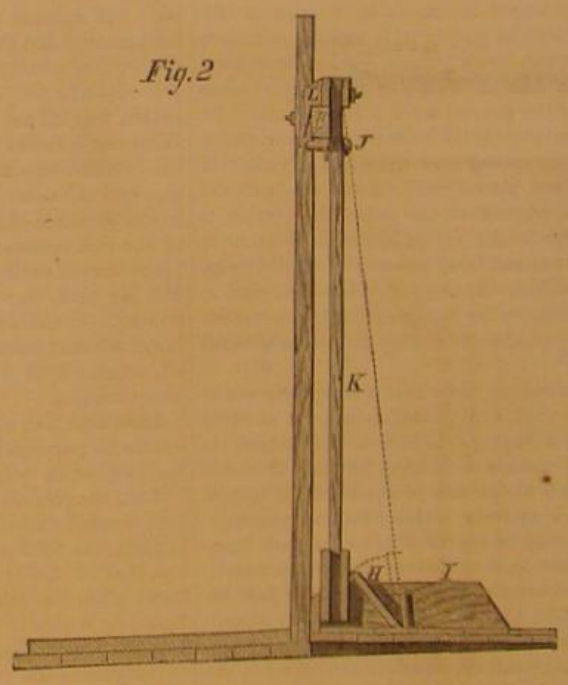
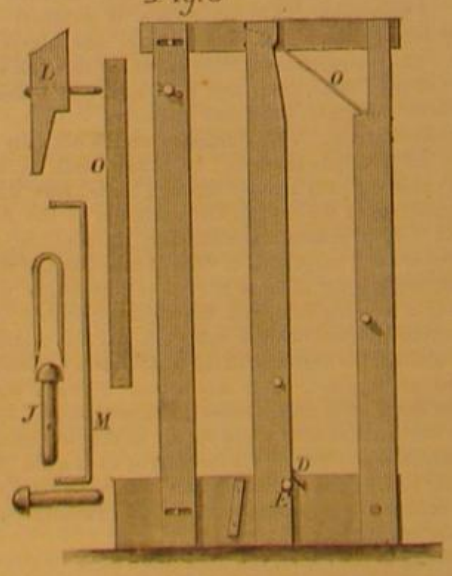


Fig. 2



GIFFORD'S AUTOMATIC CATTLE STANCHION.

Fig. 3



Japanese Porcelain.

The Japanese artists have long distinguished themselves in the ornamentation of porcelain, and many of their styles are of great beauty and originality. Their blue and white wares are somewhat similar, in general appearance, to those made by the Chinese, but can be readily distinguished from them by any one conversant with the peculiarities of Japanese art.

The most beautiful and artistic of all the fictile wares of Japan is the Satsuma. This is made in the province of Satsuma, situated in the southwest of the island of Kinsin. The body of the ware is of delicate cream or vellum tint, and is covered with a thick transparent glaze, which is in nearly all cases crackled. On this softly toned ground, figures, birds, flowers and conventional designs are painted in the most exquisite manner imaginable. The freedom and grace infused into every line of the flower and bird subjects are astonishing, while the coloring is soft and refined.

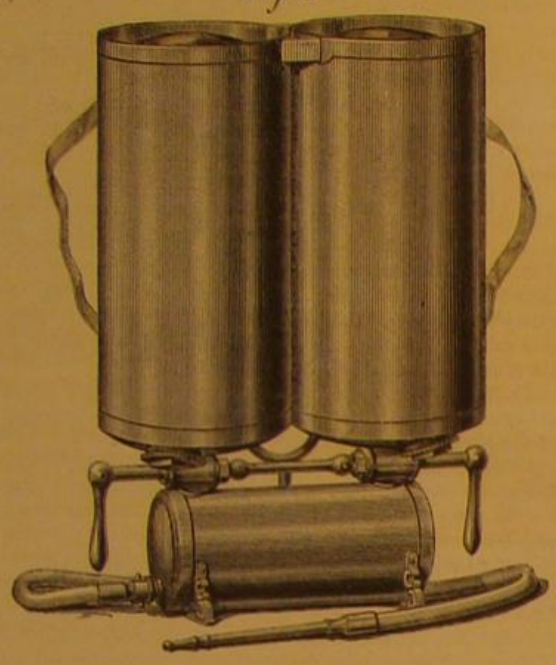
Another beautiful ware, richly ornamented with red and gold, is made in Japan, in the district belonging to the Prince of Kanga. The ornamentation of this ware is infinitely more minute and labored than that of Satsuma, but is far inferior to it in artistic excellence. Kanga ware appears to be held in great estimation in Japan, no doubt on account of its fine color and intricate ornamentation. The Japanese frequently lacquer articles of porcelain, sometimes entirely and sometimes partially. When entirely covered, they are treated, as regards their decoration, in a similar manner to ordinary lacquer work; when only partially covered, two methods are adopted. The first method consists in grounding in with lac all portions of the object, excepting those which have been already decorated and intend to remain in their original state; and the second method consists in taking the porcelain itself as the ground, and ornamenting it with raised designs in gold and colored lacs.

AT a recent trial of bicycle velocipedes in London, one of the riders made two miles in less than seven minutes, being at the rate of over seventeen miles an hour. Another rider made four miles in 17m. 21s., being at the rate, almost, of 14 miles per hour. The diameter of the wheels of the bicycles used was 4 feet 4 inches.

GARDNER'S FIRE EXTINGUISHER.

We need not repeat what we have so often said in regard to the value of small portable apparatus for extinguishing fires at their very outset. Suffice it to say that our views upon this subject have been generally approved by those who have made the extinguishing of fires a study. Among apparatus of this kind, none have so rapidly won their way into public favor as extinguishers the action of which is based upon the fact that no fire can live under even the thinnest stratum of carbonic acid gas. An envelope of this gas so effectually cuts of the supply of oxygen from the air that, when combined with water so as to cool the heated surface below the point of ignition, it forms the best known means for the extinguishing of a fire.

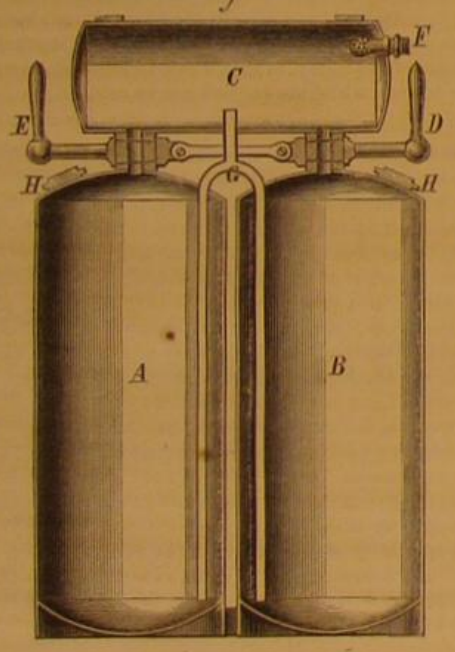
Fig. 1



Quite a number of devices have been brought out, all designed to render easy and rapid the use of carbonic acid gas and water for this purpose. The apparatus shown in our engravings has points claimed to give it superiority over others which have preceded it.

The parts of the device, as lettered in the engraving, Fig. 2, are an acid chamber, A, a bicarbonate of soda chamber, B, a gas chamber, C, handles of stop cocks, D and E, the two

Fig. 2



handles being joined by a rod so that either hand may be used for operating them, hose coupling, F, equalizing pipe, G, which keeps the pressure uniform throughout the machine, and stoppers, H, which are removed for charging the machine.

The acid chamber, A, is charged with dilute sulphuric acid (oil of vitriol), and the soda chamber with solution of bicarbonate of soda, equivalent proportions being used. When not in use, the machine is placed in the position shown in Fig. 2. In this position the acid and soda are kept asunder, and no gas is generated.

In use the position of the machine is reversed, as shown in Fig. 1, straps being provided whereby the machine is held upon the back of the operator. In the latter position, when the cocks are opened, the acid and soda solutions flow into the gas chamber, C, where the sulphuric acid instantly sets free the carbonic acid in the bicarbonate of soda, generating a high pressure, which causes a jet of mingled solution of sulphate of soda and free carbonic acid to issue from the hose pipe. This being properly directed, first upon the bottom of the fire, and so upward as the fire is extinguished, will soon put out quite a formidable conflagration.

The advantages of this extinguisher are that the diluted sulphuric acid and the solution of bicarbonate of soda are kept in separate chambers, and brought together when needed for use simply by turning the handle of a stop cock.

They are brought together in equivalent proportions, and the stream of a solution of sulphate of soda is thereby charged with carbonic acid gas from the start.

As much or as little of the charge may be used as is desired, and the remainder saved, for any future time, perfectly unaltered and unimpaired.

When the machine is charged and set away, the stopcocks and mechanical arrangements are never in contact with the chemicals. This is considered one of the greatest advantages of the machine, and is a point in which we believe it differs radically from all other extinguishers.

The machine is made of polished copper, lined with lead to prevent corrosion, and the stopcocks are made of lead bronze, and will resist all chemical action from the materials used. The machine is so constructed that it fits the back firmly and steadily, because, there being two upright chambers to contain the chemicals, the weight is equally distributed. It weighs only 65 pounds when charged, and it is claimed that it is lighter than any other machine of the kind, and can be put in action more promptly.

Patented February 14, 1871. For further information, address Philadelphia Fire Extinguisher Company, 1,306 Chestnut street, Philadelphia, Pa.

BUTTER FROM CALIFORNIA.

The transporting of fresh grass butter from the Pacific coast to New York, by rail, is something new, and is likely to become a large business.

A few days ago, a car load of 20,233 lbs. arrived from San Francisco, consigned to J. S. Martin, corner Chambers and Greenwich Streets, creating quite a sensation among the butter dealers. By the courtesy of R. L. Stuart, Esq., a well known resident of this city—but who, from the note accompanying it, we infer is at present a guest at the Fort William Henry Hotel, Lake George—we are indebted for a handsome cylindrical roll of the new butter, from the first shipment across the continent. Other shipments are announced; and if the experiment of bringing yellow grass butter, fresh from the Pacific coast, proves as feasible as it seems likely from the satisfactory result of the first shipment, we may expect to get our spring butter in this city much earlier as well as cheaper than heretofore. The color of the California product is all that can be desired, and the flavor quite equal to State butter of a month hence. It costs in San Francisco 30 cents, gold, and the freight is 2½ cents per pound, which leaves the seller in New York a fair profit at 40 cents per pound. It comes in neat 2 lb. cylindrical rolls, each wrapped in cloth, similar to the Philadelphia mode of putting up butter.

Printing from Iron.

Mr. Van Ruth, who has for several years acted as inspector of iron for the Dutch Government, has from time to time turned his attention to discovering some means of examining the fiber of iron, and recording it for the purpose of comparison. After several trials, he has arrived at an extremely simple and efficient method of obtaining the results required.

The sample of iron whose fiber is to be examined is first planed, so as to expose a suitable section, through any desired point; this section is immersed in muriatic (hydrochloric) acid for such time as is necessary to eat out the cinder; this time varies from six hours to twenty-four hours, according to the strength and temperature of the acid solution. The cinder is attacked in a more rapid manner than the fiber of the iron, and the effect is that the fiber is left in relief—in fact an etched plate is formed, from which, by suitable ink or other substance, an engraving may be printed, showing every fiber of the iron in a clear and distinct manner. The application of this simple process is too obvious to need much description. Whenever the formation of piles in a rail, round or other section of iron, is required, here is a quick and handy method for discovering it. As a means of studying the alteration of fiber in the neighborhood of welds, it is invaluable. It may also be applied in supplying information in relation to M. Tresca's valuable memoirs on the flow of solids.—*Engineer.*

The Thunderer.

A new armored war vessel, on the turret or monitor plan, called the "Thunderer" has lately been launched in England. The vessel has a burthen of 4,400 tuns, carries two turrets and four 35 tun guns, being the heaviest naval armament known. Her expected speed is 12½ knots per hour.

As she is to rely, like a true Monitor, upon steam alone, and is totally unprovided with masts or sails, she is provided with two distinct sets of engines, connected with twin screws, and capable of acting independently of each other. The object of this arrangement is that, if one of the engines is disabled, the ship will not be left without any means of motion beyond the caprice of the waves. Perhaps one of the most remarkable features of this wonderful vessel is its capacity for stowing away coal. It can carry more than twice the quantity of the largest of the iron clads, being able to provide itself with a sufficient consumption for 12 days, or as much as 1,750 tuns.

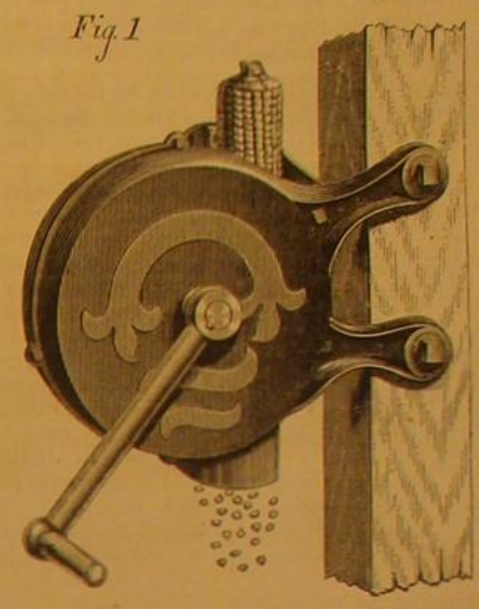
The *Thunderer* has a horse power of 5,600, divided between two double engines. The length of the vessel is 285ft. her breadth amidships 62ft., and she will draw about 26ft. of water when fully equipped. Although the iron at the stem of the ship will not exceed 8 in. in thickness, the broadside is protected by 12 in. of plating, while the turret carries 14 in. of armor, supported by the usual backing. The plating of the *Thunderer* is thus thicker than that of any other iron-clad, except her sister ship, the *Devastation*, and appears to be as strong as can be carried by vessels of the size. In order to assure the stability of the ship, no masts have been placed in her, and the sole motive power lies, therefore, in her engines. The *Thunderer* is altogether the completest and strongest iron clad yet constructed.

PATCH'S CORN SHELLER.

The extreme simplicity, durability, and compactness of this machine, together with its efficiency and convenience, will commend it to all who understand the need and use of a good corn sheller. The working parts are so few and so easily made (nearly all of them can be cast) that the machine can be constructed very cheaply. There are no complications to perplex the inexperienced, and no nice adjustments are required. The machine can be bolted to an upright post, and is then ready for work.

Two pan shaped castings bolted together form the case. One of these is removed in Fig. 2. The other, lettered A,

Fig. 1



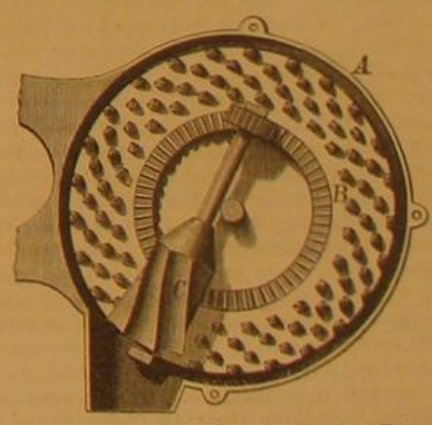
remains. B is a disk, having, about midway between its center and circumference, a circle of cogs which mesh into the pinion of the fluted roller. This roller, with its pinion, is cast all in one piece. Suitable bearings for it are bolted to the case, as shown.

The disk, B, is provided with annular rows of shelling teeth, as shown.

The corn is fed in as shown in Fig. 1. A spring (not shown), on the inner side of the case, holds the ears firmly against the disk, so that varying sizes of ears do not interfere with the operation of the machine.

The fluted roller revolves with greater rapidity than the toothed disk, the combined action of these two simple parts stripping off the kernels rapidly and thoroughly.

Fig 2



Patented through the Scientific American Patent Agency, April 2, 1872, by Asahel H. Patch, of Hamilton, Mass., who may be addressed for further information.

To Purify Water.

Chloride of iron and carbonate of soda, in the proportion of 32 kilos. of the former salt and 84·5 of the latter to a quantity of water equal to 1,000 cubic metres, has been found a most valuable and quite innocuous means of purifying water, even such as is otherwise quite unfit for drinking purposes, and could not be rendered fit by alum. The salts alluded to are best previously dissolved in some pure water, and the solutions, that of iron first, poured into the tank containing the water intended to be operated upon. The soda solution is not added until after a few moments, the water being first vigorously stirred. The soda solution having been added, the fluid is stirred again, and then left quiet for the purpose of allowing the very bulky and flocculent sediment to deposit; this takes considerable time—from twenty-four to thirty-six hours. The *strychnos potatorum* is used in India for purifying clayey water.—*Chemical News.*

AMONG the remains discovered last year in Kansas by Professor Marsh and party were bones of the flying dragon. Professor Marsh judges that the dragons, to whom these fragments of bone belonged, must have measured, from tip to tip of their extended wings, some twenty feet.

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

Lightning Strokes.

To the Editor of the Scientific American:

There is nothing more useful to the elucidation of a scientific matter than positive facts, especially where the matter in question is surrounded with so many various opinions as that of the lightning rod and its relation to thunderbolts. With as little preliminary verbiage as possible, allow me to say that Franklin never intended the lightning rod to catch thunderbolts. It was to prevent them. All electricians understand how; hence, when the rod is struck, it proves a failure. Some scientists claim for the rod the virtue of carrying off the bolt into the earth in a harmless manner, although the earth, moist earth, water if you please, is millions of times slower in its conducting capacity than iron or copper. Hence the rod may be called "the drop in a bucket" so far as its neutralizing the power of the thunderbolt is concerned.

There are some scientists who claim for the rod a power (an occult power) in its point, to neutralize the force of a thunder cloud when five miles off, because the rod at such times has been known to emit a spark when brought in proximity to the knuckle. They call it power of induction, for the want of a clearer definition. The same phenomenon applies to the human body, that is to say, at times the knuckle will give or take a spark to any piece of metal it may come near. As to the virtue of metallic points in neutralizing the capacity of a prime conductor of an electrical machine, so that it will not become surcharged, I find that any kind of point will do this; even a glass rod finely pointed will answer. I find also that the comb of the electrical machine may have its metal points all covered with glass sheaths and the sheaths pointed, and this will not prevent the prime conductor from becoming surcharged. In this experiment, the glass points present the phenomenon of illumination, as is the case with metal points.

And now for a few facts in the natural way; and in relating these I have no ends to subserve but those of science. They are the contributions of Nature in response to the investigation of the subject by the Meteorological Section of the Franklin Institute, and the writer was deputed by the Section to make diligent investigation of all this class of phenomena that may fall within his means of information.

During the past summer, twenty-nine cases of lightning came under my personal observation in the city of Philadelphia alone. While in these there appeared to be but little distinction, as to the mechanical effects of the stroke, between those that were shielded with a rod and those that were not thus shielded, the damage and loss resulting from fire, as caused by the bolt, was in the cases that were shielded by the rod, and the fire was communicated to the buildings at points in proximity to the rod. I. P. Morris & Co.'s pattern shops in this city, and the Pekin woolen mills of Manayunk, were destroyed by fire; and if eyewitnesses are to be relied on, in both cases the sparks of fire were seen to scintillate from the rod. In five of the other cases, the buildings that were struck, although having no rods on them, were surrounded with buildings from the tops of which lightning rods were peering. Now since it is suggested that lightning rods should be brought into metallic connection with underground gas and water pipes, let us see how the matter stands, at all events with gas mains, as communicated by reliable persons. In Terre Haute, Ind., a thunderbolt struck the rod on a church steeple, tumbled the rod down, ran on to the gas pipes in the wall of the church, hurling brick and plaster outside and inside the building; then, after crushing the gas meter and igniting the gas, it ran on to the street main, following it for a distance of one thousand feet, bursting the joints of the main here and there along its line. Lead, being the material the joints were packed with, and it being a slower conducting metal than iron, was the cause of these bursts, occurring, no doubt, at those joints where the iron was completely insulated by the lead packing. Another case occurred in Indianapolis, and there, after it had done considerable damage along the lightning rod of a dwelling, it ran down and over four hundred feet of street gas main, and burned every particle of lead out of the joints, leaving, as the gas engineer of the works states, nothing but dross behind. Both these cases were communicated to the Franklin Institute Section by the intelligent engineer of these works. Another case occurred last summer in Iowa City, and was communicated to the Section by the Hon. S. E. Paine, mayor of that city. It struck the rod on a church steeple, tumbled it down, passed thence through a metal roof, on to a gas pipe in the building, following the pipes to the meter and crushing that, setting fire to the gas, and thence on to the street main, melting the lead packing out of the joints for a distance of four hundred feet.

From these three cases, we may have an idea of the proximate quantity of metal necessary to the dissipation or neutralization of a thunderbolt. Certain it is that the energy of a thunderbolt must find its equivalent of neutralization before it ceases to develop its projectile force. In my investigations I learn most unequivocally that the force of a thunderbolt is always destructive where it passes from a good to a bad, or from a bad to a good, conductor; and not only that, but when it passes from a small iron conducting surface suddenly to a larger one, it does the same thing. Where it flies from an ordinary lightning rod to so large an iron conductor as a six inch street main, it leaves behind it the marks of violent force.

I look upon these gas pipe cases as very instructive to the inquirer as to the behavior of the thunderbolt, whatever the elemental nature of its substance may be, and as establishing beyond a doubt that, in its projectile energy, it is in accordance with dynamic law.

Mr. David Brookes, a good electrical authority, says: If the rod is terminated upon an underground metal surface, equal in its area to the area of the building to be protected, no harm can befall such a building from a stroke of lightning. In regard to this, I have no question of its accuracy, but I would say, better cover the building with an iron or tin roof, and thus economise the matter. While I am not prepared to say positively that a metal roofed building cannot be injured by a stroke of lightning, I have never yet found one so roofed, in my fifteen years' investigation, that has been injured by a thunderbolt; and this is the case whether the roof was or was not connected with the earth by a metal conductor.

JOHN WISE.

Philadelphia, Pa.

Gravel Mining in California.

To the Editor of the Scientific American:

It may interest some of your many subscribers to know how gold mining is carried on in California at the present day. I would say something about gravel mining. What is termed gravel here consists of pieces of rock worn smooth by the action of running water. The size of the gravel varies from that of a head of a pin to a round rock that will weigh one hundred tuns. The gravel is found not only in the beds of rivers, creeks, and ravines where water is now running, but is also found on the tops of high mountains. On some of those high places, gravel is found from 1 foot to 500 feet thick. Under these beds in some places there is bed rock; and where the bed rock is hard, it is worn very smooth by the action of water and gravel rolling over it. In other places, the bed rock is very soft, and is worn down much deeper in some places than where the bed rock is very hard. In most places, the gold that is in the gravel is on the bed rock and mixed up with the gravel about 2 or 3 feet from the bed rock; and where it occurs thus, drifts or tunnels are run in between the gravel and bed rock to take out only that portion that will pay expenses.

Some of those tunnels are some two or three thousand feet in length, and have to be run that distance before striking gravel or seeing the color of gold. And I think there are enough abandoned tunnels, if put in a straight line, to reach from New York to San Francisco.

In those tunnels that prove a success and in which lots of gold has been found, and are yet yielding some yellow stuff from the bottom, there are railroads from end to end mostly of wood rails covered with iron. The cars that bring out the gravel from the tunnel hold from 1200 lbs. to a tun of gravel. When the gravel is brought out of the mine, it is passed through sluice boxes that have a stream of water running through them. The water takes off the gravel, and the gold remains in the bottom of the sluice box, and it makes one laugh sometimes to see a big chunk as large as a stovepipe hat. But most of the gold is found in pieces that weigh from one grain to ¼ ounce. How is it that a piece of gold, one eighth of an inch long, looks when in the water to be 1 inch long?

Plum Valley, Cal. G. C. P.

Testing the Strength of Materials.

To the Editor of the Scientific American:

In your journal of March 16, 1872, you publish and illustrate a machine made by the Colt Armory Company for testing the strength of metals. The idea of using an ordinary platform scale to measure the strain, that metal will bear up to the breaking strain, is claimed by Mr. Richards as his. This may be true as far as America is concerned, but it is not so here, as, about four years ago, I found it absolutely necessary to test the tensile strength of some rolled metals and wire; and, in looking about for the means to do so quickly and cheaply, the idea of modifying one of the platform scales in the works suggested itself, and this scale is precisely the same in principle as the one illustrated in your paper. To this platform scale I attached a graduated scale to show the length to which various samples of metal would stretch up to the point of rupture, and at the same time, show the number of pounds each specimen took to tear it asunder.

This modified platform scale answered the expectations fully, and I have had it in constant use for the last four years. It is well known here, as I made no secret of it.

JOHN ABRAHAM,
Per T. R. BAYLISS.

Adderley Park Rolling Mills,
Near Birmingham, Eng.

A HUGE TIME PIECE.—The four dials of the large clock at the English Parliament House are each twenty-two feet in diameter. Every half minute the point of the minute hand moves nearly seven inches. The clock will go eight and a half days, but it will only strike seven and a half, thus indicating any neglect in winding it up. The mere winding up of the striking mechanism takes two hours. The pendulum is fifteen feet long; the wheels are of cast iron; the hour bell is eight feet high and nine feet in diameter, weighing nearly fifteen tons, and the hammer alone weighs more than four hundred pounds.

RULES FOR MAY.—Warm weather is coming; we need less internal heat; and as this internal heat comes from the food we eat, we do not need as much food: hence, like a watchful mother, Nature takes away our appetite, so that we may not eat so much as before, to burn us with fever.—*Dr. Hall.*

[Reported for the Scientific American.]

SOCIETY OF ARTS OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

MEETING HELD IN THE INSTITUTE IN BOSTON, APRIL 11, 1872.

The President, J. D. Runkle, in the chair.

A NEW FUSIBLE BOILER PLUG

was exhibited by Mr. H. P. Longley, which seems to obviate many of the difficulties met with in the use of the ordinary safety fusible plugs. The ordinary fusible plug has usually been found objectionable from the fact that after it has been in use for some time it will not melt at as low a temperature as when first put in. There are many cases on record of the exploding of boilers provided with fusible plugs, and of the crown plates of the same being overheated and distorted. To account for this, some have supposed that there was an actual elevation of the melting point of the metal, but the more probable cause is the oxidation of the metal, a crust of oxide being formed on the flat surface of the plug of sufficient thickness to prevent, to a considerable extent, the action of the steam upon the plug. The old plugs were usually placed in the crown sheet of the boiler, where they were exposed to the direct action of the steam or water on one side and the intense heat of the fire on the other.

The fusible plug exhibited by Mr. Longley is placed outside the boiler at a level a little below the lower gage cock, or it may take the place of this cock; it is so arranged that, when the plug melts, the water and steam will be admitted directly into the fire box, and extinguish the fire. The pipe in which the plug is placed is provided with a stop cock, so that the boiler may be used after the melting of the plug, and thus much delay be avoided.

Mr. McMurtie spoke of the advantage of having a reliable safety plug, and of the general disbelief in the usefulness of the plugs heretofore used.

An unrepealed law of the State of Massachusetts requires that every steam boiler in the State shall be provided with a fusible plug, but so nearly universal is the belief in their uselessness that it would be difficult to find a boiler with a plug properly inserted, or, indeed, with any plug at all.

Past experience teaches that there is no device which will fully take the place of care and watchfulness on the part of the engineer, and that where these are wanting, boilers will explode with or without fusible plugs. Several of the new plugs were blown out of a small boiler, in the metallurgical laboratory, after the meeting.

A NEW INJECTOR.

A new injector invented by W. B. Mack, and manufactured at the National Tube Works in this city, was exhibited by Mr. J. A. Grosvenor. This injector differs from others in having but one valve that has to be manipulated by hand; the waste valve is entirely automatic and requires no attention on the part of the engineer.

This machine is very compact, and its parts are few and simple; it contains but one valve besides that controlled by the engineer. One advantage, possessed by the injector over the ordinary force pump, is that it can be used, by locomotive or other boilers, while the engines are at rest.

A TURBINE WATER WHEEL.

A new diagonal turbine was exhibited and explained by the inventor, Mr. Libby, of Medford, Mass.

The chief advantage claimed for this wheel is that the lines described by the water in its passage through the wheel are as direct as possible; and thus the loss of power resulting from change of motion and consequent reduction of momentum is to a great extent avoided. The disk plate is cast in one piece, pitching in and downward to the axis of the wheel, at an angle of nearly forty-five degrees; the gate is cast in the same form, and conveys the water to the wheel in an outward and downward direction.

The water is discharged at right angles upon the curves of the buckets, which are of wrought iron.

The construction of the gate is such that a cushion of water lies between the disk plate and gate, so as to equalize the pressure upon the gate.

The superiority of this wheel in the points claimed seems to have been demonstrated by some experimental tests, made with this and several other wheels, by James Emerson, at Lowell, in Dec. 1871.

THE BLANCHARD BOILER.

At a meeting held March 28, Mr. McMurtie made a few remarks, illustrated by diagrams on the blackboard, on the Blanchard boiler. The general plan of this boiler is that of the fire box or locomotive boiler; the tubes, however, are so arranged as to form horizontal tubular diaphragms which divide the water space into three nearly separate compartments.

There is, strictly speaking, but one row of tubes; these connect with the upper part of the fire box, and are doubled upon themselves in such a manner as to traverse the length of the water space three times, forming the three diaphragms, and reach the smoke stack at the lowest and coldest part of the boiler.

The object which the inventor claims to have attained is great economy in the use of fuel; this is accomplished by reducing the temperature of the gaseous products of combustion to the lowest possible point before they are allowed to escape up the stack.

The temperature of the gases, when they reach the stack, is so low that a blower is required to produce the necessary draft. The length of the smoke stack has of course, no effect upon the draft and it may be as short as desired. The feed water is introduced at the lowest part of the boiler, and all vertical circulation is stopped as nearly as may be by the horizontal diaphragms, so that the heated gases are

brought in contact with the coldest water last, and their heat utilized to the greatest extent.

Mr. McMurtie then gave an account of a competitive trial of this boiler with two ordinary tube boilers in Portland, Me. The Blanchard boiler had 830 square feet of heating surface, the others had 1,680; the former had 19·2 square feet of grate surface and the latter 38·7; so that the Blanchard boiler had less than one half the amount of grate and heating surface possessed by the other boilers. The Portland works were run with ease by the Blanchard boiler, although the two competing boilers had been found insufficient for the same work.

The temperature of the gases in the stack of the competing boilers was 720°, while in the Blanchard boiler it was from 200° to 250°; this shows the extent to which the heat is utilized by this boiler.

Mr. Miller said that the Boardman boiler was constructed on the same general plan as the Blanchard, and that the great objection to these boilers was that the different temperatures maintained in the different parts of the boiler tended to produce fractures of the shell.

PRACTICAL INSTRUCTION IN METALLURGY.

Professor Richards explained briefly the new metallurgical machinery recently erected in the Institute.

This machinery consists of a five stamp California battery, an amalgamating pan, a settler, and a Hendy concentrator. The machinery is essentially the same as that used in the best mills in Nevada and California, and is from the well known Union Iron Works of San Francisco. The battery may be used for either wet or dry crushing, and is provided with amalgamated copper plates for catching what free gold or silver there may be in the ore.

In the amalgamating pan, the ore receives a further pulverization, and this answers the double purpose, of liberating all the metal from the rock and of scouring and brightening the metallic particles so that they are in the best possible condition for amalgamating with the mercury, which is introduced in sufficient quantity to insure the amalgamation of all the liberated metal. The contents of the pan are warmed by the introduction of steam during the amalgamation. After amalgamation, the contents of the pan are run into the settler, where the amalgam and mercury are separated from the ore. The object of the concentrator is to separate the heavy and valuable portions of the ore, sulphurets, etc., from the gangue and quartz.

The Society then adjourned to the laboratory and witnessed the running of the machinery.

This laboratory contains all the appliances necessary to enable the student of mining and metallurgy to obtain a practical knowledge of the various processes of ore dressing, smelting, amalgamation, and assaying, used in the best metallurgical works of this and other countries. All the operations of the laboratory are conducted by the students under the supervision of an instructor. A student, on receiving a quantity of ore for treatment, first samples it and determines its character and value by analysis and assays, and makes such other preliminary examinations as may be necessary to indicate the proper method of treatment.

The ore is then treated, and the products carefully examined at each step of the process. He also keeps an account of the amount of power, labor, fuel, chemicals, etc., used, and thus determines the effectiveness and economy of the process.

The Institute has gold and silver ores from over seventy mines in Colorado and Utah, amounting in all to about eleven tuns. After the ores have been treated, reports are sent to the parties who contributed them, and it is hoped that this system of co-operation will enable the Institute to always have a sufficient quantity and variety of ores for the purposes of the laboratory. W. O. C.

SCIENTIFIC AND PRACTICAL INFORMATION.

NEW CASE HARDENING PROCESS.

A resident of Montreal has recently patented in the United States a new process of carbonizing wrought iron articles. Charcoal, coal dust, oil, bone dust, have each been used for this purpose; but strangely enough, one of the most highly carbonized substances, and one most easily accessible to an iron worker, has been overlooked. This is molten cast iron, and the inventor prepares a bath of it, having previously eliminated any phosphorus and sulphur it may contain. Spiegeleisen is especially recommended for the purpose; but good malleable iron, melted in a cupola with charcoal, anthracite or bituminous coal, or coke, will serve the purpose. Crucibles for melting small quantities, or reverberatory furnaces for large masses, may be employed. The cast iron readily yields its carbon to the immersed articles, and this element would rapidly become exhausted if no means are taken to continue a supply. To obviate this, the crucibles and furnaces are lined with a coating of charcoal powder or of plumbago with which nitrogenous matter has been incorporated. Leather or horn shavings will do for this purpose. If the process were carried out on a large scale, the cast iron from which the carbon had been eliminated could be at once sent to the rollers and made into bar iron, another melting being used for a second case hardening operation; and many other changes of detail will probably suggest themselves to our practical readers.

THE CHEMISTRY OF DYEING.

The great impetus given to many manufactures by the discovery of the anilin dyes is being daily augmented by newly invented processes. One of the most recent of these is an improved treatment of ultramarine, the desire of the discoverer (Carl Fürstenau) being to attain some degree of certainty as to the quality of the product. Fürstenau states that he has achieved this by fixing the compounds of the two sorts of ultramarine, commonly called, respectively, Nuremberg or clear blue and the alum-containing and inferior kind. By ascertaining the amount and character of the contained silicates, he finds out to what limit the reducing material can be used, and enables the operator to apply without hesitation the requisite degree of heat.

Clavel, of Basle, Switzerland, has published an account of the preparation of a new violet, obtained by heating magenta and iodide of ethyle without pressure. He calls it the "night violet," and obtains it by connected the apparatus with a glass tube, in which the iodide of methyle, as fast as it is volatilized by the heat, is recondensed and falls back as a liquid. The apparatus is a common cast iron boiler heated by means of a steam jacket. The cover has two openings for two glass tubes in connection with a worm for condensation. The vapors rising out of the boilers pass into the worm, are there condensed, and from thence runs as a liquid into the second glass tube which leads back the iodide of ethyle in a regular stream. For the preparation, he takes magenta crystals, solid caustic soda, and iodide of ethyle, with a suitable quantity of wood spirit; or the iodide of methyle can be used, and alcohol used as a solvent. The magenta and the soda are put into the boiler together, and well stirred till the mixture becomes uniform. Half of the iodide of ethyle is then added, the lid closed, and the condenser connected. Heat is now applied for six hours. The apparatus is then cooled, the remaining half of the iodide of ethyle added, and heating resumed for six hours more. After this time the connection between the condenser and the second or return glass tube is closed by means of a tap, and another tap is opened to allow the condensed iodide of ethyle to run off into a receiver. Heat is again applied, and maintained until all the iodide of ethyle and wood spirit are distilled over and preserved for use on another occasion. The mass which is left behind in the boiler is then taken out, and boiled for a considerable time with a strong lye of caustic soda. This removes all the iodine in the form of iodide of potassium, while the "night violet" is deposited as a cake. This is now in the state of an insoluble base. To render it soluble in water, it must be combined with an acid. For this purpose, the cake is dissolved in dilute sulphuric acid. When this has been done, the color is thrown down by neutralizing with a solution of soda. It is then washed in cold water, dissolved in boiling water, and finally reprecipitated by the addition of common salt. Unlike the ordinary anilin violets, which when seen by artificial light, seem of a reddish brown color, this dye retains its beautiful blue tone. A variety of shades may be obtained by varying the proportions of magenta, soda, and iodide of ethyle.

A FIFTH ATLANTIC CABLE.

Immediately following the announcement, published in our last issue, of the intended laying of a fourth Atlantic cable, being the second between this country and France, comes the publication in London of the prospectus of the Great Western Telegraph Company, Limited. It is thereby proposed to lay a new cable, constructed in the strongest and most solid manner, between the Land's End, England, and Bermuda, with branch cables from Bermuda, to New York and to the West Indies. The contract for the making and laying of the cables has already been signed, and a speedy execution of the work may be looked for. The diminution of the charges for transatlantic messages will soon follow the completion of these additional facilities.

MAGNESIA.

St. Claire Deville once exposed a piece of the hydrated oxide of magnesium (caustic magnesia) to a running stream of water; and he found after a few months that it had become hard as alabaster. He left it in the same place for seven years, and found that it had become still harder. Analysis proved this hardened substance to be nearly pure hydrate of magnesia. He conducted another experiment by stirring up caustic magnesia with water, and sealing the paste up in a glass tube. In a short time, the magnesia became transparent and proved to be a pure hydrate, containing 69·3 per cent magnesia and 30·7 per cent water. Deville at once saw the importance of these facts to cement manufacturers, and published for their information the following results of some experiments on the properties of caustic magnesia: A mixture of magnesia and sulphate of lime does not harden under water, but magnesia and pulverized chalk or marble will, by the action of water, form a hard stone or artificial marble. The magnesia which yielded the hardest stone was that prepared by heating the chloride of magnesium obtained from sea water. Care must be taken to prevent overheating, as a red heat will diminish the hydraulic properties of the magnesia. Dolomite, a magnesian limestone, which has proved so perishable under atmospheric influence, especially when carved into small spires and delicate tracery, is, correctly speaking, a double carbonate of lime and magnesia; and when this is heated, pulverized and mixed with water, it yields a substance of extraordinary hardness. These discoveries were known to and used by the late M. Sorel in the manufacture of his well known artificial stone; and they will probably be of use to those of our readers who are experimenting in this direction.

AN INTERNATIONAL POSTAL SERVICE.

We are informed, on good authority that a congress will be shortly invited by Prince Bismarck to Berlin, to discuss the desirability of instituting a system of international postal arrangements. Prince Bismarck will lay before the delegates the following resolutions: 1. That all the States of Europe, Russia in Asia, Turkey in Asia, Canada, the United States, and Algeria shall form a postal union. 2. That throughout this union, there shall be a uniform postal rate, for letters, of four cents per half ounce; and (3) that newspapers, printed matter, patterns, etc., shall be conveyed for two cents per two ounces. 4. That, to all countries not included in the Postal Union, double the above rates shall be charged. 5. The uniform registration fee for all parts of the world shall be four cents.

INCREASE OF INSANITY IN FRANCE.

Political disturbances have always been followed by many lamentable consequences; and the communistic outbreak in Paris is bearing terrible fruit. The *Lancet* informs us that the number of inmates in the lunatic asylums and *maisons de santé* of France has more than doubled in the last eighteen months; and the Paris Morgue is scarcely large enough to contain the bodies of suicides daily fished out of the Seine. Moreover, there is a marked tendency to insanity in the political prisoners now in durance at Brest, L'Orient, and elsewhere, the large proportion of two per cent being deranged.

The Government Architect.

The supervising architect, the man who has the primary direction of all buildings erected by the United States government, is Mr. A. B. Mullet, a gentleman of extraordinary industry and ability. His official position gives him charge of all our post offices, custom houses, mints, assay offices, etc., both as to construction and repair, and the list of edifices he has planned and built is very large. There is the new State Department building, which will cost about six millions; the New York Post Office, at least four millions; the Chicago Custom House, not less than three millions; the Boston Post Office and Sub-Treasury, about $1,500,000; the San Francisco Branch Mint, one million and a half; and the Custom House at Portland, Maine, about $477,000. Add to the above a great series of edifices whose prices will vary from $225,000 to $395,000, and we can appreciate the enormous labor put upon this energetic and capable architect. The appraisers' stores at Philadelphia; the barge office at New York; the custom houses at Cairo, Knoxville, Omaha, Portland (Oregon), and St. Paul; a marine hospital at Chicago; court houses and post offices at Columbia (South Carolina), Des Moines, Madison, (Wisconsin), Springfield (Illinois), and Portland (Maine), all proceeding at the same time, show a rare executive spirit and capacity. Mr. Mullet is also putting up a series of buildings, which will cost from $20,000 to $80,000, at Astoria (Oregon), Bangor (Maine), Machias (Maine) Boise City (Idaho), Wiscasset (Maine), Charleston, New Orleans, and Baltimore, in some cases restoring and remodeling former edifices almost to the extent of complete reconstruction. To look upon Mr. Mullet is to see a rather small wiry, indefatigable gentleman, who can handle a hundred irons at once, work all day, and sit up the better part of the night; and it would be hard to find anywhere, in either ancient or modern times, a man who has built so much and with such general acceptability. Several of the best architects in New York competed with Mr. Mullet for the plans of the New York Post Office—the most costly edifice which has been erected by the Federal government outside of its own capital. The several plans are exhibited side by side in the architect's office at Washington; few persons fail to perceive at once the superiority of the government architect's; and we apprehend that no experienced eye can follow out Mr. Mullet's work, both in New York and Boston, and not see that, within the conditions of his office, he was probably the most available and versatile man that could be employed.—*Harper's Weekly.*

A New Method of Obtaining Potassium.

White stick caustic potash of commerce was dissolved in water and then treated with sulphuretted hydrogen in the way commonly described for making potassium sulphide, K_2S. The solution was evaporated until it was solid when cool, when the yellowish mass was mixed with more than its bulk of iron filings and chips, and the whole put into an alembic for distillation. The heat of a furnace was applied till the alembic was of a bright red heat, and the products of distillation were received in common coal oil. The product was rather small, as some of the potassium vapor decomposed the heated vessel; nevertheless the potassium showed itself, when the oil was poured off and the residuum turned upon water, by its characteristic ignition and flame. The reaction is simple and may be thus represented: $K_2S + Fe = FeS + K_2$.

I have not conveniences for experimenting upon this on a scale large enough to test its comparative value; it needs some special arrangement of protected vessels, as it violently attacks common crucibles, porcelain, and glass. The materials used for thus obtaining it are of the required cheapness, and the iron sulphide product can again be used to furnish sulphuretted hydrogen for another quantity.

It is probable that sodium can be obtained by analogous process, but I have not attempted it.—*Professor A. E. Dolbear, in the American Chemist.*

Explosive Pills.

Some pills prescribed by a physician in England contained: One half grain nitrate of silver, one sixth grain extract nux vomica, and one half grain muriate of morphine, together with *Cons. ros.* and extract of gentian. They exploded in a very short time, evolving a considerable amount of heat. A similar case occurred in the practice of Dr. Jackson, of Nottingham, England, who prescribed pills containing four grains of nitrate of silver, one grain muriate of morphia and extract gentian. The lady patient, who had the box about her person, was badly burned by the explosion. Pills containing nitrate of silver and creosote or carbolic acid become heated, and even take fire. Of course, when chlorate of potash is employed the explosion is much more violent.

Massey's Rotary Steam Engine.

While in common with most engineers we have conceded the theoretical value of well constructed rotary steam engines, the practical difficulties connected with the realization of an ideal engine of this class have seemed to us well nigh insurmountable. The advantages claimed for the rotary over the reciprocating engine are cheapness, lightness, compactness, and simplicity. If, therefore, the inventor of the engine, here illustrated, has produced an engine which in point of economy of fuel is equal to the reciprocating engine, either of the above points, alone, will insure the success of his invention. For locomotives one rotary engine can be made to do the work of two reciprocating engines, as in the rotary there are no dead points or variation in leverage as in the reciprocating engine. For marine purposes, it is desirable on account of compactness and lightness, and for stationary purposes more particularly on account of cheapness and simplicity.

Up to the present date, no rotary engine has been produced that could approach, in economy of power, the best types of reciprocating engines. The reasons for this have been found in the large amount of clearance in such as use steam expansively, in the great friction upon the journals of the shafts and upon the packing pertaining to almost all of them, and in the leakage caused by wear which occurs in most of them. We have recently published articles on this subject, and therefore need not dwell upon these principles in this connection.

The inventor of the rotary engine herewith illustrated has grappled intelligently with these difficulties, and although, in the absence of competitive tests with engines of the reciprocating class, it is impossible to assert positively what measure of success he has attained, we can say that, from examination of the engine in the performance of actual work and close scrutiny of all its details, we think he has approximated very closely to such perfection as may legitimately be hoped for in a rotary engine.

At first sight, those familiar with what has been done in this field of engineering, might be led to think the inventor had been following a beaten track, and perhaps that the improvements he has adopted were such more in name than in reality. It will be found, however, that very important ends are subserved by seemingly small changes in construction.

We have long maintained that what has generally been considered as the chief difficulty in the construction of rotary steam engines, namely, the keeping of them thoroughly packed without undue friction, was not really the greatest difficulty, nor one that ought to defy the mechanical genius of the present age. A greater difficulty has been, in our opinion, that of using steam expansively with a variable cut off, and without undue clearance. In this engine, as represented in our engravings, the variable cut off is lacking. The inventor, however, claims to have supplied this want—and from an examination of his drawings we are led to believe he has—with a device which, for good reasons, he does not yet wish to make public.

Fig. 1 is a perspective view of the engine, and Fig. 2 is a vertical section illustrating the interior construction. A is the induction port, and B the exhaust. A cam, shown in dotted outline in Fig. 2, actuates the bell crank lever, C, which is pivoted to the stem of the balanced piston valve, D. The exterior case or cylinder, E, is oval, and within it rotates, upon the shaft, F, the drum, G. The pistons, H, are actuated by fixed cams, I, formed upon each inner side of the case, their relative positions at the beginning and end of the stroke being those shown in the engraving. These moving parts are rendered steam tight by spring metallic packing at the ends of the pistons where they meet the exterior case between the points J and K. The sides are rendered sufficiently tight with minimum friction by scraping. At the top is placed a metallic abutment or septum, L, which is packed with a metallic spring packing, like the ends of the pistons. This abutment is pivoted at the middle, as shown, and is prevented from bearing too heavily upon the perimeter of the drum by the action of a set screw placed on the side opposite to the induction port.

The valve is actuated, as above stated, through the cam, shown in dotted outline in Fig. 2, acting upon the horizontal arm of the bell crank lever, C. This cam is adjustable to let off the friction roller in the end of the horizontal arm of the bell crank lever at any point of the stroke. The spring, M, Fig. 1, then acts upon a collar on the valve stem to close the valve and make a sharp cut off.

The operation, therefore, of this engine is as follows: Steam entering at A fills the space between J and L, and accumulates till the pressure is sufficient to start the engine, which commences to rotate The steam being then cut off at the proper point, the steam in the space between J and L, and that following the piston in the space between J and K, expands, till the next succeeding piston reaches the point, J, at which time the exhaust of the expanded steam also takes place, the entering piston meeting the ledge at J, and the outgoing piston leaving the ledge at K. The steam now being admitted again compresses the expanded steam in the space, J L, increasing its pressure rapidly but without shock upon the entering piston until the point of cut-off is reached, when the expansion is repeated. It will be seen that all the steam which escapes from the exhaust is expanded steam, contained between the points J and K, and that therefore this engine has no clearance, and may be instantaneously stopped and reversed, by a very simple valve motion, when required to transmit power in both directions.

The fixed cam, I, does not move the pistons during their passage through the arc, J, K; at all other times the pressure is equalized on each side of the pistons, and consequently they are thrust out and in with slight expenditure of power.

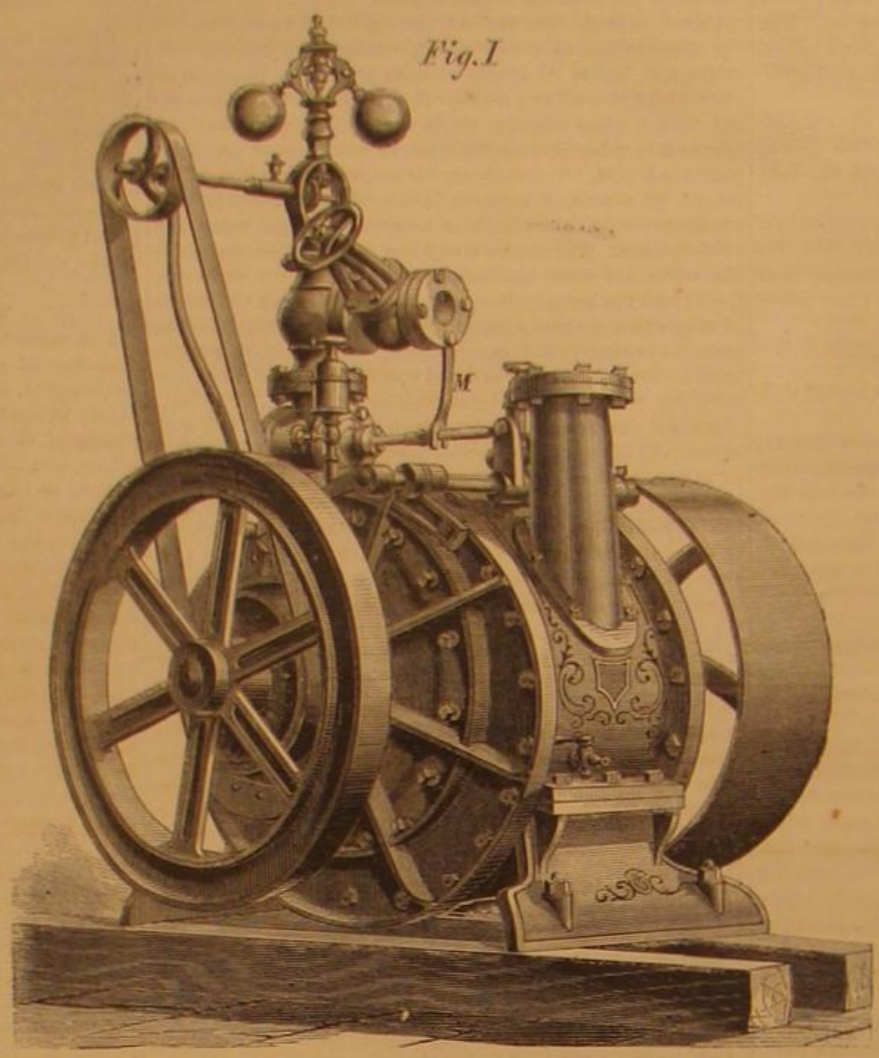


Fig. 1

MASSEY'S ROTARY STEAM ENGINE.

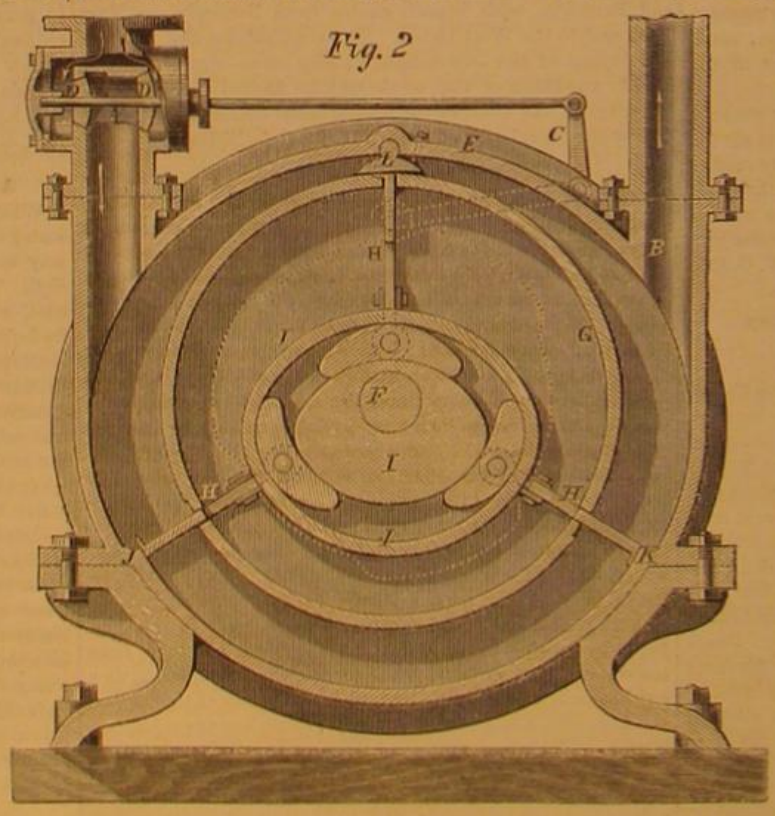


Fig. 2

It is proposed to at least partially balance the pressure, upon the journals of the main shaft, when the engine is applied to locomotives by the weight of the locomotive itself, and in stationary engines to relieve in a measure this pressure by leading off the power in the proper direction from two pulleys, one on each side of the engine. This will reduce the friction and wear of the bearings. The possible wear is still further reduced by making these bearings of steel, and a compensating device for taking up such wear is employed.

The engine from which the engravings were made has at the exterior arc, J K, a radius of 18", the interior arc between the points being 14". This gives a mean radius of 16", and a mean stroke of about 33". The piston surface is 18 × 4.

Patented through the Scientific American Patent Agency, February 13—two patents—and April 16, 1872, and also in several foreign countries. A joint stock company has been organized under the title of the "Massey Rotary Engine Company." Office, 56 Broadway, New York city, with manufactories at Paterson, N. J., and St. Louis, Mo., where engines of various sizes are now being constructed.

For further information and illustrated price list, address G. B. Massey, Secretary, 56 Broadway, New York, or Wm. Massey, Supt., care Crow, McCreery & Co., St. Louis, Mo.

Gun Making by Machinery.

A correspondent, Mr. B. F. Spalding, of New York city, in commenting on the description of gun making by machinery, recently published in our columns, points out that gun stocking machines, such as are mentioned in that article as being in use at Enfield, were made by the Ames Company, at Chicopee, Mass., fourteen or sixteen years ago; and similar appliances had been used, at Springfield, twenty years ago. The system was the invention of Thomas Blanchard and Cyrus Buckland, and other well known American mechanics. "This machinery," he continues, "has been duplicated time and again; and Russia, Spain, and, I think, Turkey and France, have each had sets of it made at the Ames works. The great perfection at which this branch of industry has arrived is mainly due to the idea of making the work to gages, so that the parts would interchange; and this principle is being every day introduced into other manufactures, such as sewing machines, watches, steam engines, etc. This idea is said to have been conceived and first put into practice by Thomas Warner, at that time master armorer of the Springfield Armory, under the superintendence of Colonel James Ripley, late Chief of Ordnance, U.S.A. Mr. Warner has never received any recognition of his valuable services from Government, but is now, at nearly 80 years of age, whether from choice or necessity, at work for days' wages at Chicopee Falls. It is like going to a play, to a modern mechanic, to hear some of the old patriarchs, at Springfield, relate their experience in the wilderness, while wandering ever towards the promised land, where the ripened fruits of ingenuity—clusters of Eshcol—should drop from perfected machinery into the hands of perfected mechanics. For instance, in regard to this very machinery, it is said that when Blanchard, while yet young and ardent, and with a rising reputation, had just got some little machine at work on something not connected with stock making, there were quite a number gathered together, looking to see it perform its automatic operations. One of the stock makers sneered, and said, tauntingly, 'Oh, you may get up some little improvements, but you can never make a gun stock by machinery.' The crowd laughed at the wit, but Blanchard replied, 'I don't know about that.' And the taunt worked on him like yeast, and kept his brain in a ferment, until it evolved the principle of irregular turning, by revolving cutters to the shape of a revolving former, a principle now in general use.

"In a later article, mention is made of the process of bayonet rolling in Ilion; and that reminds me of Harvey Waters' curious and ingenious machine, now in the Springfield armory. Other bayonet rolling processes have the blank prepared, and then a man passes it through the rolls. His machine takes the piece of bar steel, heated red hot, into its iron hand, and passing it from groove to groove, finally holds it out, a smooth shining blade, so near the size required that it only needs the touch of the grindstone to put it into its finished form. I lost about $3,000 waiting for Harvey to perfect that machine; but he has a good one, well worth an extended description.

"There are wonders to be seen and heard in the Springfield armory, and it would pay to send an able reporter there.

"It is certain that the sewing machines could never be made for $12 each, if it were not for the system of gage work and interchangeable parts devised by the old man Warner (a fine old man he is, I assure you), for which grand idea he never has realized anything. Moreover, most of the machinery that makes the work on these machines so cheaply was incubated at the Springfield armory, and most of the perfected mechanics, directly or indirectly, received their education from there."

A COMMUNICATION has been made to the Philosophical Society of Manchester on the destruction of a church by lightning, in which clear particulars are given of the metallic connections, and of the behavior of the shock when it fell. The author states, in closing his paper, that in districts where gas mains, and water mains and pipes are laid underground, all buildings may be entirely protected by connecting the lightning conductors directly with the two sets of mains. Had this been done, he says, at the church in question, it would not have suffered.

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW (PARK BUILDING) NEW YORK.

O. D. MUNN. A. E. BEACH.

☞ "The American News Co.," Agents, 121 Nassau street, New York.

☞ "The New York News Co.," 8 Spruce street, New York.

☞ A. Asher & Co., 20 Unter den Linden, Berlin Prussia, are Agents for the German States.

☞ Messrs. Sampson Low, Son & Marston, Crown Building, 188 Fleet street, Trubner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill, London, are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.

VOL. XXVI., No. 19. [NEW SERIES.] *Twenty-seventh Year.*

NEW YORK, SATURDAY, MAY 4, 1872.

Contents:

(Illustrated articles are marked with an asterisk.)

A Huge Time Piece..... 292
A New Method of obtaining Potassium..... 293
Answers to Correspondents..... 298
Artesian Wells and Malarial Fevers..... 296
A Suggestion to Inventors—Value of Patented Improvements..... 296
Automatic Cattle Stanchion..... 290
Bicycle Trial..... 290
Brandy from Wood Shavings..... 289
Burnt Iron and Burnt Steel..... 289
Business and Personal..... 297
Butter from California..... 291
Cable Towing on the Erie Canal.. 296
*Corn Sheller..... 291
Declined..... 288
Drying Substances by Mechanical Action..... 295
Effects of Frost on Plants..... 289
Explosive Pills..... 288
*Fire Extinguisher..... 291
*First Grand Industrial Exposition of Louisiana..... 290
Gravel Mining in California..... 292
Gun Making by Machinery..... 294
Hawley's Metal Roofing..... 288
*Improved Punching and Drop Press..... 287
Inventions Patented in England by Americans..... 300
Japanese Porcelain..... 290
Light, Heat, and Electricity from Motion..... 289
Lightning Accident..... 294
Lightning Strokes..... 292
New Books and Publications..... 288
Notes and Queries..... 297
Official List of Patents, Extensions, Designs, etc..... 300
Printing from Iron..... 291
Printing on Glass..... 289
Progress of Astronomy—The Variable Stars..... 295
Recent American and Foreign Patents..... 298
*Rotary Steam Engine..... 294
Scientific and Practical Information..... 293
Shad Breeding..... 288
Society of Arts of the Massachusetts Institute of Technology.. 292
Sub-Aqueous Tunnel..... 288
Testing the Strength of Materials. 292
The Congressional Sewing Machine Job..... 295
The Government Architect..... 293
The Grain Elevators at Liverpool. 289
The Tallow Tree and its Uses..... 289
The Thunderer..... 291
To Keep Gum Arabic from Molding..... 289
To Purify Water..... 291

Importance of Advertising.

The value of advertising is so well understood by old established business firms, that a hint to them is unnecessary; but to persons establishing a new business, or having for sale a new article, or wishing to sell a patent, or find a manufacturer to work it: upon such a class, we would impress the importance of advertising. The next thing to be considered is the medium through which to do it.

In this matter, discretion is to be used at first; but experience will soon determine that papers or magazines having the largest circulation among the class of persons most likely to be interested in the article for sale, will be the cheapest, and bring the quickest returns. To the manufacturer of all kinds of machinery, and to the vendors of any new article in the mechanical line, we believe there is no other source from which the advertiser can get as speedy returns as through the advertising columns of the SCIENTIFIC AMERICAN.

We do not make these suggestions merely to increase our advertising patronage, but to direct persons how to increase their own business.

The SCIENTIFIC AMERICAN has a circulation of more than 40,000 copies per week, which is probably greater than the combined circulation of all the other papers of its kind published in the world.

DRYING SUBSTANCES BY MECHANICAL ACTION.

As we have said in former articles, the desiccation of substances may be effected, at least to a certain extent, solely by mechanical agencies. In these, we include all means whatever which do not involve material change of temperature, or chemical action. Prominent among them stands a class of substances which may be called absorbents. These act through their adhesive attraction for water, and therefore can only be useful when such attraction is equal to or greater than that of the substance to be dried. Thus, if it were attempted to dry fragments of glass by the use of powdered resin, the result would be failure, as the glass attracts water powerfully while the resin does not.

A familiar example of drying by absorption is found in the use of blotting paper. This paper, being made porous and not being sized, attracts moisture and absorbs it far more powerfully than hard and sized writing paper, The former, therefore, will soak up and remove the greater part of a drop of ink from the surface of the latter. Chemists often use blotting paper to dry moist powders, precipitates, etc. So jewelers use boxwood sawdust for drying gold and silver ornaments that have been cleansed with soap and water. Sawdust in general is a good absorbent, and may be used to dry metallic objects, after their immersion in sulphuric acid for the removal of scale, etc.

Straining or filtering is another way of separating solids from liquids, but this rarely leaves the separated solid so dry that it needs no further desiccation.

A much more important process of mechanical drying is compression. This method is employed in many industries, sometimes to remove a waste liquid from a valuable solid, and oftener, perhaps, to separate valuable liquids from solids of less importance. The extraction of the juices of fruits for wines, cider, perry, etc., is thus performed; and although in the extraction of beet juice, maceration is practised to a greater or less extent, the press is still, we believe, most generally used.

In applying the press to the separation of liquids from solids, considerable skill and judgment are required. The fluid has to make its way, through innumerable small and constantly narrowing channels, to the exterior; and this is a work of time. To hurry it unduly will cause a waste of power, and often a deterioration of the product, by the expressing of essential oils and extractive principles which it is not desirable to remove. Thus castor oil is often found to contain an excess of a peculiar peppery, acrid principle, which has, through the action of heat and too rapid compression, been forced out with the oil from the ground beans. In the drying of textile fabrics by wringing or compression, much power is often needlessly expended by hurrying the process too much at first. In the wringing of wet goods, the texture is itself the press. In those machines, erroneously called wringers, which remove water by the use of compression rollers, the pressure is advantageously applied successively to different parts of the texture, and these machines constitute some of the best appliances for the drying of woven and knitted fabrics, yarns, etc.

Another very effective means of drying not only such fabrics but other substances, as sugar and the like, consists in the employment of centrifugal force. The substance to be dried is put into a circular revolving cage, of wire gauze or its equivalent, the meshes of which, while retarding the outward motion of the solid, do not obstruct that of the liquid which, by the rapid motion, is forced out and thrown off the exterior of the cage. This is a process of straining, centrifugal force being substituted for gravity. The water adhering to the interior of a bottle may be removed by making use of the same principle. The bottom of the bottle being held in the hand, if the bottle be rapidly swung around by the arm, as on the end of a spoke of a wheel, a few revolutions will impel all the water along the inner surface of the glass till it reaches the mouth of the bottle, from which it will be thrown through the action of centrifugal force. These centrifugal machines have been much employed of late. They are used in Cuba for drying sugar, to a great extent, and have proved very serviceable in many other industries.

THE CONGRESSIONAL SEWING MACHINE JOB.

The application made in the name of A. B. Wilson, to revive his expired patent for sewing machine feed, is still pending before Congress. The evidence presented before the Committee reveals some curious facts.

It appears that Wilson sold out all his rights in this extension some time ago, to Wheeler and Potter, the sewing machine millionaires, and this Congressional application is now being prosecuted in their interest and that of their associates composing the Sewing Machine Ring. They hope by the aid of Congress to get this patent of Wilson extended; and should they succeed they will be enabled to continue the enormous monopoly which, at the expense of the poor, yields them great wealth.

The evidence produced by the remonstrants, by affidavits of competent machinists in different parts of the country, shows "that the actual cost of making the sewing machines of the best quality now in the market need not exceed twelve dollars, and at fifteen dollars they will afford a very handsome profit. The figures taken from Singer's accounts, sworn to by him in 1870, prove that the machines made by that company from 1865 to 1871 cost less than twelve dollars, ($11.83), and they are sold to the public at not less than fifty-five dollars each. The aggregate of profit which must have accrued to the combination and their licensees is enormous. The number of machines, as stated in the evidence on Wilson's behalf, for seven years past is 1,882,479, at an average profit of thirty dollars; on the machines alone, not counting the profits on materials and on ornamented cases, etc., the enormous sum of fifty-five millions of dollars has been extracted from the pockets of the people, over and above a fair manufacturing profit.

The Ring have not improved their machines in any material points; they have made the same styles for fifteen years. They have added devices for hemming and filling, etc., but for these they charge generally an added price, and they have adopted only such improvements in these as they saw fit. The testimony is ample that the machines themselves are not substantially different from what they were fifteen years ago.

No better summing up of the whole matter can be given than is found in the decision of the Hon. S. S. Fisher, made by him in 1870, upon an application of Singer for an extension of a patent for his earliest invention. Mr. Fisher had been for many years familiar with the whole sewing machine controversy; he had also been of counsel for the combination in several of their suits, and as an intelligent and upright judge, he decided that Singer's patent, and others like his, ought not to be extended. He says at the close of his opinion:

"The interest of the managers of the licensed sewing manufacturing concerns, who, six at least in number, have made affidavits for Wilson, or rather for the combination in this case, leads them to demand protection for their profits; but the interest of the public, and of hundreds of inventors whose improvements could not be used by them while this Wilson patent stood in their way, imperatively require that 'all barriers to a free manufacture and sale shall be broken down as speedily as possible, consistently with individual rights.' When they have fallen by lapse of time, Congress should not aid in building them up anew.

More than one thousand patents have been granted, since the original issue of this Wilson patent, for improvements in sewing machines, and more than five hundred in addition for special devices for hemming, felling, gathering, and cording on sewing machines; and only a few of these, which the combination have graciously condescended to buy or to license upon their own terms, have been allowed to be tested by use or to be put into the market for the benefit of the public. The inventors could not use their own improvements without machines to attach them to, and they have been forbidden to make the machines. The average cost of these patented improvements, in cash expended by the patentees in fees to the Patent Office, in models and drawings, and to the patent agents for preparing applications and specifications, can hardly have been less than $250 in each case. All of them have, if the Patent Office has done its duty, some points of novelty and value, and have been adjudged by the Government to be worthy of protection by patents.

These inventors, besides the time given by them, have thus expended nearly four hundred thousand dollars, and the combination, through Wilson, now asks that there shall be no opportunity for them to receive any return therefrom, except at their good will and pleasure, for seven years longer. A large proportion of these patents will expire before the seven years will end, and thus a practical confiscation of them will be enforced, if Congress yields to the pressure of the monopoly.

The public interest requires that when an article has come into general use all barriers to its free manufacture and sale should be broken down as speedily as possible, consistently with individual right. If an inventor has produced a good thing, but the public are slow to perceive it: if he is obliged to spend the greater part of his original grant in preparing for its manufacture, in slowly bringing it to the public notice and in demonstrating its utility, and if it appears that, at the expiration of his first term, if the exclusive right is taken away from him, it is probable that all incentive to further exertions is likely to be destroyed, and no one else appears ready to step forward and take his place, it is obvious the public interest might demand an extension of the patent. But when an invention is used in thousands of households and is wanted in thousands more, the public interest equally demands that the inventors of the first crude forms of the implement, especially if they have already realized hundreds of thousands of dollars under their original grant, shall stand aside and permit the machine to be cheapened and improved by those whom they have shut out of the market. This wall of exclusive privilege has stood long enough in the way of those whose improvements and exertions would doubtless speedily diminish the cost of the machine one half or double its value to the purchaser."

PROGRESS OF ASTRONOMY.—THE VARIABLE STARS.

Next to the application of the spectroscope to practical astronomy, the use of the photometer promises to be of the utmost importance. We have often referred to these important tools of the scientist, and will now only mention one, of recent invention by Zoellner, of Berlin, Prussia, which in fact is a polariscope connected with a telescope. In the so-called polariscope, a ray of light may be made to disappear and reappear alternately, by turning an eye piece of Iceland spar, tourmalin, or other proper material around its axis, through an angle of 90°. This disappearance and reappearance is gradual, and the angle of rotation from 0° to 90° may therefore be used as a measure of the intensity of the light, a stronger light requiring more rotation, to be toned down to a certain standard, than a weaker light. The principle on which this instrument is based is the property of light that, when once reflected under certain angles or refracted by certain media, it becomes incapable of being reflected or refracted again except under certain conditions; the rotating eyepiece of the polariscope procures an alternation of these conditions, and therefore it is equivalent to a measure of light.

The results obtained by Zoellner, in measuring the relative luminosity of heavenly bodies may be summed up thus: Taking the light of Capella as the standard of measurement, or — 1·

PLANETS.	
Neptune	0·0007
Uranus	0·0066
Saturn	0·4
Mars	7·0
Jupiter	10·0
Venus, when full	48·0
FIXED STARS.	
Pollux	0·3
Regulus	0·4
Betelgeuse	0·5
Capella	1·0
Vega	1·2
Sirius	5·0
The light of the sun	55,000,000,000·0
The light of the full moon	10,000·0

In regard to the comparative amount of light given by stars of different magnitudes, when taking as a unit the telescopic stars of the ninth magnitude, we have:

Telescopic	star of	the	9th	magnitude	equals 1
"	"		8th	"	" 2·5
Visible	"		7th	"	" 6·0
"	"		6th	"	" 15·0
"	"		5th	"	" 48·0
"	"		4th	"	" 120·0
"	"		3d	"	" 340·0
"	"		2d	"	" 960·0
"	"		1st	"	" 2,700·0

The most interesting result, however, of these measurements is the determination of the periods of the variable stars, and the intensity of their light at different periods. The first astronomer who noticed a variable star was Fabricius, in 1596; he saw a star, in the constellation *Cetus* entirely disappear, while Holwarde, in Franeker (Netherlands), discovered that there was a regular periodicity in its reappearance, and that its period was 331 days and 20 hours. It is the most remarkable of all periodic stars, as the intensity of its light during this time varies from 1,000 to 1 or 0, showing for about two weeks as a star of the second magnitude, decreasing for three months, remaining invisible for five

months, and increasing again for about two months and a half. There are, however, irregularities, in the degrees of brightness, it attains which are also periodical; and another remarkable fact is that, when decreasing, it changes its color from white to a full red, which is a problem for spectroscopic investigation, not yet explored.

In 1669, Montanari observed the variability of Algol, in *Perseus*, which, among the variable stars, possesses perhaps the shortest period. For 7 hours in every 68 hours, it undergoes a gradual decrease from an intensity of 800 to 120, or, from a star of about the second magnitude to the fourth; then a slow decrease till the minimum intensity is reached, which lasts only 18 minutes; then an increase sets in, till, some 30 hours later, it has attained its first splendor.

Goodricke discovered in 1784 that a star in *Cepheus* changes, in 5 days and 9 hours, from the third to the fifth magnitude; it takes only 38 hours to become bright, while the decrease lasts 91 hours. In *Lyra* is another variable star, which varies every 13 days from the third to the fourth or fifth magnitude; while in *Cygnus*, there is a small star which disappears entirely every 406 days, and at its maximum brightness has from the fourth to the seventh magnitude.

The most remarkable of all temporary stars was seen in 1572 by Tycho Brahe; it appeared suddenly on the 11th of November, in the constellation of *Cassiopeia*, and reached very soon the brightness of Sirius; then it increased slowly till it surpassed even Jupiter and could be seen during the day. In December of the same year, it commenced to diminish in luminosity, and disappeared at last in March, 1574, sixteen months after its first appearance. At first it was white, in March, 1573, it was red, and in January, 1574, again white. From private astronomical records, it appears that, in the years 945 and 1264, a bright star appeared at the same spot, and therefore some astronomers hold that this is the same star, which has a periodicity of 313 years. If so, it will again appear in 1885. Kepler observed a similar star which appeared in October, 1604, and soon reached the brightness of Jupiter. It soon diminished, and in January, 1605, was still as bright as Arcturus; but in March, 1606, it disappeared entirely.

The record of a certain star in the constellation *Argus* is remarkable. It was seen by Halley in 1677 as one of the fourth magnitude. In 1751, Lacaille observed it as of the second magnitude. In February, 1827, it had increased to the first magnitude, but returned soon to the second, till 1837. In 1838 it increased in brightness till it became equal to the third star in the heavens, then it diminished, but not below the first magnitude, until April, 1843, when it increased again till it equaled Sirius in splendor. Then it diminished, till in May, 1863, it was scarcely visible to the naked eye; and now, in 1872, though it seems to have commenced again to increase, it is still of only the sixth or fifth magnitude.

On May 12, 1866, a new star of the second magnitude was suddenly seen in the constellation of the *Corona Borealis*, in the place of a telescopic star of the tenth magnitude; it was investigated by Huggins with the spectroscope, and he found that, besides the dark absorption lines similar to those found in the light of our sun and produced by its atmosphere, there was another spectrum of four luminous lines, as produced by our flames. The conclusion which was drawn from the observation was founded on the fact that three of these lines were perfectly identical with those of hydrogen when illuminated by the electric spark passing through it. Thus the star had suddenly become so bright by the evolution of luminous hydrogen, probably burning; therefore it was predicted that it would soon diminish, as such an enormous conflagration could not last forever; and this was actually the case. First the hydrogen lines disappeared in the spectrum, and the star had, on May 20, already fallen below the sixth magnitude, while it sank soon to the tenth, as before. Since that time it has fluctuated slightly. In 1870, it was of the seventh magnitude, and is now, in 1872, of the eighth, and thus invisible to the naked eye.

The temporary stars which disappear totally are very rare; during the last 2,000 years, only some twenty have been recorded. The variable stars which do not entirely disappear are scarcely more numerous; their number thus far recorded is twenty-four; but by the greater perfection in the photometers by the application of the polariscope, there is no doubt but that observations will reveal a great number of slight fluctuations which have thus far escaped notice. Our sun itself is a periodical star of which the time is eleven years, this being the period of a greater or less number of sun spots. In other stars, the periodical number of spots is larger, or they have a companion, which is darker and periodically eclipses the main star. The hypothesis of double stars revolving around a common center of gravity, one being light and the other darker or perhaps non-luminous, is now being adopted by the most advanced astronomers.

ARTESIAN WELLS AND MALARIAL FEVERS.

We recently noticed the connection of water obstructions with the increase of malarial disease in the Eastern States. A cognate subject is the increase of similar complaints through causes connected with artesian wells. The leading article in the *Georgia Medical Companion* for January, discusses this subject at length, attributing the great increase of malaria in certain districts to wells of this kind.

It appears from this article that, although physicians and the people at large have striven to shut their eyes to probable injuries arising from the artesian system on account of the many advantages it possesses, they are finally compelled to acknowledge that the wells are operating disastrously upon the sanitary condition of the regions where they are most numerous. We quote a paragraph or two which sets forth the magnitude of the evil:

"The military and Hamilton roads, which converge at Columbus, Lowndes county, Miss., are the oldest roads in that section of the State, and, as they passed through a productive agricultural region, were early settled and well improved. This section of country was never regarded as sickly, even when the lands were first opened. But since 1841 or 1842, or since the introduction of artesian wells, which are found at almost any homestead, malarial fevers have so increased in severity and prevalence that almost all the entire male population of the early settlers are dead, and the country is owned by a remnant of widows and by new settlers.

The increase and severity of the fevers has also been observed in Pickens and Green counties, Alabama, in which these artesian wells abound. The Subute, Lipsey and Black Warrior counties have become more and more unhealthy, and of late years a new and virulent form of malarial disease, called yellow disease, or hæmatural intermittent fever, extremely fatal, has been developed, and upon inquiry found to originate in the vicinity of these same artesian wells.

This ugly disease has extended into this section of Mississippi, and with singular uniformity sticks closely to the bored well neighborhoods. In fact, so common is the occurrence that in the absence of some very obvious source of malarial poison, the physician inquires at once for an artesian well. A conversation, with a number of the members of this society, reveals that at least 7-10 of all their cases of yellow disease, particularly the fatal ones, occurred on premises containing artesian wells.

The same is true, also, of that aggravated form of algid congestive fever, which prevailed at the first settlement of the country, but which had almost entirely disappeared. It is found reappearing in these artesian well neighborhoods.

Any place very sickly, more so than the surrounding settlements, is very apt to be distinguished by the abundant overflowing well located thereon. The northwestern portion of Columbus—the sickliest portion of the city—contains most bored wells, and until an artesian well ran out in the main street of the city, chill and fever among the clerks and young men was almost unknown. Since that time they have been very prevalent."

The causes for this serious evil are various, but all are considered to be traceable to the wells as their source. First, a large portion of the waters flowing from the wells is impregnated with iron. While chalybeates have always been considered the most healthy of all mineral waters, how far their continued constant use may debilitate the system and fit it for the reception of malarial poison, is a question not answered. Like other stimulants, they may produce a resultant depression, or they may by protracted use produce other obscure effects, as the magnesian limestone springs of Switzerland produce cretinism and goitre.

These surmises may well lead to further investigation, but there are more direct influences connected with artesian wells not so difficult to connect with the diseases in question. Artesian wells constantly flowing necessarily bring to the surface a large amount of moisture, which in the heat of southern climates facilitates vegetable decay, all the more since the mineral character of the waters causes them to deposit deliquescent oxides and salts which retain moisture. The fact that districts which abound in mineral waters of this kind are generally subject to malarial fevers has been observed without the inference that artesian wells would be likely to set up a similar set of conditions.

If this increase of vegetable decay be, as seems probable, the chief cause of malaria, a remedy for it without foregoing the advantages of the artesian system seems difficult to suggest. It appears that the old saying "there is no great loss without some small gain" may be reversed in applying it to many of our attempts to ameliorate the condition of mankind.

A SUGGESTION TO INVENTORS.---VALUE OF PATENTED IMPROVEMENTS UPON PATENTED INVENTIONS.

A certain proportion of useful improvements is found upon examination to be temporarily unavailable to their inventors, because they can only be used in connection with other inventions already protected by letters patent. On this account, inventors often neglect to procure patents upon such improvements, though many of them are of great value and would ultimately prove remunerative.

To illustrate this: Suppose a man were to perfect an improvement which should increase the utility of any one of the popular mowers and reapers now in use. The proprietors of the machine would not be slow to see the value of such an improvement, and, knowing that it would better enable them to compete with the manufacturers of rival machines, would be willing to pay a reasonable price for the privilege to apply the invention. This is one way in which inventions of this class prove valuable when patented.

Suppose, however, that an invention is made of a combination of devices which work well together, yet among which is found something covered by another patent, and without which the improvement is valueless. In this case, investigation often shows that the obstructing patent has only a small portion of its term to run, after the expiration of which the new invention, if patented, may have twelve, eight, or six years of uninterrupted prosperity.

Such being the case, in securing a patent the latest inventor avails himself prospectively of a valuable franchise, which it were the hight of folly to neglect simply because it cannot be made immediately remunerative.

Great loss is annually sustained by such neglect. We can call to mind numerous improvements now meeting with large sale, which pay nothing to their inventors in consequence of such neglect, yet which would, if patented, for some years to come make large returns to those whose ingenuity and thought produced them. Let inventors remember that, although "a bird in the hand is worth two in the bush," a bird in the bush is sometimes a most valuable bird, worth a good deal more than it costs to secure him.

CABLE TOWING ON THE ERIE CANAL.

In addition to the offering of a reward of one hundred thousand dollars for an economical motive power for canal boats, heretofore noticed by us, the Legislature of the State of New York, by an act passed in 1870, authorized the laying down of traction cables in the canal, for the purpose of propelling boats on what is known as the Belgian system. To effect the desired propulsion, the cable is made to wind around a drum placed upon the boat. When power is applied to the drum the boat is propelled, and the cable falls again to the bottom of the canal as fast as it unwinds from the drum.

Many miles of canals, in France, Belgium, Holland, the North German Confederation, Austria, and Russia, are now navigated on this plan.

Under the provisions of the act before alluded to, a company was organized in 1871, called the New York Steam Cable Towing Company; and in November, 1872, the corporation laid down a cable six miles long, in the Erie Canal, extending from Albany to West Troy, and proceeded to make a practical trial of the system. On this portion of the canal there is one lock, and several curves, none of a less radius than 1,000 feet. The cable, an inch in diameter, resembles a submarine telegraph cable. The machinery for working the cable was placed on board the small steam tow boat *Governor Clinton* and connected with the engine. The mechanism is known as Fowler's clip drum. It consists of a cast iron wheel, the circumference of which, forming the groove of a pulley, is provided with a number of movable clips, turning round steel centers. These clips, each pair about two and a half inches long in the direction of the circumference, nearly touch each other, and form thus a complete movable groove, into which a rope may be placed. The centers of the clips are so arranged that the rope, pressed into the groove by its own strain, produces a slight movement of the clips toward the center of the drum, narrowing thus the space in which the rope rests. This will produce a certain pressure of the clips against the rope, which increases with the force with which the rope is pressed into the clips, and which again is in proportion to the strain exerted by the rope. It is, therefore, clear that, with a very small strain in what is called the back or slack rope, a very considerable strain in the pulling or front rope can be exerted without any danger of slipping, as the friction between rope and pulley increases in proportion to the power exerted.

The necessary tension in the back rope is gained by a press pulley, which, rolling on the rope where it leaves the drum, produces sufficient friction between the last clips touched by the rope and the cable itself to replace the required back-strain and secure the action of the clips.

The experience of many years has proved that drums of four to five feet diameter, acting on a rope which touches half the circumference of the groove, are capable of transmitting with perfect safety forty to fifty horse power, the rope moving at the rate of four feet per second, or, in other words, exerting a direct pull of over six thousand pounds.

Into the groove of this drum, which is attached to and worked by machinery on board the vessel, the towing cable is placed. The engine being put in motion, the boat is naturally hauled along the towing cable, which by the action of the machinery is, in a slanting direction, lifted up from the bottom of the canal, and after passing over the clip drum falls back again, slack and nearly perpendicularly into the water.

The weight of the rope, which produces the necessary friction and adhesion to the bottom of the canal, is, if we may say so, the fixed point at which the clip drum pulls. The strain produced by it will be felt some distance ahead of the boat, stretching out that part of the rope. But, after having passed the clip drum, the wire will fall back into the bottom of the canal with the slackness it had before.

The slackness of the rope behind (combined with the fact that ahead of the boat the cable is lifted from the bottom of the canal to a considerable distance), given by the strain, by its weight per foot, and by the depth of the canal, allows an almost perfectly free movement of the boat with regard to steering.

It is alleged that the loss of power by the friction of the cable and winding machinery is only five per cent. We fear that this estimate is too small. The loss of power, from slip of the screw or paddle wheels of ordinary steam vessels, is generally from twenty to thirty-five per cent.

A large number of trials were made with the *Governor Clinton*, including some severe tests in towing heavily loaded barges, all with the most satisfactory results. A number of intelligent engineers, canal officers, and others, who witnessed the experiments, express themselves very strongly in favor of this plan of propulsion on account of its economy and reliability.

The company states that this system will enable boats to make twice the usual number of trips in a season. This will double their earnings, and practically double the equipments and capacity of the canals, and reduce the cost of transportation.

Hitherto no process has been invented for towing boats on canals so cheaply as animal power. For a series of years past animal towage has cost from thirty-five to fifty cents per boat per mile. During the season of 1871, the price has ruled from thirty-five to forty cents per mile. Therefore, the aggregate cost of towing a boat the whole length of the Erie canal, 350 miles, at, say, thirty-five cents, is $122.50.

By the steam cable system, it is confidently believed that boats can be towed through the canal, with double the speed, at a greatly reduced cost. For example: One tug will haul six canal boats at a uniform speed of three miles per hour.

The cost of running the tugs for twenty-four hours may be stated as follows:

Two tuns coal at	$6	.....	$12
One captain	3	.....	3
Two engineers	3	.....	6
Two wheelsmen	2	.....	4
Two deckhands	1.50	.....	3
Board of 7 men	1	.....	7
Oil, incidentals, etc.		.....	5
			$40

Then, if six days be allowed for making a trip, the cost of towing six boats through the Erie canal, by this system, will be only $240, against $122.50 for one boat by animal towage.

Of course, interest on capital, wear and tear of machinery, and unforeseen contingencies, will increase the cost of steam cable towage considerably above these figures.

The cost of equipping the Erie canal for this system will be as follows:

350 miles double cable — 700 miles steel wire cable	$1,400,000
100 tugs, with machinery complete.....	1,000,000
Cost of preparing locks, gates, and laying cable..	25,000
	$2,425,000
Contingencies, say,.....	75,000
Total.....	$2,500,000

State Engineer Richmond, in his report to the Legislature in 1871, estimates the cost of the construction and equipment of the canals at $80,710,832. In addition to this large outlay of money by the State, individual capital has stocked these canals with nearly 7,000 boats of sufficient capacity to carry, with the present method of towage, over 10,000,000 tuns in a single season. The commerce of these canals has, for the last ten years, averaged nearly 6,000,000 tuns per annum. By virtue of its charter and certificate of organization, this cable company has the exclusive right to tow or propel boats by this system upon the canals for fifty years.

Practical Hints to Inventors.

MUNN & CO., Publishers of the SCIENTIFIC AMERICAN have devoted the past twenty-five years to the procuring of Letters Patent in this and foreign countries. More than 50,000 inventors have availed themselves of their services in procuring patents, and many millions of dollars have accrued to the patentees whose specifications and claims they have prepared. No discrimination against foreigners; subjects of all countries obtain patents on the same terms as citizens.

How Can I Obtain a Patent?

is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them: they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row New York, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible, and send by mail. An answer as to the prospect of a patent will be received, usually by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention, if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

Rejected Cases.

Rejected cases, or defective papers, remodeled for parties who have made applications for themselves, or through other agents. Terms moderate. Address MUNN & Co., stating particulars.

European Patents.

MUNN & Co. have solicited a larger number of European Patents than any other agency. They have agents located at London, Paris, Brussels Berlin, and other chief cities. A pamphlet pertaining to foreign patents and the cost of procuring patents in all countries, sent free.

MUNN & Co. will be happy to see inventors in person, at their office, or to advise them by letter. In all cases, they may expect an *honest opinion*. For such consultations, opinion, and advice, *no charge is made*. Write plain; do not use pencil, nor pale ink; be brief.

All business committed to our care, and all consultations, are kept *secret and strictly confidential*.

In all matters pertaining to patents, such as conducting interferences procuring extensions, drawing assignments, examinations into the validity of patents, etc., special care and attention is given. For information, and for pamphlets of instruction and advice,

Address

MUNN & CO.,

PUBLISHERS SCIENTIFIC AMERICAN,

37 Park Row, New York.

OFFICE IN WASHINGTON—**Corner F and 7th streets, opposit Patent Office.**

Examples for the Ladies.

Mrs. T. M. Scullin, Troy, N. Y., has used her "dear friend," a Wheeler & Wilson Machine, since 1858, in dress and cloak making. The last six months she earned $332, and the year before, $417.

Mrs. Mary Hacher, Muscatine, Iowa, has used her Wheeler & Wilson Machine since September, 1857, and earned from $10 to $23 a week, making dresses and cloaks, from the finest to the heaviest, and her machine is now in as good order as when she bought it.

Mrs. C. D. Goodman, Cleveland, Ohio, has used her Wheeler & Wilson Machine 4½ years with the same No. 2 needle that came in it without breaking or blunting it.

Mrs. J. R. Bowen, Wellsboro, Pa., has used her Wheeler & Wilson Machine almost constantly since 1859 on all kinds of material, without any repairs or personal instruction.

Governor Merrill on the Marion Watches.

Messrs. GILES BROS. & Co., Chicago, Ill.:

I take pleasure in saying that the watch I bought of you, being 21,767, "Fayette Stratton, Marion, New Jersey," made by the United States Watch Co. (Giles, Wales & Co.), has given perfect satisfaction; its variation from mean time since regulated being scarcely perceptible.—SAM'L MERRILL, Gov. of Iowa.

Beware of Fictitious Flavoring Extracts. Try Burnett's. Go to the dealer who has them.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin. $4 00 a year. Advertisements 17c. a line.

Wendell's Patent Door Stop, illustrated Dec. 23d, 1871. The best thing for Agents. State and County rights for sale. Samples post paid 40c. Wendell and Francis, 436 Walnut Street, Philadelphia, Pa.

Edge tool makers' Grindstones—J.E.Mitchell,York av., Phila

Hammer makers' Grindstones—J.E.Mitchell,Philadelphia,Pa.

Owners of patents for articles in general hardware trade can sell, or have made and introduced on royalty to advantage by Van Wagoner and Williams, 27 Park Row, New York.

For Steam Whistles, address Exeter Machine Works, 75 Congress Street, Boston, Mass.

A competent mechanic wishes to take charge of machinery in a manufacturing concern—well versed in demonstrating machinery. Reference given. Address G. P., care A. Frank, Erie-Basin Dock, South Brooklyn, N. Y.

Adrian H. Muller, P. R. Wilkins & Co., will offer at Auction, on Tuesday, May 7th, at 12 M., at Exchange Sales Room, 111 Broadway, New York, Fireproof Factory in South Brooklyn, L. I. For particulars, address P. O. Box 129, Jersey City, N. J.

Nickel in Solution, fit for plating by applying the same with a brush, for sale by W. F. Wuterich & Co., Harlem R. R. Depot, White St., New York. Invention for sale.

Over 800 different style Pumps for Tanners, Paper Makers, Fire Purposes, etc. Send for Catalogue. Rumsey & Co., Seneca Falls, N. Y.

"Best protection against Fire," Babcock Extinguisher, 407 Broadway, New York.

Lord's Patent Separator for Ores, or any dry material, built to order. State rights for Sale. 232 Arch St., Philadelphia, Pa.

Important.—Scale in Steam Boilers.—We will Remove and prevent Scale in any Steam Boiler or make no charge. Geo. W. Lord, 232 Arch Street, Philadelphia, Pa.

For Sale—Twenty and thirty horse power Portable Engine of superior quality. Poole & Hunt, Baltimore.

"Anti Lamina" will clean and keep clean Steam Boilers. No injury to iron. Five years' use. J. J. Allen, Philadelphia, Pa.

Iron Roofing—Made and Sold by C. A. Scott, Cincinnati, Ohio.

For the best and cheapest Water Wheel Regulator "in all creation," address Sullivan Machine Co., Claremont, N. H.

Wanted—The best machine in the market for making Boiler Rivets. Address, giving full particulars, P. O. Box 169, Milton, Pa.

Painters, attention—New Pat. Quick, Clean, Easy, and Cheap Way of Graining, first class Imitations of Oak, Walnut, Rosewood, etc. Send Stamp for Circular. J. J. Callow, Cleveland, Ohio.

Williamson's Road Steamer and Steam Plow, with Rubber Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1309.

Kelley's Chemical Metallic Paints, $1, $1·50, $2 per gallon, mixed ready for use. Send for cards of colors, &c., 116 Maiden Lane, N. Y.

For Circulars of Miter Dovetailing Machines, with or without the Angular Attachment, patented Nov. 28, 1871, address, for price and particulars, Asahel Davis, Lowell, Mass.

Tested Machinery Oils—Kelley's Patent Sperm Oil, $1 gallon; Engine Oil, 75 cts.; Filtered Rock Lubricating Oil, 75 cts. Send for certificates. 116 Maiden Lane, New York.

Portable Mulay Saw Mill, that may be run profitably by the power of a Thrashing Engine. Manufactured by Chandler & Taylor, Indianapolis, Ind. Send for circular.

For Diamond Turning Tools for Trueing Emery Wheels and Grindstones, address Sullivan Machine Co., Claremont, N. Hamp.

Billiard Cushions—Manufacturers of Billiard Tables, use Murphy's Patent Cushions. The finest made. Send for sample set. Gutta Percha and Rubber Manufacturing Company, 9 & 11 Park Place, New York.

For the best Recording Steam and Indicating Gauges, address The Recording Steam Gauge Co., 94 Liberty Street, New York.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N. Y.

In the Wakefield Earth Closet are combined Health, Cleanliness and Comfort. Send to 36 Dey St., New York, for descriptive pamphlet.

Presses, Dies & all can tools. Ferracute Mch Wks, Bridgeton, N.J.

Hoisting and Pumping Engines (Locomotive principle); best and simplest, from 6 to 40 H.P. J. S. Mundy, 7 R. R. Av., Newark, N. J.

L. & J. W. Feuchtwanger, 55 Cedar St., New York, Manufacturers of Silicates, Soda and Potash, Soluble Glass, Importers of Chemicals and Drugs for Manufacturers' use.

To Ascertain where there will be a demand for new Machinery, mechanics, or manufacturers' supplies, see Manufacturing News of United States in Boston Commercial Bulletin. Terms $4.00 a year.

Kelley's Pat. Petroleum Linseed Oil, 50c. gal., 116 Maiden Lane.

Diamond Carbon, of all sizes and shapes, furnished for drilling rock, sawing stone, and turning emery wheels or other hard substances, also Glazier's Diamonds, by John Dickinson, 64 Nassau st., New York.

Seeds and Fertilizers. R. H. Allen & Co., New York.

Railway Turn Tables—Greenleaf's Patent. Drawings sent on application. Greenleaf Machine Works, Indianapolis, Ind.

Pattern Molding Letters (metallic), to letter or number the patterns of castings. All sizes. H. W. Knight, Seneca Falls, N. Y.

Peck's Patent Drop Press. For circulars address the sole manufacturers, Milo, Peck & Co., New Haven, Ct.

Enameled and Tinned Hollow-Ware and job work of all kinds. Warranted to give satisfaction, by A. G. Patton, Troy, N. Y.

Best and Cheapest—The Jones Scale Works, Binghamton, N. Y.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Belting as is Belting—Best Philadelphia Oak Tanned.—C. W. Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

Boynton's Lightning Saws. The genuine $500 challenge. Will cut five times as fast as an ax. A 6 foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

Over 1,000 Tanners, Paper-makers, Contractors, &c., use the Pumps of Heald, Sisco & Co. See advertisement.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro., 414 Water st., N. Y.

Hydraulic Jacks and Presses, New or Second Hand, Bought and sold. send for circular to E. Lyon, 470 Grand Street, New York.

Notes & Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—SULPHATE OF MERCURY.—Will some person inform me how to prepare the sulphate of mercury used in electric batteries?—F. G. V.

2.—DYEING.—Can some of your readers inform me how I can dye an article a cedar color without boiling?—A. C. R.

3.—PHOSPHATE OF CHALK.—What are the proportions of amorphous phosphorus and chalk in the phosphate of chalk, used in the Holmes' signal mentioned in your paper of April 13, page 243?—A. H. C.

4.—AEOLIAN LYRE.—I have tried to find out how to make an aeolian lyre, but the one I have made gives no sound. Will some one please give the true construction?—J. F.

5.—WILD BEES.—Will some one inform me which are the best ingredients for baiting wild honey bees, in order to course them to their homes?—C. J. M.

6.—SODA WATER.—Will some one inform me how to make a soda or mineral water generator, or fountain, and the material or ingredients for the mineral waters?—T. E.

7.—GALVANIZED IRON VESSELS FOR MILK.—Will a vessel made of iron and galvanized bright be suitable to hold milk or cream till it sours or clabbers ready for churning? Will it impart any poisonous properties to the milk? And will the milk affect the galvanized metal on the vessel?—W. P. T.

8.—PARCHMENT.—Will some of your readers please inform me how the skins that form the heads of banjos, tambourines, etc., are made so transparent? Can the skin of a cat be made so?—F. W.

9.—MAGNETIZATION.—Is it possible to magnetize a circular piece of steel about six inches in diameter by half an inch thick? How can I apply loadstone to steel? Must the steel be tempered?—M.

10.—DIMENSIONS OF WOODEN AXLES.—Will some one give me a practical and reliable rule for cutting ordinary wooden and thimble skein axles for wagons, so that the wheels will track five feet from center to center? The size of boxes, weight of wheels, dish and length of hub are known.—E. T. C.

11.—GALVANIZED IRON PIPES.—I have through my house galvanized iron pipes, with occasional lead connections and brass fittings. What will prevent zinc poisoning? What is the antidote for zinc? Keeping the water constantly fresh will lessen the evil. I wish its prevention. My tank is galvanized iron.—B.

12.—BRITTLE SPIRAL SPRING.—Can any one tell me why a tempered spiral spring of a pegging machine breaks after it has been run some time? Does the continual pounding condense the steel and make it harder, or does it change the grain of the steel and make it coarse and brittle? Is the steel harder or softer than at first?—W. A. S.

13.—CONCRETE WALLS.—A number of concrete buildings have been put up in this city within a few years past, and but one difficulty is experienced. That is the flaking or scaling off of the outside of the walls, at or near the surface of the earth, caused by the action of the frost on the water which has been absorbed by the wall. What is wanted is a coating, for the outside of the wall, that is impervious to water or moisture. If the difficulty can be remedied a concrete wall would no doubt be superior to any wall yet known for economy and warmth. Who among your many readers can suggest the remedy?—T. D. D.

14.—GREASING COGS.—Is it any use to grease the teeth of geared wheels, as, for instance, the gearing of reaping and mowing machines?—C. A. A.

15.—CRUDE PETROLEUM.—Can this substance be used as a paint? Is it a good preservative of wood work exposed to weather? And will it preserve polished iron or steel from rust?—C. A. A.

16.—ARTIFICIAL CORAL.—Will some one describe the way to make imitation or artificial coral?—W. S. P.

17.—BLACK BOARD.—What is the best preparation for black boards? I have tried several paints and other solutions without success. Is there any preparation whereby a liquid slating may be applied?—F. D. W.

18.—DIMENSIONS OF ENGINE.—I have an engine, the cylinder of which is 6 x 12, the boiler 14 x 32. I ordered an engine of 12 horse power, and received one as above described. Will some of you readers inform me what power the engine can safely develope?—W. A. M.

19.—CLEANING INSTRUMENTS.—Will some one please inform me what is the best material or polish for cleaning surveyors' instruments and the like?—H. O. M.

20.—PREVENTION OF RUST.—What will prevent cast iron stoves from rusting in the salt moist air of the West India islands?—H. C.

21.—PREPARING FABRICS FOR PAINT.—Will some one please inform me how to prepare white cotton cloth so that the oil from paint will not spread and leave a yellow streak around the paint? Some preparation that will not color the cloth, or render it hard and stiff, is desirable. —F. O. L.

22.—BLOWING OUT BOILER.—Having some doubts as to the propriety of our plan of blowing out, I was much interested in D. & N.'s query (21, March 9) hoping it would draw forth satisfactory information. The advice by S. F., of Pa., (April 6) is in my opinion very good; but it is so different from the general course that I am afraid there is prevalent a great error—and one that does not confine itself to this country—or else S. F. is over cautious. We work two boilers at 70 pounds to the square inch; they might be termed twin boilers, being equal in dimensions and style of build, return flues, etc. They are swung in the ordinary way, divided by midfeather or wall of brick. When the machinery is partially stopped for cleaning, etc., we can run very well with one boiler, the steam being at 55 or 60. We draw the fire from underneath one boiler, and leave open the furnace door, closing the damper and opening the lid in front of the flues. We shut off the connections with the other boiler and open the discharge. In 30 minutes the water is gone. We then open safety valve, close the discharge, open the supply, and commence pumping. In 30 or 40 minutes more our boiler is charged with fresh water, our steam all the time up at from 50 to 60. If this is wrong, will our friends set us right by showing how we ought to act, as I know from observation that many others act in a manner very similar to our own?—J. W. K.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at $1·00 a line, under the head of "Business and Personal.

ALL reference to back numbers must be by volume and page.

S. W. S., of Mass., will find the desired information on page 9, Vol. XXIV. of the SCIENTIFIC AMERICAN.

R. T., of N. Y.—Butter is contained in little oil cells which float in the milk. In churning, the envelopes of these cells are burst, and the particles of oil coming together cohere in gradually increasing masses; this is called "gathering."

J. R. E., of N. Y., writes us that no wells are dug in his neighborhood without using a forked limb of plum wood as a divining rod to tell where water may be found. We believe that forked limbs of every kind of timber have been used by the ignorant and superstitious, in search of water or hidden treasure. The ones who pretend to have the power to use these rods for such purposes are forked limbs of—that is, they are humbugs, either self deceived or wilfully deceiving. A man taking a pinch of snuff and digging on the spot where he first begins to sneeze will find water as many times as he will by the fancied indications of forked rods of plum, elder, birch, witch hazel, or any other wood where these varieties do not grow.

MEASURING GASES.—The temperature and pressure are always to be referred to a standard in measuring gases. In metering illuminating gas, temperature is not made standard, as it will average about the same under ordinary circumstances from year to year. The standards of pressure are generally fixed in the charters of gaslight companies, and if they deliver gas at lower pressures they violate their legal obligations to consumers.

F. A. K.—Shall be happy to receive your communication, and will consider it upon its merits.

M. B. C., of Canada.—You need and should get the advice of a practical engineer.

LUBRICATOR FOR STEAM ENGINE.—The best lubricator for a steam engine I ever found was beef tallow and beeswax.—T. W. K., of Texas.

COLORING CASTOR OIL.—To S. W. O., query 1, page 249.—Make a strong tincture of turmeric root with strong alcohol, and add a few drops to the oil until you have the desired color. Rather than being a disadvantage, it will prove a benefit, tending to prevent griping.—E. H. H., of Mass.

NICKEL PLATING LEAD PIPE.—To B., query 9, page 249.—Lead pipe so coated will undoubtedly be good, and the water will be preserved from contamination with the lead, as occurs with all soft water. But, as a matter of economy, no advantage would be gained over the tin lined lead pipe.—E. H. H., of Mass.

DYEING.—S. W. O., query 5, page 249, does not state the particular fiber of which his goods, requiring to be dyed, are made. Wool, cotton, and silk, each requires a change in treatment.—E. H. H., of Mass.

DURABLE WHITEWASH.—Query 3, page 265.—Salt or glue size renders whitewash durable.—B.

LAMP CEMENT.—Query 7, page 265.—A high heat will calcine and thus soften the gypsum used to fasten lamp collars.—B.

DOMESTIC EMPLOYMENT.—Query 10, page 265.—Home employment for every working member of a family can be afforded by caning chair seats, making brushes, brooms, baskets, rag carpets, ink, dyes, flavoring extracts, yeast cakes, salves, or a hundred other articles. Don't forget the children's education.—B.

QUESTION IN OPTICS.—Query 12, March 23, 1872.—The magnifying power of a refracting telescope depends upon the relative focal distances of the object glass and eye glass, the exact magnifying power in diameter being found by dividing the focal length of the object glass by that of the eye glass. The illuminating power, or the power which makes objects appear brighter and enables us to see stars which are invisible to the unaided eye, depends upon the diameter and purity of the object glass employed, or, in other words, upon the increased amount of light which is conveyed to the eye by the object glass of the instrument. In the microscope the amplification is found by multiplying the magnifying power of the object glass by that of the eye glass.—J. B.

DOEBEREINER'S LAMP.—To L. G. G.—Take an ordinary fruit jar, with a cork stopper or leaden cover; procure any old bottle that will go into the jar, at least two thirds as tall as the jar. Cut off the bottom of the bottle either with a file, or by wrapping a piece of candle wick soaked in alcohol around it, burning the wick, and dipping in water while hot. A hole is cut in the cork or lead cover to admit the neck of the bottle and prevent it resting on the bottom of the jar. The bottle is closed with a cork fitted with a short glass tube bent at right angles and drawn to a fine opening. Some pieces of zinc are suspended in the bottom by a wire or little basket of lead. The jar is then filled to about one half with dilute sulphuric acid. The acid, coming in contact with the zinc, generates hydrogen gas which escapes from the glass tube. The mixture of air and gas being highly explosive, the lamp should not be ignited at first. After all the air has escaped, a piece of spongy platinum may be placed a little distance from the point of the tube. The gas, impinging on the platinum, heats it sufficiently to ignite itself. The escape of gas may be cut off by slipping a rubber tube closed at one end over the glass tube, or a tube with a stop cock may be used. As soon as the escape of gas is cut off, its pressure drives the acid out of the bottle into the jar, and no more gas is generated. Pieces of spongy platinum mounted on wires suitable for this use may be obtained of dealers in apparatus for thirty-five cents each, and can be sent in a letter.—J. S., of N. Y.

BLOWING OUT STEAM BOILERS.—D. and N., query 21, page 169, are informed that steam boilers should never be blown out under steam pressure. The safety valve should first be raised until the pressure is all removed by letting the steam escape as rapidly as possible; then the hand hole plate or other device should be opened, and the dirt and sediment will run out with the water. But if the boiler is allowed to cool off, the dirt will settle to the bottom and be fastened on by the heat. The dirt is always on the top of the water when there is any pressure of steam on it. I have practiced the above method for ten years, and have had no trouble whatever with scale, although the water was very hard.—J. C., of O.

CLEANSING BOILERS.—Hot water will do no harm to D. and N.'s boiler.—J. C., of O.

COPAL VARNISH.—Good varnish is difficult to get; one trick of the trade is to use but little gum, and putting, into the linseed oil, white vitriol and sugar of lead, rendering the oil nearly thick enough for varnish before any gum is added. Another cheat is to make cheap, sticky, worthless stuff by using raw oil without dryers; because, forsooth, if a black, stiff, worthless article dries quickly (and cracks and scales quickly also), a light colored, limpid, slow drying article must be good. Twenty years ago we mechanics up here in Vermont made our own varnish and Japan; it was the only way by which we could get anything reliable. In the meantime, Mr. Abbott, of New Hampshire, got Moses Bigelow to go up to Concord and make varnish for the carriage shops, and then we commenced buying of Mr. Abbott. Since that time, we have had dealings with all the manufacturers in Boston, New York, and Newark, and, until the recent war, generally got good varnish; but during the war, adulteration found its way into every manufactory, and even to-day a good article of varnish is, perhaps, stored in one cask out of a hundred, and there are two ways to get it. One is to make it, and the other is to eschew dealers and speculators; buy of the maker, pay just what he asks, and, if your custom is worth anything, you will get a good article. Otherwise—doubtful. The best copal varnish is made as follows: Take three pounds of the best Zanzibar copal gum to every gallon required, pulverize the gum in an iron mortar, and then put it into a copper pot which will hold double the quantity required; fit a cover to the pot with a small hole in the cover, through which to insert an iron rod to stir the gum when melting; heat over a slow fire until thoroughly melted, stirring it constantly during the process. In the meantime, put into another pot and over another fire 1½ pints of raw linseed oil to every pound of gum in the first pot, and add to the oil sufficient dryers to make a medium drying oil, boiling as usual for ordinary purposes, keeping it hot until the gum is thoroughly melted. Then remove from the fire to a distance of twenty or thirty feet, pour the oil in gradually, stirring at the same time; and, while still hot, add sufficient turpentine to reduce the gum to a proper consistency, which can be tested by dropping a little from the end of the rod on to a piece of glass to cool in the air. The gas arising from a hot pot of varnish is very inflammable; and if the steam, by floating around, reaches the fire, it will flash as quick as gunpowder, and the face and hands of the workman will be burned and the varnish set on fire; therefore remove to a distance before adding the turpentine; also have a wet cloth ready to throw over the fire in case of accident. When all is well mixed, strain, while quite hot, through a funnel partly filled with clean flax, through which not a speck of unmelted gum, dirt, or settlings will pass. If flowing varnish is required, add a trifle more oil, with no dryers except a little red lead. If hard or scraping varnish is required, use but half a pint of oil to each pound of gum, and boil hard with plenty of dryers.—C. T., of Vt.

Declined.

Communications upon the following subjects have been received and examined by the Editor, but their publication is respectfully declined:

BOILER EXPLOSION.—C. E. G.—G. J. E.
BROADWAY TRAFFIC.—G. E. N.
CANAL BOATS.—J. M. E.
CHLORO-ACETIC ACID.— —.
DOOR FASTENER.—J. M. P.
ENDORSING ENVELOPE.—X. P. M.
PROPULSION OF CANAL BOATS.—J. N. P.
ROTARY ENGINES.—J. A. H.
TUBAL CAIN.—W. B.
VENTILATION.—C. G. V. P.
ANSWERS TO CORRESPONDENTS.—S.—X.—C., S., & Co.—J. B. —H. S. M.—T. W. K.
QUERIES.—S. A. E.—J. G. X.—L. S. F.—O. F. H.—H. N. M. —R. A. R.—W. N. B.—F. K.—J. H. W.—C. C. B.—V. P. —E. H. F.—C. O. D.—L. S. B.—H. B. H.—G. L. H.—T. K. McI.—J. B.—W. B. W.—J. H., Jr.—S. D. W.

NEW BOOKS AND PUBLICATIONS.

THE LAND OF DESOLATION: Being a Personal Narrative of Observation and Adventure in Greenland. By Isaac L. Hayes, M.D. New York: Harper & Brothers.

Dr. Hayes is well known as an arctic explorer. In 1869, he formed one of a party who accompanied the artist, William Bradford, to the icy regions of the North, and in this volume the author gives us many particulars about Greenland. Five hundred years ago this arctic continent, now so desolate, was the home of a large and enterprising population. They had churches, cathedrals, and the principal institutions of advanced civilization. From Greenland came the Northmen, who discovered this country and began settlements on the coast of Massachusetts, A.D. 1000—almost five hundred years before the discoveries of Columbus. But through the combined agencies of pestilence, the invasions of savage tribes from America, and finally, about A.D. 1500, by the attacks of the English, the settlements were destroyed. The present inhabitants, Christianized natives, few in number, are under Danish rule, and are employed in fishing and seal hunting. It is believed that the climate is now more rigorous than formerly. The interior of the country, as far as it has been penetrated, is covered with solid ice, thousands of feet in thickness, which finds its way to the sea through the valleys in the form of glaciers. One of these, the Humboldt glacier, is 60 miles wide and 2000 feet thick. The glaciers break into pieces on reaching the sea, forming icebergs, which float southward as far as Newfoundland. Dr. Hayes's book is full of useful and interesting information.

FARM GARDENING AND SEED SOWING. By Francis Brill.

This is another of the useful agricultural books from the publishing house of Orange Judd & Co., New York. This little book is devoted to farm gardening, by a practical market gardener, and contains full directions for raising vegetables of every variety, indicating the soil best adapted for each—best mode of propagating, storing, packing for market, and other matters of a practical sort pertaining to the management of a garden.

HINTS TO PERSONS ABOUT BUILDING IN THE COUNTRY. By A. J. Downing, Author of "Landscape Gardening, etc." And "Hints to Young Architects, Calculated to Facilitate their Practical Operations." By Geo. Wightwick, Architect, Author of the "Palace of Architecture," etc., with additional Notes by A. J. Downing. Third American Edition. New York: John Wiley & Son, 15 Astor Place.

These are two works in one volume, the price of which is $2. The book is neatly printed and bound in cloth. The authors are well known to the public through their hitherto published works, and it is scarcely necessary to say that the present volume is likely to prove in the present, as in former editions, a valuable addition to the literature of architecture.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

WINDOW SHADE.—Elliott Metcalf, of Taberg, N. Y. and Charles Allen of Woodstock, Canada.—This invention relates to venetian shades for windows. The shade consists of slats, which may be made of wood, metal, or other suitable material, connected together so as to lap onto each other, by means of a cord or cords, or by tapes or webs. This shade is opened, either in whole or in parts, by two cords, one of which is attached to the edge of the lower slat of the shade, and the other to the middle shade, or about the middle as may be desired. By pulling one of these cords the lower half of the shade will be opened while the upper half will remain closed. By pulling the other cord, the upper half will be opened while the lower half may be kept closed. These cords pass through holes in the lower edges of the slats, and are knotted, so as to raise the slats when their other ends are pulled down, as before stated. The cords pass over a pulley or through a screw eye at the upper corners from which point they are carried horizontally to the center confined by screw eyes, whence they drop down and are attached to the slats. On the other side of the window two cords are arranged, by means of which the shade is raised when both cords are pulled down. When one cord only is pulled down the shade is raised on one side only and thrown into the form of a fan or quarter circle. The shade may be attached to a rod, which is fastened to the casing of the window, or attached directly to the casing.

THILL COUPLING.—Edward S. Roberts, of East Canaan, Conn.—This invention is an improved thill coupling, claimed to be simple, strong, durable and reliable, and which will allow the thills to be readily attached and detached when desired. It consists in the thill coupling constructed so that by raising the thills into a vertical position, to turn certain flanges out of their respective rabbets, the thills may be moved laterally, uncoupling the coupling and detaching the thills. A rubber block prevents rattling and the thills cannot become detached while in the working position.

SASH HOLDER.—George H. Johnson and Frederick Bottner, of Bridgeport, Conn.—This invention consists in a novel arrangement of a pivoted flexible pawl for supporting carriage and other window sashes, as hereinafter described. This fastener is particularly adapted to the doors and sashes of landaus, the sash being required to extend far up above the door, and be held so as to close the space between the two parts of the carriage top when the latter is closed; but it is useful also for holding the sashes of houses, etc. A flexible pawl and cord are combined with the sash; and a combination with a spring and an attaching plate, with some other arrangement, are used, which together make this an undoubtedly useful, as it is a somewhat unique, invention.

VELOCIPEDE.—Solon A. Gregg, of Oneida, N. Y.—This invention has for its object to furnish an improved velocipede wagon, so constructed as to adapt it for use upon common roads. The machine may be made with one or two forward wheels, and is designed to be made of such a size and strength that a pair of shafts may be attached to it when desired to use it with horse power. A combination of a hand bar, rod, lever, pitman, foot rests and crank with each other and with the frame and axle of the velocipede, gear wheels, and shaft; also a combination of a rod with the swiveled axle, hand bar, rod, lever, pitman, foot rests, crank, and axle; also, a combination of a spring with the pitman, foot rests, crank, axle, lever, rod and hand bar constitute the claims on which a patent has been issued.

SEATS FOR VEHICLES.—John R. Linton, of New Bedford, Mass.—This invention has for its object to furnish an improved riser or base for the seats of vehicles, which shall be so constructed as to obtain the requisite strength and lightness combined with such a size as not to be out of proportion with the other parts of the vehicle. A d it consists in a riser or base formed by the combination of a metallic brace or plate with a wooden frame of the riser or base, the bottom bar of which rests upon the rail or edge of the wagon box, and to the top bar of which the seat is attached. A brace, or plate made of wrought or cast metal, is attached to the wooden frame by screws, bolts or rivets. The brace or plate may be placed within the frame or upon its outer side, as may be desired, and may be made of any desired pattern or style and ornamented to any desired extent.

MEDICAL COMPOUND FOR HOGS.—John Shannon, of Palmyra, Mo.—This invention consists in a compound formed of sulphur, copperas, alum, saltpeter, resin, fenugreek, antimony, assafœtida, soot, and salt. The peculiar diseases or ailments of the animal for which it is intended are not stated in the specification.

DENTAL PLUGGER.—White F. Griswold, of Leavenworth, Kan.—This invention consists of a plugging instrument in which the sliding mallet, with a spring for impelling it against the tool stock, is inclosed in a tubular stock and is provided with several studs projecting through slots in the stock at equal points of distance around it, to be used for forcing the mallet back against the springs, and so that the instrument may be rotated, as is often required while at work, and yet always have a stud at command for retracting the mallet. The invention also consists of notches in the end of the tube, out of which the tool stock projects, and pins in the latter, falling into said notches when the tool stock is retracted by its spring, and serving to hold the tool against turning on its axis while at work; also, to hold it for attaching and detaching the tools from the stock to change them, said tools screwing in and out of the stock, and thus saving the necessity of holding such stocks from turning in the tube holder by one hand while screwing the tools in and out by the other. In taking out and putting in tools by one hand, which is sometimes highly necessary, the stock is held against the palm of the hand by the third and fourth fingers and the tool actuated by the thumb and first finger. The stem of the mallet may be extended through the case or not, at will, and the tool may have a hole through it to introduce a lever for screwing it in or out.

SAW SET.—Hiram R. Lavey, of Bristol, Wis.—This invention relates to a new arrangement of rest, gage, guide, and punch in a saw set; and has for its object to so construct and combine these devices as to reduce the size and cost of the complete instrument to a minimum, and enable the punch holder and guide to be secured and adjusted by the same screw in order to facilitate the practical operation of the instrument. The slotted gage or guide and the punch holder provided with the horizontal slotted base, arranged in a peculiar way, and secured to a base, having ribs, by means of a screw, constitute the claim on which a patent has issued.

COMBINED SHOVEL AND TONGS.—Thomas G. Newnam, of Pleasant Hill, Mo.—This invention is an implement for handling live or other coals, brands of fire, and other articles, designed to be used as a substitute for the separate shovel and tongs in common use. It consists in a shovel blade on a slotted handle, and in a wire brush or rake on the end of a handle, which works in the slot of the shovel handle. The shovel handle is bent so as to form two arcs of circles, with a ring handle at the end to take hold of. A brush or fine rake is on the end of a third handle. This handle passes through the slot in the shovel handle, where it is allowed to play longitudinally and up and down, according to the purpose for which the implement is to be used. A shoulder limits the distance which this handle extends through the slot. The shovel can be used to take up ashes, etc., and coals can be raked onto the shovel by a longitudinal movement of the rake handle, and a brand of fire, stick of wood, or other article can be griped between the parts and handled as with a pair of tongs.

CASTING PIPE.—Charles J. Ellis, Louisville, Ky.—The invention consists in improving the usual means for casting pipe, by constructing the stools which support the flasks in arc sections, and thereby rendering them adjustable by the simple addition or subtraction of one or more sections.

CLEANING LAMP CHIMNEYS.—Henry W. Prouty, Boston, Mass.—In this case, a suitable handle is provided with rubber or other elastic disks or washers, so applied and adjusted as to admit of the use of a cloth or other material for cleaning chimneys with ease and rapidity.

BERRY BOX.—Charles Reese, Baltimore, Md.—The invention consists in improving the construction of paper fruit boxes by fastening the previously slitted and folded sides with tin clamps. This method of construction involves so little expense on the articles as to make the cost inappreciable and to allow them to be given away with the fruit, while at the same time they are sufficiently strong for handling and transportation.

ROTARY STEAM ENGINE.—William Darker, of Philadelphia, Pa., assignor to himself and Josiah D. Thompson, of same place.—A hollow cylindrical stationary case of cast metal has a tubular projection projecting from each side of the side plate, at the center, for the support of the shaft, which at the outer end carries the driving pulley, and at the inner end a hub and radial arms, on each of which is mounted a tread wheel which, in conjunction with flexible devices, confined steam tight between the sides of the case and vibrating between the inside of the periphery and the annular ribs of the case, constitute the means of impelling the shaft around on its axis by steam admitted at the ports between the flexible devices and the periphery of the case, and escaping into a space inclosed by the concave side, covering a large central opening through the side of the case, from which space it escape through an exhaust pipe. The flexible devices are composed of short metal bars backed with flexible vulcanized india rubber packing, or any equivalent, the said bars being arranged transversely of the strips on the inside, and the strips extending around the case, with the periphery nearly half way, and being fastened at one end, just in advance of the steam ports, by clamping pieces and bolts. The said plates have pins passing through the inner strips of india rubber, to keep them in place. The inner strips are of pure rubber, and fit snug and steam tight against the polished sides of the channel, and the outer strip is composed of rubber and canvas, to prevent too much elasticity, and fits loosely. These flexible devices are depressed against the periphery of the case, steam tight, in advance of the steam, which, forcing them behind the wheels, impels them forward and causes them to revolve on their own axes. The movement of these flexible devices is very slight, being only about a quarter of an inch, which, it is believed, will not injuriously affect the rubber, the integrity of which is preserved by the moisture of both the exhaust and the live steam, the former being diffused throughout the whole interior space of the engine. Idle ports are applied for running the engine in the opposite direction, which may be done, if desired, by reversing the flexible devices. For the purpose of lubricating the axles of the wheels, water is used, to avoid the use of oil or tallow which are injurious to rubber. Peculiar devices are employed for this purpose.

COMBINATION LOCK.—John Moffet, of New York city.—In this improved lock a disk with a wide edge, having six (more or less) large grooves across said edge at equal distances apart, and with a deep and narrow circumferential groove between the transverse grooves, all in different planes, is mounted on a spindle which carries the bolt operating wheel, and as many blocks are provided in corresponding transverse grooves in a case surrounding the disk as the number of transverse grooves in the latter, with an adjusting screw for each block, which has also a tongue projecting into a transverse groove of the disk, all of which tongues must be adjusted by the screws to the circumferential grooves before the bolt can be thrown, and these adjustments are made according to a record kept, showing how many turns each screw must make to bring the tongue of its block to the right position. The screws, which are confined within the case, have each a toothed wheel with which a wheel on an arm revolving around the axis of the knob spindle is brought in contact for effecting the necessary adjustments, by turning a sleeve on the said spindle. The arrangement is such that even a quarter turn of one of the screws out of the true position will prevent the opening of the lock. As many changes can be made made as there are transverse notches and shifting tongues, and with each change a different combination table of revolutions for the turning of the screws is required. The construction is such that a perfectly tight packing is maintained around the spindle, so that the introduction of powder or other explosive material is prevented. A novel arrangement of a tappet wheel is introduced for throwing the bolt, which is adapted to throw the bolt with the spindle set in any one of the six positions to which it may be adjusted in making the changes.

EAVES TROUGH SUPPORTER.—Benjamin Prugh and Henry Austry, of Grant City, Mo.—This invention relates to a mode of putting eaves troughs together, and supporting them beneath the eaves of the building. The invention consists in the mode of connecting the tube, trough, and clamp, and in the construction of the leader clamp. This clamp is made in two parts. The lower part supports the trough and covers the joints where the lengths of the trough are put together. The upper part extends across the trough, being connected with the lower part, at its outer end, by a screw and nut. The other end is bent over the inner edge of the trough and brought in contact with the inner end of the lower part, where the two ends are secured together and to the building by an angular bolt. The upper portion of the clamp prevents the trough from spreading; and by turning down the nut the two lengths of trough are firmly clamped together, and the joint is made tight without the use of solder or rivets. This is a great advantage in putting up tin troughs, as the sheets of tin may be soldered in short lengths, and put up very easily with these clamps. Where other means are employed for attaching the trough to the building, the clamp is constructed with shoulders on the under side of the upper part, which bear against the inner edges of the trough. A clasp, the ends of which are bent over the edges of the trough and secured thereto by lips, has shoulders which bear against the inner edges. These clasps are used between the clamps to prevent the trough from spreading. The conducting tube is attached to the trough and to the clamp. The leader is secured to the tube by a screw clamp, and to the side of the building by a screw or all.

BEE HIVE.—Cyrus C. Aldrich, of Morristown, Minn.—This form of hive is claimed to be adapted to the habits of honey bees. In their natural state they cluster together in a globular form and lay their brood in this form; and in the cylinder the honey is nearer the brood than it is in a square hive. By this mode of construction the hive may be opened and access had to the surplus honey, while the brood chamber is entirely closed and the heat retained. By sliding shutters and an adjustable ventilating tube, the heat or temperature of the hive is readily controlled both in winter and summer. The claims are as follows: A combination of a bottom apertured cylinder, having longitudinal slat at the top, with a perforated tube let into said slat, and the separate ring frames arranged to provide a circulation of air. A two part cylinder having an upper notched and a lower unnotched slat combined, with notched partition plates, so that said partitions shall be prevented from turning or laterally sagging. Frames, each provided with hooks diametrically opposite and reversed, in combination with a two part cylinder having projecting plates, so that said frames cannot sag laterally or turn. A combination with a two part cylindrical hive, of jointed bars, arranged between the said two parts, so that they can be drawn out first to break the bee cement and to allow the hive to be easily opened.

HOISTING APPARATUS.—James D. Warner, of Brooklyn, N. Y.—An endless chain is arranged to run on pulleys alongside the spring piece on a pier. At the land end it is led under the roadway or under a cover of any suitable kind. An engine operates a windlass, around which the chain is wound, so as to give it the required "bite." The end of the hoisting rope is attached wherever needed by hooking on a clutch. As soon as the required hoisting or drawing is done, the clutch can be unhooked by pressing a handle in toward the chain. Whenever there are goods being continually hoisted or drawn a certain required distance, the clutch may be unhooked automatically by passing against a trip. In order to prevent the goods running down before needed, when the clutch is unloosed the rope will jam, by an eccentric button (as soon as the action begins to retrograde), against the side of the narrow passage of a brake, or projection. This is released as required by pressing in a handle, or used to prevent the merchandise from being lowered too rapidly. Hoisting may be done at several different places around the pier at the same time, whereby steam power may be substituted, for the horse or hand power now used, to great advantage.

APPARATUS FOR LEVELING MILLSTONES.—Benjamin H. Meitzler and Philip L. Hoos, of Fort Seneca, Ohio.—The object of this invention is to provide efficient and convenient means for leveling the grinding surfaces or faces of burr millstones. It consists in the mode of supporting, adjusting, and leveling the "staff" upon the stone. The bed plate of the apparatus is fitted to the neck of the spindle. It is a round disk provided with set screws for adjusting the staff on the face of the stone. Curved stanchions, four, more or less, in number), have their upper ends attached to and support a vertical cylindrical block upon which an inverted cup is fitted, provided with an adjusting thumb screw by which the cup is raised or lowered on the block. The staff is connected with the cup by a curved bar. This bar extends out horizontally on top of the staff, and is fastened thereto by thumb screws. In the center of the staff, and visible through a suitable aperture in the bar, is a spirit level, by which the face of the staff is leveled. The staff, being connected with the inverted cup (which cup is allowed to turn or revolve on the top of the block), may be moved around the bed over the grinding face of the stone. The face of the staff is covered with red or other coloring matter, so that wherever it touches it leaves a mark or colors the stone. The highest places or points on the face of the stone are thus ascertained, and the places are indicated where the stone should be picked down to make its surface even and of uniform hight.

BALE TIE.—David L. Miller, of Madison, N. J.—This invention relates to a new tie for cotton, straw, hay, and other bales; and consists in applying a fastening catch, in form of a double hook, to one end of the band or strap that embraces the bale, and in providing loops at the end of the said strap for the reception of the hook, by which arrangement the band can be quickly and securely closed around the bale. The hook is connected with the strap and, therefore, not liable to be lost or misplaced, and is always in position for immediate use whenever the strap is placed around the bale. The invention also consists in a peculiar manner of forming the loops at the ends of a wire strap or band by twisting, and in thereby insuring greater strength and durability. The hook firmly unites the ends of the strap, and constitutes a reliable tie for holding the bale compressed.

OYSTER BASKET.—Charles D. Martin, of Port Chester, N. Y.—This invention consists of a basket with woven sides and bottom of flat strips of thin galvanized iron, with wooden hoops for the top, bound with galvanized wire, and with wooden handles, the said iron strips being woven with large meshes to facilitate the washing, and riveted together at the crossings for keeping the vertical and horizontal ribs in their places; and an auxiliary stay rib is woven in at the bends of the verticals for the bottom, where they cannot well traverse each other, in such manner as to retain the bands in shape against the action of the weight, which has a constant tendency to straighten out the said bands. A basket of this kind will be much stronger and more durable than a basket of the ordinary wood splints, and the strips can be riveted at the crossings to keep them from shifting out of place with safety, which will not do with the wooden strips, because it weakens them so.

ELECTROMAGNETIC ENGINE.—William G. Thornton, of Victoria, Texas.—This very novel invention relates to a new practical application of electromagnetism to moving machinery. The invention consists principally in the transmission of electromagnetic power through compressed air for motor purposes, and the mechanism and combination of machinery necessary for that purpose. A lever is pivoted to a fulcrum standard. An air pump, with all necessary valves and fixtures, is worked by the lever to supply an atmospheric receiver. The lever is worked by electromagnets, in conjunction with gravitation—the electromagnets to lift the piston and gravitation to drive it down. The distance, at which the first armature and pair of magnets is fixed from the fulcrum of the lever, depends upon the strength of the magnets. The first pair of magnets have little more to do than to lift the piston of the air pump. The next pair of magnets, being of the same power as the first, continue the movement, owing to mechanical advantage in length of lever, and so on, each pair of magnets gaining mechanical power as the distance from the fulcrum increases, thus enabling them to meet the constantly increasing resistance of the air during the whole time of magnetic action. It must be understood that the first pair of magnets—that is, those nearest the fulcrum—will bring down the lever so that the next armature will be brought under the influence of the next pair of magnets. When the first armature, therefore, has reached its magnets, it will remain idle during the continuance of the stroke; and so with each armature, one after the other. They all will become idle and stand upon the magnets until the stroke is finished and the circuit opened. When the circuit is opened, the weight of the piston at the opposite end of the lever, aided, if necessary, by an extra weight or spring, will lift this end of the lever to the starting point, and, as it rises, each armature will be taken up in its turn, and they will all assume their places on the lever ready for another stroke, at which time the circuit is closed by an automatic tender, and the action repeated, and so on. The power stored up in the air receiver is advantageously used to propel an engine.

INVALID BEDSTEAD.—Henry A. Scott, Winchester, N. H.—This invention relates to a new invalid bedstead, whose movable frame is raised and lowered by means of arms projecting from geared cams, to thereby insure even and convenient motion. The pivoted head rest is supported by a spring ratchet, which permits rapid adjustment. The geared cams, carrying the arms, arranged on a bedstead to constitute supports for the adjustable frame, and the pivoted head rest, provided with spring ratchets, and combined with pins and a string, are the parts upon which the claims are based and allowed.

APPARATUS FOR RAISING DOUGH.—Sophronia V. Dodge, De Soto, Iowa.—This is an improvement in apparatus for raising bread, which consists in an outer shell or casing, with a removable false bottom and lamp chamber, and, in combination therewith, a containing vessel and lamp, the whole constructed and arranged so that a very small flame will supply sufficient heat, which will be evenly distributed around the containing vessel. The contents will be uniformly warmed for producing the desired effect. This apparatus is claimed to effect a great saving in time, and to do the work thoroughly and perfectly in the coldest weather. The vessel is provided with a tightly fitting cover, so that a kerosene lamp may be used without any ill effects upon the bread.

MACHINE FOR WELDING EARS ON ELLIPTIC CARRIAGE SPRINGS.—Aaron Richards and Josiah Jones, Concord, N. H.—This invention relates to a new arrangement of foot or power hammer for welding ears to the ends of elliptic carriage springs and equivalent purposes. The invention consists, first, in making the hammer vertically and horizontally adjustable at its pivoted end to make it fit the lower die in the desired manner. The invention also consists in the peculiar arrangement of the die, which is made in three sections, the central one of which, when struck by the hammer, causes lateral motion of the side sections for acting against the sides of the ears.

CARDING MACHINE.—Ephraim French, North Adams, Mass.—The card rollers working in connection with the main cylinder are arranged in the ordinary manner. The doffer is revolved in the usual manner by a belt on the pulley. The fancy is revolved in contact with the surface of both main cylinder and the doffer, by a belt from the main cylinder, and is given a traversing or endwise reciprocating motion, as it revolves, by means of a cam groove on the block of the doffer shaft. One end of a vibrating lever plays in a groove in the "fancy" shaft, and the other end plays in the cam groove of the block on the doffer shaft. As the doffer shaft revolves, the "fancy" is made to traverse back and forth a distance equal to the "throw" of the cam groove. The inventor is not confined to this particular device, as there are many ways by which this traversing motion could be produced. The "fancy," thus traversing in contact with the surfaces of both the main cylinder and the "doffer," keeps the material (wool, etc.,) on the surfaces of those cylinders more even and uniform than when it is run in the ordinary manner, thereby avoiding streaks of the material on the cylinders. In ordinary carding machines, the doffer requires to be cleaned daily, or at least very frequently; and when low or dirty stock is used, the doffer soon becomes coated, so that the stock drops to the floor and becomes waste, thus necessitating cleaning of the doffer several times a day. This of course occasions a stoppage in production, and entails much loss. The inventor claims that, with the reciprocating fancy roller, it is unnecessary to remove the doffer for cleaning it for several weeks at a time, as it is cleaned by the teeth of the fancy during the operation of the machine.

MACHINE FOR CUTTING LEAD.—Charles Koehler, Evansville, Ind., assignor to himself, Charles Babcock, and Edgar Sharpe, of same place.—This is a new machine for cutting blocks of lead into cubic or other four sided prismatic pieces to be used in the manufacture of shot, according to a plan for which letters patent were granted to the same inventor, January 25th, 1870, or on any other plan, or for cutting other material for suitable purpose. The invention consists, first, in the arrangement of rotary cutter heads, carrying three kinds of cutting tools—for ribbing horizontally, cutting vertically, and, finally, chopping or slicing the pieces from the end of a block of lead or equivalent material. The invention also consists in the combination of the above with an automatic feed device for moving the lead ahead whenever a series of cubes have been cut therefrom.

TRUSS.—Edmund P. Banning, Jr., New York city, assignor to the "Banning Truss and Brace Company," of same place.—This is a new arrangement of balls for a truss for the cure of prolapsus ani, and also to improvements in the spring holder of a truss for umbilical hernia, and in the shoulder brace attachment to a spinal support. It consists in a peculiar mode of applying the balls to the adjustable shank of the first named truss, so that the balls may not move on the body, though the truss may be moved; secondly, in providing a slot in the spring holder of the umbilical truss for the self-adjustment of the ball; and, finally, in slotting the upper end of the spinal support to permit the automatic adjustment thereon of the shoulder braces.

THROTTLE VALVE STAND AND STEM.—John M. Compant and Engelbert Krauskopf, of Fredericksburg, Texas.—This invention relates to a new arrangement of support for the stem of a throttle valve, and has for its object to facilitate the lubricating of the screw and cause the parts to be firmly held in place. The invention consists in forming a screw on the outer end of the stem and fitting it into a nut that is, by braces, held to the stand. The valve is attached to the inner end of the stem in the ordinary manner. The outer end of the stem carries a hand wheel. By the outer nut and inner bearing, the stem is securely held at both ends. The screw can be conveniently lubricated, so that it will not grind in the nut, nor wear out in a short time, like the screws of ordinary throttle stems.

CANE GUNS.—Albert Karutz, of Brooklyn, N. Y.—This invention relates to improvements in cane guns; and it consists of a novel arrangement of a cranked lever and catch spring with the needle, whereby the lever is employed both to retract the needle and to trip the catch spring to allow the needle to fire the cartridge. The arrangement of the barrel allows of loading at the breech by disconnecting two sections and putting the cartridge in the end of the forward section, after which they are connected again. A combination of a cranked lever, spring, and needle, arranged in a peculiar manner, constitutes the claim.

SOLID BILGE BOAT.—Daniel Brader, of Beach Haven, Pa.—This invention relates to an improvement in the construction of solid bilge boats to form a gradual slant and cause them to run more easily. Upon the front portion of the keel is placed a triangular piece of wood, called the dead wood, which abuts against the inner side of the timber head. The flooring beams are, with their inner ends, tenoned into the dead wood, so that they gradually ascend from the flat bottom toward the bow. The outer ends of the flooring timbers are secured, by tenons or otherwise, in the bilge logs, which form an angle at a point which is in line with the lower end of the dead wood, and then ascend toward the timber head parallel with the upper face of the dead wood. In this wise the floor of the boat receives a slant or rake of one foot or more at the bow, which eases the boat, making it cut more readily through the water. At the stern there is the same arrangement, excepting the stem, which is omitted. A lap timber is placed upon the bilge logs, where the same form the angle; and an inner lap timber is placed against the angle of the bilge logs.

STOP MOTION FOR MACHINE FOR COVERING CORD.—Reuben Lowe, New York city.—The nature of this invention precludes an intelligible verbal description of its details. We can say, from close examination, that it seems a very ingenious and useful device to effect the purpose intended, and is evidently the work of a practical mind, thoroughly conversant with the requirements of the case.

EARTH SCRAPER.—Michael Kelly, of Fairfield, Vt.—This is an improved earth scraper for grading, road making, etc., enabling more work to be done with less labor to man and team than when an ordinary scraper is used. It is provided with wheels and a seat for the driver, and the scraper proper guided and controlled by suitable mechanism, the claim in the patent covering a combination of uprights, a gate or frame, a scraper, rods, racks, gear wheels, shaft, ratchet wheel, pawl, lever, and lever pawl, with each other and with the axle, wheels and tongue.

SHOVEL PLOW.—George Hopkins Smith, of Des Moines, Iowa.—This is a cast shovel plow for cultivators, so made as to possess the requisite strength while leaving its forward side or surface of the proper form to do the required work. Upon the middle part of the back of the shovel is formed a strong rib, extending down to, or nearly to the point. The upper part of the rib is made wider, and has cavities or recesses formed in it, to receive the bosses or projections of the plow seat, by which the plow is secured to the plow standard. Upon the rear sides of the side edges are found short projections, ribs, or thickenings, extending for such a distance as may be necessary for throwing out a full corner and giving the requisite strength to the shovel, the upper parts of the side edges, where so much strength is not required, being made lighter. The shovels may be cast of any metal that will give a good tough cutting edge and a strong back, and will take the highest possible temper upon the front. Cast steel fronts cast upon Bessemer steel backs, in cast iron molds, are recommended.

RAILROAD CAR VENTILATOR.—Samuel E. Kirkpatrick, of St. Albans, Vt.—This invention consists of an arrangement of passages adapted to promote the inflowing of pure air and escape of heated and foul air through openings similar to the ordinary ones used in the upper parts of the sides of cars and controlled by one valve. It also consists of an arrangement for locking the valve open or shut. The uppermost escape passages for the warm and light air discharge under the roof, which prevents the cinders from falling in through the passages, while the warm air either escapes up through an opening in the roof when the cars are not running, or downward through other openings when they are running, by reason of the down draught caused by the motion. Lower passages for the inflowing air, allow it to enter free from the cinders.

PROPELLING CANAL BOATS.—Wilson P. More, of Moresville, N. Y.—An endless chain passes lengthwise around the middle of the boat (or nearly so.) Grooved driving wheels, on pulleys, are rotated by suitable power applied on the boat. Pivoted chain guides are placed respectively at each end of boat, and movable laterally on rods, so as to serve the purpose both of rudder and guide. A trough is arranged on deck, beneath the chain, receiving the drip therefrom. This trough is constructed on a decline from the middle toward each end, so as to transfer the drippings and discharge them at any desirable point. The chain is made heavy, to give tractional power; and loose, so as to bring as large a portion as possible of its surface in frictional contact with the bottom of the canal. It may or may not be provided with spikes or points, they being auxiliary but not necessary to the principle of operation. The chain is composed of heavy main links and intermediate open connecting links, so that, on levels, larger or smaller portions of the chain may be readily removed, and reinserted when on grades of more or less acclivity or declivity. The claim allowed covers a combination, with the movable endless drive chain of a canal boat, of pivoted and laterally vibratory chain guides, arranged, respectively, at bow and stern, as set forth, for the purpose both of guiding and steering as described.

HOSE NOZZLE.—George O. Wickers, of Lawrence, Mass., assignor to himself and Henry P. Chandler, of same place.—The invention relates to that well known class of hose nozzles which are provided with spreaders; and consists in improving them by the application of a movable ring having pins and stationary cylinder having other pins, combined with spreaders having slots in their shanks and fulcrumed on points in a peculiar manner, whereby the form and character of the stream discharged may be varied at will by the fireman to suit various circumstances.

AXLE LUBRICATOR.—John E. Mowerson and Cornelius S. De Baun, of Westwood, N. J.—This invention consists in flanging an oil cup at the top, concaving it on the sides, and pressing its lower ends against a flexible packing in the axle box, whereby the oil holder cannot work upwardly, but is always held firmly in place, and must deliver its lubricating matter with great uniformity. This improved lubricator is arranged in the hub with its greatest diameter in the circumferential direction of the hub, as shown, and has the advantage over others of a larger oil chamber in a recess of a given capacity.

BALING PRESS.—George F. Grund, of Fremont, Ohio.—This invention consists in the arrangement of two presses horizontally in two different parallel planes, with a long lever between, connected to the follower of each on opposite sides of its pivot, in such manner as to produce a double acting apparatus, by which two bales of hay are pressed at one time, whereby time is economized and some of the labor, lost with a single press in withdrawing the followers, saved. The invention also consists of an arrangement of the press door fastening devices, consisting of hooks, which being hinged to the door, are adapted to hook over a cross piece and are secured by a slotted bar pivoted and arranged to swing on the straight ends of the hooks, and hold them, when forced against them, by a lever.

[OFFICIAL.]

Index of Inventions

For which Letters Patent of the United States were granted

FOR THE WEEK ENDING APRIL 23, 1872, AND EACH

BEARING THAT DATE.

Arithmetical sum setter, A. W. Price 125,123
Arms, clasp for side, Will and Finck 125,921
Atomizer, W. R. Leonard 125,965
Axle box, D. Dalrell, (reissue) 4,877
Balls, die for shaping, J. Britton 125,932
Bed bottom, spring, E. Parker 126,081
Bedstead sofa, H. R. Reichert 126,088
Bee hive, S. O. Higgason 126,055
Berry box, C. Reese 126,087
Billiard cushion, J. Wagner 126,113
Blacking spreader, H. S. Kerr 125,894
Boats, detaching hook for, W. H. Miles 125,900
Boiler flue scraper, A. Way 125,919
Boiler, wash, G. W. and M. B. Adams 126,005
Boilers, feed water regulator, etc., for steam, J. B. Smith 125,993
Boring tool, A. F. Whitin 126,120
Bottles, coloring capsules for, H. Stiassny 125,912
Bottling machines, striping device for, W. Tollast 126,103
Brake, steam and air, J. W. Gardner, (reissue) 4,879
Brick kiln, J. Eisele 126,040
Brick mold sanding machine, R. Lent 126,063
Bronzing machine, C. Shoop 126,097
Brush, fly, W. M. Cline 126,022
Buckle, H. B. Worcester 126,003
Buckle, turn, M. White 125,909
Bureau and washstand, combined, J. Schneeman 124,991
Burning hydrocarbons and bagasse, E. S. Roman 125,889
Camera, photographic, H. W. Vaughn 125,914
Cans, machine for making tin, C. Barry, (reissue) 4,876
Carbureter, gas, G. W. Coleman 126,024
Car coupling, G. W. Loyd 125,967
Car coupling, H. W. Pike 125,985
Car coupling, C. Whitus 126,009
Car coupling, B. A. Worden 126,122
Car, dumping, D. S. Cook 126,029
Car, dumping, J. Disterdick 126,036
Car, railway, I. G. Macfarlane 125,969
Carriage rocker, A. L. Wells 125,998
Carriages, spring, etc., for children's, J. Loughridge 126,016
Car spring, Jeffrey and Fisher 125,959
Car spring, A. Middleton, Jr 126,073
Cart body catch, C. F. Chew 125,935
Cartridge, W. W. Hubbell 126,058
Car truck, S. N. Norton 125,981
Car wheel, F. M. Ray, Jr 126,085
Car wheel, casting, N. Washburn 125,917
Car wheel, elastic, J. J. Sherman 126,096
Cars, pedestal for street, D. R. Hart 126,054
Castings, machine for trimming, A. S. Gear 125,948
Chain making machine, W. C. Edge 125,940
Chair, folding, C. A. Jackson 126,059
Churn, J. D. Harrison 126,052
Cigar box, H. Schmeer 125,910
Cigars, molding, J. Carter 126,018
Clothes dryer, C. H. L'Amoreaux 126,062
Cooking utensils, F. P. Warren 126,114
Composition for filling safes, C. Berger 126,011
Compound for the cure of horses, J. Burns 125,933
Corn sheller, T. J. Mayall 126,067
Corset, M. P. Bray 125,877
Corset, S. Ottenheimer 126,079
Cultivator, C. M. Clark 125,956
Cultivator, H. P. Jordan 125,961
Cultivator, wheel, S. Rockafellow 126,092
Curtain fixture, T. Lovell 125,966
Cylinders, apparatus for straightening, T. F. Hammer 125,892
Digger, potato, J. M. Lumbard 125,968
Dish drainer, butter, F. C. Booth 125,876
Drilling machine, A. and C. Van Haagen 126,111
Drilling machine, rock, A. D. Williams 125,928
Dryer, fruit, C. A. Boynton 125,929
Egg carrier, E. L. Mueller 125,977
Elevator, ice, L. Townsend 126,106
Engine cylinders, relief valve for steam, R. Colburn 126,023
Engine, fire, C. and W. C. Cleveland 125,883
Fabrics, apparatus for bleaching, etc., textile, Lea and Eberhardt 125,897
Fastening, sash, F. W. Brockleper 125,879
Fertilizer, J. R. Black 125,927
Fertilizing compound, J. M. Deering 125,939
Fertilizer distributer, W. F. White 126,118
Fibers, process for obtaining vegetable, W. Adamson 126,006
File, paper, S. E. Harrison 126,053
Fire arm, breech loading, O. M. Robinson 125,988
Fire place, S. D. Dearman 125,938
Flask, molder's, J. A. Blake 126,012
Flower pot, F. C. A. Von Levetzow 126,112
Fork, hand cutting, D. Arnold 125,926
Furnace, puddling and boiling, A. and J. Reese 125,987
Furnaces, safes, etc., lining for, A. C. Hamlin 125,951
Gas, apparatus for the manufacture of, H. H. Edgerton 125,941
Gas generator, Fox and Irland 125,888
Gas, purifying illuminating, R. J. Everett 125,943
Gas regulator, G. M. Eldridge 125,942
Gas retort, Sloper and Potter 126,098
Gate, Friedrich and Allen 125,947
Glass mold, C. Strudelmann 126,099
Governor, J. B. Duff 126,039
Governor valve, W. H. Cowle 125,937
Grain steaming apparatus, Campbell and Evans 125,934
Grate, furnace, C. Kugler 126,060
Hammers, cylinders for steam, T. B. Morgan 125,976
Harness rosette, J. W. Dayton 125,885
Harness, breeching stay for, W. R. Knowles 125,963
Hats, ventilator for, A. O. Knapp 125,962
Hay loader, R. Shaw 125,992
Heater for steam generators, feed water, H. N. Waters 125,918
Hedge trimmer, J. S. Crum 126,033
Hod iron, mason's, L. W. Lake 126,061
Hoisting machine, W. Neal 125,978
Hoops, box for steaming barrel, J. L. Gage 126,047
Hub, Hitt and Chapman 125,955
Husker, hand corn, A. W. Brinkerhoff 125,931
Ice carrier, L. Townsend 126,108
Ice float, L. Townsend 126,107
Ice increaser, L. Townsend 126,109
Implement, compound, C. W. Russell 126,094
Inkstand, T. J. Mayall 125,973
Jack, lifting, Mulligan and Imlay 126,076
Joint coupling for connecting shafts, universal, M. Clemens 125,880, 125,881
Knob, etc., door, E. Day, (reissue) 4,878
Knob, glass door, A. E. Young 126,004
Lamp, A. Combs 126,025
Lamp, T. H. Mott 126,075
Lamp chimneys, preventing the breakage of, B. Vitalis 125,915
Lamp chimney cleaner, H. W. Prouty 126,084
Lamp for burning heavy oils, R. Hitchcock 125,954
Lamp wick adjuster, H. Woodbury 126,009
Latch and lock, combined knob, J. Imray 125,957
Leather boarding and graining machine, L. Townsend 126,105
Leather, trimming the edges of, W. F. Foley 125,946
Liquors, apparatus for forcing, J. F. Bennett 126,010
Lock, permutation, S. Miller 126,074
Lock, permutation, O. E. Pillard 125,905
Locks, key hole guard, etc., for, Townsend and Potter 126,104
Locomotive, H. N. Hamilton 125,891
Loom shuttle, R. Whitehill 126,119
Lubricator, car axle, J. S. Sanson, (reissue) 4,880
Marble working machine, A. Safler 125,990
Medical compound, C. Shute 126,134
Milk rack, revolving, H. Blake 125,928
Mill, flour, R. M. Thomas 126,101
Mill pick, C. McNeal 126,072
Mirror, adjustable duplex, G. S. Roberts 126,091
Mirror and frame hanger, J. S. Thomson 125,913
Mop head, S. C. Ketchum 125,895
Motor, rotary, W. Reading 126,086
Mower, lawn, G. W. Tischer 126,102
Night soil, etc., deodorizing, J. E. Dotch 125,886
Nozzle, R. R. and J. Craig 125,884
Nut, spring clip lock, E. M. Turner 126,110
Ore crusher, J. W. Cumings 126,034
Overall, E. F. and J. H. Stacy 125,994
Oyster dredge, T. W. Landon 125,964
Paint compound, S. F. Mathews 125,972
Paper pulp, manufacture of, H. Voelter, (reissue) 4,881
Paper, etc., machine for grinding wood pulp for, Elliott and Wood 126,041
Pipe coupling holder, B. Vitalis 125,916
Pipes, device for lining cement, M. Stephens 126,100
Pipes, stool for casting, C. J. Ellis 126,043
Pitmen, method of connecting, T. Hall 126,051
Plow, W. B. Bradford 125,930
Plow, T. Nabers 126,077
Plow points, mold for casting, H. J. Brunner 126,015
Plowshare blank, D. H. Howe 125,909
Plowshares, machine for manufacturing, D. H. Rowe 125,908
Press, baling, G. F. Felton 125,944
Press, baling, A. W. Mason 125,971
Press, baling, W. Golding 125,890
Press board, tailor's, W. Frizzell 125,889
Printer's case stand, R. Chapman 126,017
Pulley block, differential, Clemons and Clemens 125,882
Pump, rotary, G. S. Follensbee 126,046
Pump, steam, W. Porter 126,083
Rack, map and chart, F. G. Johnson 125,960
Rail, hand, M. M. Manly 125,898
Railway frog, D. C. Pierce 126,082
Railway tie, A. B. Tripler 126,127
Railway rail splice, A. B. Davis 125,935
Registers, composition stone frame for hot air, Elliott and Wood 126,042
Riveting device, T. J. Allison 125,924
Roaster, coffee, G. W. Dodson 126,037
Roofing, composition, D. G. Conger 126,026
Rubber hose, manufacture of flexible, C. McBurney 126,069
Saddle tree, harness, C. J. Paine 126,080
Safes, etc., material for filling, H. C. Hahn 126,049
Safes, etc., fireproof, composition for rendering, J. F. Wood 126,121
Sash balance, J. J. Cowell 126,031
Sash holder, J. E. Scott 126,095
Sash pulley case, C. B. Clark 126,019
Sawing machine, C. B. Morehous 125,975
Sawing machine, J. D. Culver 126,035
Saw mill band, H. Peterson 125,984
Saw mills, feed apparatus for, Etches and Wilson 126,044
Saw swinging, E. W. Roff 126,093
Saws, handle for cross cut, A. C. Martin 125,899
Screw cutting device, S. Nofth 125,980
Screw cutting machine, Olinger, Manning, and Green 125,983
Seats, attachment to the backs of, H. M. Beidler 126,009
Seed dropper, W. C. Willey 126,001
Sewing machine, C. W. Howard 126,056, 126,057
Sewing machines, braid guide for, J. B. Price 125,986
Sewing machines, corder for, H. M. Hall 126,050
Sewing machines, shutter for, W. H. Hockensmith 125,956
Sewing machines, motor for, J. H. and R. W. Welch, (reissue) 4,882
Shaft, spindle or vertical, G. Richardson 126,089
Shafts, coupling for tumbling, W. Click 126,021
Shears, clipping, Smith and Priest 125,911
Shutter, metallic fire proof, J. B. Clark 126,020
Sifter, ash, A. H. Pulcifer 125,906
Signal, railway, J. F. Andrews 125,925
Soldering iron, J. W. Hoard 125,893
Soldering tool, McMurray and Hollingsworth 126,071
Spring, door, F. Stemmler 125,995
Steam generator, D. Renshaw 125,907
Steam trap, J. G. Baker 126,007
Steam pressure regulator, N. C. Locke 126,065
Stone, machine for sawing, J. Maydwell 126,068
Stone, machine for working, A. S. Gear 125,949
Stove, cooking, J. D. Harden 125,953
Stove hearth and ash pit, combined, C. Cook 126,028
Table, R. Weber 125,997
Table, ironing, J. R. Cazier 126,016
Teeth, artificial, M. Newton 125,979
Telegraph, printing, R. H. Gallaher 126,048
Telegraph wires, insulator for, J. L. Conklin, Jr 126,027
Telegraph wires to insulators, fastening, D. Doren 126,038
Telegraphs, unison stop for printing, M. F. Wessman 125,920
Thill coupling, S. O'Haire 125,982
Thrashing machine, S. E. Oviatt 125,904
Thrashing machine, A. Wemple 126,117
Tongs, pipe, J. F. Brewer 125,878
Tool, farrier's clinching, S. Ogden 126,078
Tool handle, Will and Finck 125,922
Tubes, bars, etc., machine for straightening, A. Watkin 125,996
Umbrellas, manufacture of, J. McAuliffe 125,974
Valves, link block for slide, E. Marsland 125,970
Vegetable cutter, Weed and Du Faur 126,115, 126,116
Vent plug, Mill and Wetmore 125,901
Vest, Z. Ober 125,903
Wagon brake, A. S. Notestein 125,902
Wagon, peddler's, J. Treffeison 126,126
Washing machine, W. Cooper 126,030
Washing machine, S. G. Eubank 126,045
Washing machine, J. Killinger 125,896
Washing machine, N. C. Goodloe 125,950
Washing machine, steam, D. C. Kellam 126,125
Water elevator, N. H. Lindley 126,064
Weather strip, Brown and Brownell 126,014
Weather strip for window sashes, R. A. Jackson 125,958
Whip socket, S. W. Beach 126,008
Whisk and hat brush, combined clothes, A. M. Richmond 126,090
Window blind, G. M. Fowler 125,887
Wrench, H. G. Brown 126,013
Writing machine, type, H. R. M. J. Hansen 125,953
Yeast, separating and collecting, C. Fleischmann 125,945

DESIGNS PATENTED.

5,807.—STOVE DOOR.—R. A. Cutter, Peoria, Ill.
5,808.—SHEET METAL CAN.—H. Everett, Philadelphia, Pa.
5,809.—ORNAMENTING GLOVES.—F. Regle, New York city.
5,810.—FLAT IRON HEATER.—M. Little, East Saginaw, Mich.
5,811.—GAS HEATER.—T. J. Mayall, Boston, Mass.
5,812.—TIN PAIL.—G. D. Napheys, Philadelphia, Pa.
5,813.—DOOR BOLT.—A. Wunder, New Haven, Conn.
4,814 and 5,815.—TYPE.—D. W. Bruce, New York city.
5,816.—TYPE.—J. Herriet, New York city.
5,817.—LAMP CHIMNEY.—M. J. Wellman, New York city.
5,818.—CHANDELIER HOOK.—J. B. Sargent, New Haven, Conn.

TRADE MARKS REGISTERED.

776.—INDIGO SOAP.—H. C. Borgner, Lebanon, Pa.
777.—FILES.—W. & S. Butcher, Sheffield (Eng.), and New York city.
778.—FILES, EDGE TOOLS, ETC.—W. & S. Butcher, Sheffield (Eng.), and New York city.
779.—LINIMENT.—Cloud, Akin & Co., Evansville, Ind.
780.—CLOTHING, ETC.—Devlin & Co., New York city.
781.—WHISKIES.—T. & J. W. Gaff & Co., Aurora, Ind.
782.—BOOTS AND SHOES.—C. B. Gay, Syracuse, N. Y.
783.—RUBBER GOODS.—National Rubber Company, Bristol, R. I.
784.—FLOUR.—A. Nones & Co., New York city.
785.—CONDENSED LYE.—J. H. Seibert, Philadelphia, Pa.
786.—AGRICULTURAL FORKS.—F. P. Shumway, Leominster, Mass.
787.—REFRIGERATOR.—D. W. C. & G. F. Taylor, New York city.
788.—MOWING TOOLS, ETC.—The Greenwoods Scythe Co., Hartford, Conn.
789.—TONIC BEER.—C. L. Thompson, Baltimore, Md.

SCHEDULE OF PATENT FEES:

On each Caveat $10
On each Trade-Mark $25
On filing each application for a Patent, (seventeen years) $15
On issuing each original Patent $20
On appeal to Examiners-in-Chief $10
On appeal to Commissioner of Patents $20
On application for Reissue $30
On application for Extension of Patent $50
On granting the Extension $50
On filing a Disclaimer $10
On an application for Design (three and a half years) $10
On an application for Design (seven years) $15
On an application for Design (fourteen years) $30

For Copy of Claim of any Patent issued within 30 years $1
A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from $1
upward, but usually at the price above-named.
The full Specification of any patent issued since NOV. 20, 1866 *at which time the Patent Office commenced printing them* ..... $1·25
Official Copies of Drawings of any patent issued since 1836, *we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.*
Full information as to price of drawings in each case, may be had by addressing

MUNN & CO.,
Patent Solicitors, 37 Park Row, New York.

APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending, for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

20,927.—TUBE JOINTS FOR CONDENSERS.—H. Allen. July 5, 1872.
21,030.—FEEDING QUARTZ, ETC., TO CRUSHING MACHINES.—C. P. Stanford. July 10, 1872.
20,970.—ELECTROMAGNETIC ALARM.—W. Whiting. July 8, 1872.
20,214.—CARTRIDGE CASE.—G. W. Morse. May 6, 1872.
20,235.—FLY NET.—R. Wilson. May 8, 1872.
20,267.—WOVEN FABRIC.—J. Gujer. May 8, 1872.

EXTENSIONS GRANTED.

19,966.—WATCH CASE.—E. Bliss.
20,100.—BUREAU DRAWER.—H. R. Taylor.

EXTENSIONS REFUSED.

Peter V. Mathews, for the extension of letters patent No. 20,078, dated April 27, 1858, for an improved mode of protecting gilding on glass.

Thomas Lee, for the extension of letters patent No. 20,073, dated April 27, 1858, for an improvement in breech loading fire arms.

Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing

MUNN & CO., 37 Park Row.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]
From March 30 to April 8, 1872, inclusive.

ATTACHMENT TO BURNER.—S. Raynor, New York city.
CARPETS.—G. Crompton, Worcester, Mass.
CLEANSING CARPETS.—L. Stern, Boston, Mass.
ELECTRO MOLDS.—S. P. Knight, Brooklyn, N. Y.
ENGINE PACKING.—G. Gwynn, New York city; G. Gilbert, C. Barnes, Brooklyn, N. Y.
HORSE SHOE NAILS.—T. H. Fuller, Boston, Mass.
LOOM.—J. Fhort, New Brunswick, N. J.
PAPER PULP.—G. Swift, San Francisco, Cal.
PAPER RAG ENGINE.—N. W. Taylor, J. W. Brightman, Cleveland, Ohio.
PREPARING FIBERS.—F. T. Chase, J. H. Platt, Dudley, Mass.
PROPELLING AND STEERING VESSELS.—C. Henje, Hoboken, N. J.
RAILWAY, ROLLING STOCK, ETC.—J. Frye, New York city.
ROOFING.—J. B. Cornell, New York city.
SEWING BOOTS, ETC.—C. Goodyear, Jr., New Rochelle, N. Y.

FOREIGN PATENTS—A HINT TO PATENTEES.

It is generally much better to apply for foreign patents simultaneously with the application in the United States. If this cannot be conveniently done, as little time as possible should be lost after the patent is issued, as the laws in some foreign countries allow patents to any who first make the application, and in this way many inventors are deprived of valid patents for their own inventions. It should also be borne in mind that a patent is issued in England to the first *introducer*, without regard to the rights of the *real* inventor; therefore, it is important that all applications should be entrusted to responsible agents in this country, who can assure parties that their valuable inventions will not be misappropriated. The population of Great Britain is 31,000,000; of France, 37,000,000; Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address

MUNN & CO.,
37 Park Row, N. Y.

☞ Circulars, with full information on foreign patents, furnished free.

Advertisements.

RATES OF ADVERTISING.
Back Page - - - - - - - $1·00 a line,
Inside Page - - - - - - - 75 cents a line
or each insertion.
Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

BAIRD'S BOOKS

FOR PRACTICAL MEN.

Painter,

Gilder, and Varnisher's Companion.

SIXTEENTH EDITION.

The Painter, Gilder & Varnisher's Companion,

Containing Rules and Regulations in everything relating to the Arts of Painting, Gilding, Varnishing, Glass Staining, Graining, Marbling, Sign Writing, Gilding on Glass, and Coach Painting and Varnishing; Tests for the Detection of Adulterations in Oils, Colors, etc.; and a Statement of the Diseases to which Painters are peculiarly liable, with the Simplest and Best Remedies. Sixteenth Edition. Revised, with an Appendix, Containing Colors and Coloring—Theoretical and Practical. Comprising Descriptions of a great variety of Additional Pigments, their Qualities and Uses, to which are added, Dryers, and Modes and Operations of Painting, etc. Together with Chevreul's Principles of Harmony and Contrast of Colors. 12mo. Cloth.....$1.50

A Complete Guide for Coach Painters. By M. Arlot and A. A. Fesquet. 12mo.....$1.25

The Interior Decorator; the Laws of Harmonious Coloring adapted to Interior Decorations, with a Practical Treatise on House Painting. By D. R. Hay. 12mo.....$2.25

Sign Writing and Glass Embossing: A Complete Practical Illustrated Manual of the Art, with fifteen Plates of Alphabets, and other illustrations. 12mo.....$1.50

☞ The above, or any of my books, sent by mail, free of postage, at publication prices.

My new, revised and enlarged CATALOGUE OF PRACTICAL and SCIENTIFIC BOOKS, comprising almost every art trade and calling, 96 pages, 8vo., will be sent free of postage to any one sending his address.

HENRY CAREY BAIRD,
INDUSTRIAL PUBLISHER,
406 WALNUT STREET, Philadelphia.

SOLUBLE GLASS

SILICATES OF SODA AND POTASH. FIRE, WATER and MILDEW PROOF. Manufactured by L. & J. W. FEUCHTWANGER, 55 Cedar St., N.Y.

Highest Premium awarded by American Inst. Fair, 1871.

TRADE MARK.

An Indestructible Coating for Iron, Tin and Wood.

PRINCE'S METALLIC PAINT

is acknowledged, wherever known, to be the

BEST & CHEAPEST PAINT

in the market.

[Extract from the Report to the U. S. Navy Department on Prince's Metallic Paint.]

PAINTING DEPARTMENT, NAVY YARD,
WASHINGTON, March 21, 1867.

To Rear Admiral William Radford, Commander:

" " " I am of the opinion that Prince's Metallic Paint is a valuable acquisition to the class of metallic paints, and if a similar quality as that furnished to this yard to be tested can be procured in quantity, it ought to be substituted for red lead, Spanish brown, Venetian red, and the so-called brown zincs. There is no waste in it, and, according to its composition, it must be more durable than any of the above-named paints.

" JOHN W. PEAKE, Master Painter."

For Sale, Dry and in Oil, by the Trade and by

PRINCE & BASS, MANUFACTURERS,
96 CEDAR STREET, New York.

☞ All packages are marked with name and trademark.

SCHENCK'S WATERPROOF SHIPPING TAGS

P.O. BOX 2,564 NEW YORK 90 ANN ST.

IMPROVED FOOT LATHES. Slide Rests, Hand Planers, Scroll Saws. Superior to all others. Selling every where. Catalogues free.
N. H. BALDWIN,
Laconia, N. H.

Solid Tubular Cast Steel!

CAST STEEL GEARING, DIES, HEAVY TOOLS, and Forgings, made to pattern.
MORSE & BENNET, No. 57 Cedar St., N. Y.

TO MANUFACTURERS, CAR BUILDERS &c.—FOR SALE AT A LOW PRICE, Thirty Acres of Land Eligibly Located for Manufacturing purposes, having a large front on the Philadelphia & Trenton Rail-Road, ADJOINING A STATION and near the Village of Holmesburg, Twenty Minutes Ride from the Kensington or West Philadelphia Depot. COAL AND OTHER SUPPLIES can be landed on the ground by Rail, and DIRECT CONNECTION ALSO, by Rail, can be had with NEW YORK, PHILADELPHIA, and any other points, North, South or West. Address Box 1512, Philadelphia P. O.

WE ARE MAKING SUPERIOR STEAM Engines of all sizes, equal in all respects to the best in the market. Several new and second hand Engines and Boilers, also one new Shaping Machine, thirteen inches stroke, for sale cheap. Apply to WATTS, CAMPBELL & CO.,
Passaic Machine Works,
Newark, N.J.

LIGHTNING ROD POINTS AND NUTS, in every style. Samples free.
J. R. GILCHRIST, Mt. Pleasant, Iowa.

Reynolds'

TURBINE WATER WHEELS.

The Oldest and Newest. All others, only imitations of each other in their strife after complications to confuse the public. We do not boast but quietly exceed them all in staunch, reliable, economical power. Beautiful pamphlet free. Geo. TALLCOT, 96 Liberty st., New York.

Gearing. Shafting.

WOODWORTH SURFACE PLANERS, $125. Woodworth Planers and Matchers, $250. HILLS & HOAG, 32 Courtlandt St., New York.

STEEL CASTINGS,

UNDER HAINSWORTH'S PATENT.

We are making **Steel Castings, Smooth, True, Free from Porosity**, capable of receiving **Very High Polish**. Can be **Forged** or **Welded** easily as **Bar Steel**, and **Strong as Forged Steel**. Send for Circular. PITTSBURGH STEEL CASTING CO. Pittsburgh, Pa.

$10 **To $20 Daily Paid Canvassing Agents.** Exclusive territory. New monopoly. Sells in every family to entire satisfaction. **Agents wanted.** MYERS M'F'G CO., 104 John St., New York.

STEAM PUMPS WRIGHT'S Bucket Plungers are the best. Send for circular. Valley Machine Co., Easthampton, Mass.

PATENTS SOLD BY MOODY & CO., 183 Broadway, New York. ☞ Send for "The Patent Bulletin."

NEW PATTERNS.

MACHINISTS' TOOLS—all sizes—at low prices. E. & R. J. GOULD, 97 to 113 N. J. R. R. Ave., Newark, N. J.

PORTABLE STEAM ENGINES, COMBINing the maximum of efficiency, durability and economy, with the minimum of weight and price. They are widely and favorably known, more than **900** being in use. All warranted satisfactory or no sale. Descriptive circulars sent on application. Address J. C. HOADLEY & CO., Lawrence, Mass. 46 Cortlandt st. New York.

Niagara Steam Pump.

CHAS. B. HARDICK,
23 Adams st., Brooklyn, N. Y.

STAVE MACHINERY
And WOODWORTH PLANERS for 12 years a specialty.
T. B. RICKER & SONS, Harrison, Me.

OTIS' SAFETY HOISTING Machinery.

OTIS, BROS. & CO.
No. 348 BROADWAY, NEW YORK.

PATENT BAND
SAWING MACHINES

Of the most approved kinds to saw bevel as well as square without inclining the table, by FIRST & PETTIBIL, heretofore at 432 10th avenue—now removed to a more spacious place, 461 to 467 West 40th street, cor. 10th avenue, New York, where we manufacture various sizes of our well known sawing, moulding, double spindle boring and mortising Machines, general and oval turning Lathes, Shafting, Pulleys, &c. &c.

Prices for Hand Saw Machines (of which at the present time, April 1st, 126 of our make operate in New York City alone), are $250, $275, $350, and $400. To the largest a feed can be attached to resilt boards. A machine to resilt heavy timber is in construction. Have on hand a large stock of best French Band Saw Blades.

CINCINNATI BRASS WORKS. — Engineers and Steam Fitters' Brass Work, Best Quality at lowest Prices. F. LUNKENHEIMER, Prop'r.

PATENTS.—Send for our Descriptive List of Patents for Sale or Exchange. Parties desiring to dispose of meritorious Inventions should consult us. More Agents wanted. E. H. GIBBS & CO., 11 Wall St. N.Y.

NEW YORK STENCIL WORKS,

87 NASSAU ST., NEW YORK.

Stencils of all kinds; Brass Labels for Manufacturers; Steel Stamps and Dies, and Stencil materials. Terms reasonable, and good work guaranteed.

ROPER HOT AIR

ENGINE COMPANY, 124 Chambers St., New York.

VILLE'S LECTURES on Chemical Fertilizers.—This admirable work, translated by Miss E. L. Howard, of Georgia, recently reviewed in the columns of "The Scientific American," will be sent prepaid to applicants at 50 cts. per copy. Address THE PLANTATION PUBLISHING CO., Atlanta, Ga.

MANUFACTURING SITES—Cheap. Water and Rail Facilities. Address JAMES STRATTON, Secretary Board Trade, Bordentown, N. J.

AGENTS WANTED to sell articles needed by every one. Address PLUMB & CO., Phila., Pa.

MACHINISTS' PATTERN and BRAND Letters—Every size or style on hand, OR TO ORDER. VANDERBURGH, WELLS & CO., 18 Dutch St., corner Fulton, N. Y. Engravers' BOXWOOD—METAL for Machinists.

FOR SALE OR LEASE—AN IRON MINE, in Morris County, N. J., two miles from Canal, one fourth of a mile from Railroad. The Ore is Magnetic and **FREE FROM SULPHUR & PHOSPHORUS**, particularly desirable for the manufacture of Steel Rails, etc. Ore can be raised in large quantities immediately. Steam Engine, Pumps, etc., in perfect working order. Miners' houses, etc., on the premises. Satisfactory reasons for disposing of this property. Address J. LOVELL CANFIELD, Pres't, Nos. 55 & 57 White St., New York.

Ure's Dictionary

OF

Arts, Manufactures, and Mines:

CONTAINING A

CLEAR EXPOSITION OF THEIR PRINCIPLES AND PRACTICE.

Edited by ROBT. HUNT, F.R.S.,

Assisted by numerous contributors eminent in Science and familiar with Manufactures.

Illustrated with nearly 2000 Engravings on Wood.

SIXTH EDITION, CHIEFLY REWRITTEN, AND GREATLY ENLARGED.

In Three Volumes.—8vo., cloth, $10. ½ Russia, $17.50. Sent by mail, post-paid, on receipt of price.

D. VAN NOSTRAND,
PUBLISHER AND IMPORTER, 23 MURRAY AND 27 WARREN ST., NEW YORK.

Machinery,

Wood and Iron Working of every kind. Leather and Rubber Belting, Emery Wheels, Babbitt Metal, &c. GEO. PLACE & CO., 121 Chambers & 103 Reade Sts. N. Y.

Machinists' Tools.

The largest and most complete assortment in this country, manufactured by NEW YORK STEAM ENGINE COMPANY, 121 Chambers & 103 Reade Streets, New York.

Cold Rolled Shafting.

Best and most perfect Shafting ever made, constantly on hand in large quantities, furnished in any lengths up to 24 ft. Also, Pat. Coupling and Self-oiling adjustable Hangers. GEORGE PLACE & CO., 121 Chambers & 103 Reade Streets, New York.

Sturtevant Blowers

Of every size and description, constantly on hand. GEORGE PLACE & CO., 121 Chambers & 103 Reade Streets, New York.

WOODBURY'S PATENT
Planing and Matching

and Moulding Machines, Gray & Wood's Planers, Self-oiling Saw Arbors, and other wood working machinery. S. A. WOODS, 91 Liberty street, N. Y.; Send for Circulars. 107 Sudbury street, Boston.

Whalen Turbine. No risks to purchaser. Send for Pamphlet, free. SETH WHALEN & BRO., Ballston Spa, N. Y.

WROUGHT IRON BEAMS & GIRDERS

THE Union Iron Mills, Pittsburgh, Pa. The attention of Engineers and Architects is called to our improved Wrought-iron Beams and Girders (patented), in which the compound welds between the stem and flanges, which have proved so objectionable in the old mode of manufacturing, are entirely avoided, we are prepared to furnish all sizes at terms as favorable as can be obtained elsewhere. For descriptive lithograph address Carnegie, Kloman & Co. Union Iron Mills, Pittsburgh Pa.

MAGIC For the Parlor. Send a Stamp for a price list. HARTZ CONJURING REPOSITORY, No. 743 Broadway, New York.

STEAM
PUMPING MACHINERY

EVERY VARIETY.

Large and Splendid **Illustrated Catalogue** Sent Free, on Application.

Cope & Maxwell Man'fg Company,
118, 120 & 122 East Second St.,
CINCINNATI, O.

$100 to 250 per month guaranteed sure to Agents everywhere selling our new seven strand **White Platina Clothes Lines.** Sells readily at every house. Samples free. Address the GIRARD WIRE MILLS, Philadelphia, Pa.

THE "PHILADELPHIA"
HYDRAULIC JACK.

PISTON guided from both ends; all working parts guarded from dust; single or double pumps cylinders, shafts, rocker arms, pistons, etc., entirely steel. No. 14 N. 5th st., Philadelphia, } PHILIP S. JUSTICE. No. 42 Cliff st., New York. }

EDWARD H. HOSKIN,
CONSULTING AND ANALYTICAL CHEMIST,
Lowell, Mass.

PARR'S
TECHNICAL GUIDE,

Containing full instructions, with illustrations, how to produce Sorrento fret Carving, with description and designs of Flower Stands, Table Mats, Corner and Hanging Shelves; Work, Fruit and Card Baskets; Picture and Photograph Frames, in all 80 elegant, artistic and useful home requisites, which can be engaged in by young and old of both sexes. Tool Chests for the child, youth, mechanic and farmer; Model Upright, Horizontal and Locomotive Steam Engines; Model Yachts, schooners, brigs and steamships; Mathematical Instruments and Microscopes; Portable Foot Lathes and Fittings and fine Machinists' Tools; Fret Cutting Machines and Materials; Chemical Chests and Laboratory for boys, youths and students, and also first steps in Chemistry, being a series of 145 select and amusing Chemical experiments, instructive and entertaining, harmless and free from danger; also, description and price of 90 different kinds of useful and precious Woods from all parts of the World. Naming 1,100 Scientific Mechanical Appliances and over 228 Illustrations. Interesting and beneficial to every one. Mailed on receipt of 15 cents.

GEORGE PARR, Buffalo, N. Y.,
Manufacturer of Mechanics' Tools.

A CAREFULLY SELECTED assortment of
PATENT RIGHTS

Constantly on hand and for sale, either for cash or on royalty. We offer those only, which, after a business experience of fourteen years, we can thoroughly endorse, both in a pecuniary and mechanical aspect. Manufacturers and capitalists negotiating through us will therefore continue to find safe and profitable investments, as in former years. See advertisements in the New York daily papers. Patentees and Inventors will do well to communicate with us for terms, &c. E. E. ROBERTS & CO., Consulting Engineers, 15 Wall St., New York.

$10 from 50 cts.

12 SAMPLES sent (postage paid) for Fifty Cents, that retail easily for Ten Dollars. R. L. WOLCOTT, No. 191 Chatham Square, N. Y

AUSTRALIAN COLONIES.
BENCRAFT & SMITH, Solicitors and Patent Agents, Melbourne, Victoria. Agencies in all the Colonies. References—*New York:* John Stephenson & Sons. *Melbourne:* United States Consul.
Powers of attorney to Charles Chichester Bonsfield.

You ask WHY we can sell First Class 7 Octave Pianos for $290? We reply—It costs less than $300 to make any Piano sold through Agents, all of whom make 100 per ct. profit. We have no Agents, but ship direct to families at Factory price, and warrant Five Years. Send for illustrated circular, to which we refer to 800 Bankers, Merchants, &c. (some of whom you may know) using our Pianos in 40 States and Territories.

U. S. Piano Co., 865 Broadway, New York.

1832. SCHENCK'S PATENT. 1871.

WOODWORTH PLANERS

And Re-Sawing Machines, Wood and Iron Working Machinery, Engines, Boilers, etc. JOHN B. SCHENCK'S SONS, Matteawan, N. Y. and 118 Liberty st., New York.

UNIVERSAL WOOD WORKER.
HORIZONTAL AND UPRIGHT BORING MACHINES.
McBETH, BENTEL & MARGEDANT, Hamilton, O.

WOOD-WORKING MACHINERY GENerally. Specialties, Woodworth Planers and Richardson's Patent Improved Tenon Machines. Nos. 24 and 26 Central, corner Union st., Worcester, Mass. WITHERBY RUGG & RICHARDSON.

MACHINISTS.

Illustrated Catalogue and Price List of all kinds of small Tools and Materials sent free to any address. GOODNOW & WIGHTMAN, 23 Cornhill Boston, Mass.

Milling Machines.

STANDARD, UNIVERSAL, INDEX AND PLAIN, in every variety, of unequalled design and first class workmanship. Send for illustrated catalogue to the BRAINARD MILLING MACHINE COMPANY, 80 Milk Street, Boston. Works at Hyde Park.

AGENTS WANTED. Agents make more money at work for us than at anything else. Particulars free. G. STINSON & Co., Fine Art Publishers, Portland, Me.

RICHARDSON, MERIAM & CO.
Manufacturers of the latest improved Patent Daniels' and Woodworth Planing Machines, Matching, Sash and molding, Tenoning, Mortising, Boring, Shaping, Vertical, and Circular Re-sawing Machines, Saw Mills, Saw Arbors, Scrol. Saws, Railway, Cut-off, and Re-saw Machines, Spoke and Wood Turning Lathes, and various other kinds of Wood-working Machinery. Catalogues and price lists sent on application. Manufactory, Worcester, Mass. Warehouse, 105 Liberty st. New York. 17 1

SHINGLE AND BARREL MACHINERY.—Improved Law's Patent Shingle and Heading Machine, simplest and best in use. Also, Shingle Heading and Stave Jointers, Stave Equalizers, Heading Planers Turners, etc. Address TREVOR & Co., Lockport, N.Y.

PUMPS.—For Description, Price Lists etc., of the Best Centrifugal Pump ever Invented, with Overwhelming Testimony in its favor, send for new illustrated pamphlet (48 pp.) to Messrs. HEALD, SISCO & CO. Baldwinsville, N. Y.

MODELS FOR THE PATENT OFFICE, and experimental machinery of all kinds. HOLSKE MACHINE CO., 79 Cherry St., New York, near Jefferson St. A special shop for Patent Models. Many years experience. Refer to Scientific American Office.

PATENT IMPROVED
VARIETY MOLDING MACHINERY
And Adjustable
CIRCULAR SAW BENCHES.
For Machines and Information, address
J. P. GROSVENOR, Lowell, Mass.

5000 AGENTS WANTED.—Samples sent free by mail, with terms to clear from $5 to $10 per day. Two entirely new articles, saleable as flour. Address N. H. WHITE, Newark, New Jersey.

DAVIS' PATENT
RECORDING GAUGE.
Adopted by the Board of U. S. Supervising Steamboat Inspectors. Simple and Cheap. NEW YORK STEAM GAGE COMPANY, 46 Cortlandt Street, New York.

BUY BARBER'S BIT BRACE.

BUERK'S WATCHMAN'S TIME DETECTOR.—Important for all large Corporations and Manufacturing concerns—capable of controlling with the utmost accuracy the motion of a watchman or patrolman, as the same reaches different stations of his beat. Send for a Circular. J. E. BUERK, P. O. Box 1,057 Boston, Mass.

N. B.—This detector is covered by two U. S. Patents. Parties using or selling these instruments without authority from me will be dealt with according to law.

YOU WANT THE CHOICEST
ORNAMENTAL
FOLIAGE PLANTS
Ever Offered in this Country.

☞ See our Illustrated Catalogue of new and rare plants. Send Stamp. Address OLM BRO'S, Springfield, Mass.

THE WOODWARD
STEAM PUMP.

Woodward Pat. Improved Safety Steam Pump and Fire Engine, Steam, Water, and Gas Fittings of all kinds. Dealers in Wrought-iron Pipe, Boiler Tubes, etc. Hotels, Churches, Factories, and Public Buildings heated by Steam, Low Pressure. Woodward Co., 74 and 76 Center st., N. Y.

LATHE CHUCKS—HORTON'S PATENT from 4 to 36 inches. Also for car wheels. Address E. HORTON & SON, Windsor Locks, Conn.

Andrew's Patents.

Noiseless, Friction Grooved, or Geared Hoisters, suited to every want.
Safety Store Elevators. Prevent Accident, if Rope, Belt, and Engine break.
Smoke-Burning Safety Boilers.
Oscillating Engines, Double and Single, 1-2 to 100-Horse power.
Centrifugal Pumps, 100 to 100,000 Gallons per Minute, Best Pumps in the World, pass Mud, Sand, Gravel, Coal, Grain, etc., without injury.
All Light, Simple, Durable, and Economical. Send for Circulars.
WM. D. ANDREWS & BRO.,
414 Water street, New York.

RIVERVIEW Military Academy, Poughkeepsie, N. Y. A thorough-going school for boys.

P. BLAISDELL & Co.,
MANUFACTURERS OF FIRST CLASS MACHINISTS' TOOLS. Send for Circulars. Jackson st., Worcester, Mass.

AGENTS & Peddlers for our Press & Strainer. Presses and strains jams, jellies, herbs, vegetables, lard, tallow, meats, cheese, etc.; quick and profitable. Over 60,000 sold in a few localities. Every family wants it. Circulars free. LITTLEFIELD & DAME, 102 Wash'n St., Boston, Mass.

VALENTINE'S IMPROVED
Fourneyron Turbine.

This celebrated WATER WHEEL, the most powerful in use, constructed on scientific principles by WM. J. VALENTINE, Ft. Edward, N.Y. **No fancy prices.**

MASON'S PAT'T FRICTION CLUTCHES are manufactured by Volney W. Mason & Co., Providence, R. I. Agents, R. BROOKS & CO., 128 Ave. D, New York; TAPLIN, RICE & CO., Akron, Ohio.

WE warrant every Steam Gauge bearing our name and numbered above 12,000 FOR TWO YEARS.
☞ Send Circulars.
UTICA STEAM GAUGE CO., Utica, N.Y.

Advertisements.

dvertisements will be admitted on this page at the rate of **$1·00** *per line for each insertion. Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.*

The value of the SCIENTIFIC AMERICAN *as an advertising medium cannot be over-estimated. Its circulation is ten times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading-rooms of the world. We invite the attention of those who wish to make their business known to the annexed rates. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. If it is worth 25 cents per line to advertise in a paper of three thousand circulation, it is worth $2.50 per line to advertise in one of thirty thousand.*

Tin-Lined Lead Pipe

Is a Block-Tin Pipe, heavily coated with solid lead. It is the best and cheapest Water Pipe when strength and durability are considered. By its use iron-rust, lead and zinc poison are all avoided, and general health promoted. Price 15 cents a pound for all sizes. Circulars and sample of pipe sent by mail, free. Address the COLWELLS, SHAW & WILLARD M'F'G Co., No. 213 Centre Street, New York. Also, manufacturers of Block-Tin Pipe, Sheet Lead, Lead Pipe, Solder, &c. Orders solicited, and filled at sight.

ASPHALTE ROOFING FELT.

A WELL tested article of good thickness and durability, suitable for steep or flat roofs; can be applied by an ordinary mechanic or handy laborer. Send for circular and samples to E. H. MARTIN, 70 Maiden Lane and 9 Liberty Street, N. Y.,

VULCANIZED RUBBER

Adapted to Mechanical Purposes. New York Belting and Packing Co., 37 & 38 Park Row.

Waltham Watches.

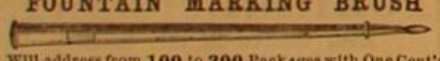
We send them by Express to any place in the United States or Canada. We send the bill to collect on delivery, but allow you to open the package and examine the Watch before paying, and if afterward it should not prove satisfactory, we will exchange it without expense, or refund the money.

It is first necessary that you should have a copy of our Descriptive Price List. This we send free to any one who writes for it. From it you will learn full particulars in regard to the different styles and grades; also prices of each. The Silver Watches cost from $16 upward, and the Gold Watches from $55. *All are warranted.* We sell none but solid Gold and Silver. We can refer to over Ten Thousand different persons who have had these Watches from us. Send for a Price List, and mention the SCIENTIFIC AMERICAN. Address

Howard & Co.,
No. 865 Broadway, New York.

TUYERE IRONS—Best in use. Address Adjustable Tuyere Iron Co., P.O. Box 3919, N. Y.

THE SELF-FEEDING FOUNTAIN MARKING BRUSH



Will address from **100** to **300** Packages with One Cent's worth of Fluid. Is always ready for use. Clean, Neat, and Handy. Can be carried in the pocket. Manufactured by G. W. KINGSLEY, Buffalo, N. Y.
E. CUMMINGS, Gen. Agent, 168 Fulton St., New York.
"It's just the thing. I number over 1,000 pieces of Freight with it daily.—WHITMORE, Ship'g Cl'k, Adams Ex. Company, N. Y.
"We have tried it, and endorse the above.—H. B. CLAFLIN & Co., R. F. NEIL, Ship'g Cl'k.

GEORGE PAGE & CO., Manufacturers of Portable and Stationary
STEAM ENGINES AND BOILERS;
Patent Circular, Gang, Mulay, and Sash
SAW MILLS, with OUTFITS COMPLETE,
combining all reliable improvements—Grist Mills; Shingle Machines; Wood Working and General Machinery.
Send for Descriptive Catalogues. Address No. 5 W. Schroeder Street, Baltimore, Md.

SMITH'S ASBESTOS ROOFING

FIRST PREMIUM (MEDAL) AWARDED IN 1870 AND IN 1871. Endorsed by Certificate from AMERICAN INSTITUTE as **"The Best Article in the Market."**
Also, manufacturer of **Asbestos Boiler Felting,** Roofing and Sheathing Felts, Acid, Water and Fire Proof Compositions, Boiler Scale Preventive, and dealer in ASBESTOS, ASPHALTUM and GENERAL ROOFING MATERIALS.
Descriptive Pamphlets, Price Lists, &c., by mail.
{ *Established* / *in 1858.* } H. W. JOHNS,
78 William St., New York

Steam Super-Heaters.

For latest improvements,
Address HENRY W. BULKLEY, ENGINEER,
98 Liberty Street, New York.

Working Models

And Experimental Machinery, Metal, or Wood, made to order by J. F. WERNER, 62 Center st. N. Y.

PYROMETERS, For Ovens, Boiler flues, Hot-blast pipes, Oil stills, Superheated Steam, &c.
Address HENRY W. BULKLEY,
98 Liberty Street, New York.

MACHINERY, NEW and 2d-HAND.—Send for Circular. CHAS. PLACK & CO., 60 Vesey st., New York.

PROPELLER PUMPS

Of any capacity and elevation, without Valves. For clean water, sand, sawdust, &c. W. B. BUCK, Sec., 61 N. Front St., Philadelphia, Pa.

PAT. SOLID EMERY WHEELS AND OIL STONES, for Brass and Iron Work, Saw Mills, and Edge Tools. Northampton Emery Wheel Co. Leeds, Mass.

Swain Turbine.

"Our Low-Water Wheel from this on"

WILL DO TEN PER CENT MORE WORK on small streams, in a dry season, than any wheel ever invented. Gave the best results, in every respect, the Lowell Tests.
For Report of tests at Lowell, with Diagrams and ales of Power address
THE SWAIN TURBINE CO.,
North Chelmsford, Mass.

RISDON'S IMPROVED
Turbine Water Wheel.

There are now several hundreds of these in successful operation. Their simple and tight gate, and their economical use of water at all stages of the gate, makes them every where liked. One of these was tested by James Emerson, of Lowell, and gave
EIGHTY-FOUR AND SIX ONE-HUNDREDTHS PER CENT.
Send for a circular.
T. H. RISDON & CO.,
Mount Holly, New Jersey.
Manufacturers of all kinds of Mill Machinery, and Circular Saw Mills

And Shaped Diamond Carbon Points, Indispensable for Turning Emery Wheels, Grindstones, also Truing up hardened steel and Paper Calender Rollers, &c. Address J. DICKINSON, Patentee, 64 Nassau St., N. Y.

Diamond Pointed STEAM DRILLS.

THE adoption of new and improved applications to the celebrated Leschot's patent, have made these drills more fully adaptable to every variety of ROCK DRILLING. Their unequalled efficiency and economy are acknowledged, both in this country and Europe. The Drills are built of various sizes and patterns; WITH AND WITHOUT BOILERS, and bore at a uniform rate, of THREE TO FIVE INCHES PER MINUTE in hard rock. They are adapted to CHANNELLING GADDING, SHAFTING, TUNNELLING, and open cut work; also, to DEEP BORING FOR TESTING THE VALUE OF MINES AND QUARRIES. TEST CORES taken out, showing the character of mines at any depth. Used either with steam or compressed air. Simple and durable in construction. Never need sharpening. Manufactured by
THE AMERICAN DIAMOND DRILL CO.,
No. 61 Liberty St., New York

IMPORTANT IMPROVEMENT ON THE DIAMOND POINTED STEAM DRILL!—Stevenson's Spring Core Retainer, patented Dec. 12, 1871, which prevents all chasing of the drill and secures a perfect core, can be applied to the Diamond Pointed Steam Drill at small expense. Rights to use may be had on application to HARDING, HAYDEN & CO., 325 Washington St., N. Y.

MORRIS, TASKER & CO.,
MANUFACTURERS OF
American Charcoal Iron Boiler Tubes.
Wrought-Iron Tubes and Fittings,
FOR GAS, STEAM, WATER AND OIL.
Steam and Gas Fitters' Supplies, Machinery for Coal Gas Works, &c. &c.
NO. 15 GOLD ST., NEW YORK.

The Union Stone Co.,
Patentees and Manufacturers of
EMERY WHEELS & EMERY BLOCKS,
In Size and Form to Suit various Mechanical Uses;
GRINDERS, SAW GUMMERS, DIAMOND TOOLS, and WOOD'S PATENT KNIFE-GRINDER,
For Planing, Paper Cutting, Leather Splitting, and other Long Knives.
OFFICE, 29 KILBY STREET, Boston, Mass.
BRANCH OFFICES { 23 Liberty Street, New York. / 502 Commerce Street, Philadelphia.
Send for circular.

E. M. MAYO'S BOLT CUTTER—Patented in 1867—Revised and Improved in 1871 and 1872. Send for Illustrated Circular Cincinnati, Ohio.

STEAM HAMMERS
FERRIS & MILES
24TH & WOOD STS PHILA.

VENEERS
AND
HARDWOOD LUMBER.
BUTTERNUT, FRENCH AND AMERICAN WALNUT, ASH AND CHERRY BURLS; HUNGARIAN ASH, BIRDSEYE & BLISTER MAPLE, etc. etc.
Mahogany, Rosewood, Cedar, etc., in boards, plank, and logs. Large and choice stock at low prices.
GEORGE W. READ & CO.,
160 & 172 Center St., New York.
Mill and Yard, 186 to 200 Lewis, bet. 5th & 6th Sts. E. R.
Send for Catalogues and Price List.

BLAKE'S PATENT STEAM PUMP.

SEND FOR CIRCULAR.

51 CHARDON ST., Boston, Mass.
79 LIBERTY ST., New York.

COLT'S ARMORY TESTING MACHINE—Strength of Materials.—The Colt's Arms Company, of Hartford, Conn., is prepared to measure the strength of all materials by its testing machine, which is capable of determining strains from 1 oz. to 100,000 lbs., in specimens from 7 inches to 8 feet in length, and with cross-sections up to 1 square inch in area. The price of testing half a dozen specimens of the same material, $25. See Scientific American, March 16, 1872. For further information, apply direct to the Company.

PATENT COLD ROLLED SHAFTING.

The fact that this Shafting has 75 per cent greater strength, a finer finish, and is truer to gage, than any other in use, renders it undoubtedly the most economical. We are also the sole manufacturers of the CELEBRATED COLLINS PAT. COUPLING, and furnish Pulleys, Hangers, etc., of the most approved styles. Price lists mailed on application to JONES & LAUGHLINS,
120 Water street, Pittsburgh, Pa.
Stocks of this Shafting in store and for sale by FULLER, DANA & FITZ, Boston, Mass.
GEO. PLACE & CO., 126 Chambers street, N. Y.

Damper Reg. Pat. Gage Cocks. Water Feed Reg's.

Send for circulars. MURRILL & KEIZER, Balt., Md.

IRON PLANERS, ENGINE LATHES, Drills, and other Machinists' Tools, of superior quality, on hand, and finishing. For sale low. For Description and Price address NEW HAVEN MANUFACTURING CO., New Haven, Conn.

STANDARD AMERICAN BILLIARD TABLES
NEW DESIGN

H. W. COLLENDER Successor PHELAN & COLLENDER.
738 Broadway, New York.
ILLUSTRATED PRICE-LIST SENT BY MAIL.

THE BAND SAW!
Its ORIGIN and
HISTORY, with Engravings of the OLDEST MACHINE, sent gratis. Address RICHARDS, LONDON & KELLEY, 22d st (above Arch), Philadelphia.

FOOT LATHES, Back Geared and Plane Chucks, Slide Rest, &c. Just the article for Sewing Machines and Shoe Factories. T. SHANKS, Baltimore, Md.

RANSOM SYPHON CONDENSER perfects and maintains vacuum on Steam Engines at cost of one per cent its value, and by its use Vacuum Pans are run with full vacuum without Air Pump. Send to G. S. WILSON, 51 Chardon St., Boston, for a personal call, or the Company, at Buffalo, N. Y., for a circular.

SPECIAL NOTICE.

ON THE 15th OF APRIL WE SHALL MAKE A GENERAL ADVANCE OF 15 PER CENT ON THE PRICE OF "THE TANITE EMERY WHEEL." *On and after the above date Tanite Emery Wheels will be sold at the NEXT LIST price, instead of 15 per cent Discount from same, as heretofore. There will be a corresponding advance to the trade.*
The increasing demand for, and reputation of, THE TANITE EMERY WHEEL warrants its manufacturers in at last making an advance from the price list which they have held rigidly fixed from the very infancy of the Company. Constant care and unremitting attention, the employment of the greatest mechanical and chemical skill, and the most assiduous study of the wants of Mechanics and Manufacturers, have enabled THE TANITE COMPANY to bring their *speciality* to the *highest point of perfection.* Constant outlays are required to meet the novel wants connected with this branch of industry; and this, with the necessity of maintaining and even increasing the high reputation of these goods, calls for a moderate increase in price. COMMON GOODS *can be made for ordinary prices, but* STANDARD GOODS, *of uniform quality; on whose perfection, both chemically and mechanically, not only the economy of the buyer, but the bodily safety of his hands depends: can only be furnished at full or high prices.* IT IS CHEAPER, SAFER, AND BETTER TO DEAL WITH A COMPANY WHO MAKE A DISTINCT SPECIALTY BOTH OF SOLID EMERY WHEELS AND OF EMERY GRINDING MACHINERY, THAN TO RISK THE POOR ECONOMY OF BUYING CHEAP AND UNSATISFACTORY GOODS.
Address **THE TANITE COMPANY,**
Stroudsburg, Monroe Co., Pa.

STROUDSBURG, MONROE CO., PA., March 18, 1872.
The Prices of the Tanite Co.'s Emery Grinding Machinery are *this day* advanced, as follows:

The Tanite Co.'s Saw Gummer		$15
" " "	No. 1 Emery Grinder	50
" " "	" " " on Table	50
" " "	No. 2 "	50
" " "	" " on Table	75
" " "	No. 3 "	110
" " "	Diamond Tools	15

The general and great advance in the price of Metals and Supplies, together with recent improvements in and additions to these Machines, necessitates the above advance. Notwithstanding this advance, the above Machines are the cheapest in the market. Take notice, that we make no charges for boxing and shipping, and no charges for Extra Rests. Each Emery Grinder is supplied (in addition to the two ordinary Rests) with one of our improved adjustable Face Rests, and one of our improved adjustable Side Rests. These Rests can be set at any angle.
Address, THE TANITE CO.,
Stroudsburg, Monroe Co., Pa.

THE TANITE CO.'S GOODS are kept in Stock, and sold at *Factory Prices*, by CHAMPLIN & ROGERS, 214½ *East Madison St., Chicago*, who are also Exclusive Western Agents for the New York Tap and Die Co.'s goods, and Dealers in Railway, Mill, and Machinists' Supplies.

WIRE ROPE.
JOHN A. ROEBLING'S SONS,
MANUFACTURERS, TRENTON, N. J.
FOR Inclined Planes, Standing Ship Rigging Bridges, Ferries, Stays, or Guys on Derricks & Cranes, Tiller Ropes, Sash Cords of Copper and Iron, Lightning Conductors of Copper. Special attention given to hoisting rope of all kinds for Mines and Elevators. Apply for circular, giving price and other information. Send for pamphlet on Transmission of Power by Wire Ropes. A large stock constantly on hand at New York Warehouse No. 117 Liberty street.

TODD & RAFFERTY, Manufacturers of Steam Engines, Boilers, Flax, Hemp, Tow Bagging, Rope and Oakum Machinery. Steam Pumps and Governors always on hand. Also Agents for the New Haven Manufacturing Co.'s Machinists' Tools. We invite especial attention to our new, improved, Portable Steam Engines. Warerooms, 10 Barclay st. Works Paterson, N. J.

STEAM PIPE AND
BOILER COVERING.
ECONOMY, Safety, Durability. CHALMERS SPENCE Co., foot E. 9th st., N. Y.; 1232 N. 2d st., St. Louis.

Brass & Copper
SEAMLESS TUBING
FOR LOCOMOTIVE, MARINE, AND STATIONARY BOILERS.
Merchant & Co.,
507 Market Street, Philadelphia

T. V. Carpenter, Advertising Agent. Address hereafter, Box 773, New York city.

A. S. CAMERON & CO.,
ENGINEERS,

Works, foot of East 23d street, New York city.
Steam Pumps,
Adapted to every possible duty.
Send for a Price List.

L. W. Pond---New Tools.
EXTRA HEAVY AND IMPROVED PATTERNS.
LATHES, PLANERS, DRILLS, of all sizes; Vertical Boring Mills, ten feet swing, and under. Milling Machines, Gear and Bolt Cutters; Hand Punches and Shears for Iron.
Office and Warerooms, 98 Liberty st., New York; Works at Worcester, Mass.
A. C. STEBBINS, New York, Agent.

American Saw Co., Manufacturers of

And Perforated Circular and Long Saws. Also Solid Saws of all kinds. No. 1 Ferry st., corner Gold street New York. Branch Office for Pacific Coast, No. 606 Front street, San Francisco, Cal.

BUILDING PAPER

FOR
SHEATHING,
PLASTERING,
ROOFING,
DEAFENING,
AND
CARPET LINING.
Samples & circulars sent free, by
ROCK RIVER PAPER CO., Chicago; or,
B. E. HALE & CO.,
21 & 24 Frankfort St., N. Y.
Sole Agents for Eastern States.

KIDDER'S PASTILES—A Sure Relief for Asthma. STOWELL & CO., Charlestown Mass.

Wanted Agents—**$75 to $250 per month.** everywhere male and female, to introduce the GENUINE IMPROVED COMMON SENSE FAMILY SEWING MACHINE. This Machine will stitch, hem, fell, tuck, quilt, cord, bind, braid and embroider in a most superior manner. Price only $15. Fully licensed and warranted for five years. We will pay $1000 for any machine that will sew a stronger, more beautiful, more elastic seam than ours. It makes the "Elastic Lock Stitch." Every second stitch can be cut, and still the cloth cannot be pulled apart without tearing it. We pay Agents from $75 to $250 per month and expenses, or a commission from which twice that amount can be made. Address SECOMB & CO., *Boston, Mass.; Pittsburgh, Pa.; Chicago, Ill.; or St. Louis, Mo.*

PORTLAND CEMENT,
OF the well known manufacture of John Bazley White & Brothers, London, for sale by JAMES BRAND, 55 Cliff St., N. Y.

C. J. Bandman. L. Jaffe.
Portland CEMENT,
For making **Artificial Stone.** EXTRA QUALITY, imported by the NEW YORK STONE WORKS. Send for circular. 1193 BROADWAY, New York.

MACHINERY,
Safes, and Mechanical Supplies,
A. S. & J. GEAR & CO.,
56 to 62 SUDBURY STREET, BOSTON, MASS.,

ELECTRIC APPARATUS for BLASTING and Submarine Work, manufactured solely by GEORGE E. LINCOLN & CO., Room 9, 32 Summer St. Boston, Mass.
Consisting of:
Electric Batteries of various sizes,
Electric Fuses of any required length
Electric Fuse Heads, detached,
Connecting Wire, Leading Wire, &c., &c.
Send for Circular.

THE NEW VOLUME OF
SCIENTIFIC AMERICAN
commenced JANUARY FIRST; therefore, now is the time to organize Clubs and to forward subscriptions. Clubs may be made up from different post offices.

TERMS FOR 1872.

One copy, one year		$3.00
One copy, six months		1.50
One copy, four months		1.00
CLUB RATES	Ten copies, one year, each $2.50	25.00
	Over ten copies, same rate, each	2.50
One copy of Scientific American for one year, and one copy of engraving, "Men of Progress,"		10.00
One copy of Scientific American for one year, and one copy of "Science Record,"		4.00
Ten copies of "Science Record," and ten copies the Scientific American for one year		35.00

CLUB PREMIUMS.

Any person who sends us a yearly club of ten or more copies, at the foregoing club rates, will be entitled to one copy, gratis, of the large steel plate engraving, "Men of Progress."
Remit by postal order, draft or express.
The postage on the Scientific American is five cents per quarter, payable at the office where received. Canada subscribers must remit, with subscription, 25 cents extra to pay postage.
Address all letters, and make all Post Office orders or drafts payable, to

MUNN & CO.,
37 PARK ROW, NEW YORK.

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard sts. Philadelphia and 59 Gold st. New York.

SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE. MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXVI.—No. 20. [NEW SERIES.] NEW YORK, MAY 11, 1872. $3 per Annum [IN ADVANCE.

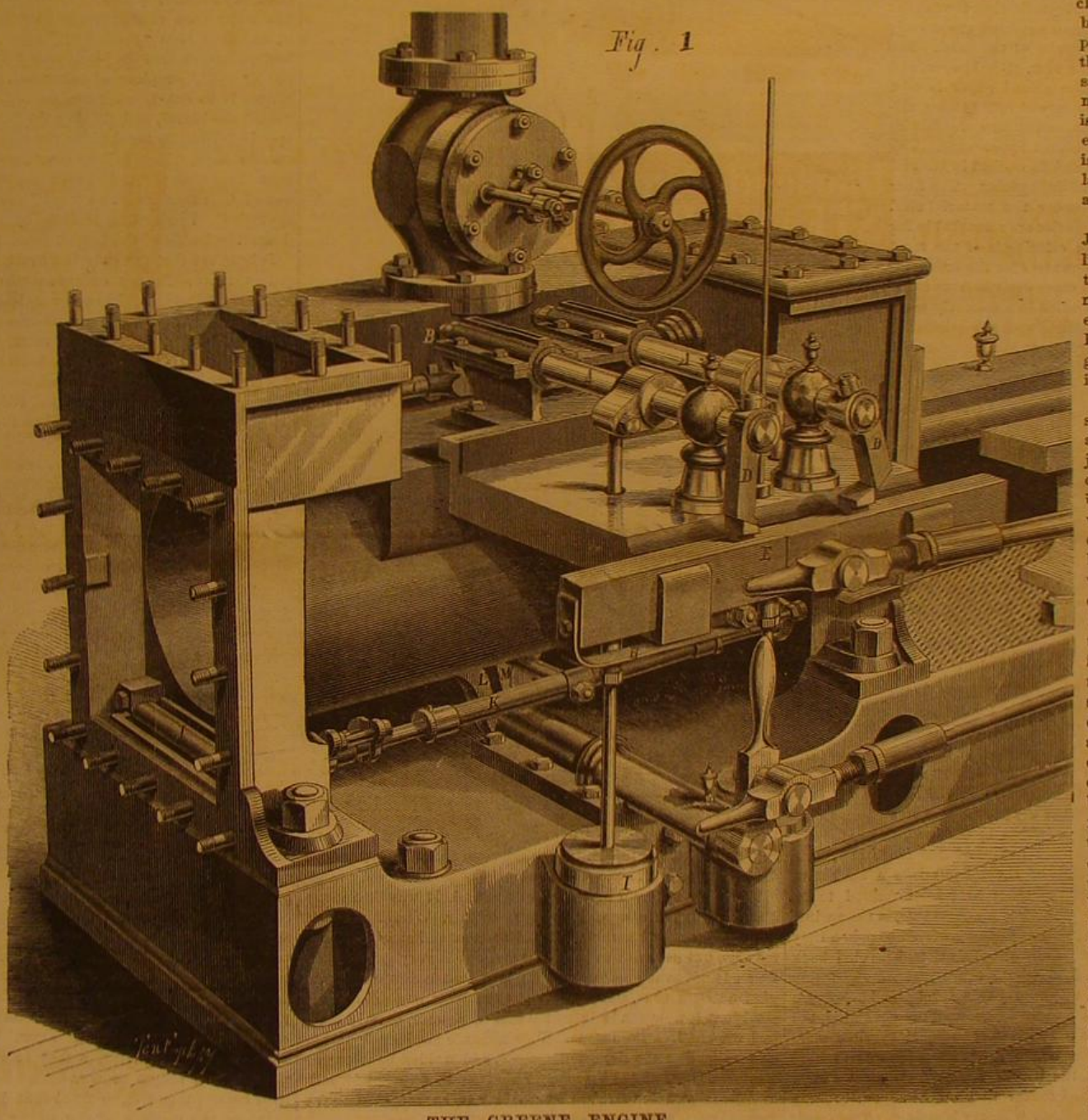
Improved Steam Engine.

The cut-off patented by Noble T. Greene has been favorably known for many years, its simplicity and durability, its economy and sensitive regularity ranking it among those improvements which are conceded to represent the highest state of the art. In March, 1869, the patent was extended and passed into possession of the Providence Steam Engine Company, who, it is stated, are now unable to build the engines fast enough to supply the demand.

The following improvements have been made: A new bed plate has been designed; access is had to the exhaust valves by removing the cylinder heads, as shown in Fig. 1; an intermittent movement allows these valves to remain at rest through nearly seven eighths of the stroke, and the mechanism actuating both steam and exhaust valves is now placed outside of the steam chest. The principle of the original Greene engine is not changed, but the parts retained, after reconstruction, are more durable, have larger bearing surfaces, and are made easy of access to the engineer.

The engine is of that class which does not require a throttle valve. The steam enters the cylinder at boiler pressure, and the governor fixes the period of time during which the steam valves shall remain open, allowing more or less steam to flow into the cylinder as there is more or less load to be driven. There are four flat slide valves, one (as shown in Fig. 3) at each end on the top to let in the steam, and one (as shown in Fig. 4) at each end on the bottom to let out the exhaust, and with as little clearance as the thickness of metal in the cylinder will allow.

Fig. 1



THE GREENE ENGINE.

While one valve is admitting and cutting off the steam, the other three are entirely at rest until just before the completion of the stroke, when the exhaust valves instantly rearrange themselves, opening the exhaust on one side of the piston and closing it on the other. The return stroke then commences, and the operation is repeated.

The short space of time during which the exhaust valves are moving is when the pressure upon them is the least, and, by an arrangement of cushioning the steam, the induction valve is at all times nearly balanced.

Fig. 3

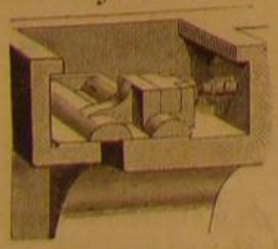
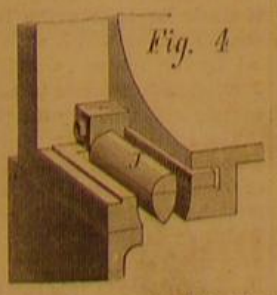


Fig. 4



The power which moves the valves is applied parallel to, and nearly in line with, their seats, so that they cannot rock or twist, thus greatly reducing any tendency to wear. One end of each valve stem being in the steam chest, the whole boiler pressure acts upon it to aid the weight in closing the valve when tripped, and the valve stem is made large in diameter to obtain the full benefit derived from cut-off valves closed by steam pressure. The governor can adjust the point of cut-off over a range of three fourths the entire stroke.

The working of the valve gear will be understood by reference to the engravings. Figs. 1 and 2 are perspective views of the cylinder and valve gear, Fig. 1 having certain parts removed. Figs. 3, 4, and 5 are sectional details.

The induction valves, Fig. 3, are connected with the rock lever shafts, A, Fig. 1, arms, B, working in slots in the valve stems, C. Below the rock levers, D, is a sliding bar, E, receiving a reciprocating motion from an eccentric on the main shaft. Behind the sliding bar is a gage bar, F, Fig. 5, connected with the governor, which bar receives an up and down motion from a corresponding movement of the governor balls. The adjustable tappets, G, Fig. 5, in the sliding bar, are kept up in contact with the gage bar, F, and are made to move up and down in unison with it by the springs, H, Figs. 1 and 5.

It will be seen from this description that, as the sliding bar moves in the direction of the arrow, Fig. 5, one of the tappets is brought in contact with the inner face of the toe on the rock lever, causing it to turn on its axis, thereby opening the steam valve at one end of the cylinder, the other tappet meanwhile passing under the other rock lever without moving it, the toe and tappet being so beveled that the tappet will be forced down against the action of this spring until it has passed by the toe, when the spring causes it to fly up to its original position, ready to open the induction valve at the opposite end. As a result of this motion, the two tappets always open the steam valves at the same period, but, the tappets moving in a straight line while the toe describes the arc of a circle, the tappet will pass by, liberating the toe, which is brought back to its original position by a weight, I, Fig. 2, and the steam pressure on the valve stem, thus closing the valve and cutting off the steam. This liberation will take place sooner or later, according to the elevation of the tappets; that is, the lower the tappets are, the sooner the toes will be liberated, and *vice versâ*; and so, by simply elevating or depressing the gage bar, F, Fig. 5, the period of closing the valves can be changed, while the period of opening them remains the same. The adjustment of the gage bar is effected by the governor, and the steam is cut off sooner or later according to the amount of load.

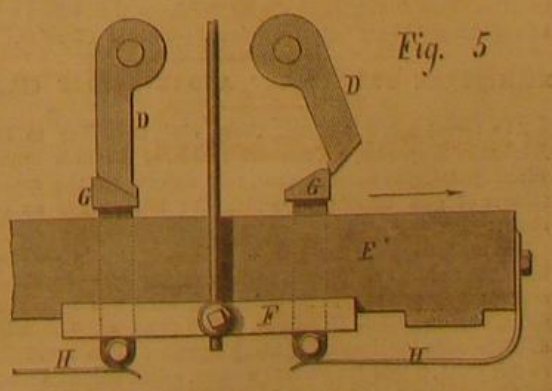
The exhaust valves, J, Figs. 1 and 4, which lie in the bottom of the cylinder, are connected at their outer ends by parallel rods, K, which are tied together by a crossbar in the inside.

The exhaust rock shaft arm, L, is a jaw, as shown in Fig. 1, just under the cylinder. One side of this jaw comes in contact with a lug, M, on the crossbar, and moves both the exhaust valves simultaneously opening one and closing the other. While the exhaust eccentric is taking up the lost motion, between the sides of the jaw, the exhaust valves remain at rest. The other side of the jaw coming in contact with the crossbar, the exhaust valves receive a reverse motion. The lug on the crossbar is so shaped that it receives no blow from the jaw, L, but takes a gradually accelerated motion.

The strength, simplicity, and durability of this engine is very noticeable, and it embodies all the advanced views in stationary engineering which have stood the test of actual practice.

Its finish is also neat and tasty, and, with the improvements described, it thus embodies all the essentials necessary to extend the wide popularity the original engine enjoyed.

Fig. 5



In these days of active competition, any marked improvement upon the construction of a steam engine is of importance not only to purchasers but to manufacturers. As the use of steam expansively is now well nigh universal, the

value of a variable cut off that combines, in so great a degree as this does, delicacy of action with strength and durability, is sufficiently obvious.

For circulars and other information, address Providence Steam Engine Company, Providence, R. I.

Japanese Textile Art.

Some years ago, there existed a law in Japan forbidding the exportation of high class textile fabrics, and judging by the few examples of any sort one sees at the present time, it is likely that the restriction still remains in force. The first time Europeans had an opportunity of forming definite ideas, regarding the state of the textile arts of Japan, was during the Paris Exhibition of 1867, where a remarkable series of samples was shown, and for the exportation of which, no doubt, special license was given to the Japanese Commissioners. At a recent meeting in London, Mr. Audsley was enabled to show several of the best fabrics from the Paris collection. The finest silks of Japan are manufactured on a small barren island, by high-born exiles who adopt the art of silk weaving as their means of procuring the necessaries of life. Ships convey provisions and raw materials to the island, and return with the product of its looms. There is little doubt that the fabrics so produced and protected are used exclusively by the Mikado and princes of the land. The materials employed are silk, gilded paper, and some strong fiber. The gilded paper is of a very tough nature, and is cut into narrow ribbons: in this state it is woven into the fabrics and presents a most brilliant appearance. The silk is of rich quality, and is worked in cut and terry velvets, satins, and dead grains. The fiber is only introduced to render the material stiff. The designs of these fabrics are remarkable for their boldness, and the coloring is of the most vigorous character. The ideas for the ornamentation are in nearly all cases derived from natural objects, and are handled in a masterly manner, and in strict accordance with the principles of decorative art. Turning to the lowest grade of the scale of textile fabrics, the common towels used by the peasantry of Japan (worth about a penny each in Japan) show more clearly than the costly silk fabrics do that the appreciation of and love for art is inherent in the Japanese mind, and that it is cultivated by all classes of the people, and carried into even the smallest and commonest articles of daily use. We can never correctly estimate a people by its great works, or the true wealth of a nation by the luxury of its princes. The towels are poor in material, and very trifling in cost, but they are ornamented in a most artistic and thoroughly original manner.

Preserving Nuts.

H. J. S. is one of our tree enthusiasts. His is an enthusiasm that never wanes; he never wearies of experiments to find out the best methods of culture. For years he has been at work on the problem, How can chestnuts, hickory nuts, and hazel nuts be kept over winter in the best condition? His experiment the past winter was quite satisfactory, and is given by him as follows;

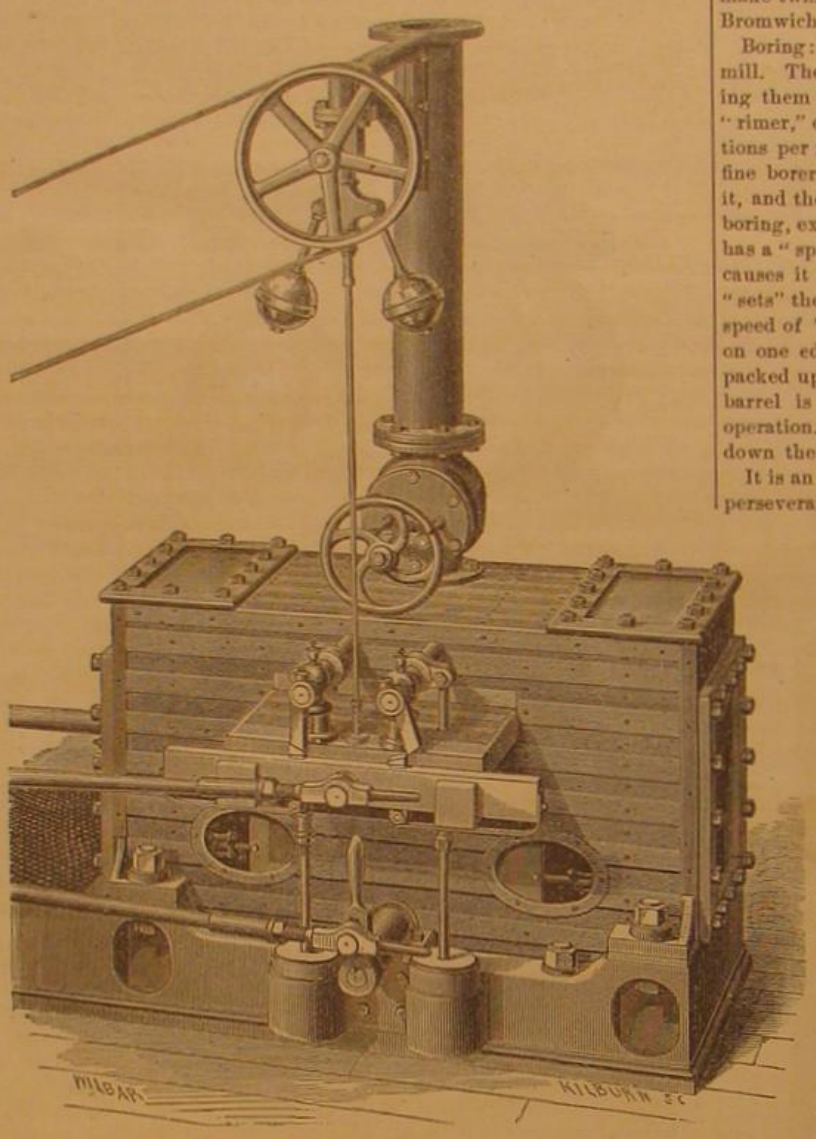
"Last fall I had about six quarts of fine large chestnuts and a few walnuts. Half of them I put into a bucket of moist sand as usual, but the other half I determined to experiment with. I had often picked up chestnuts, in the spring, from among the leaves, that appeared as fresh as when they dropped from the trees. Following this clue, I leveled back the earth on a plowed field where there was no vegetation or covert to attract the mice. On this level plot I strewed a quantity of leaves. On these I deposited my chestnuts, not so close as to touch one another. On these I deposited more leaves, and, top of the whole, I put some boards to hold them down. Around the border I threw up some dirt to discourage any vagabond mouse that might chance to stray that way, and then left them with my blessing. The result was that when I examined my treasures, about the twentieth of April, I found those in the bucket of sand were soft, brown, moldy and lifeless, as usual, while those under the leaves were as fresh and hard as ever; and where the spring warmth had come near them, they were already sprouted. I mention these circumstances with the hope that others will be encouraged to try the experiment,"—*Oneida Circular.*

BIRMINGHAM GUN MAKERS' AND INVENTORS' CLUB.

At a recent meeting of the above club, according to the *Mechanics' Magazine*, Mr. Samuel Smith, of Weaman street, Birmingham, gun barrel maker, read a paper on the manufacture of gun barrels, of which the following is an abstract:

The material used for gun barrels was mostly charcoal iron. For plain and figured barrels, at the date of which I am speaking—namely, 1793—the iron used was stub, stub twist, wire twist, and Damascus. Stub twist was first made as plain stub, but, instead of being hammered into a "skelp" or flat plate, it was drawn into a strip, coiled around a mandrel, and welded in the usual way. Stub twist is now made of old horse shoe nails and steel cuttings, about 2 inches long ¼ inch in breadth, and the same in thickness. The two are mixed up together and "balled" in a furnace, and the bloom drawn out under the forge hammer. It is then rolled into a strip, coiled round a mandrel, and welded as before. If the balls are very large, or the stubs or steel of inferior quality, the iron will not be good. Plain stub barrels were made of the same iron, forged into a skelp, and welded longitudinally.

Damascus and wire twist are now made by "piling" plates of iron and steel alternately. The plates are about three inches broad and a quarter of an inch thick. From sixteen to twenty are piled on top of each other; they are then placed in a furnace and raised to a welding heat, drawn down under a forge hammer, and rolled into square rods, 3-8 7-16, 1-2 and 9-16 inch, according to the size of the barrels required. The wire twist is rolled so as to show the edges of the different plates on the flat of the strip, so that when it is welded together it looks like a coil of wire from one end of the barrel to the other. The Damascus is rolled into square rods; these are cut into suitable lengths, heated white hot, and twisted until they become round like a screw. Two or three of these are welded together, and then rolled down to rods of the size required. These are then coiled round a mandrel, and welded in the usual way.



THE GREENE ENGINE.—Fig. 2. (See Preceding Page.)

There is another iron, called silver steel. It was first made about forty years ago, I believe, by Mr. Whitehouse, of Wednesbury, by laminating Swedish iron and steel, like Damascus, but not with so many layers. It is very good. The figure is not much better than the iron that is now called single iron Damascus, but it was a very strong iron. The silver steel that is now made is rolled into a square of .7-16 inch, and worked like Damascus. Two rods are welded together and rolled down to the size required, and welded in the same way as other twisted barrels. This iron is now made both at Adams' and J. Clive's. There is not so much used as formerly.

About 45 years ago, J. Clive began to make iron for gun barrels, and the best iron is now made by Mr. G. Adams and J. Clive, who may be said to be indeed the only makers of "best twist" gun iron. The iron now in use is of six qualities—1st, skelp twist, price 2d. per lb.; 2d., iron twist, 3d. per lb.; 3d, fourpenny stub, 4d. per lb.; 4th, fivepenny stub, 5d. per lb.; 5th, silver steel, 7d. per lb.; 6th, Damascus, 7d. per lb. No. 2 is twisted into a screw, like Damascus, and is called iron Damascus. This is worked in single rod and double rod—that is, two rods put together and rolled into a strip. The same is done with fourpenny and fivepenny stub and the result is called stub Damascus, but cheap guns are chiefly made of the iron Damascus. This is the cheapest figured iron. It contains no steel, being generally made of waste screws mixed with other scrap. It requires experience to distinguish it from the true steel Damascus.

Welding: Best barrels are welded by coiling the strip round a mandrel, and then heating it to a welding heat in a smith's fire; it is then taken out and jumped up on an iron plate on the floor, then put in a swage with a "stamp" or mandrel inside, and hammered down. About three inches are welded at a time. Here I may observe that there are very few welders who use the "stamp" except for a few inches at each end; but best barrels ought to be welded on a stamp throughout.

History of gun iron: Mr. R. Adams began to make twist iron about the year 1815. He was before that time a tilter of barrel skelps or plates for making plain iron barrels. At that time a great deal of iron was made from swaff or filings, which were first washed and then mixed with scrap, made into a ball, and welded in a smith's forge; this was called "swaff ball drawing." It made very good iron, and was used by lock forgers, breech forgers, and occasionally made into barrels for fowling pieces. In the early time of the barrel trade, there were a number of small forges for making barrel skelps by tilting; one in particular was at Wednesbury Bridge, and here Mr. R. Adams, above mentioned, worked; and there is no doubt that he saw what the trade required. At the close of the French war, he began to make twist iron as a trade. Before this time, it had been made at various forges, but no one made a specialty of this kind of iron. Mr. Adams continued working at Wednesbury till unfortunately killed by the bursting of a boiler, after which Mr. G. Adams took up the business, and continues to make twist gun iron at his new works, in Church lane, West Bromwich, up to the present day.

Boring: After the barrels are welded, they go to the mill. They are first rough bored. This is done by fastening them in a socket or holder; the "bit" is a square steel "rimer," of suitable length, running at about 500 revolutions per minute, which is forced through the barrel. The fine borer then examines the barrel, "sets" or straightens it, and then it is "spilled up," a process the same as rough boring, except that the bit does not cut on all the edges; it has a "spill," or piece of oak wood, put on one side, which causes it to cut much more evenly. The workman then "sets" the barrel, and finishes the boring, which is done at a speed of 70 to 80 revolutions per minute. The bit only cuts on one edge, which is left sharp, and a deal spill is used, packed up with strips of paper as the boring proceeds. The barrel is examined, and "set" several times during the operation. The setting is done by the shade or reflection, down the inside of the barrel, from the top of the window.

It is an art that can only be acquired by long practice and perseverance. Some men have worked at the trade all their lives, and have never learned to set a barrel correctly. The same process is used for sporting and military barrels up to the fine boring. After fine boring, the military barrels are turned, or stripped as it is called, which is done by a self-acting slide lathe, which takes off the thick side, if they have any. The grinder then finishes them to the gage. The history of boring and setting I cannot attempt to state, but setting, I think, does not go back much more than 100 years. My father began to work as a fine borer in the year 1793. Setting was known then, but not generally. He had to pay for the secret. According to my father, a man named P. Parsons was the first to set barrels that he had heard of. He worked at Duddeston Mill, being what was called a "best workman" at sporting barrels. This Mr. Parsons used at first, for the purpose of setting, a string or wire which was drawn tight by a bow, or otherwise, and applied to the inside of the barrel. By this means he discovered the crooks, and then corrected them with a hammer. The process of fine boring is the same now as it was in 1793; that is, it is done with a square bit, but only two edges cut, and only one at a time. The advantage of taking off the edges was said to be discovered about 1790, by Mr. Beesley, and this was kept a secret among good workmen for a long time. I think we may be sure that boring and setting had not attained their present perfection until the beginning of the present century.

In the year 1787, there were 27 gunmakers in Birmingham, and barrels were made, bored, and ground at water mills all round the town. Such mills still exist, chiefly in the neighborhood of Hales Owen, where large numbers of barrels are now made. I have not touched on the subject of rolled barrels, which are chiefly used for military firearms and the commoner sort of sporting guns. The rolling of barrels from short taper skelps, a foot or more in length, is comparatively a recent process. The barrel is drawn over an oval headed mandrel, so fixed that its head is immediately between the grooves of the upper and under roll. These grooves are of a shape corresponding to the outline of the barrel. Of late years, steel barrels have come very much into use for rifles, but to a very small extent for sporting guns as well, the want of "figure" operating much against them. Steel rifle barrels are sometimes drilled out of a solid bar, which must be "set" from time to time, as the drill is certain to run out. As there is usually more to turn off one side, they are generally of unequal hardness, and is a difficult matter to keep them straight. Steel barrels are now usually rolled from 12 to 15 inch drilled blanks, the hole in which is much larger than the intended bore. The punching of shorter blanks, which were afterwards rolled out into a barrel by two rollings, constituting the patent of Deakin and Johnson, appears now to be discontinued, though very good barrels were made by the process.

The reading of Mr. Smith's paper was accompanied by practical illustrations of the method of "shading" barrels, or detecting internal or external irregularities. Barrels, straight and bent, were supported at each end, and Mr. Smith explained the entire process, which has been kept very much as a secret by the very few who really understand it. So delicate is this test that the distortion, produced by warming one side of the barrel with a common candle, was distinctly perceptible. Independently of its practical utility, the "shading" of a gun barrel is an exceedingly interesting optical problem, which has never yet been investigated.

How Genuine Pearls are Prepared in China.

Imperfect and contradictory accounts of the mode of producing pearls in mussels having at different times appeared, and as the only place of culture is within a few days' journey from Ningpo, Mr. Consul Hague and myself, says Dr. Macgowan, despatched an intelligent native to make enquiries on the spot concerning the art, and to procure specimens in different stages of growth. The following result of these investigations, made on two successive journeys, may be relied on as authentic:

The practice of the art is confined to two conterminous villages near the district of Teh-sing, in the northern part of Chih-kiang, in a silk producing region. In the month of May or June large quantities of the mussels (*mytilus cygnus*) are brought in baskets from the Tahu, a lake in Kiang-su about thirty miles distant, the largest among the full grown being specially selected. As their health suffers on the journey, they are allowed a few days' respite in bamboo cages in the water before tortured for the sake of human vanity, when they are taken out to receive the matrices. These are various in form and material, the most common being pellets made of mud taken from the bottom of water courses, dried, powdered with the juice of camphor tree seeds, and formed into pills which, when dry, are fit for introduction into the unfortunate subject. Molds which best exhibit the nacreous deposit are brought from Canton, and appear to be made from the shell of the pearl oyster; the irregular fragments thus produced are triturated with sand in an iron mortar, until they become smooth and globular. Another class of molds consists of small images, generally of Buddha in the usual sitting posture, or sometimes of fish; they are made of lead, cast very thin by pouring on a board having the impression. Pearls having these forms have excited much surprise since they first attracted the attention of foreigners a few years back.

The introduction of the pearl nuclei is an operation of considerable delicacy. The shell is gently opened with a spatula of mother of pearl, and the free portion of mollusc carefully separated from one surface of the shell with an iron probe; the foreign bodies are then successively introduced, at the point of bifurcated bamboo sticks, and placed in two parallel rows upon the mantled or fleshy surface of the animal; a sufficient number having been placed on one side, the operation is repeated on the other. Stimulated by the irritating bodies, the suffering animal spasmodically presses against both sides of its testaceous skeleton, keeping the matrices in place. This being done, the mussels are deposited one by one in canals or streams, or pools connected therewith, five or six inches apart, at depths of from two to five feet, in lots of from five thousand to fifty thousand.

If taken up a few days after the introduction of the mold these will be found attached to the shell by a membranous section, which at a later period appears as if impregnated with calcareous matter; and finally, layers of nacre are deposited around each nucleus, the process being analogous to the formation of calculary concretions in animals of a higher development. A ridge of nacre generally extends from one pearly tumor to another, connecting them all together.

About six times in the course of the season, several tubs of night soil are thrown into the reservoir for the nourishment of the animals. Great care is taken to prevent goat manure falling in, as it is highly detrimental to the mussels, preventing the secretion of good nacre or killing them, as the quantity may be great or small.

In November, the shells are carefully collected by the hand, the muscular portion removed and the pearls detached by a sharp knife. If the basis of the pearl be of nacre, it is not removed, but the earthen and metallic matrices are cut away, melted yellow resin poured into the cavity and the orifice artfully covered by a piece of mother of pearl. In this state, these more than semi-orbicular pearly pellicles have much of the luster and beauty of the solid gem, and are furnished at a rate so cheap as to be procurable by all who care to possess them. They are generally purchased by jewellers and others, who set them in tiaras, circlets and various ornaments of female attire. Those formed on the image of Buddha are finished in the same manner, and are used as ornaments and amulets on the caps of young children. A few shells are retained with their adhering pearls, for sale to the curious and superstitious, specimens of which have by this time found their way into the principal public and private cabinets of Europe and America. They are generally about seven inches long and five broad, containing a double or triple row of pearls or images, as many as twenty-five of the former and sixteen of the latter to each valve! That the animals should survive the introduction of so many irritating bodies, and in such a brief period secrete a covering of nacre over them all, is certainly a striking physiological fact. Some naturalists, indeed, have expressed strong doubts as to its possibility, supposing the pearls were made to adhere to the shell by some composition; but the examination of living specimens in different stages of growth, having both valves studded with pearls, has fully demonstrated its truth. A tinge of yellow is found over the whole inner surface of some shells, showing that the more recent secretion of nacre by the suffering animals was unnatural. The flesh of all, however, is eaten.

About five thousand families are represented as being engaged in this singular branch of industry in the villages of Chung-kwan and Sian-Chang-Ngan; they, however, mainly derive their support from cultivating the mulberry and in rearing silkworms and other agricultural occupations. Those who are not expert in the management of the shells lose 10 or 15 per cent by deaths; others, none in the whole season.

BIBORATE OF SODA dissolved in water, used as a lotion, will remove prickly heat.

The Sun a Probable Cause of Terrestrial Magnetism.

If an electrified body were placed near a moving conductor so as to induce an opposite charge in the moving body, this charge would move on the surface of the conductor so as to remain opposite the electrified body, whatever the motion might be. Suppose the moving conductor to be an endless metal band running past a body negatively charged, the positive charge would be on the surface of the band opposite to the negative body, and here it would remain whatever might be the velocity of the band. Now the effect of the motion of this negative electricity on the conductor would be the same as that of an electric current in the opposite direction to the motion of the band.

If instead of a band the moving body consists of a steel or iron top spinning near the charged body, the effect of the electricity on the top would be the same as that of a current round it in the opposite direction to that in which it was spinning.

It might be that the electricity in the inducing body would produce an opposite magnetic effect on the top; but even if this were so, its effect, owing to its distance, would be much less than that of the electricity on the very surface of the top. If we take no account of the effect of the inducing body, the current round the top would be of such strength that it would carry all the electricity induced in the top once round every revolution. And if the top were spinning from west to east by south, it would be rendered magnetic with positive pole uppermost, that is, the pole corresponding to the north pole in the earth or the south pole of the needle.

In order to show that such a current might be produced, a glass cylinder, twelve inches long and four across, was covered with strips of tinfoil, parallel to the axis, with very small intervals between them. These strips were about six inches long and one half inch wide, and the intervals between them the two hundredth of an inch. In one place there was a wider interval, and from the strips adjacent to this, wires were connected by means of a commutator with the wires of a very delicate galvanometer. This cylinder was mounted so that it could be turned twelve hundred revolutions in a minute, and brought near the conductor of an electrical machine. This apparatus, after it had been thoroughly tested, was found to give very decided results. As much as 20° deflection was obtained in the needle, and the direction of this deflection depended on the direction in which the cylinder was turned, and on the nature of the charge in the conductor. When this was negative, the current was in the opposite direction to that of rotation. It may be objected that the measurement was not actually made on the cylinder. It must, however, be remembered that it was made in the circuit of metal round the cylinder, and that my object was to find the relative motion of the cylinder and the electricity. Altogether, no doubt it may be taken as experimental proof, of the fact previously stated, that if a steel top were spinning under the inductive influence of a body charged with negative electricity, the effect would be that of a current round the top such as would render it magnetic.

The cause of terrestrial magnetism has not been the subject of so much speculation as many much less important phenomena. It seems to have been regarded as part of the original nature of things, like gravity and the heat of the the sun, as a cause from which other phenomena might result, but not as itself the result of other causes.

Yet, when we come to think of it, it has none of the characteristics of a fundamental fact; it appears intimately connected with other things, and when two phenomena have a relation to each other, there is good reason for believing them to be connected, either as parent and child, or else as brother and sister—the one to be derived from the other, or else both to spring from the same cause.

Now the direction of the earth's magnetism bears a marked relation to the earth's figure, and yet it can have had no hand in giving the earth its shape, which is fully explained as the result of other causes; therefore, we must assume that the figure of the earth has something to do with its magnetism, or what is more likely, that the rotation which causes the earth to keep its shape also causes it to be magnetic.

If this is the case, then there must be some influence at work with which we are as yet unacquainted—some cause which, coupled with the rotation of the earth, results in magnetism. From the influence which the sun exerts on this magnetism, we are at once lead to associate it with the cause. Yet the cause itself cannot be the result of either the sun's heat, light, or attraction. What other influence then can the sun exert on the earth?

The analogy, between the magnetism produced in a spinning top, by the inductive action of a distant body charged with electricity, and the magnetism in the rotating earth, probably caused by the influence of the sun, which influence is not its mass or heat, seems to suggest what the influence which the sun exerts is. If the sun were charged with negative electricity, it seems to follow, from what the experiments described establish, that its inductive effect on the earth would be to render it magnetic, the poles being as they are.

The only other way in which the sun could act to produce or influence terrestrial magnetism would be by its own magnetism. If the sun is a magnet, it would magnetise the earth. If this is the cause, the sun's poles must be opposite to those of the earth. Now, it follows that such a condition of magnetism would or might, if its materials are magnetic, be caused by the rotation of the sun under the inductive action of the earth and planets in exactly the same way as that caused in the earth by the inductive action of the sun. As the direction of rotation is the same in both bodies and the electricities are of the opposite kind, the magnetism would be of the opposite kind also. So that on this hypothesis it is probable the sun would act by both causes.—*Professor Osborne Reynolds, in the Mechanics' Magazine.*

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections in the month of March, 1872:

During the month 896 visits of inspection were made, and 1,870 boilers were examined—1,794 externally, and 589 internally—while 174 were tested by hydraulic pressure. The number of defects in all discovered was 1,113, of which 271 were regarded as dangerous. These defects, in detail, are as follows:

Furnaces in bad condition, 45—12 dangerous; fractures of plates, 122—63 dangerous; burned plates, 78—30 dangerous; blistered plates, 130—13 dangerous; sediment and deposit, 110—18 in dangerous condition; incrustation and scale, 193—17 dangerous; external corrosion, 73—17 dangerous; internal corrosion, 25—7 dangerous; internal grooving, 15—3 dangerous; water gages defective, 59—8 dangerous; blow out defective, 19—5 dangerous; safety valves overloaded and in dangerous condition, 32; pressure gages defective, 147—19 dangerous; these varying from — 20 to + 10. Boilers without gages, 9; deficiency of water, 16—4 dangerous; broken braces and stays, 60—30 dangerous; boilers condemned, 12.

When such an array of defects and defective fittings as the above is presented, we are aware that some will inquire, "What proof have we that they are correct?" All we can say is that each inspector employed by the company is required to make report of every defect coming under his notice, and to sign his name to the same. These reports are kept on file in the company's office, and can be referred to at any time, and each individual defect can be traced out. It will be noticed, by reference to these reports, that fractured plates and blistered plates usually figure high. This can only be accounted for on the ground that much of the iron used in the construction of boilers is of inferior quality. In a recent number of the "Locomotive," we remarked at some length on the subject of laminated iron, showing that, in consequence of that condition, blisters and other weaknesses were developed in the plates of boilers. If care is not used in piling the bars preparatory to rolling, or if the bars are not free from rust and scoria, there will be imperfect welding of the parts, and consequent weakness. It is true that boilers constructed of the best of iron are frequently fractured, and nearly or quite ruined from injudicious management. Requiring more work from a boiler than it is constructed to bear is a fruitful source of trouble. The only safe rule to follow is, "Get the best, both in material and workmanship, and take good care of it."

Gas Meters.

Wet gas meters are the most convenient and generally used in France, but for many years the introduction of dry meters has been attempted.

The comparative merits of both systems have been often discussed; one thing is certain, that neither assures a perfect registration. The opponents of wet meters argue that the water level should be kept constant, and that the meters must be periodically filled. If too much water is introduced, the flow of gas is checked, and by letting these become too dry the gas does not flow at all.

Between these two limits moreover, the meters vary three or five per cent from the actual consumption. On the other hand, it is urged against the dry meters that their action is irregular, and that still greater uncertainty is inseparable from them than is found with the wet meters.

The Parisian Gas Company has undertaken a series of comparative experiments on both classes of meter. At the conclusion of these trials, which have lasted over several years, the company applied to the municipal authorities of the city definitively to suppress the use of the dry meter.

This demand has been complied with, and the Prefect of the Seine has recently issued a decree forbidding the employment of dry meters amongst the gas consumers of the city.

AT the Victoria Institute, recently, Dr. Bateman having called attention to Mr. Darwin's statement that the difference between man and the higher animals was only one of degree, and not of kind, he proceeded to show that such could not be the fact, and instanced the faculty of articulate language, a distinctive attribute of which there was no trace in the ape or other animals. After defining articulate language, he demonstrated that it was exclusively man's prerogative, and there was no analogy between it and the forms of expression common to the lower animals. He then stated that it had been thought that a particular part of the brain was the seat of language, and, if it were so, the Darwinian might contend that, as there was a certain similarity between the brain of man and of the ape and other animals, that the latter had the germs of the faculty. He then cited many cases, which had been brought under the notice of German, French, American, English and other surgeons, to show that even where various portions of the brain had been injured or destroyed, the faculty of speech remained. He concluded by stating that the faculty of articulate speech seemed to be an attribute, the comprehension of which was at present beyond us.

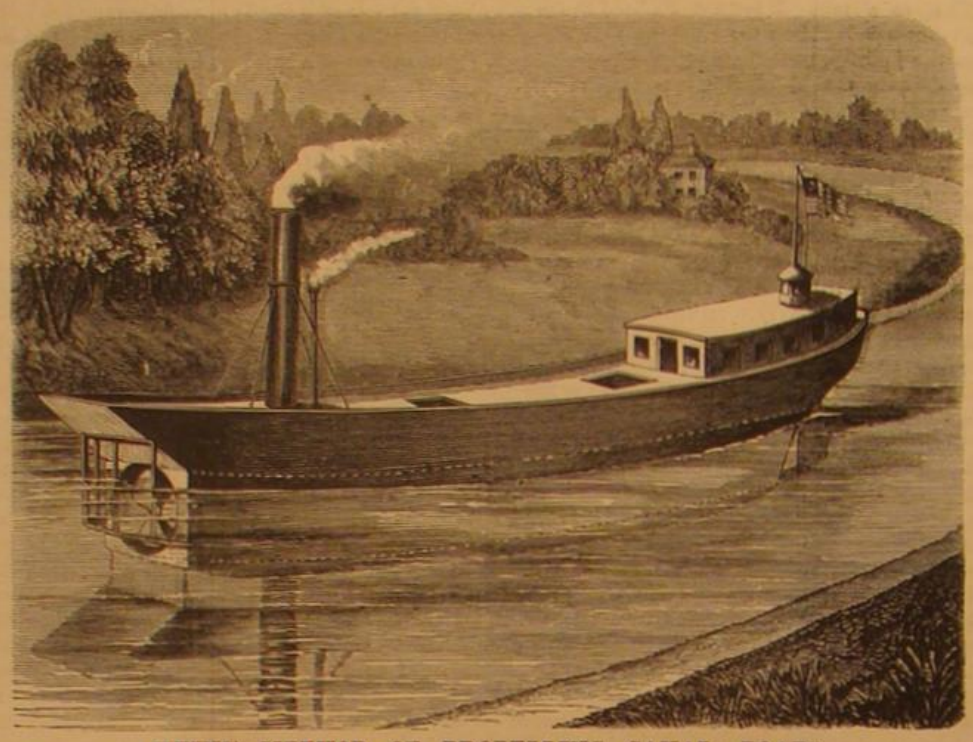
THE *Adriatic* is the name of a new and splendid screw steamship plying between New York, Cork, and Liverpool. She belongs to the White Star line. On her first passage to this city, recently, the time made was 8 days 14 hours. The *Adriatic* is believed to be the fastest ocean steamer afloat.

New Method of Propelling Canal Boats.

Notwithstanding the numerous attempts to substitute something better for canal boat propulsion than the wheel or screw, it may be safely said that the majority of mechanics and engineers still adhere to these time honored devices as being superior to anything else yet produced or likely to be produced for the purpose. The question of position is, however, still a moot-point. Side, bow, and stern have each their advocates, and arguments *pro* and *con* are not wanting for either of these positions. Resort to practical experiment can only determine which is the best, and this will, no doubt, soon be brought about, by the action of the New York State Commission and the alluring prize it has at its disposal for the successful competitor.

The inventor of the method illustrated in the accompanying engraving believes the bow is the position for either a propelling wheel or screw, and in order to produce direct longitudinal displacement and obviate side swells, he proposes to combine one or other of the devices referred to with a tube or passage from bow to stern of the boat through which the displaced water shall pass, while the boat is made to advance correspondingly.

Although we have shown in our engraving only the screw thus applied, the application of a paddle wheel instead will easily be comprehended. No special peculiarity in the engine or construction of the boat is involved, with the exception of the longitudinal tube or passage. The most approved practice in steam engineering can, therefore, be applied in the construction of the engine, and its application to driving the propelling wheel or screw. There can be no doubt that the displacement taking place through the tube will obviate side swells. How far power can be economically applied to propulsion in this way can only be settled by actual trial. The inventor desires to enlist capital to enable him to make such a trial and to compete for the prize offered. Those who would like further information or to correspond with the inventor, Dr. L. Heins, can address him till the 20th May at 36 Platt street, New York, care of Sprague and Close, or, after that date, at his residence, Brunswick, Ga.



HEINS' METHOD OF PROPELLING CANAL BOATS.

Chinese by Telegraph.

The managers of a telegraph company in China have recently solved the problem of how to transmit telegraphic messages in Chinese. At first sight the difficulty of an alphabet which is made up of about fifty thousand distinct characters appears almost insurmountable, but the obstacles have been overcome, and A-Fat at Hong Kong encounters no more difficulty, in communicating with A-Chum at Shanghai, than does Brown with Jones under similar circumstances. The plan adopted is this: Some few thousands of the more common Chinese characters are cut on wooden blocks after the manner of type, and on the reverse end of each is a number cut in the same way. Now A-Fat, having handed in his message written in Chinese, the native clerk selects in order the corresponding blocks from the case, and prints off the numbers on their reverse. This he hands to his English colleague, who telegraphs the numbers to the destination desired. Here the reverse process is gone through, and, the numbers having been taken from the cases, the characters are stamped on paper, and thus A-Chum is put in possession of the cherished wishes of A-Fat through the medium of his native language.

POCKET BOOTJACK.

This device consists simply of a leather strap about an inch in width and eighteen inches in length, which is united at its ends, and slit as shown. The foot, upon which is the boot to be removed, being put through the slit, a pull on the

part, B, by the other foot, is claimed to readily remove the boot. If this invention is effective, there will be a large demand for it from travelers and others, who desire an article of this kind which occupies only a small space. Patented Feb. 8, 1870, by Charles Brown, Charlotteville, Va.

Iron Telegraph Pole.

A galvanized iron pole comprising two sections jointed together where the upper one, which is the smallest, screws into the top of the other, has its base set in a box and packed in with cement, concrete, etc. The box is to be planted in the ground for holding the pole erect. At the top of the box is provided a hub, with arms, extending laterally to the edges of the box; and at the upper end of this section is a ring or collar, for the connection of the upper ends of guys whose lower ends are connected to the lower end of the lower section; while near the center the said guys are stretched over the two ends of a cross tree used for bracing the section. Below the collar is a screw threaded ring or collar, employed for forcing the collar upward for straining the guys; and below this ring is another hub, with arms for straining another set of guys, which are connected at the lower ends of the hub and at the top of the upper section. These guys may be tightened like the others by an adjustable collar, or they may have swivels for tightening them. Any number and lengths of sections may be used, and the tube constituting the body of the pole may be made round, square, or otherwise, or of any size. One or more tubes in each section may be used side by side, and confined together by a band or hoop for strengthening one by the other. If the pole is not to be more than fifteen or twenty feet high, one section of tube will do, with one set of guys; but if higher, it will be better to have two sets. The box may have a bottom, as shown in the drawing, for holding the lower end of the pole resting on and connected to it, and the lower hub and arms may be attached to the top of the box by straps of iron bent over and nailed to it. But instead of having the box for holding the pole, it may be mounted on a stone or other suitable base or planted in the ground. The arms at the top of the pole for holding the insulators may be insulated by means of an inverted cap, mounted on the top of a wood, glass, india rubber, or other block, placed in the top of the upper tube. In the top of this cap is placed a composition point to which a copper rod or wire is attached with its lower end anchored in the ground to convey away the electricity and prevent the pole from becoming a conductor. This copper conductor may be placed inside of the pole, if preferred. If, however, it be desired to use the pole as a conductor, the insulators at the top will be dispensed with, and in this case the hub at the top of the pole will serve both as a support for the message wires and for tightening the guy rods, which may then be connected to it.

The message wire supporter and cap which cover the insulators may be made of malleable cast iron or other suitable material. The cap is made larger than the cup, at the top of the pole, which holds the insulators and fits over it so as to shed rain.

Mr. Alfred Homer Trego, of Philadelphia, Pa., is the inventor.

Substitute for Lithographic Stone.

A substitute for lithographic stone has been introduced. For the purpose in question, the inventor takes a block or slab of slate, or other material, which is to be made perfectly smooth and true, and then coated with glue or other gelatinous matter. In some instances he adds a solution of silicate of soda and bichromate of potash, or uses this solution alone. The coated block is exposed to sunlight, and then washed to remove the superfluous coating; and after being dried, it is ready for drawing or writing upon. The ink or pigment is prepared with albumen or other gelatinous matter, dissolved in a saturated solution of bichromate of potash, either with or without chrome alum, and with a small quantity of ivory black, to render the ink visible. The picture is drawn upon the prepared block with this ink, and exposed to sunlight, and afterwards the surface is covered with gum or glycerin. The block is then ready for the printer. Another method consists in using, as substitutes, metallic substances, as tin, brass or zinc, preparing them first by rubbing with a solution formed of one ounce of hydrochloric acid, one fourth of an ounce of zinc, and one dram of glacial acetic acid. After the plate has received the impression from the stone or wood in an ordinary lithographic press, or by means of a "transfer," the ink thereon is dried by heating the plate, which is afterwards plunged while still hot into cold water; this latter operation being supposed to confer permanency upon the impression. The ordinary ink is used in this process, which appears to consist, in reality, of "soldering" the design on the plate and burning it in.

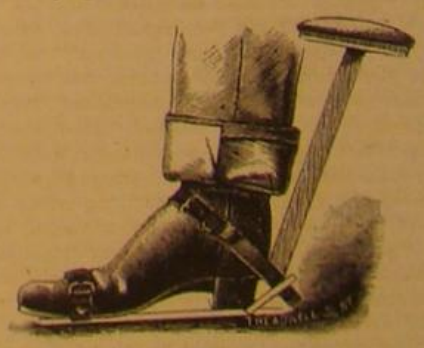
Underground Rope Tramways in Germany.

The coal mines of the Saar are situated in a hilly district, and this configuration of the country, and the circumstance that the coal measures come up to the surface over a large area of the district, is singularly favorable for adits and levels, instead of shafts; and although a great part of the coal beds above these adits is already exhausted, they are still used to bring the coal on the surface to the smaller valleys. The wagons or tubs used to be drawn by horses in trains of 15 to 20; but this system is now abandoned, and the wagons are drawn by stationary steam engines, after being fastened to long ropes or chains. There are now three different systems of rope tramways in use. The counter rope system has been adopted in one mine, in an adit 1,024 fathoms long, and in another, 1,420 fathoms; it is also used at a third mine for a length of 800 fathoms. This system consists of two engines—one in the mine, one outside, alternately pulling a train of 30 to 36 wagons out or in, when the end rope runs freely off the winding drum, which is for a time disconnected from its engine. The tail rope system, used also at some collieries near Newcastle and Durham, has been adopted in two other places, for 1,400 and 1,020 fathoms of length respectively. With this system a single steam engine is required, which drives two drums in opposite directions—one hauling in the rope, the other paying it out, when the rope at each end of the tramway is carried round a sheave back to the engine. The train being connected to one branch of the rope, and the empty wagons to the other branch, the engine pulls the loaded train out, and drags the empty one into the mine, and is reversed after every journey. The endless rope system is in use elsewhere, and consists in one engine driving a rope continuously round in the same direction, when loaded trains are fastened to it on the way out, and empty trains on the way in. This system is adapted to short distances. Instead of attaching the wagons in trains, it is now found more useful to fasten them singly at certain intervals, so that the tipmen have time to empty one wagon over the screen before the next arrives. The advantages of the single wagon system are too conspicuous to be overlooked, but it is only in connection with the endless system they can be fully developed. The difficulty of the increasing dead weight of the rope for great distances must be overcome by the adoption of auxiliary engines, and the regulation of their speed can be effected by the use of telegraphs and self acting brakes and governors. The underground transport through the road ways has always been a heavy item in collieries. There is much still to be done in this matter, and the use of electric telegraphic apparatus in connection with underground transport is at present far too little valued.

POTASH FROM CORN COBS.—Dr. Herbert Hazard suggests the use of corn cobs for supplying potash, the ordinary sources of which are rapidly failing. He states that the average yield of corn cobs is 7·62 parts of carbonate of potash in 1,000 parts of the cobs, which is nearly twice as much as the best specimens of wood furnish. The present corn crop of this country will supply 15,400,000,000 lbs. of cobs, from which 115,500,000 lbs. of potash can easily be manufactured.

GARDENER'S STOOL.

This invention, recently patented by Eliphalet Whittlesey of Mullica, N. J., is intended to afford a convenient support to gardeners in such operations as, without it, would require continued stooping.



The stool is strapped to, and carried by, the foot, leaving the hands free, so that whenever the operator desires he may sit upon the pad or seat. The same device is applicable as a milking stool, and perhaps for other purposes where it is desirable to avoid the fatigue of continued or often repeated stooping.

THE safety of Dr. Livingstone, the celebrated African traveller, is now assured. Recent accounts state that he has arrived at Zanzibar, from the interior of Africa.

Narrow Gage in the United States.

Engineering, in an editorial on "Narrow Gage Progress," says: "It is less than a year since the advantages of narrow gage became firmly fixed in the Western American mind; yet to-day nearly all the new lines being constructed or projected in the West are narrow gage."

It is, of course, not to be expected that an English journal should have complete and minute information concerning American railroads; still this extraordinary statement is quite unaccountable.

We make it our business to obtain (and give) information concerning the progress of all new lines whatsoever, and we are very sure that not one twentieth—and probably not one fiftieth—of the lines in progress are narrow gage roads. We are likely to lay track on six or seven and perhaps eight thousand miles of new railroad during the year 1872, three fourths of it in the West. Of this probably not more than from two to three hundred miles will be narrow gage.

That there are projected narrow gage railroads to the amount of several thousand miles is not improbable; but then there are probably a million or two miles of standard gage railroads projected, there being not many townships in the United States which have not a projected railroad. We are accustomed, however, to count the railroad only when the rails are laid, the organization of a company signifying little; the letting of a contract, not much; the completion of considerable grading, even, only a probability (as hundreds of miles of old road beds testify). The slips between the cup and the lip are increased in the case of a narrow gage railroad by the possibility that after all it may be made of the standard gage—a fate that has befallen several promising narrow gage projects.

As for the history of the narrow gage movement in this country, not nearly so many lines of that gage are being projected now as were a year ago. Then most of the narrow gage companies were organized by men with no knowledge either of engineering or railroad operation. When these companies have come into the control of experienced railroad men, as they have occasionally, their first step frequently has been to adopt the standard gage.—*Railroad Gazette.*

Improvement of the Steam Engine.

In a paper read before the Polytechnic Association of the American Institute by Professor Thurston, on the above subject, he summed up his conclusions in the following statements:

The direction which improvement seems now to be taking, and the proper direction, as indicated by an examination of the principles of science, as well as by our review of the steps already taken, would seem to be:

Steam must enter the machine at the highest possible temperature, must be protected from waste and must retain, at the moment before exhaust, the least possible amount of heat. He whose inventive genius, or mechanical skill, contributes to effect either the use of higher steam with safety and without waste, or the reduction of the temperature of discharge, confers a boon upon mankind.

In detail: *In the engine*, the tendency is, and may probably be expected to continue, in the near future at least, toward higher steam pressure, greater expansion in more than one cylinder, steam jacketing, superheating, a careful use of nonconducting protectors against waste, and the adoption of higher piston speeds.

In the boiler, more complete combustion without excess of air passing through the furnace, and more thorough absorption of heat from the furnace gases. The latter, I am inclined to suppose, will be ultimately effected by the use of a mechanically produced draught, in place of the far more wasteful method of obtaining it by the expenditure of heat in the chimney.

In construction, we may anticipate the use of better materials and more careful workmanship, especially in the the boiler, and much improvement in forms and proportions of details.

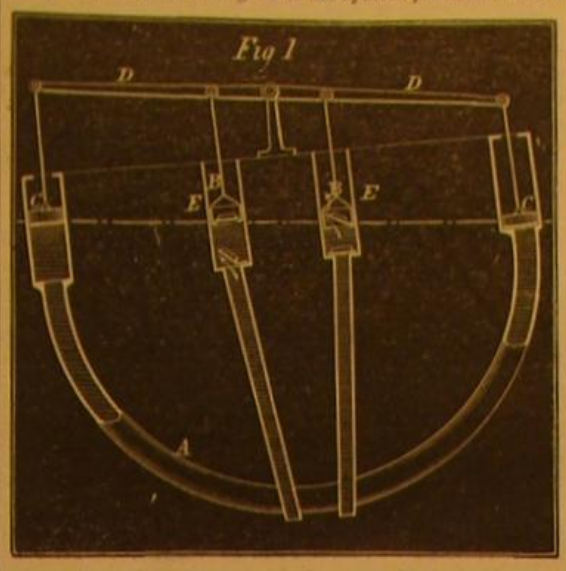
In management, there is a wide field for improvement, which improvement, we may feel assured will rapidly take place, as it has now become well understood that great care skill and intelligence are important essentials to the economical management of the steam engine, and that they repay liberally all of the expense in time and money that are requisite to secure them.

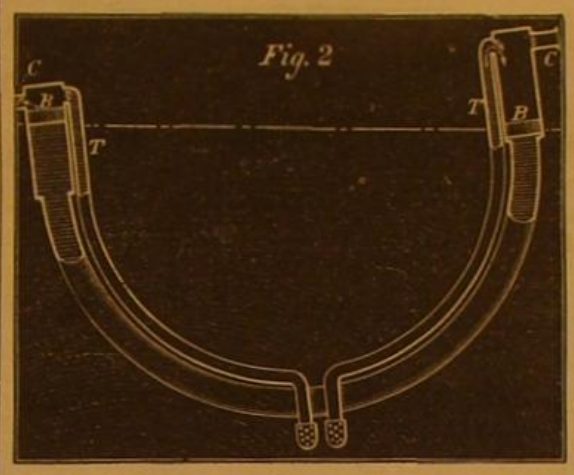
A correspondent of the Birmingham *Post* writes that recently one of the trains from Liverpool, "which usually stops at Northwich, did not stop there; but on arriving at a point on the line between Northwich and Middlewich, it slackened speed and finally stopped. After some delay the passengers felt uneasy, and one gentleman walked up to the engine to ascertain the cause of the stoppage, when he found both driver and fireman drunk and lying asleep on the foot plates of the locomotive, the steam exhausted, and the fire out." The correspondent added that the driver and fireman have both been suspended. Most readers will feel that if they had received their deserts, their suspension would have been by their necks.

THE Western and Southern Railway Association, at its recent session in Atlanta, Ga., discussed the questions appointed for the meeting and adjourned to meet at the Kennard House, Cleveland, July 9. Among the questions discussed were: The best means of preventing accidents; responsibility of railroads for injuries to employees; interchange of cars, mileage and demurrage; the maintenance of agreed rates and contracts; sleeping cars and express contracts; brakes and platforms; hight of car buffers; breakage of rails and axles; national time; repairs of foreign cars, etc.

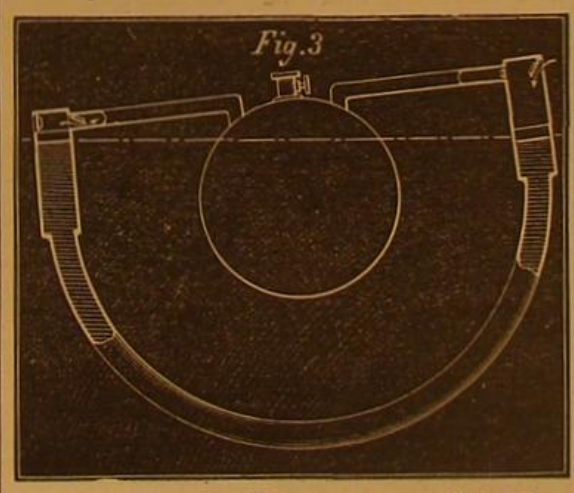
Hydromotor for Ships, Pumps, and other Purposes.

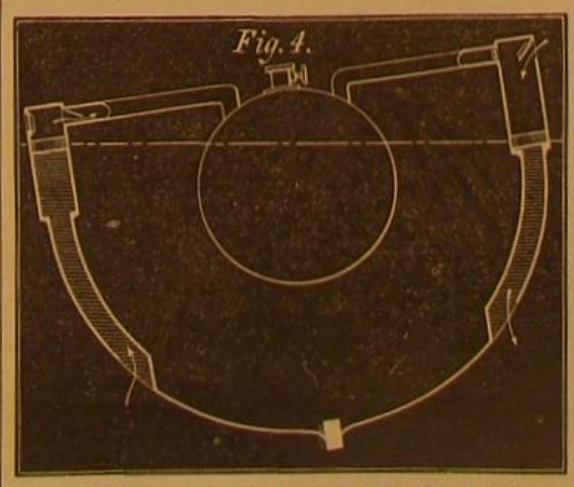
The following system, for utilizing the motion of rocking vessels for the pumping and ventilation of ships, is communicated by Mr. Henry Baudouin, of Grass Valley, Cal. In many respects, it is analogous to the system published and illustrated on page 15, current volume of this journal; but it differs considerably in detail, and, in the employment of compressed air as an intermediate motor for pumps, adds a new feature which seems valuable. Mr. Baudouin thus describes his method:





In Fig. 1, A is a curved tube, containing a certain quantity of liquid, water or mercury. The two branches of the tube are terminated by two cylinders, of which the upper part is open. In these cylinders are placed two pistons, C, resting on the liquid. The rods of these pistons are fixed to the arms, B, D, of two pumps, P. Below each pump cylinder, E, are placed two valves, B. According to the principle of the equilibrium of liquids, whatever position the ship may take, the tendency of the liquid in the tube A to remain at the same level, whether the ship roll to one side or the other, will cause the pistons to move in the cylinders, E, and so to work the pumps.





The pressure of the liquid can be directly employed to work the pumps by terminating the rod of the piston in the cylinder by a T, to the two arms of which are fixed the rods of the pumps placed one on each side. By this means a longer stroke of the pump piston is obtained, but the power is diminished.

In Fig. 2, the cylinders, 1 and 2, perform the functions of exhaustion and force pumps. The pistons, B, have no rods; and to the upper part of each cylinder is attached a tube, T, descending to the bottom of the vessel. Two other tubes, C, communicate with the external air; these tubes are furnished with valves, as shown. Supposing the ship to be resting on the keel, with one piston, B, at the bottom and the other at the top of its course: when the ship's side lifts and she rolls to the starboard, the pressure of the liquid will cause the piston in one cylinder to rise, the compressed air between the piston and the upper part of the cylinder will open the outer valve and will close the inner one, while in the cylinder opposite the contrary will take place. When the ship returns on to the port side, the action is reversed; and this will take place at each rolling motion until the water comes into the cylinders, whence it will flow out. We thus have two exhaustion and force pumps, to the pistons of which we can give long strokes.

Fig. 3. As the movements of a ship are far from being regular, the power of the liquid can be used to compress the air in a receiver, and this compressed air can be used, as steam is, to work the pumps with regularity. In this case, each cylinder acts as a machine for compression, the pistons have no rods, and the valves act as represented in Fig. 3. The air which flows into the reservoir performs the office of the boiler of a steam engine, the pressure of the compressed air on the inner valves forcing them to remain closed, and the air being led to the engines through a pipe from the top of the reservoir.

Fig. 4. In place of a tube full of liquid, the lower part of the cylinders can be made to open into the sea; placing two cylinders on each side of the ship, in front and behind, a considerable force for compression can be obtained, and at the same time the rolling and pitching of the vessel can be utilized. With several cylinders on each side, all along the ship, a larger force can be obtained.

I leave to those who have the necessary time and money the work of carrying out this problem. Awaiting this, I suggest the compressed air: 1st, for improving the ventilation; 2d, for working the pumps; 3d, in substitution of steam for the fog whistles on board of sailing ships.

Vesuvius and other Volcanoes.

The volcano of Mount Vesuvius, near Naples, in Italy, has lately broken out with violent eruptions of lava, the molten streams of which had, at the latest accounts, completely destroyed some of the mountain villages, while others were threatened. The lava streams advanced at the rate of three fifths of a mile per hour.

The eruption was accompanied by fearful electrical phenomena. Lightning darted incessantly from the summit of the volcano, the quakings of the mountain were violent and frequent, and thunder continuous. Burning cinders, stones, and scoriæ fell fast and thick in the surrounding towns.

At Naples, ten miles distant from the volcano, dense clouds of smoke and ashes covered the city. The ashes fell in the streets like snow, and reached a depth of two or three inches. The people made use of umbrellas to protect themselves from the ashes. The Bourse was closed and business generally suspended.

The present is the most destructive eruption that has taken place since 1631. The town of Torre del Greco, which is now mentioned as threatened, was, in 1794, utterly overwhelmed by a stream of lava which contained upwards of 46,000,000 of cubic feet. Thick sulphurous smoke, white as snow, resembling the fumes of gunpowder, at that time enveloped the side of the burning mountain, and sometimes rose up in solid masses to an altitude of 14,000 feet, presenting at night time, when lighted up by the lurid columns of fire from the crater, a spectacle of extraordinary magnificence.

The phenomena of volcanic eruptions seem to be chiefly limited to certain regions of the earth whose area is well defined. In some of these, there are continual burstings forth of flame and smoke, scoriæ and lava, like Stromboli in the Mediterranean, on the coast of Sicily.

Stromboli discharges lava every hour with unceasing regularity, and has done so for the last 2,000 years. Mauna Loa, in the island of Hawaii, is famous for the enormous size of its crater and the incalculable quantities of lava it discharges at irregular intervals.

Sangay, a volcano in Chili, 17,000 feet high, has an eruption every quarter of an hour, belching out scoriæ and lava with a hideous roar.

In the island of Java, there are some forty-six volcanoes, and eruptions are constantly going on.

IRON shipbuilding appears to be rapidly becoming an important branch of industry in Denmark. Although for the last fifteen years small iron vessels, designed for trading between the various Baltic ports, have been built at Copenhagen, it is only recently that the construction of large steamers has been attempted. At present several of 1,000 tuns are being built, and one of these, it is stated, will be employed in laying down the telegraph cable between China and Japan. Two steamers, each of nearly 900 tuns—the *Rolfe* and the *Thorwaldsen*—have just made the passage to New York.

M. Champouillon avers that putrefaction is much more rapid in the dead bodies of alcoholized subjects than in those of comparatively sober individuals.

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

A New Astronomical Instrument.

To the Editor of the Scientific American:

At the last meeting of the Natural History Society in this city, Professor Bushee exhibited a new instrument, of his invention, for illustrating the precession of the equinoxes, or in other words, the deviation of the axis of the earth from an exact parallelism with itself; this deviation is about 50" a year, hence the equinoctial points will make (as is well known) an entire revolution in about 25,000 years; and hence also the circuit of our North star is gradually widening and will, in the course of distant future, cease to be our North star; and, in about 12,000 years, will appear to move in a circle of more than 45° radius.

The instrument is a skeleton model of our celestial sphere, about 18 inches diameter, composed of several light brass rings arranged as meridians and parallels, and one flat ring, with its signs and divisions representing the ecliptic or celestial equator; within this skeleton sphere, a model sun is adjusted, around which a model earth, with its extended north pole, is made to move by means of appropriate gearing; so that, by the turning of a crank, the principle or *modus operandi* of this immense sweep of the terrestrial around the celestial pole is clearly made manifest to the observer. Of course no degree of accuracy as to time or proportion can be expected in a model of this kind, yet such instruments are a great help to our comprehension of the vast movements going on in the universe.

While listening to the lucid explanation and lecture of the Professor, it occurred to me that, to say nothing of our ignorance of celestial things, mankind generally have but a vague conception of the comparative significance or importance of various matters upon the earth. For instance, a model earth 21 feet diameter gives us only one thirty-second of an inch to a mile; on such a globe, one hundred acre farms would of course be utterly invisible to the naked eye, and the loftiest ranges of mountains might be represented by a few grains of rifle powder; and the entire human family, estimated at one thousand millions, might be gathered without uncomfortable crowding, upon a spot less than one twelfth of a superficial inch. And the greatest depths which man has yet been able to reach, in the way of mining or otherwise, would not exceed the thickness of thin card board, and the entire animal portion of the earth now living would scarcely fill a child's thimble. The extent of the sensible atmosphere would not exceed one inch and a quarter; and if man shall ever be able to penetrate the earth to the depth of ten miles, it would be but little more than a quarter of an inch on this 21 feet model; hence the model earth must be many times 21 feet in diameter in order to show to the naked eye any of the great works of mankind on a like scale.

Boston, Mass. F. G. W.

Governor Evans on Sea Sickness.—Practical Working of his New Patent Swing Berth.

To the Editor of the Scientific American:

Your favor notifying me that a patent had been allowed on my plan for a ship's berth and chair to prevent sea sickness is received, and I am daily expecting the documents from the Patent Office.

It may be of interest to you to have its history.

A remarkable fact is that my residence is as far removed from the sea and from all connections with navigation as any place on the continent. And although, while Governor of Colorado, in reply to Secretary Stanton's complaint that I, being simply a civilian, had no right to press my views, of our defences against the Indians, on the War Department, I claimed to be "Commander in Chief of the Army and Navy of Colorado," no sail vessel or steamer ever comes within four hundred miles of the Territory. So you see that it was not familiarity with the sea that directed my attention to the means of avoiding sea sickness.

In June, 1869, my wife sailed from New York to Liverpool, in the Cunard ship *China*, in good health. Though the voyage was by no means a stormy one, she suffered so much from sea sickness that before landing she was greatly prostrated, and for a month after was confined to bed, and a considerable part of the time was unconscious and not expected to live. After eighteen months of the best care and medical attention, she remained so feeble that I was satisfied that for her to return home across the ocean, without some efficient means of preventing sea sickness, would be fatal—it would have been little short of suicide. I therefore instituted a general enquiry for some means of avoiding the influence of the motion of the ship in producing sea sickness. To this enquiry, I got uniformly the assurance that it could not be done, as everything had been tried and failed. The question with me had resolved itself into this shape: I must either leave my wife permanently on the other side of the Atlantic Ocean, or procure some apparatus to prevent sea sickness. And finding that no reliable means had been devised, I had no hope except in my own ingenuity. In November last I went to an ingenious mechanic in London and described to him the berth for which you have secured me letters patent. He told me it would not answer the purpose, and declined to make one on that account. But from my observation of the sickness on ship board being increased, by the rolling and pitching of the vessel and its subsidence when the sea became calm, I was satisfied that sea sickness was caused entirely by the deviations from a horizontal position of the support of the patient, caused by the rolling and pitching of the ship—and that the berth I proposed, by keeping the patient, or his or her support, constantly in a horizontal position, would prevent the sickness. I therefore, with the permission of the mechanic, went to his workmen and had a berth constructed as represented in the application made to you for a patent. I had it put in the place of one of the ordinary berths on the steamship *Russia*, and my wife came over on it last December. Although the passage was a very stormy one and a large number of the passengers suffered greatly from sea sickness, she came over without suffering the slightest effects of the malady. That this result was not on account of any change in her predisposition to suffer from sea sickness was proved by the fact that her head would immediately commence swimming when she would get out of her berth, if the ship was rolling, and it would only cease when she returned to her berth. The berth kept her supported in a horizontal position during all the varied motions of the ship, and saved her from any sickness, and I have no doubt saved her life. Necessity was, emphatically, the mother of this invention, and I doubt not it will prove a great blessing to all who suffer sickness from crossing the ocean. Its successful operation, during the voyage, was witnessed by a large part of the passengers and officers of the ship, Senator Stewart of Nevada, Governor Ward of New Jersey, Governor McCook of Colorado, and other prominent persons being among the number. It has already been patented in Great Britain, France, Italy, and the United States.

As the berth takes little more room than those in ordinary use, and can easily be put in all vessels of ordinary construction at a moderate expense, I feel confident of its early introduction into general use. I have already the offer of the officers, of one of the popular lines of steamships plying between New York and Liverpool, to put the berths in their ships.

Denver, Col. JOHN EVANS.

Sewing Machines and their Effect upon Health.

To the Editor of the Scientific American:

Reading your article, in No. 16 of the current volume, with the above title induced me to write the following, in the hope that it may benefit those interested. My objections, after an experience of five years, to some machines, are these:

1st. Many makers place the machines too far back from the front of the table, causing the operator to lean toward it, particularly when near sighted.

2d. In many machines, the fly wheels are too light for the power required to keep up the momentum, making it a continual effort to keep the machine in motion.

3d. Any machine in which the work runs across the front of the table, instead of from the operator, is very objectionable, as persons unconsciously lean over the machine to direct their work, producing a pain in the back or neck; besides which, having to pass large articles over the lap is very uncomfortable and fatiguing in warm weather.

These objections can be remedied by makers who will leave the old beaten track and construct machines on more physiological principles.

Until such changes are made, I would suggest that some one invent a sewing machine chair, to be made inexpensively with cane seat, which can be raised or lowered with a screw like a piano stool, and with a moderately low back, like a school chair. This would permit one to lean well backward to rest while basting, etc. The revolving seat allows a person to turn to or from the machine, avoiding lifting the chair each time, and the seat should be raised until the lap inclines downward to the knees, which position allows the lower muscles their full action. A chair of this kind can be set much closer to a machine than any other, if the base is made like a tripod.

Persons who use a piano stool find it preferable to an ordinary chair. By carefully cleaning and oiling both the motive and operative parts of the machine regularly, and using this improved chair, keeping the body erect, almost any one would be able to sew continuously with little fatigue.

Three to five minutes, each morning, spent in cleaning the machine will give an operator an advantage of an hour or more in a day by economizing strength. Sewing will thus be more beneficial than otherwise.

A TEXAS SUBSCRIBER.

American Silk Manufacturing, Silk Throwing and Weaving, and Locomotive Building, at Paterson, N. J.

To the Editor of the Scientific American:

During the last few years, rapid advances have been made in this country in the manufacture of silk goods. While stopping for a day at Paterson, N. J., accompanied and guided by Mr. Frederic Baare, of the Baare Silk Manufacturing Company, I saw more of this manufacture going on than I had supposed could be seen in the whole United States.

We first entered a room, where girls were engaged in assorting the skeins of raw silk, taken from the sacks in which it was imported from Japan, China, Italy or France. The raw silk differs as much as wool in size and quality of thread. Before it can be wound, it is necessary to remove the gum which is left on it by the silkworm. This is done by soaking it in soap and water. To remove the soapy water without injuring the silk has, until recently, been a very difficult matter. This difficulty has been entirely overcome by a machine, the invention of a member of the French Academy, lately deceased. The essential portion of the machine is a tub, similar in shape to a large wash tub, the sides of which are a series of rings one above another with open spaces between. The skeins are carefully lifted from the vats and laid into this tub around the edge. The tub is then made to revolve rapidly around a vertical shaft, and the water is driven out, by centrifugal force, through the chinks in the sides. To keep the water within bounds, the revolving tub is cased with another having close sides and a perforated bottom. By this means the silk is quickly made sufficiently dry for winding. A similar application of the centrifugal force I lately saw at Herkimer, N. Y., in a contrivance for extracting honey from the comb without breaking the latter, thus enabling the bees to "gather honey all the day" without the loss of six days in seven in making wax. In the winding room, the skeins are put upon reels from which the silk is wound off upon bobbins. In the room visited were nearly 5,000 reels, arranged in rows on long frames, 224 on a frame, two persons attending to one frame. From the winding room, the bobbins are taken to the doubling room, where the silk from two, three, or four bobbins is wound together upon one. The spinning follows, which is done on what are called three deckers, or three story spinners, on which 12,000 spindles made music enough for a Boston jubilee, and not less melodious, perhaps, if rightly heard, than the harmony of which the Rev. Robert Collyer speaks as resulting from 2,000 discords. The processes above mentioned, by which the silk is prepared for the loom, form a distinct branch of the silk business; those engaged in it are called throwsters. In this instance, the feminine termination, *ster*, has not, as in many cases, lost its significance, the employees being mostly females. The establishment visited was that of the Ryle Silk Manufacturing Company.

We next visited the works of the Baare Manufacturing Company, where we witnessed the operations of warping and weaving broad silks. They have some forty looms, and are now engaged in making plaid silks of various patterns for ladies' scarfs. Mr. Baare is one of the pioneers in the silk business in this country. Several years ago, he started a factory in Schoharie county, N. Y.; but afterwards, in order to secure better facilities, he removed his machinery to Paterson, N. J. He showed me some pieces of beautiful dress silk of his own manufacture.

In the same mill is the ribbon factory of John Day & Co. Here are 46 long looms, on each of which from 10 to 40 ribbons are woven at once, the exact number depending upon the width of the ribbon. There is a distinct shuttle for each ribbon, but they all move simultaneously. Ten yards is about the average daily product per shuttle, and the entire weight of silk used per day, about 100 pounds. In one loom was the warp for 14 six inch ribbons, each 240 yards long. Mr. Day has lately patented an improvement in ribbon looms, by which all strain on the thread of the warp is obviated.

Mr. Strange, of the firm of William Strange & Co., Secretary of the American Silk Manufacturers' Association, took me through his factory, and gave me some interesting facts. This factory employs about 500 operatives, and combines the throwing of silk and the making of ribbons, trams, and organzines, running 100 looms. It is estimated that 6,000 persons are employed, that $2,000,000 wages are annually paid, and that some $10,000,000 capital is invested in the Paterson silk factories.

Paterson has other extensive manufacturing establishments. I spent half an hour in a hasty walk through the Rogers locomotive works, where I saw the various pieces which form the "iron horse" being shaped and fitted for their places.

The Falls of the Passaic, the water works, and the hights which overlook the busy, thriving city occupied our attention for an hour, in pleasant contrast to the din and bustle of the factories.

Paterson, N. J. C. H. DANN.

Concentration of Tannin.

To the Editor of the Scientific American:

A short time since, I noticed an article in your paper relative to the production of a concentrated extract of hemlock or oak bark. Every chemist knows that the reduction of tannin into gallic acid is due to the action of oxygen. Without going into a detailed discussion on the *modus operandi*, allow me to say that if a suitable vessel (not iron) is used, and the tan liquor is placed therein, covered with a deep layer of hydrocarbon oil or paraffin (sufficient to protect it from the action of air), and heat applied, a superior extract is procured. Heavy oils that have a high boiling point only are to be used, and any degree of concentration may be secured. I have repeatedly carried out this experiment, and now give it to the public, having no facilities for engaging in the manufacture, and believing it to be valuable to those who have. GEORGE VINING, M.D.

Troy, N. Y.

FROZEN BEEF ESSENCE.—Dr. H. B. Hare (*Philadelphia Medical Journal*) writes that, in a case of scarlet fever in a child, the patient could not be induced to swallow the beef tea which his condition required. As he took ice with avidity, the father suggested that if the beef tea were frozen he might then be induced to take it in that form. The suggestion was carried out, and the child took the frozen beef tea readily. This expedient may, in many cases, be advantageously adopted.

AT some of the English works, slag is now broken up by Blake's stone breaker, and sold for road making; and we are told that the Bessemer slags, from the iron ore known as hematite, make excellent concrete, because of the large quantity of lime they contain; for which reason, and for the silica which they also contain, they make excellent manure for potatoes and barley. In the fields, the broken slag crumbles to powder.

BISCUIT MANUFACTURE.

Civilization and biscuits go together; indeed, it is only in very highly civilized countries that biscuits are made, although we are unable to call to mind the name of any nation, civilized or savage, by which they are not more or less highly appreciated. Messrs. Huntley and Palmer, of Reading, England, are perhaps the largest producers of biscuits in the world. Their buildings cover a very extensive area; at present not less than 1,800 persons find full occupation, while in busy seasons—as, for example, about Christmas—as many as 2,000 have been at work.

About 100 different varieties of biscuit are made by Huntley and Palmer; and they are continually inventing new biscuits and cakes. Speaking of cakes, we may add here that the firm turn out fabulous quantities of tea cakes, forty tuns being no uncommon order, Bristol cakes, sponge and supper cakes, with which they supply confectioners' shops all over England. With one or two exceptions all biscuits are produced in the same way. A dough is first made, and this is then stamped into biscuits, which are subsequently baked, *boiled*, and variously manipulated, according to the species.

We first enter the mixing room, in which are five or six machines used for making fancy doughs, and about as many used for plain biscuits. The "fancy" machines consist each of a miniature mortar mill, the cast iron pan of which is about 4 feet 6 inches diameter, and a foot deep. This revolves at some fifty revolutions per minute under a single heavy roller, nearly as wide as the semi diameter of the pan. In some cases the rollers are smooth, in others grooved. An attendant stands by each pan, and is supplied with the requisite proportions of treacle, sugar, butter, lard, whipped eggs, milk, etc., in large round iron buckets or drums. Over each pan is a canvas shoot, down which the requisite quantity of flour for one batch descends when required. The attendant is armed with a great wooden spatula or shovel, with which he turns over and mixes the materials, which are quickly reduced to a smooth homogeneous mass by the roller. From the pan the mass is transferred to barrows, where we shall leave it for a moment.

The "plain" mixers are horizontal cylinders, about 3 feet diameter and 4 feet long, traversed by a horizontal shaft armed with knives, by the rotation of which the body of materials is quickly reduced to the condition of dough. The bottom of the cylinder is then allowed to fall down by a very ingenious piece of mechanism, and the contents put in barrows.

The next process consists in converting the dough into sheets and stamping it into biscuits. The machinery used is ingenious and perfect.

The dough is passed between a pair of breaking rollers, under which runs an endless web of pure white felt. As it passes through the rollers it falls on the web, and is carried back to the attendant, who, again seizing the end of the sheet of paste, puts it between the rollers. This operation is repeated twice. The third time, after the dough—now in a sheet some 8 feet long, and 2 feet 6 inches wide—has just begun to issue from the breaking rollers, it is laid hold of by a boy and placed on a second endless band running up an incline and lying at a higher level than the endless belt just named. This second belt is of a very thick pure white felt. It travels round a roller, about 12 inches in diameter, 8 feet or 9 feet—measured horizontally—from the breaking roller. Round the belt roller the sheet of dough, clinging closely to the felt, is carried. Opposite the roller is a vertical frame oscillating on pins at the lower end. The upper end of this frame carries a set of swing stamps. The frame, set in motion by the gearing, alternately approaches to and recedes from the roller. As it approaches, the swing stamps assume a horizontal position and strike the sheet of dough, which is caught between the stamps and the roller. The former each cut out a complete biscuit of the required form. As the swing frame retreats, the stamps assume a vertical position and deposit the biscuits on a third endless band, by which they are carried to a set of open wire trays on which to be baked. They are quickly arranged on these by a boy. It is obvious that, as the biscuits are of various irregular shapes, much of the dough is left between the stamps. This falls on a short endless web under the machine, by which it is carried to an attendant who takes it away to be worked up again. The next process is the baking of the biscuits, but before proceeding to the ovens we must describe the extremely curious way in which some of the smaller biscuits, such as "ratafias," "cocoa nut," and one or two others, are made by hand.

The dough for such biscuits is incorporated in special mixers, simply large wooden boxes within which a horizontal shaft armed with paddles or spades rotates slowly, thoroughly incorporating the ingredients. The resulting dough, unlike that used for ordinary biscuit—which is very hard and leathery in consistence, the smallest possible quantity of fluid being used in its preparation in order to insure crispness—is, in the case of "ratafias," "cocoa nuts," etc., semi-fluid. In other words, it is a thick paste. Proceeding to another department but a few yards off, we find eight or ten white capped, white aproned men hard at work making the dough into biscuits in the following way: Each man is provided with a kind of waterproof bag, capable of holding a pound or so of dough. The bag has at the lower end two tin orifices, jets, or tubes. The bag being supplied with the proper quantity of dough, the upper end or mouth is twisted up to close it. The bag is then grasped by the workman in a way impossible to describe. By squeezing the bag, the dough can be made to flow out of the tubular orifices. Opposite each man is a sheet of that peculiarly thin paper with which everybody who eats sweet biscuits is, no doubt, familiar. Holding the dough bag over this sheet of paper, the workman, beginning at the left hand side of the sheet of paper, squeezes the bag gently, and thereby forces out two big gouts or drops of dough; a jerk detaches these from the bag, and behold two ratafias on the paper ready to be baked. A slight motion of the hand to the right, another squeeze and a jerk, and two more biscuits lie in a line with the first, and so the operative proceeds line after line till his paper is filled. The operation is very simple to look at, but it requires great sleight of hand, to work at a high speed and yet make all the biscuits as nearly as possible of the same size. The rapidity with which a man will cover a large sheet of paper with little dabs of biscuit dough is really remarkable. The whole operation constitutes one of those feats of manipulation, perfection in which can only result from long and careful practice.

We may now proceed to consider the means by which the biscuits are baked. On the ground floor are eight or ten ovens of very large dimensions. These are all heated by hot air flues from separate furnaces. The general principle consists in depositing the unbaked biscuits on an endless web of wire or of flat bars of iron, which, continually moving through the oven at a velocity regulated by the size and nature of the biscuits to be baked, carries them through in from five to ten minutes. The biscuits are continually fed in at one end, and are continuously delivered into hoppers or boxes placed to receive them at the other. The delivery ends of the ovens open into the sides of a long and rather dark passage. No machinery is to be seen here, nor any trace of fire—nothing, in short, but a series of long, narrow, horizontal openings, like that of a gigantic letter box, in the walls, and beneath these the boxes to receive the biscuits. These last come tumbling through the wall without visible cause, at short intervals, in ten or a dozen at a time, just as though the street ran outside the wall and a great public, who used biscuits instead of letters as a means of corresponding with their friends, kept on posting biscuits all day. The incautious visitor who picks up one of these incoming morsels is likely to feel sensations of keen regret immediately afterwards, the biscuits being quite hot enough to inflict a mild burn.

A very large proportion of the biscuits thus made are finished as soon as they are baked, but this is not true of all—some require to be ornamented. This ornamenting is effected in various ways. In some cases a glaze of sugar properly colored is put on before they are baked; in others the biscuits proceed to the fine art department. Here we have a light, airy studio, in which we find four or five artists—we can find no more suitable title—some engaged in decorating supper cakes, others building up a magnificent wedding cake, carefully preserved, during such time as the builder is not at work, under a glass shade; others again are at work on biscuits—pretty little things for dessert; some of these have a bright red sugar glaze on them; these are being decorated with ships, swans, roses, branches, or geometrical patterns. The pencil used by the artist is simply a bag, similar to that used in making ratafias and already described, with the exception that it is very much smaller, and fitted with but one small nozzle, the hole in which is less than a sixteenth of an inch in diameter. The white thick pigment used by the artist is simply a preparation of white sugar, and with this pencil he turns out all manner of dainty devices, with a skill, taste, artistic feeling, and endless powers of invention which must be seen to be appreciated as they deserve.

We have stated already that biscuits are sometimes *boiled*. Two or three sorts are thus treated; of these we may particularise the very light crisp cracknels, triangular in shape with the corners turned up. The boiling process is one of the most curious conducted by Messrs. Huntley and Palmer. At the top of the house, in a little out of the way room, we find a large cauldron, heated by steam and nearly full of water boiling away merrily. Into this cauldron the cracknels are thrown just as they come from the stamping machines. They sink at once to the bottom, where they remain for about five minutes. The moment they are sufficiently cooked, they float up to the top, and are skimmed off with a wire skimmer. They are then sent down stairs to be baked.

A very large portion of Messrs. Huntley and Palmer's works is devoted to the operations of sorting, packing, and sending out goods to all parts of the world. We cannot give a better idea of the magnitude of the trade than by stating that the average output of biscuits suffices to occupy no fewer than thirty railway trucks per day.—*Engineer.*

Soap a Source of Skin Diseases.

Obscure affections of the skin, of the face of men especially, are well known to specialists to be widely spread. They are commonly classed as *ekzema*, and, while causing great discomfort, especially at night, show nothing, or almost nothing to the eye, if the patient be otherwise in good health. Skin specialists frequently ask patients whether they have been using any new sort of soap, but no one seems hitherto to have traced any distinct communication between soap and this troublesome disease.

It is a fact, but very little known to the multitude of both sexes who use the "Prime Old Brown Windsor Soap" of the perfumers' shops, that by far the largest proportion of it is manufactured from "bone grease." Few more beautiful examples of chemical transformation are to be found in the whole range of chemical manufacture than this one. At one end of a long range of buildings, we find a huge shed heaped up with bones, usually such as are of little value to the bone turner or brush maker, in all stages of putrefaction as to the adherent or inherent portions of softer animal matter attached to them, the odor of which is insupportable.

These are crushed and ground to a coarse powder, exposed to the action of boiling water under pressure, sometimes of steam, until the grease and marrow are extracted.

We need not here pursue the subsequent treatment of the rest of the material from which bone glue and "patent isinglass" are prepared, the latter of which we often eat in the soups and jellies of the pastrycooks, and finally to the "bone dust" or phosphate of lime, nearly free from animal matter, which is produced for the use of the assayer and the china manufacturer, etc., as well as for other purposes in the arts.

But let us follow up the bone grease, which is of a dark tarry brown color, and of an abominable odor.

By various processes it is more or less defæcated, bleached and deodorized, and is separated into two or three different qualities, the most inferior of which goes to the formation of railway or other machinery greases, and the latter is saponified, and becomes, when well manufactured, a hard brown soap, still, however, retaining an unpleasant smell. It is now, after being remelted, strongly perfumed, so that, like the clothes and persons of the magnates of the Middle Ages, its own evil odor is hidden by the artificial perfume.

This is the "Fine Old Brown Windsor Soap" of most of our shops. The natural brown color of the grease gives it the right tint in the cheapest way, without the coloring by caramel, which was the original method of the manufacturer.

Like all other things, there are cheap and dear Windsor soaps; and for the production of the former, little is done beyond saponifying and casting into blocks or bars. Were we to rely upon the many experiments that have been made as to the degree of elevation of temperature at which putrescent or other contagious matter is deprived of its morbific power, we might conclude that boiling and saponifying had made this hitherto putrescent grease innocuous.

It seems, however, more than doubtful that such is the fact in this case, for the soap thus made seems to be capable of communicating skin diseases when rubbed on the face for use in shaving.

But another promoter of irritation is not unfrequently also found. Whether it be that it is more profitable to the soapmaker to have a liberal proportion of the finer particles of the ground bone made up with the soap, or that these are difficult to separate completely, the fact is that bars of this "Brown Windsor" soap are to be bought containing a rich mixture of those small sharp angular fragments of bone which before boiling was putrid. When a piece of such soap is rubbed hard to a man's face, the skin is more or less cut and scored by these bony particles held in the soap like emery in a head "lap," and thus the skin is placed in the most favorable state to absorb whatever there may be of irritant, or contagious, or putrid in the soap itself. The existence of the bone fragments is easily verified by solution of the soap in water or alcohol, and examination of the undissolved particles with a lens; and I can readily, if need be, send you a piece of such soap for examination.

Now, without occupying too much of your space, I may just state that I have, while using such shaving soap, thrice suffered from ekzema of the face. On the first occasion, I derived no benefit from treatment by the two most celebrated dermal surgeons in London, and at last the disease went away of itself after giving up shaving for a time. I had by me a quantity of this brown soap, and through inadvertence took to using it again, for a time without effect; but when dry and hot weather came, with it came a recurrence of the skin disease, which also again, after some months of discomfort, went away. Curious to make sure whether or not the soap was the real cause, I a third time employed the soap deliberately to see if the ekzema was due to it. I was in excellent health, and in about three weeks I found the disease re-established, so that I think the soap must be viewed as found guilty. Good white unscented curd soap is now my resource, and with no ill effects.

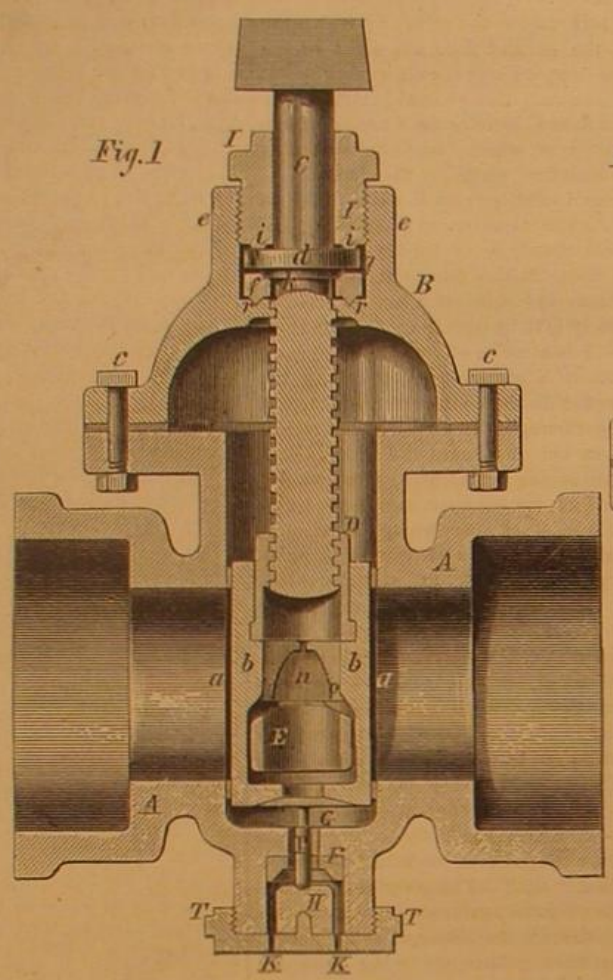
Ekzema is always a distressing complaint even when affecting those in the most robust health. With those of bad constitution or lowered health, however, it seems to degenerate into bad or intractable skin diseases, so that probably this notice may not be deemed useless or uncalled for. —*R. M., in Nature.*

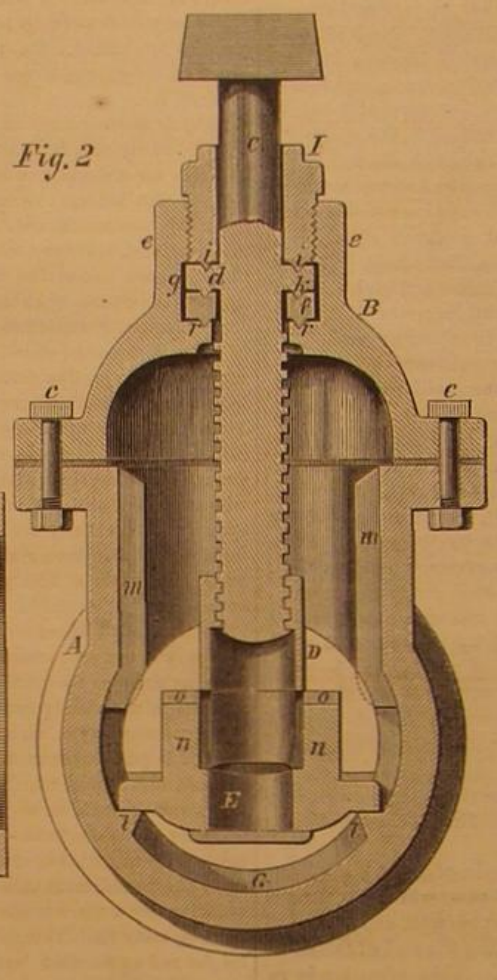
TEST FOR SULPHUR AND PHOSPHORUS IN IRON.—M. K. Meincke recommends the use of chloride of copper in place of that of iron, the former presenting the advantages of much greater facility in filtering the various solutions and liquids, and of producing more precise results. The method employed differs little from that in use by metallurgical chemists. The iron, finely divided, is dissolved in the chloride of copper, then the metallic copper is separated by means of an excess of chloride of copper and common salt the solution is then filtered through asbestos, which detains the insoluble particles, and the latter are then oxidized by means of concentrated nitric acid and chlorate of potash, and set to evaporate with hydrochloric acid; lastly, the sulphur is precipitated by barytes in the form of sulphate, and the phosphorus by molybdic acid according to the ordinary method.

A MUSEUM OF WORKING MODELS.—A correspondent, E. J. O., suggests, as an addition to the art museums the erection of which we have lately advocated, the formation of collections of working models of machinery. He maintains that such an exhibition would be a popular sight and a pecuniary success; and he believes that profits would be realized sufficient to make a dividend among the exhibitors. This scheme has been frequently proposed, and in a few instances tried, with pecuniary loss. There is so much working machinery to be seen in every town and village that it is doubtful whether a permanent exhibition, such as proposed, would pay expenses.

Improved Water Gate.

Our engraving illustrates the construction of an improved water gate, which comprises valuable and new features and to which we call the attention of hydraulic engineers as probably being, for some purposes, superior to others which have preceded it. The water flows through a straight passage, and the construction is such that, with minimum size a large proportional flow is obtained. The parts are accessible and easy of adjustment, and the whole combination will, we think, commend itself to those competent to judge of such matters. The valve can be used for gas or steam, and has much to recommend it for these purposes. The gate, as will be seen by the description of details below, is easily operated, even under great pressures. The extreme compactness of this gate, its automatic drain, and the peculiarly constructed resting place of the double wedge, whereby an unobstructed recess for sediment is secured, are also features which will impress those of our readers who are familiar with the requirements of a good water gate. The stem packing is remarkable for its compactness, durability, and effectiveness.





A, Figs. 1 and 2, denotes the shell or case of the valve through which a straight passage for the flow of water or steam is made. Two seats, *a*, Fig. 1, are formed on the internal opposite sides of the passage, against which the two valve disks, *b*, close. B is the bonnet, the flanged base of which is connected with the flanged top of the shell by means of bolts or screws, *c*, passing through the two flanges. C is the stem, which extends down through the neck of the bonnet and carries on its lower end a flanged traversing nut, D, to which the valve disks, *b*, Fig. 1, are affixed. On the stem is an annular collar, *d*, which is disposed within the neck, *e*, of the bonnet and rests upon a brass or metallic washer, *f*, which, in turn, rests upon the bottom of the chamber, *g*, of the neck. I is a screw nut, which screws into the neck and down upon the collar, *d*, serving to prevent any longitudinal movement of the stem, while it allows it to rotate upon its axis. For the purpose of perfectly packing the stem there is formed on the lower surface of the screw, I, a circular V shaped rib, *i*, which fits into a correspondingly formed depression or groove made in the upper surface of the collar, *d*. A similar shaped annulus or rib, *k*, and a corresponding channel are formed respectively on the under surface of the collar and the top surface of the washer, *f*.

Another and similar annular rib, *r*, and fellow groove are formed respectively on the under surface of the washer and the bottom of the chamber, *g*. All the series of annular ribs are ground and so formed that the apices of their angles shall not impinge against the bottom of the grooves, but so made that each shall have two bearing surfaces upon opposite walls thereof, whereby a double protection is afforded at each joint. These ribs being forced down upon their seats by means of the screw, I, with any desirable degree of force, a most perfect steam or water tight connection is insured.

The disks, *b*, are guided in their vertical movements by means of channels, formed respectively on the opposite sides of the disks, operating in conjunction with vertical ribs, *m*, disposed on opposite walls of the shell, as shown in Fig. 2. Each of the disks is connected independently and loosely with the flanged traversing nut, D, and each has two inclined recesses, *o*, Figs. 1 and 2, formed in its inner face to receive two wedges, *n*, disposed near the ends of a wedge-carrying plate, E, through which the stem slides, this plate being stopped in its downward movement by means of projections or lugs, *l*, disposed on the inner surface of the valve shell, as shown in Fig. 2. G is a recess or chamber, formed underneath the disks when at their lowest position, which receives any sediment which may be in the water or which may be removed from the valve seats by the closing of the disks.

The employment of the double wedges is designed for large sized water gates, they being especially useful when the valve plates used are more than a foot in diameter, as a single wedge arranged centrally between the two disks would admit of too great oscillation of the disks while being opened and closed.

The operation of the disks and wedges is as follows:

To close the valve or the disks upon their seats, we have simply to rotate the screw stem in the proper direction. The disks being hung to the traversing nut, D, and carrying the wedge plate and wedges between them, will be forced downward until the projecting ends of the wedge plate strike upon the lugs, when the wedges become stationary and, by their action against the inclines on the inner faces of the disks, the latter will be forced in close contact with their seats. To open the disks, the stem is to be rotated in the opposite direction to that used in closing them. As soon as the disks begin to start, they are instantaneously relieved from their pressure against their seats, so as to produce but little friction or wear of either the disks or their seats. The employment of the two wedges, arranged as described, serves to preserve the disks from too great lateral play under the pressure of the water or steam while being operated.

The automatic drain is constructed as follows:

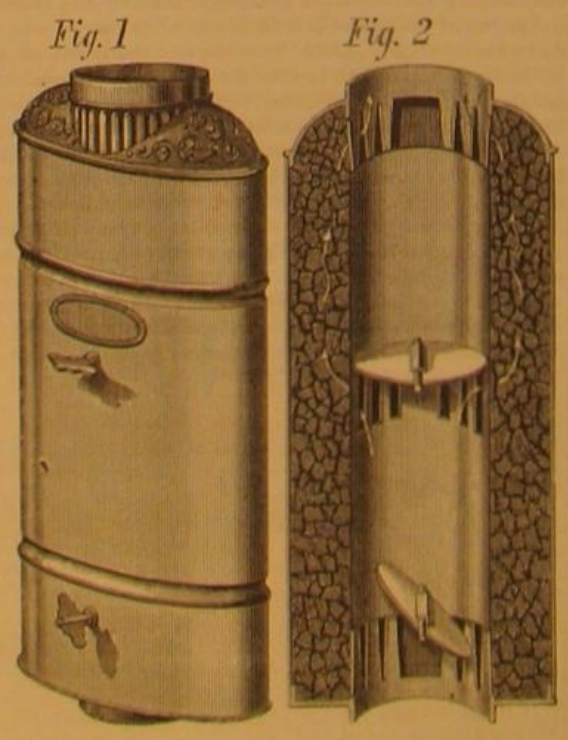
H represents a rubber spring fitted into a boss cast on the bottom of the shell; this spring is enough smaller than the hole in the boss to leave the drain, K. F is a white metal washer with a conical shaped seat fitted to the size and shape of the upper end of the rubber spring. P is an iron pin firmly fitted into the top of the spring; this pin is of sufficient length to reach up three eighths of an inch into the water way when the valve is open or the disks sufficiently raised. This spring is forced into position by means of the screw nut, T.

This invention was patented March 19, 1872, and further information may be had by addressing the Peet Valve Co., 152 Hampden street, Boston, Mass.

PEET'S IMPROVED WATER GATE.

TWITCHELL'S DRAFT REGULATOR AND HEAT ECONOMIZER.

The accompanying engraving illustrates an attachment applicable to any kind of stove or range, the object being to regulate the draft and more fully extract the heat from the gases of combustion than is done by the ordinary dampers in use.



The attachment is neat in design, while, we judge, the principle on which it operates must lead to the desirable results claimed for it. These claims are sustained by a large number of testimonials from those who have used the invention, and who have thereby made a notable reduction in their coal bills.

It is claimed that, while one third or more of the fuel ordinarily used for heating or cooking may be saved, other conveniences, such as the perfect control of the heat and the easy preservation of the fire during the night, etc., are secured by the device, which costs little and requires very little attention to operate it.

Fig. 1 is a perspective view, and Fig. 2, a section of the apparatus. It consists of an external and internal sheet iron case, the annular space between which is filled with some solid material in lumps, hard coal being the handiest and most preferable substance for the purpose. There are two dampers, as shown. When both are open, the gases of combustion escape through the center of the regulator directly to the chimney. When the upper one is closed and the lower one opened, the gases take the direction of the arrows, passing into the annular space through slots in the inner shell and traversing the interstices between the lumps of coal, and are retarded in their course, thus being rendered less sensitive to external winds and currents than would be the case if they passed directly to the chimney. The draft thus produced is steady instead of fitful, and the coal, becoming heated, radiates its heat into the apartment. The radiating surface is large, owing to the fragmentary state of the material, and the extraction of the heat from the gases can be carried to the utmost extent consistent with the continuation of the draft.

The lower damper, when used, lengthens the distance which the gases must traverse through the interstices; and by the proper adjustment of the two, the consumption of fuel is controlled without danger of extinguishing the fire.

Patented Feb. 7, 1871. For further information address S. H. Twitchell, 27 Bedford avenue, Williamsburgh, N. Y.

[See advertisement on another page.]

COMPRESSED AIR LOCOMOTIVES.

In a recent article on the use of compressed air engines, the editor of *Engineering* expresses the opinion that the proper way, to prevent the great reduction of temperature which necessarily attends the expansion of air, through the engine, from its compressed state, is to apply heat to the main reservoir and to the engine cylinders; and that the best way to do this is by means of a jacket supplied with hot water. On a street car, weighing with load six tuns, it is estimated that 318 pounds of hot water would furnish the necessary temperature. It is also estimated that to drive such a car, for a distance of four miles at the rate of eight miles per hour, will require the employment of 170 cubic feet of air, condensed to an initial pressure of 300 pounds to the square inch. This supply of air could be packed into thirty-four wrought iron tubes 10 feet each in length and 9⅝ inches interior diameter. Such a locomotive would not be an economical method of using power as compared with steam, but might be highly advantageous where steam cannot be used, as, for example, on street railways or city railway tunnels.

Manufacture of American Sewing Machines in Scotland.

The Howe Sewing Machine Company of Glasgow, Scotland, has recently held in that city the first annual social meeting of the employees. Mr. F. M. Tower, the chairman of the meeting, informed the audience that the manufactory in Glasgow was only an offshoot from the American one, which has been in operation for many years. One of the chief motives of the Company in transferring a portion of their production to that country was the conviction that it was needed. Within less than five years the Company's production had increased from 50 to 500 per day. After giving an account of the Company's great works at Bridgeport, Connecticut, and at Peru, in one of the western States, Mr. Tower mentioned that the demands now are for 50,000 machines per annum, and that ground extending to 8,000 or 9,000 square yards has been secured in the east end of Glasgow, on which very extensive works are to be erected forthwith. The Company sell their machines in England at half the price they charge for them here, and still make immense profits. In this country, under the cover of the Wilson and other patent monopolies, they are enabled to charge extortionate rates. It is to be hoped that Congress will refuse to extend the Wilson patent.

It is found, in Canada, that 100 lbs. of peat will last longer than half a cord of wood, for locomotive fuel.

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW (PARK BUILDING) NEW YORK.

O. D. MUNN. A. E. BEACH.

☞ "The American News Co.," Agents, 121 Nassau street, New York.

☞ "The New York News Co.," 8 Spruce street, New York.

☞ A. Asher & Co., 20 Unter den Linden, Berlin Prussia, are Agents for the German States.

☞ Messrs. Sampson Low, Son & Marston, Crown Building, 183 Fleet street, Trubner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill, London, are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.

VOL. XXVI., No. 20. [NEW SERIES.] *Twenty-seventh Year.*

NEW YORK, SATURDAY, MAY 11, 1872.

Contents:

(Illustrated articles are marked with an asterisk.)

A Long Felt Want..... 312
American Silk Manufacturing, etc., at Paterson, N. J..... 308
A Museum of Working Models ... 309
A New Astronomical Instrument 308
Answers to Correspondents 313
Birmingham Gunmakers' and Inventors' Club..... 304
Biscuit Manufacture 309
Boiling Rice in India 307
Business and Personal..... 312
Chinese by Telegraph..... 306
Compressed Air Locomotives..... 310
Concentration of Tannin 308
*Draft Regulator and Heat Economizer..... 310
Drunken Railway Officials..... 307
Drying by Chemical Action..... 311
Fireproof Building.—The Lesson of Chicago..... 311
*Gardener's Stool..... 306
Gas Meters..... 305
Governor Evans on Sea Sickness 308
How Genuine Pearls are Prepared in China..... 305
*Hydromotor for Ships' Pumps and Other Purposes..... 307
*Improved Water Gate..... 310
Improvement of the Steam Engine..... 307
Inventions Patented in England by Americans 315
Iron Shipbuilding in Denmark.... 307
Iron Telegraph Pole 308
Japanese Textile Art..... 304
Man and the Lower Animals..... 305
Manufacture of American Sewing Machines in Scotland..... 310
Narrow Gage in the United States 307
*New Method of Propelling Canal Boats..... 306
Notes and Queries..... 313
Official List of Patents, Extensions, Designs, etc..... 315
Opening the Public Libraries on Sunday..... 311
*Pocket Bootjack 306
Potash from Corn Cobs..... 306
Power Produced by Steam, under Different Temperatures and Pressures..... 312
Preserving Nuts..... 304
Recent American and Foreign Patents..... 313
Sewing Machines and their Effect upon Health..... 308
Soap a Source of Skin Diseases... 309
Substitute for Lithographic Stone 306
Test for Sulphur and Phosphorus in Iron..... 309
The *Adriatic*..... 305
*The Greene Engine 303
The Hartford Steam Boiler Inspection and Insurance Company 305
The Sun a Probable Cause of Terrestrial Magnetism..... 305
The Western and Southern Railway Association..... 307
Underground Tramways in Germany 306
Vesuvius and other Volcanoes... 307

Importance of Advertising.

The value of advertising is so well understood by old established business firms, that a hint to them is unnecessary; but to persons establishing a new business, or having for sale a new article, or wishing to sell a patent, or find a manufacturer to work it; upon such a class, we would impress the importance of advertising. The next thing to be considered is the medium through which to do it.

In this matter, discretion is to be used at first; but experience will soon determine that papers or magazines having the largest circulation among the class of persons most likely to be interested in the article for sale, will be the cheapest, and bring the quickest returns. To the manufacturer of all kinds of machinery, and to the vendors of any new article in the mechanical line, we believe there is no other source from which the advertiser can get as speedy returns as through the advertising columns of the SCIENTIFIC AMERICAN.

We do not make these suggestions merely to increase our advertising patronage, but to direct persons how to increase their own business.

The SCIENTIFIC AMERICAN has a circulation of more than 40,000 copies per week, which is probably greater than the combined circulation of all the other papers of its kind published in the world.

OPENING THE PUBLIC LIBRARIES ON SUNDAY.

For some time there has been a growing popular opinion in favor of opening the public libraries on Sunday. It is a just inference that there were and are grounds on which to base argument in support of such a movement. As people have had their attention called to the subject, they see that, instead of tending to greater violation of sabbatarian observance, the opening of the libraries will in all probability prevent many from spending the day in a manner injurious to themselves, and totally out of keeping with the character of the Sabbath. The public libraries are all of them free from any associations tending to vice or immorality. They are retired resting places, where silence, comfort, and order reign. In these respects they are far more desirable places, for clerks, mechanics, and others, than the cramped, ill ventilated lodgings so many are compelled to occupy.

No one, we suppose, will at the present day declare it a violation of the Sabbath day to read good books, even of a secular character. If this be admitted, it is clear that the provision of good books, and a comfortable place to read them in, cannot be objectionable in either a moral or religious point of view.

A primary effect would be that the cheap and often filthy trash, sold in such large quantities at the news stands, would be less sought after, and a general elevation of taste in reading would commence. It needs no argument to show that this must exert a salutary influence on morals. Another scarcely less desirable result would be the attraction of youth from evil associations, found in suburban places to which, by their unpleasant and unsocial surroundings, they are almost driven on the Sabbath.

It may be asked if the luxuriant seats, the excellent music, and the pulpit ability of the churches do not draw young men from such associations as are hurtful, how is it to be expected the opening of the libraries will accomplish it? We reply, that neither libraries nor churches will attract all. The churches will attract some whom the libraries will not, and *vice versâ;* but both together will do more towards purifying the morals of the community than either working separately.

The recent lecture of the Rev. Henry Ward Beecher, at the Cooper Institute, placed this point in an admirable light, and we are glad to see that not only this prominent divine, but others scarcely less influential, are strenuously advocating the measure.

It is announced that the Cooper Institute reading room and library will be opened on Sunday in the Fall. The Mercantile Library will undoubtedly soon follow, and this action will, for the most part, undoubtedly be imitated by the trustees of public libraries throughout the country. We can see no probability or possibility of evil effects resulting from this movement, while its advantages seem obvious. The present state of morals in this country demands that no means of improvement should be neglected.

In an educational point of view, the opening of the libraries is certainly very desirable. It will afford opportunities, for the acquisition of knowledge and for self discipline, now wholly denied to a large class of our city population. Mechanics, clerks, and others, confined at labor almost constantly during the week, will, it is believed, gladly avail themselves of the facilities thus offered, and the usefulness of the libraries will thus be largely extended.

DRYING BY CHEMICAL ACTION.

Having already penned several articles upon various methods of drying substances, we propose to conclude with some remarks upon drying by chemical action. That wonderful property, called by chemists affinity, which exists between different substances, exerts a force so much greater that any which is practicable to the resources of mechanics, that it may be made one of the most effective means known whereby the desiccation of substances can be accomplished. Sometimes it may be employed singly. In other instances, it may be used in connection with heat or mechanical action, or all three may be used together. There are few substances that have no affinity for water, but there are some which seize upon it and hold it with such intense force as almost to defy separation. The strongest chemical reagents, such as sulphuric acid and the other strong acids, the alkaline bases, potassa, soda, lime, etc., owe much of their usefulness in the arts to their affinity for water. There are few substances that have so strong an attraction for water that some one of the alkaline bases will not seize upon it and hold the whole of it.

Of course, when water is an essential ingredient of a compound, and not an extraneous substance, its removal effects decomposition; and in all such cases, the use of chemicals for drying, as it not only removes the superfluous water but injures what remains, is, of course, inapplicable. One of the most important processes in which chemical drying is employed, and one of the best illustrations of the principles upon which it is based, is that of *separation*, as it is called in the soap manufacture. The fats or oils used for soda soaps are first saponified by an excess of the solution of caustic soda, technically called "ley." The soap thus formed contains glycerin, excess of water, and soda, which it is desired to remove. Now, although the soap has a strong affinity for water, it could be dried sufficiently by the slow and careful application of heat, but to do this would require a long time, and, besides being very tedious, would be a very expensive process. Soda, or chloride of sodium (common salt), has a much stronger attraction for water than soap. If either of these substances in strong solution should be added to the soap in sufficient quantity, and heat be applied, the following actions are set up: The soap floats upon a strong solution, "ley," of soda or salt (sometimes both are used). The heat applied to the bottom of the kettle drives off a portion of the water in the solution, which is replaced by water attracted to the salt or soda from the soap; this is in turn converted into steam by the heat, and so on, the soda or salt taking water constantly from the soap, which the heat expels until the soap has been sufficiently freed from water. Meanwhile the soda ley has dissolved out all of the glycerin, and the water in departing from the soap has carried with it the excess of alkali, adding it to the solution at the bottom of the kettle, and so the purified soap floats in hard grains or lumps upon the ley. The soap being then drained is ready for the subsequent operations, which fit it for sale and use.

This is a fine example of chemical action combined with heat to eliminate water. Another illustration is the production of absolute alcohol by distilling it in contact with quicklime, the latter seizing and holding all the water contained in the alcohol, which then passes over and is condensed in the receiver.

Chemists pass gases through quicklime, chloride of calcium, calcined potash, or soda, to rid them of watery vapor. Polished metallic articles, liable to tarnish through the action of watery vapor, may be protected by placing them in a case in which is also placed a little quicklime. Whenever the lime falls into fine powder, it is an indication that it has absorbed all the water it can hold, and that a new supply of quicklime is required.

Very rapid drying without heat can be accomplished by the use of quicklime and a fan blower, using the same air over and over, first passing over or through the substance to be dried, and then over quicklime in lumps. The process can be accelerated greatly by heating the air on its passage from the lime to the substance to be dried (the heating greatly increasing the absorbing power of the air) and keeping the lime cold by means of tubes through which cold water passes. By regulating the heat properly, very delicate substances may be thoroughly desiccated without injury. The writer has applied this process in certain operations with great success. Where an operation of this kind is conducted on a large scale, the lime can be renewed over and over again by calcination, which drives off the moisture (and perhaps carbonic acid) it has absorbed.

The hints thus thrown out may serve as a guide to inventors who are devising means for the desiccation of fruits, vegetables, meats, etc., and for the concentration of milk, etc. Processes of this kind are being extended rapidly at the present time, and the preparation of articles of food, in a palatable form and in a condition to keep a long time, is daily becoming of greater industrial and commercial importance.

FIREPROOF BUILDING.—THE LESSON OF CHICAGO.

A disaster is partially compensated for when from it is derived the knowledge necessary to avoid similar catastrophes. The lesson of the great Chicago conflagration was a severe one, yet full of instruction which, we regret to say, appears not to be fully heeded in the haste to reconstruct that devastated city. In the first tide of excitement that spread over the country, as the news of the terrible conflagration was received, the press teemed with theories hastily devised to account for the magnitude of the fire and the rapidity with which it devoured the richest part of the Garden City. Statements equally baseless, as subsequent developments have proved, were circulated far and wide about the influence, of the wood and tar pavements and the bituminous stone largely employed in some of the buildings, upon the spread of the flames. It was to be expected that many conflicting accounts would be promulgated and much false theorizing be indulged in, and that some months would elapse before the opinions of calm and dispassionate observers would be listened to. It is the purpose of this article to give in condensed form the opinions of such an observer, and to make such brief comments upon them as may suggest themselves.

The gentleman referred to is Mr. P. B. Wight, Secretary of the American Institute of Architects, whose remarks upon the subject of fireproof building in connection with the Chicago fire constituted the most interesting and valuable part part of the "Proceedings" of the above named association at its fifth annual convention, a copy of which proceedings now lies before us.* The views of this able architect and engineer, and the facts stated at the convention will correct many erroneous impressions.

Red brick and Milwaukee buff brick are the kinds chiefly used in Chicago. The buff brick endured the trial much better than the red, but both yielded in many instances under the heat. Mr. Wight attributes the great destruction of brick buildings to the extreme thinness of their walls, and to the use in them of soft brick fillers. This latter practice, Mr. Wight says, is yet in some instances indulged in, notwithstanding the evident inefficiency of such walls to withstand excessive heat as demonstrated by the fire. These walls were cracked and warped, in fact "all shattered to pieces" by the heat. The bricks were "all burned white, even the red ones." Some of the bricks were rent in pieces, others were rounded off at the corners, and some softened instead of being vitrified.

The Illinois limestone was the worst to withstand the heat, being in many instances entirely calcined. Some of the fronts of this material were burned off entirely, leaving one or two stories of brick backing standing after the fire. In other instances, this stone was so rounded at the corners as to appear like "boulders." The Lockport limestone proved better, but still was badly damaged. The two sandstones which withstood the heat the best were the Cleveland stone and the Lake Superior stone. Little granite was used in the burned district, but such of it as was exposed to the heat was cracked badly and rounded at the corners.

The Illinois stone exploded where the heat was very intense. "It seemed," says Mr. Wight, "to calcine with great rapidity, and I suppose the effect was very much like that seen in the manufacture of pop corn." No observations of marble were made. One building, in which a great deal of artificial stone was used, stood the heat remarkably well. Mr. Wight says: "I do not know whose patent stone it was, but it was used from the second story up to the top in pilasters, cornices, and sills. In many places, this stone was scarcely injured at all." We deem this fact of importance as proof of the part which artificial stone is destined to fill in future building.

A correlative fact is that all kinds of mortar were less affected by the heat than natural stone. This might be inferred from the statement relative to artificial stone, since mortar, strictly speaking, is an artificial stone. This point has much significance, showing that, when the real constitution of stone which will withstand destructive influences is thoroughly comprehended, chemical science will be able to supply the requisite conditions for its artificial formation.

The petroleum stone, of which so much was said in the newspapers and which was charged with having greatly assisted the spread of the fire, is spoken of as follows:

"There was one church in Chicago built of what they call prairie boulders, which ten years ago were supposed to contain tar, but really contained petroleum. The amount of petroleum in the church was so great that the heat of the sun would draw it out, soon after being set up in a wall, and it would run down in black streaks. The effect of the heat on the inside of the walls threw out upon the exterior all the oil it contained, which formed a thick hard coating about a quarter of an inch in thickness; and though the interior of the church was exposed to great heat, and every particle of wood in it was burned up, so that there was not a scrap left in it, the interior sides of its walls were not greatly injured. In some places the stone had flaked off, and yet this stone stood the test better than any other natural stone used in the city."

* Proceedings of the Fifth Annual Convention of the American Institute of Architects held in Boston, November 14th and 15th, 1871. Published by the Committee on Library and Publications of the American Institute of Architects, and sold by D. Van Nostrand, Nos. 23 Murray street and 27 Warren street.

He also says that the Nicholson pavement, contrary to many statements, stood the test remarkably well.

"In some places the upper part was charred off, especially where it was new; but the curbstones were in some places actually destroyed, while the Nicholson pavement remained intact. I would suggest as to whether the presence of tar in the wood was not similar in its effects to the presence of the oil in the stone. We may possibly discover a valuable property in tar or oil, from this experience."

Iron structures and parts of structures were badly injured, with the exception of corrugated iron floors supporting concrete arches of masonry, the iron being simply a basis for the masonry.

Vaults built in the tower form, from the cellar up, proved the most efficacious; heavy brick vaults built upon floors are severely deprecated.

The importance of fireproof shutters is earnestly dwelt upon. Mr. Wight says:

"No matter how they are made, so long as they are strong enough; make them double or treble or quadruple, with air spaces between, but by all means keep out the fire from neighboring buildings, even if you have nothing in your own house to burn. Every fireproof building should have fireproof shutters on every window, whether on the front or on the rear. It is the habit with us to put them on the rear, and very often to leave them off the front. We say "Our building is fireproof; there is nothing in it to burn." But there is something in it to burn, and the very books, papers, furniture and carpets used have proved—as in some of these buildings in Chicago—sufficient to soften an iron beam, and destroy the best constructed floors."

Great emphasis is also laid upon the proper construction of roofs. They should "be made the best part of the building." In a great fire fanned by a hurricane, the current of heated air comes directly down on the tops of the buildings, instead of the fire communicating from house to house. This fact is shown by numerous examples, adduced by the speaker, which we have not space to reproduce, having already exceeded our prescribed limits.

We have seldom read a more instructive discussion, and if Mr. Wight fulfils his intention of writing an elaborate paper upon the subject, he will confer a great benefit upon the public.

POWER PRODUCED BY STEAM, UNDER DIFFERENT TEMPERATURES AND PRESSURES.

At the present stage of our knowledge in regard to the conversion of heat into motion, the steam engine stands foremost as the least expensive and most convenient apparatus to accomplish this transformation. Being founded on the increase in volume of water, when changed by heat into steam, it is easy to calculate the amount of heat required to produce a given power, for the reasons that the amount of the increase in volume of water when becoming steam, and the amount of heat required to accomplish this, are both well known.

To simplify our calculation, let us suppose that we have a long vertical tube 6 inches in diameter, or of 27 square inches, or $\frac{1}{2}$ of a square foot, sectional area. The whole length we suppose to be 144 feet; then the whole contents of the tube would be $\frac{1}{2} \times 144$, or 27 cubic feet. Suppose now we have, at the bottom of this tube, water one inch high; then we shall have 27 cubic inches, or one pound of water. Let us finally assume that we give this water heat enough to convert it all into steam. Then, as it expands 1,700 times, it will just fill the tube, which is 144 feet, or 1,728 inches long. The heat required to change one pound of water into steam is 965 units, and the power produced we may easily estimate by considering that the steam will possess one atmosphere's pressure and be just able to remove the atmosphere from the tube, as this has a pressure of 15 pounds per square inch, or $15 \times 27 = 405$ lb. for the whole sectional surface of the tube, in which a piston might separate the steam from the air. This piston will, by the expansion of the steam, be moved through a distance of 144 feet, and, being subject to the atmospheric pressure of 405 pounds, the force produced by the evaporation of one pound of water will be $144 \times 405 = 58{,}320$ foot pounds.

If this result is accomplished in one minute, we shall have one and two thirds horse power, as 33,000 foot pounds per minute has been adopted for the amount of one horse power. We see, therefore, that the evaporation of one pound of water per minute, or 60 pounds per hour, gives us one and two thirds horse power, and this agrees tolerably well with experience, which has taught that the evaporation of one cubic foot—that is, 63 pounds of water per hour—is amply sufficient for one and a half horse power. As we have seen (p. 184) that one pound of coal is able to evaporate 13 lbs. of water, the evaporation of $5 \times 13 = 65$ lbs. water requires 5 lbs. of coal (producing one and two thirds horse power), or three pounds of coal per hour for one horse power. And this is indeed the ordinary estimate for economical engines with Cornish boilers; locomotives consume double that amount, and even more.

The question now arises: Is it not more economical to raise the temperature of the water higher than only 212°, which only obtains one atmosphere's pressure? Is it not more advantageous to work with a pressure of several atmospheres?

The answer to these questions is affirmative; but it must be remembered that the rule, usually given, that water expands 1,700 times so that one cubic inch of water makes one cubic foot of steam, is only applicable to steam of 212°; at higher temperatures there is a lesser bulk of steam. At 250° Fah, we have increased every inch of water only to 900 inches of steam and a pressure of 30 lb.; at 293°, the volume is 475 inches and the pressure, 60 lb.; at 340°, the volume is 250 inches, and the pressure, 120 lb.

In regard to the heat required: Steam of 212° consumes 965 units of latent heat; steam of 250°, or 38° more, does not require 38 more units, but only 11, as the specific heat of this denser steam is less. At 293°, or 43° more heat than the latter and 4 atmospheres' pressure, we require only an addition of 12½ units of heat; at 340°, or 47° more heat and 8 atmospheres' pressure, we require only an addition of 14 units of heat.

It is thus seen that every additional atmosphere's pressure requires the addition of a lesser amount of heat, while the capacity for heat or specific heat of the steam decreases by an increase of the heat and pressure. Therefore, the same addition of heat has more effect, when applied after a high temperature and pressure have already been obtained, than at a lower temperature and pressure. The figures here given have been obtained, by Régnault, by the most careful methods of research.

If we apply the same reasoning as before to our tube, with steam of 250° Fah. and two atmospheres' pressure we find that the piston is lifted, by a force of $2 \times 27 \times 15$ lbs., or 810 lbs., through a space of 900 inches, or 75 feet, producing 810×75, or 46,170 foot pounds, for $965 + 38 = 1{,}003$ units of heat. When heating the water to 293°, we have 4 atmospheres' pressure, and thus $4 \times 27 \times 15 = 1{,}620$ lbs.; and as the water expands only 475 times, it will raise the steam of this pressure to the hight of 475 inches, or nearly 40 feet, and will lift the 1,620 lb. that distance, which is equivalent to 64,800 foot pounds, for $965 + 81 = 1{,}046$ units of heat. Finally, for 340°, the steam expands 250 times, fills the tube to the hight of 250 inches, or nearly 21 feet, at a pressure of 8 atmospheres, or $8 \times 15 \times 27 = 3{,}240$ lbs.; this, lifted 21 feet, gives 68,040 foot pounds, for $965 + 128 = 1{,}093$ units of heat employed.

It is seen that there is an advantage gained, but it is not as great as supposed by many. The pressure of one atmosphere gives 58 foot pounds per unit of heat; 2 atmospheres, 60 foot pounds; 4 atmospheres, 63·5; and a steam engine of 8 atmospheres, 65·5 foot pounds for every unit of heat consumed. But if we take into consideration that, at high temperatures, there is more loss of heat by waste of fuel, radiation, etc., it is evident that the advantages gained may be overbalanced by disadvantages.

In practice, it is customary not to consider the first atmosphere, or 15 lb. pressure, but to call steam of 250° Fah. and two atmospheres, or 30 lb. pressure, one atmosphere, considering only the 15 lb. above the ordinary atmospheric pressure; one atmosphere has, therefore, to be subtracted from our theoretical figures, in order to make them agree with the customary terms used in practice.

A LONG FELT WANT.

There has been a long felt want for a transparent material, which could take the place of glass for many purposes, without the fragility of the latter substance. The substance which comes nearest to these requirements is mica, but in many respects this fails to meet the want. It would seem that the present resources of chemistry might be adequate to furnish to the world such a material as we have named. So far as we are aware, but little experiment has been made toward the attainment of less brittleness in glass. The ancient process of annealing is still solely relied upon; with how much success, let the myriads of broken lamp chimneys globes and mirrors testify.

It would not be necessary, to render a non-brittle transparent and easily molded material valuable, that it should be insoluble in water, but it would be very desirable that it should withstand the effects of considerable heat. Gelatin, of which beautifully transparent plates can be made, is not only soluble but is decomposed by high temperatures. Are the two properties of transparency and brittleness in solids inseparable? We have no general reason, except the fact that most transparent materials are brittle, to justify such a belief.

Chemistry may yet render glass as little liable to breakage as hard rubber. Could this be done without change in its other characteristics, the utility of glass for general purposes would be increased a thousand fold. The man who can do this cheaply would supply a process of incalculable value.

Watch No. 24008. Stem Winder—Trade Mark "United States Watch Co. (Giles, Wales & Co.), Marion, N. J."—has been worn by me about five months, during that time has varied but eight seconds. I have worn it while riding on horseback and in railroad cars.—CHAS. H. WOLF, firm Chas. H. Wolf & Co., Pearl Str., Cincinnati, Ohio.

All Druggists sell Burnett's Cocoaine for the hair.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4 00 a year. Advertisements 10c. a line.

Have you sent for a Pat. Door Stop? It is the best thing for Agents—40c. prepaid. Wendell & Francis, 436 Walnut St., Philadelphia, Pa.

Stone Sawing Machines wanted. H. Dodds, Osage City, Kans.

Presses, Dies & all can tools. Ferracute Mch Wks, Bridgeton, N.J. Also 2-Spindle axial Drills, for Castors, Screw and Trunk Pulleys, &c.

Grindstones for Axe Manufacturers. Worthington & Sons, North Amherst, Ohio.

To Ascertain where there will be a demand for new Machinery, mechanics, or manufacturers' supplies, see Manufacturing News of United States in Boston Commercial Bulletin. Terms $4.00 a year.

The best Wrought Iron Sectional Steam Boiler in the world for small power. Samuel Harris, Washington, D. C.

Harris' Pat. Wro't Iron Sectional Boiler cannot be Exploded.

The "Bellis Patent Governor," made by Sinker Davis & Co., of Indianapolis, Ind., is acknowledged to be the most perfect engine regulator now in use.

Axe Makers' Grindstones—J. E. Mitchell, York Av., Phila., Pa.

"Grindstones & how to use them." Address 310 York Av., Phil.

Persons in want of Portable or Stationary Steam Engines, or Circular Saw Mills combining the latest improvements, should correspond with Sinker Davis & Co., of Indianapolis, Ind.

For 4 Jaw Independent Screw Chucks, address Fairman & Co., Baltimore, Md.

The Patna Brand of Page's Patent Lacing is the best. Orders promptly filled by the Page Belting Co., No. 1 Federal St., Boston.

Absolutely the best protection against Fire—Babcock Extinguisher. F. W. Farwell, Secretary, 407 Broadway, New York.

For Steam Whistles, address Exeter Machine Works, 75 Congress Street, Boston, Mass.

Over 800 different style Pumps for Tanners, Paper Makers, Fire Purposes, etc. Send for Catalogue. Ramsey & Co., Seneca Falls, N.Y.

Lord's Patent Separator for Ores, or any dry material, built to order. State rights for Sale. 222 Arch St., Philadelphia, Pa.

Important.—Scale in Steam Boilers—We will Remove and prevent Scale in any Steam Boiler or make no charge. Geo. W. Lord, 222 Arch Street, Philadelphia, Pa.

For Sale—Twenty and thirty horse power Portable Engine of superior quality. Poole & Hunt, Baltimore.

"Anti Lamina" will clean and keep clean Steam Boilers. No injury to iron. Five years' use. J. J. Allen, Philadelphia, Pa.

Wanted—The best machine in the market for making Boiler Rivets. Address, giving full particulars, P. O. Box 169, Milton, Pa.

Painters, attention—New Pat. Quick, Clean, Easy, and Cheap Way of Graining, first class Imitations of Oak, Walnut, Rosewood, etc. Send Stamp for Circular. J. J. Callow, Cleveland, Ohio.

Williamson's Road Steamer and Steam Plow, with Rubber Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1829.

Kelley's Chemical Metallic Paints, $1, $1·50, $2 per gallon, mixed ready for use. Send for cards of colors, &c., 116 Maiden Lane, N.Y.

Tested Machinery Oils—Kelley's Patent Sperm Oil, $1 gallon; Engine Oil, 75 cts.; Filtered Rock Lubricating Oil, 75 cts. Send for certificates. 116 Maiden Lane, New York.

Billiard Cushions—Manufacturers of Billiard Tables, use Murphy's Patent Cushions. The finest made. Send for sample set. Gutta Percha and Rubber Manufacturing Company, 9 & 11 Park Place, New York.

For the best Recording Steam and Indicating Gauges, address The Recording Steam Gauge Co., 91 Liberty Street, New York.

An inducement.—Free Rent for three months to tenants with good business, in commodious factory just built for encouragement manufacturing. Very light rooms, with steam, gas, and water pipes, power elevator, &c. &c. Manufacturers' Corporate Association, Westfield, Mass. Plans of Building, Room 22, Twenty One Park Row, N. Y.

A sober, steady mechanic, who has a thorough practical knowledge of the manufacture of German Silver Ware, such as Table Spoons, Forks, &c., is open for an engagement as Nickel Melter right away. Address William Crookes, 34 Elm St., New York City.

For Tri-nitroglycerin, insulated wire, exploders, with pamphlet, as used in the Hoosac Tunnel, send to Geo. M. Mowbray, North Adams, Mass.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N. Y.

In the Wakefield Earth Closet are combined Health, Cleanliness and Comfort. Send to 36 Dey St., New York, for descriptive pamphlet.

L. & J. W. Feuchtwanger, 55 Cedar St., New York, Manufacturers of Silicates, Soda and Potash, Soluble Glass, Importers of Chemicals and Drugs for Manufacturers' use.

Derricks built by R. H. Allen & Co., New York and Brooklyn.

Boiler and Pipe Covering manufactured by the Chalmers Spence Non-Conductor Co. In use in the principal mills and factories. Claims—Economy, Safety, and Durability. Offices and Manufactories, foot E. 9th street, New York, and 1202 N. 2d street, St. Louis, Mo.

Dickinson's Patent Shaped Diamond Carbon Points and Adjustable Holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24 and Nov. 20, 1869. 64 Nassau st., New York.

Vertical Engines—Simple, Durable, Compact. Excel in economy of fuel and repair. All sizes made by the Greenleaf Machine Works Indianapolis, Ind. Send for cuts and price list.

For 2 & 4 Horse Engines, address Twiss Bros., New Haven, Ct.

Peck's Patent Drop Press. Milo Peck & Co., New Haven, Ct.

Kelley's Pat. Petroleum Linseed Oil 50c. gal., 116 Maiden Lane.

Enameled and Tinned Hollow-Ware and job work of all kinds. Warranted to give satisfaction, by A. G. Patton, Troy, N.Y.

Best and Cheapest—The Jones Scale Works, Binghamton N.Y.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Belting as is Belting—Best Philadelphia Oak Tanned. C. W. Arny, 303 and 305 Cherry Street, Philadelphia, Pa.

Boynton's Lightning Saws. The genuine $500 challenge. Will cut five times as fast as an ax. A 6 foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

Over 1,000 Tanners, Paper-makers, Contractors, &c., use the Pumps of Heald, Sisco & Co. See advertisement.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro., 414 Water st., N.Y.

Hydraulic Jacks and Presses, New or Second Hand, Bought and sold. send for circular to E. Lyon, 470 Grand Street, New York.

For the best Galvanized Iron Cornice Machines in the United States, address Calvin Cary & Co., Cleveland, Ohio.

Self Feeding Fountain Marking Brush. Send 75 cents for sample. See advertisement, page 302.

Facts for the Ladies.—Dr. A. K. Gardner, of New York, says there is not the slightest foundation for the vague and interested statements that the light Wheeler & Wilson Lock-Stitch Sewing Machine is injurious to feminine health. We speak advisedly when we deny most positively that any form of disease is traceable to its proper use by any woman in health. For twenty years we have carefully watched the progress of the Sewing Machine, visited the large factories where it is used by the hundred, questioned the makers, the foremen in the workshops, the girls daily working them, and never yet have been able to trace a single disease as having originated from the use of this domestic implement. See the new Improvements and Woods' Lock-Stitch Ripper.

Notes & Queries.

(We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.)

1.—COATING CAST IRON WITH COPPER.—I wish to know of a good process for coppering cast iron by dipping.—F. M.

2.—SIGNAL LIGHT.—What composition is used for the white (Bengal) Indian light?—H. M. L.

3.—INDIAN INK STAINS.—Will some reader inform me how to entirely obliterate Indian ink marks from the skin?—H. W. B.

4.—WATER TELEGRAPH.—How can I construct a water telegraph such as is used in most mountainous districts? Any information will be highly appreciated.—W. M. R.

5.—PAINTING INSIDE OF WATER TANK.—Please inform me what kind of paint I should use for the inside of a wrought iron water tank? The water is to be used for domestic purposes.—P. R.

6.—KEEPING IRON CONTINUOUSLY MELTED.—Will some of your correspondents inform me if there is any way of running a cupola continuously, day and night, so that one or two tuns of iron could be drawn from it per hour, and if so, how?—B. A.

7.—KEY WAYS AND KEYS.—Will some of your many machinist readers please inform me the correct taper of keys, for connecting rods for engines, also the average taper of key seats of pulleys, etc. ?—A. P.

8.—LINING CAST IRON VESSELS.—I have a number of cast iron porcelain lined soda water fountains, with part of the porcelain broken off, exposing the iron. Is there any cement or other preparation, which I could apply, that would be durable and not color the soda water or make it taste?—C.

9.—PRESERVING TELEGRAPH POLES.—Will some of your readers inform me the best way to preserve butt ends of chestnut telegraph poles, that they may be made to last as long as their tops? Will gas tar or charing the ends help to preserve them?—H. R. R.

10.—GROVE'S BATTERY.—I am constructing a Grove's battery, and I understand that the amalgamated plate is a mixture of zinc and mercury. Am I right, and will some one give me the right proportions of the two metals? What proportion should the surface of the amalgam have to that of the platina? What should be the dimensions of the porous cup? My zinc cylinder is open at one end; it is a quarter of an inch thick, and eight inches high by four inches internal diameter. How should the amalgam be prepared?—J. C. G.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

PAINT FOR IRON.—In reply to enquiry No. 6, April 27th, about paint for iron, etc., we have received letters from various makers, stating that their article is the best, and asking us to publish an account of their goods. We would suggest to these manufacturers that they insert short advertisements of their goods in the column of "Business and Personal," and in this way they will be able to place the merits of their articles before all our readers.

C. B., of N. C.—The specimen you send is pulverized quartz containing a little iron.

LEAKY BOAT.—A. B., of Pa, should caulk his boat with oakum and pitch.

NEST OF BOILERS.—T. E. W., of Md., is referred to pages 356, 368, 394 of Vol. XXV. of the SCIENTIFIC AMERICAN for a full discussion of the question he proposes.

B. F. B., of R. I.—An advertisement in our "Business and Personal" columns will doubtless obtain you the information required.

B. C., of Ohio.—Artificial stone is either run into molds while in a fluid state, or is, while plastic, pounded into the molds by an instrument similar to that used by iron molders.

J. S., of Col. Ter.—We shall be glad to hear from you as proposed.

A. H. A., of Mich.—Upon examination of the description and drawings sent, we do not find anything to account for the anomalous working of the boilers described. An examination on the spot by an expert might perhaps lead to the discovery of the cause.

L. P. L.—We do not think you incur danger from the use of a galvanized iron chain in your pump.

J. W. G.—We do not know of a reliable meter for measuring the flow of steam through pipes. Measuring the water supplied to the boiler is a good way of determining the quantity of steam used in a given time. Or you may condense the steam, and by ascertaining the weight of the condensed water, determine it in that way.

F. J. L., of Ohio.—There is no solvent of scale in boilers that can be universally used with good results. We have published much upon this subject; consult back numbers. Also see recent editorial for answers to queries about asbestos packing.

G. A. B., of Ohio.—Glass could, we think, be easily molded as you require. Consult some manufacturer.

J. R. W., of N. Y.—The salts used in England for street watering are the chlorides of calcium and sodium. Chloralum has also been used, it is said, with good results.

A. W. C., of Iowa.—The specimen of rock which you send is a limestone, with disseminated particles of iron pyrites or "fool's gold."

A. V. P., of Mich.—The specimen you send appears to consist mainly of alumina and some alkali, either lime or potash. An analysis will be needed to determine exactly, which will cost $10.

CEMENT FOR RUBBER BOOTS.—P. H. W. can find the required information on page 153, current volume SCIENTIFIC AMERICAN.

DEPOSIT IN LOCOMOTIVE CYLINDERS.—The enclosed is a sample of a substance which gets into some of the cylinders of locomotives. It accumulates so as to fill up the clearance space in a short time. We are all using the same tallow, yet some engines of the same class do not form it, although all use about the same quantity of tallow. What is your opinion of it, and what is the stuff composed of? When first taken out it is like soft pitch. Some of the engineers blame the stacks; these are nearly all self cleaners. All the engines burn wood.—J. R. M. Answer: It is the result of the distillation of some hydrocarbon, probably derived from the tallow. The engineer should be able to tell why it gets into some cylinders and not into others.

SEPARATION OF MERCURY IN THERMOMETER TUBE.—To F. D. H., query 1, page 281.—Heating the thermometer bulb until the mercury fills the whole length of the tube will unite the separated parts of the column. The separating of mercury in a barometer tube is caused by air entering; it is rather difficult to remedy. You had better take it to a maker of those instruments and get him to refill the tube.—L. T. Y., of Pa.

MERCURIAL COLUMN.—Query 11, page 217.—The chamber containing the mercury should be of sufficient size to hold more mercury than the column, so that water from the pump will not get into the latter. The pipe leading to the column should be let into the bottom of the chamber. The pipe from the pump should be let into the top of the same. One atmosphere, or 14·71 pounds pressure per square inch, equals a column of mercury 29·22 inches in hight, nearly two inches mercury for every pound pressure per square inch. This is near enough for all practical purposes; therefore a column, to indicate 60 pounds per square inch, should be 120 inches in hight from the zero or starting point to the last mark. The columns in different cities ought to agree if they are spaced off with equal care, and the board upon which the spaces are marked does not shrink or expand.—F. J., of N. J.

TEMPERING SPRINGS.—Query 26, page 169.—Harden the spring in linseed oil, then heat it gradually over the fire until it becomes hot enough to burn a small shaving, scraped off, on the sharp edges of the spring, from a piece of hickory wood. At first the shaving will lie on the spring a few moments before it will burn, but as the spring becomes hotter, the shavings will burn as soon as they are scraped from the wood. At a point between these two extremes, I have been able to give a spring temper to different qualities of steel.—L. V. B., of N. C.

TINNING CAST IRON.—On page 212, current volume, Mr. Charles Thompson gives a method to tin cast iron. It will not do at all. I have tried the same thing before. If he ever had occasion to tin cast iron, he certainly could not have done it by the method he describes. I use muriatic acid with zinc dissolved and diluted with water, and a small quantity of sal ammoniac; but it is not what is wanted. There must be some other preparation which is better.—W. S. M.

TIMBER FOR WATER PIPES.—Query No. 8, page 249.—Spring water can be conveyed in pipes, during one generation, made as follows: Take "tamrack," or, as it is called in Massachusetts, "hackmatack" logs, with the bark on or off, from six to eight inches diameter and ten feet long. Bore these, beginning at the small end with a gimlet pointed pod bit. Get three quarter inch band iron, and make some hoops thus: Bend a piece to make a circle say of four inches diameter, then bend back each end making a semicircle or a little more; then, with a hammer, drive this into the end of the log around the hole edgewise. This will secure the log from splitting when the thimble is driven in to connect the logs. Dip the iron thimbles in boiling tar. The holes, of course, must be reamed to fit the slant of the thimbles.—R. S. B., of Mass.

ADHESION OF RUBBER BELTS.—Query 2, page 233.—Use castor oil; it will keep the gum soft and prevent its becoming glossy.—J. H.

ADHESION OF RUBBER BELTS TO PULLEYS.—Query 2, April 6.—Linseed oil will prevent rubber belts from slipping, and will make them last longer.—J. H. G., of Tenn.

FIREPROOF WOOD.—H. S., query 9, February 24, should immerse his wood in nitric acid. The surface of the wood corroded by the acid is incombustible.—G. H., of Mo.

PRESERVING BIRD SKINS.—To W. J. L., query 15, April 20.—The cheapest and most successful process is to rub the skins with equal parts of alum and arsenic.—H. W. U., of Wis.

DRIVING ELEVATOR.—To C. W. W., query 3, page 333.—You can drive your elevator from the lower pulley with fair success, yet I would much prefer driving from the upper pulley. I am using one, elevating all kinds of grain and mill feed, driving from the bottom, with 13 inch belt, 12 inch buckets (12 inches apart), 75 feet high. The lower pulley is 2 feet and the upper 3 feet in diameter. The larger the lower pulley the better it will work.—R. G. S., of Ill.

FINISHING FURNITURE.—Query 6, page 265.—The cheapest and quickest way to finish cheap furniture is, for black walnut color, to use asphaltum varnish for a stain; when dry, rub smooth with curled hair, then coat it with shellac and alcohol varnish; rub that with fine cane shavings, and lastly use furniture varnish. Other colors may be obtained by using a combination of cheap colors mixed with japan and spirits of turpentine.—A. B.

PRESERVING BIRD SKINS.—Query 15, page 265.—I have used powdered white arsenic for four years with good success. It keeps out moth, and cures the skins perfectly. It is applied dry. I have also used an arsenical soap for heavy skins and large birds. It is made of the following ingredients: Arsenious acid, 2 pounds; carbonate of potassa, 12 ounces; camphor, 5 ounces; white soap, 2 pounds; powdered lime, 8 ounces; reduce each to powder and mix.—A., of N. Y.

TEMPERING SPRINGS.—To W. R. H.—Tempering is only one, and that the last, condition essential to a good spring. The first is good material, and this should be the best refined cast steel. The next is that the material must be carefully and properly worked into the proper shape and proportions throughout; lastly, heat the spring evenly to a bright blood color, cool or chill it in melted lard or lard oil, free from salt, acids, or other chemicals (home made lard is the sure thing), hold it over the fire, blowing a little heat slowly and evenly, till the lard begins to blaze; then hold it away from the fire till it is entirely blazed off, and lay it down to cool. If appearance is an object, now carefully polish your spring and it will improve in elasticity. A strict compliance with all the above conditions will make good springs for all purposes, for traps set under water not excepted. A spring trap set under water is the greatest test that I know of. Many good springs will stand severe frost that water will break in fifteen minutes.—S. P., of Mo.

GATE FOR GANG SAWS.—Mr. J. V. Walter states, in his comments on E. F. J.'s communication about gang saws, etc., in your issue of March 2d, "that a less number of pounds of cast iron makes a better and stiffer gate than wrought iron." We build wrought gates very light, some as light as 600 pounds, to carry 32 four and a half feet saws; and 750 pounds is plenty heavy enough for a gate to carry 40 saws. Now if Mr. Walter will inform us how to make a lighter gate of cast iron (or any other metal no more expensive) which will bear the strain and labor required of a gang, he will do not only us but the milling public a great favor. I heartily concur with him in regard to the source of trouble with E. F. J.'s gate. I think that 5,500 pounds is too heavy a load to be jerked about at the speed a gang should run.—P. H. W.

PIN POINTS IN STEEL.—To H. M. H.—When the forging is done, heat the article to a dark blood color, just such as can be distinctly seen in a dark place; then cool it in soft water. The exact degree of heat can be ascertained by experimenting; a little too hot or a little too cold will harden it. It must be heated evenly throughout.—S. P., of Mo.

TO COLOR CASTOR OIL.—Take two ounces of annatto and form it into a paste with a little water; add half a pint of alcohol, shake occasionally for a day or two, and filter. To one quart of castor oil, add the above tincture until the desired color is obtained.—H. W. B., of N. J.

Declined.

Communications upon the following subjects have been received and examined by the Editor, but their publication is respectfully declined:

BOILER EXPLOSIONS.—B. C. T.—J. B.
COTTON WOOD TREE.—H. G. M.
ELECTRICAL MACHINE.—J. C. W.
RAPID TRANSIT FOR NEW YORK.—A. M. W
STEAM PROPULSION ON CANALS.—C. B.
NOTES AND QUERIES.—F. X. F.—W. C.—T. C.—H. W. B.—J. L. R.—J. T. C.—N. F. O.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

HARNESS SADDLE.—Samuel E. Tompkins, of Sing Sing, N. Y.—This invention relates to improvements in the coach pads particularly intended for double harness, and which have heretofore been, for cheapness, made with a metal top plate and leather under pad, and finished on the end with a metal extension of the top plate instead of a leather pad, inclosing a metal stiffening plate, as in the better class. The invention consists of separate and attachable metal or leather extensions, either of which may be used at will, as preferred; and it also consists of a construction of the top plate by which it is adapted for said extensions, whereby greater beauty of design and finish are combined with a form of top plate that can be cast cheaper, and that insures more perfect and uniform castings than can be had with the top plates as at present arranged. In the better class of harness the top plate is inclosed between the leather, and the bindings are formed on the cushion, which is the most desirable way, except for the cost. The object of this invention is to approximate the advantages of the method named and yet economize considerably in the cost. The top plate is made with ends in separate pieces, to be attached as heretofore described, so that either leather or metal ends may be used, as desirable. Another advantage in the use of the attachable iron end is that the cushion part is fitted to the plate, and the space between it and said plate for the side strap is preserved much easier than in the old way, in which it is necessary to insert leather pieces temporarily, over which the leather cushion is fitted, and then the pieces are withdrawn and the side straps put in, which requires experienced workmen; whereas in this case, the metal extension being put on, it remains and becomes the form or part to which the cushion is fashioned.

STAND FOR TESTING FIRE ARMS.—Julius Lehnert, of Louisville, Ky.—This invention provides convenient and reliable means for holding firearms, such as rifles, pistols, etc., to be loaded and fired without danger of displacement, in order to ascertain the accuracy of the bore and adjust the sights. The invention consists in the use of a table, provided with a hinged leaf to which a clasp for holding the arm is applied. When the leaf is in a vertical position it holds the arm convenient for loading, while when horizontal the same is in a position for firing. The arm to be tested can be conveniently loaded in the vertical position, and fired as often as necessary in the horizontal position, and will, as long as the table is not shifted, remain in the position for firing, thus giving good opportunity for accurate tests. The leaf is locked in the horizontal position by pins or catches, applied to or through its front part.

METALLIC TELEGRAPH POLES.—Francis Boyd, of Newburgh, N. Y.—This improvement in metallic telegraph poles consists in constructing such a pole with collars for supporting horizontal arms which carry the insulators, in the means of connecting it with the base piece, and in the arrangement of a lightning rod or conductor. The cast metal tube has a suitable step, with arms for bedding in the earth to support the pole. Braces extend from the extremities of the arms to ears cast on the pole, the braces being fitted through them, with screen nuts above for straining them to adjust the pole to a vertical position. A collar or ring is cast on the pole for holding the lowermost insulator arms; and shoulders for the other arms are formed by successive reductions of the size of the pole. The arms may be made of metal bars, with a large hole at the center to fit on the pole snugly above the shoulders, each arm having its hole corresponding in size to that of the pole above the particular shoulder whereon it is to rest, said arm either being made in one piece and put on over the top of the pole, or it may be divided in two parts, longitudinally and vertically, and bolted together. The lightning rod passes down through an insulating tube, and projects above the top of the pole, being insulated by an india rubber cap fitted watertight on the top of the pole, the hole through which the rod passes being packed tightly to prevent the water leaking out. The insulated arms have holes for holding wood pins or india rubber insulators which may screw into the arms or be attached in any other suitable manner. The arms are galvanized; the parts below ground are coated with coal tar and the parts of the pole above ground are scaled and primed with red lead.

BOOT STRAP MACHINES.—Aaron F. Stowe, of Worcester, Mass.—This invention has for its object to furnish an improved machine for cutting the draw straps for boot legs, which shall be so constructed as to adjust itself to the varying thickness of the doubled leather, and which will feed the leather steadily to the knives, so that the straps may be cut straight. It consists in a combination of a grooved or channeled feed roller, with circular knives, a knife roller, and top roller of the machine. If desired, part of the knives may be placed at a distance apart different from the others, so that straps of different widths may be cut by the same machine and at the same time. This construction is particularly advantageous in shops where different sizes of boots are made, as, for instance, men's, youths' and boys'.

WAGON WRENCH.—Roland J. North, assignor to himself and B. B. North, of Cornwall, Conn.—This invention furnishes an improved wrench for removing the axle nuts of wagons and other vehicles, so constructed that, when applied to the nut, the nut will be screwed from or upon the axle by simply revolving the wheel. The body of the wrench is made with two arms which are curved, so that the body may enter the hub band and receive the nut. The arms are made of such a length that they may extend along the sides of the hub and pass between the spokes, so that the wheel, when revolved, will carry the wrench with it, and thus screw the nut off or on, according to the direction in which the wheel is revolved. The wrench has a square hole sufficiently large to receive any axle nut, which may be made to fit smaller nuts by a bushing or block having a hole of the proper form and size to fit the desired nut. Coiled springs, the ends of which are attached to the outer parts of the arms, and the other ends of which have hooks formed upon them to hook upon the spokes of the wheel, hold the wrench securely in place while allowing the nut to move out or in as it is screwed off or on the axle. If desired, the wrench may be secured in place by screws, wedges, or other suitable and convenient devices.

COMBINED PROPELLER AND FIRE EXTINGUISHER.—Allen Turner, of Bronson, Mich.—In this invention a screw works in a cylinder closed at the forward end, but having a pipe descending through which air passes into the cylinder and is forced out against the water to propel the boat. The reversing of the screw draws in water and forces it out of the pipe for the extinguishing of a fire should it occur upon the vessel carrying the device. Two or three screws are employed, one on each side of the rudder.

BRIDLE.—Martin A. Penn, Sumter, S. C.—The invention consists in making the headstall of a bridle of metallic plates which can be made more cheaply and more durable than leather; in the mode of adjusting the bitads by means of a projecting and adjustable spring to which they are each attached; in holding the side plates at any adjustment by means of a catch and sliding sleeve; and in attaching the headstall and reins to bit by hooks.

ATTACHING SHOES TO SLEIGH RUNNERS.—Gilbert Budd and Gabriel T. Daved, of Phillipsport, N. Y.—This invention consists in constructing the main portion of the shoe with oblique tenons to fit into corresponding mortises in the under sides of the runner. The main portion of the shoe may be made in two or more parts, connected by oblique V shaped joints, and secured firmly in position by the front part of the shoe or banger, as it is technically termed; or the main part of the shoe may be made in one piece. By this construction neither the shoe nor runner will be weakened by bolt holes. There will be no bolt heads to wear off, and the wearing surface of the shoe will be perfectly smooth. This construction strengthens both the shoe and runner, and enables the shoe to be easily detached when required.

GLASS GLOBES OR RESERVOIRS FOR LAMPS.—Adolph Otto, of New Braunfels, Texas.—The object of this invention is to prevent the breaking of glass globes used in kerosene lamps as reservoirs for the burning fluid; and the invention consists in the application around the reservoir of a rubber ring let into a groove, but projecting sufficiently to receive the concussion in case the lamp is overthrown. An oil reservoir of suitable shape is made of glass and arranged to form part of a lamp in ordinary or suitable manner. The globe or reservoir is provided with a continuous groove around it, at the point where, without such groove, the globe would have the largest diameter. Into this groove is fitted a ring of india rubber, which projects beyond the surface of the globe to constitute a protective cushion on every side of the lamp. Whenever the lamp is overthrown, the rubber ring will receive the concussion and prevent the breakage of the globe and consequent concussion.

FORMING SCREW THREADS IN THE NECKS OF BOTTLES.—Goveneur M. Keeffer, of East Birmingham, Pa.—This tool consists substantially of a revolving plug having a screw thread cut upon it, provided with a notched circular flange, and pivoted to the forward end of a stationary rod, to adapt it to be conveniently locked and released, also of a stationary plate, provided with a countersink and a sleeve to adapt it to receive the flanged base of the plug and the stationary rod to which it is attached, also of combination of a lever catch with the elastic handle, stationary rod, plate and pivoted flanged plug. The tool seems a very excellent one for the purpose intended.

TOOL FOR REMOVING THE ROLLER AND REPLACING IT UPON THE BALANCE SHAFT OF WATCHES.—James Ingram, of Troy, N. Y.—To the upper end of screw is attached a handle. In the lower or forward end of the screw is formed a small hole, to receive the fine pivot of the staff. A U shaped piece, having a screw hole formed in its middle part or bend, receives the screw. Upon the lower ends of the arms of the U shaped piece is formed a disk, having a hole formed in one side and extending to the center of said disk to receive the roller, so that, by screwing down upon the shoulder, the roller may be raised from the staff without any danger of breaking the pivot or putting the balance out of shape. Another U shaped piece is designed for replacing the roller upon the balance staff, and is constructed the same as the first named U shaped piece, except that, instead of a slotted disk, it has two inwardly projecting hooks, beveled upon the upper sides of their inner edges.

ANIMAL POWER.—James R. Deyo, of Sterling, Ill.—This is a new mode of combining means to form a small power, which may be operated by a dog or other animal. A combination of an inclined tread wheel and shaft, a friction wheel, crank shaft, and crank wheel, pitman, beam, and posts, arranged in a frame, constitute the claim on which a patent has issued; the principal novelty being the means of adjusting the inclined shaft to any degree of inclination, to adapt it to the amount of work required.

FOLDING TABLE.—Joseph Quevedo, of Brooklyn, N. Y.—This invention is a dining or other table so constructed that the legs thereof may be readily folded down onto the rails, and so that the table may be extended in length and suitably supported in the middle. A novel arrangement of drops and recesses in combination with the top and leg frames and a combination of a cross piece hung at journals or pivots, a center leg, rod, and drops, with the folding table, having hinges, is employed and covered in the claims by letters patent.

APPARATUS FOR MIXING SOAP.—Horace N. Humiston, of Troy, N. Y.—This invention has for its object to furnish an improved apparatus for mixing, soap so constructed as to raise the heavy insoluble materials to be incorporated with the soap and distribute them thoroughly through all parts of the mass, and keep them from settling into the lower parts of the mass before the mass has become sufficiently stiff to hold said materials.

SPITTOON CHAIR.—Antonio Quirolo, of New York city.—This is an improvement in chairs, by the connection with them of spittoons that can be swung out of the way under the seats, or made to project from the sides for use. It also consists in hinging the chair back and operating it with rod springs and catches. To invalids and others a chair thus arranged will be a great convenience, as well as to those not requiring its comfort, from whom the spittoons will be concealed the greater part of the time.

CHARGER FOR SHOT POUCHES.—Joseph T. Capewell, of Woodbury, Conn.—This invention relates to a new arrangement of the inner cut-off of a lever shot charger attachment to a shot pouch or belt; and consists more particularly in applying said inner cut-off to work within the enlarged shank of the discharge tube close to the inner end of said tube, and in hinging it so that it may have a slight play on its pivot. The object is to prevent the inner cut-off from crowding against the shot and preventing its discharge, and also to facilitate the filling of the pouch or belt without requiring the removal of the tube or the constant manipulation of the ever. The invention is applicable to all kinds of shot flasks, pouches or belts, of whatever construction, and is, in our opinion, a decided improvement on the chargers hitherto used.

SAW MILL.—John J. Reinhart and William Houghton, of Loogootee, Ind.—The saw is rigidly attached to the crank pin by means of iron straps or otherwise. No pitman is employed, but the saw itself partakes of the character and receives the motion of a pitman. Adjustable muley boards guide the saw. The frame work which supports the feed and gigging gearing of the mill has an adjustable frame connected with it by means of which the upper end of the saw is supported and adjusted. A bar or arm, slotted at one end to receive the saw, is attached to it by a pin. The other end of the bar is hinged or pivoted, or so connected with the adjustable frame that it allows the opposite end to vibrate with the saw and describe the arc of a circle. As the log is fed up to the saw, the saw will make its cut as it descends, and will be carried back in its kerf by the crank, thus preventing the sawdust or fibers of wood from wedging or retarding the upward or back movement of the saw. The points of the teeth of the saw are preferably of chisel form. The cut of the saw should be at right angles with the grain of the wood, so that the fibers or dust will be as short as possible. The driving crank wheel is so constructed that the saw and the parts connected thereto are balanced or nearly balanced. The upper end of the saw can be properly adjusted to the center without difficulty. A feeding apparatus of peculiar construction also constitutes a feature of the invention.

MITERING MACHINE.—Harry Malin, George W. Malin, and Albert D. Malin, of Pleasantville, Pa.—The invention relates to mitering machines for cutting picture frame and box joints, and consists in a combination of a table, plane, guide and plate arranged in a peculiar manner for the purpose specified.

OSCILLATING ENGINE.—John W. Van Sant, of Perth Amboy, N. J.—An adjustable sliding plate provided with slots and holes for the entering steam, and holes for the exhaust steam, in combination with a stationary plate provided with holes for the passage of the steam, and with a pivoted or oscillating cylinder provided with holes for the same purpose, are the features of this invention.

CLOTHES BEATER.—Alden Jameson, Boston, Mass.—This is a new implement for use in washing clothes and other articles with boiling hot suds, in common wash tubs, barrels, boxes, boilers, etc., and consists in the arrangement of an inverted funnel on a tubular handle, and provided with radial and other beating edges at its large end. The instrument is, by hand or machinery, moved forcibly up and down, beating the clothes in its descent. It should be brought upon a new part of the clothes at every stroke. It beats and squeezes the clothes under the beating edges, and also compresses the air in the inverted funnel, and forces the hot suds and the air through the pores of the fabric in descending. When slightly lifted it creates a momentary vacuum, somewhat lifting the clothes and keeping them light and prepared in the best manner for the next blow. It also keeps a fine lather on the suds, and thereby retains the same in best condition for the process of washing. The implement is adapted to fine as well as coarse fabrics.

ORGAN.—George Woods, Cambridgeport, Mass.—This invention consists, first, of a peculiar form of the case, which is very simply and economically formed of the reed board for the bottom, with moldings for the sides, and a cover, the instrument not being inclosed below the reed board, the said moldings forming such inclines that a large reed board, and also a large sound board, with a small top surface, is secured, suitable for a card table and the like, on which is arranged a chess board. The case is, by this construction, adapted for the arrangement of the stops in a row along the front of it under the keys. Also, the invention consists of an arrangement of the blow pedals and their supports in connection with the stand or frame supporting the case, two pedals being used to equalize the action of the wind and to divide the labor between the two feet. The invention also consists of a box arranged in a vacant space behind the keys and below the cover, for storing away chess men when not in use, and in a peculiar construction of the valves, claimed to improve their action.

PROPELLER WHEEL FOR FLUID METERS.—William Van Anden, Poughkeepsie, N. Y.—This is a propeller wheel for fluid meters made from a plate of metal of even thickness, and stamped up and pressed into shape by means of dies, in the ordinary way of shaping metal, for the purpose of stretching the outer edge and giving additional length to the blades or wings made therefrom. This method of producing a wheel without adding to it additional parts insures accuracy and uniformity, also a light and well balanced wheel, the lack of which has been a great defect in the construction of meters. The wheel varies in speed according to the amount of water or fluid which passes through it; thus, when a large quantity passes through, the wheel moves swiftly; therefore, it should be equally balanced to prevent vibration and wear. When a small quantity of water passes through, the wheel moves slowly; and unless it is light and properly balanced, and very sensitive to the slow movement of the water, a portion will pass through without its revolving. The utility of a meter depends on registering the smallest quantity of water that passes through it without the flow being obstructed. By this method of stretching the metal, it is claimed, the most water surface and the greatest degree of pitch to the blades is secured, which makes the wheel more accurate and more sensitive to the varying flow or quantity of water that passes through it.

PLUG FOR LEAKY BOILER TUBES.—John M. Spiegle, Philadelphia, Pa.—This invention consists of a long rod with a plug on one end small enough to allow of being pushed through the tube to the rear end; and at the inner end of said plug is a leather or other flexible disk, which follows the plug through the tube and there expands, so that, being pressed against the end of the tube by the plug being pulled forward, the plug and leather disk will stop the end of the tube tight, and the other end of the tube is packed by a cap forced against it by the nut and rod, which draws the packing of both ends against the tube; and another wood plug or a metal disk is applied to the rod near each end to fit snugly in the tube, to center the binding rod.

BALING COTTON, ETC.—Benjamin W. Collier, Oxford, assignor to himself and W. H. Ford, Vaiden, Miss.—This invention has for its object to furnish an improvement in baling cotton, hay, and other substances suitable to be put up in bales, simple, inexpensive, and secure, protecting the substance baled better, from thieves, fire, animals, etc., than when baled in the ordinary manner, and which shall be equally applicable to loose and compressed bales. It consists in the use of wire baling cloth, and in the manner of securing it upon the bales. The baling cloth is made of fine wire of sufficient strength to hold the cotton or other substance securely without ties. In the wire cloth, at suitable distances apart, are larger wires. The wire cloth may be secured upon the bale by locking the ends of the coarser wires into each other; but in the case of compressed bales this will not answer. In this case, metallic hooks or buckles are used, which are secured to one end of the coarser wires and hooked upon them.

COUGH MIXTURE.—Matthew Connell, Jersey City, N. J.—This remedy, for coughs, colds, and kindred diseases, consists in a combination of ingredients solidified as sugar candy, in the form of tablets, or in any other form convenient for use. The compound consists of sugar, phosphate of soda, oil of peppermint, and water, combined, poured, in a semi-fluid state, after the combination has been made, into molds, where it solidifies, thereby forming cakes or tablets of about two inches diameter and one fourth (more or less) inch in thickness.

GRINDING MACHINES.—William Battell and Milton E. Worrell, Quincy, Ill.—This invention consists in the improvement of grinding machines, for grinding the revolving cutters of plows, and other revolving cutters, by which improved arrangement of adjusting devices the disk, which sustains the cutters, may be supported so as to present the cutters to be ground to an edge, or thicker at the edge than at the center, or to the same thickness, as may be required.

CLOD FENDER.—Robert T. Gillespie, Millport, Ohio.—This invention consists in a fender connected with a plow or cultivator for protecting growing plants from clods of turf and from stones in the process of working between the rows of plants, the construction and arrangement of parts constituting a fender shoe and scraper combined together, which is broadly claimed in the patent which has issued.

REVERSIBLE AXLE SKEINS.—Andrew F. Smith, Aiken, Texas.—This invention consists of cast metal axle skeins fitted on the axles, whether of wood or iron, so that they can be turned from time to time, as they wear away, to remove the worn place from the wearing position and bring a part not worn thereto. The invention also consists in pinning the skein to the axle, to relieve the linch pin or nut from the end thrusts of the skeins. The axle skein is polygonal in form and diagonally apertured, so that the bearing surface can be changed and the wear taken on different parts of its perimeter.

CLOTHES DRYER.—George W. Ainsworth, Waterbury, Vt.—This invention furnishes a simple and convenient clothes dryer, which may be compactly folded, and securely held when expanded to any desired extent. It consists in the construction and combination of standards, rounds, bars, and lock bars, arranged together in a peculiar manner for the purpose set forth.

HEAD BLOCK FOR SAW MILL.—Henry C. McEwen, Oakdale Station, Pa.—The object of this invention is to facilitate the operation of setting logs to the saw in the process of sawing lumber, so that the thickness of the lumber sawn may be determined with greater accuracy than it is by the usual method. The invention consists in a new mode of arranging the parts which operate the knee on a head block, whereby the sawyer can reach the setting apparatus from the side of the log, and can set the log with the greatest precision while standing erect. This invention is more especially designed for the circular saw mill, but may be applied to other kinds of saw mills.

PNEUMATIC SPRINGS.—Matthew F. Maury, of Richmond, Va.—Pneumatic springs have long been used in machinery, but the great obstacle to their general employment has been the inability to secure a packing sufficiently tight to prevent the escape of air when under pressure. The inventor thinks that he has accomplished this object in a perfect and economical manner as follows: He constructs the lower section with a central and upward convexity which produces a narrow channel between it and the wall of said section. He fill this channel with oil or other equivalent substance, while into the upper part of the chamber, formed by the two sections, is forced the proper quantity of air or other gas. The lower edge of the upper section rests in the oil, and hence the joint between the two sections is hermetically sealed, and with but a comparatively small quantity of oil.

COMPOSITION STONE.—John W. Hopkins, of Fayetteville, N. C.—This invention relates to an artificial stone made under pressure in the usual manner. The elements of which this stone is composed are common sand and rosin, the first in the proportion of 80 parts by measure to the hundred, and the rosin in the proportion of 20 parts. These materials, when thoroughly mixed, the rosin being, of course, in a melted state), and pressed and dried in the ordinary manner of manufacturing artificial stone, constitute a durable article of an agreeable dark brown color and very cheap. The sand forms the body of the artificial stone, the rosin serving to hold it together.

FENCE.—William Post Rollo, of Holland Patent, New York.—This invention furnishes an improved farm fence, designed for line and other permanent fences, claimed to be strong and durable, and at the same time neat, tasteful, and substantial in appearance. The foundation or base of the post is built of common stone upon a level or prepared surface, and from one and a half to four feet square, as the firmness of the soil and the required hight of the post may require. The foundation is leveled up to the bottom board or picket rail, allowance being made for the settling of the post, and it is then banked up. The bottom board or rail is then arranged upon the foundation, and the upper part of the post is then built up to the required hight with selected blocks of stone, the bottom board or lower picket rail being thus anchored in the center of the post. The top boards or upper picket rails are placed end to end in grooves formed in the top of the posts, to receive them, and are connected by ties with a grip. In the case of a board fence the top boards are covered and strengthened by a board nailed to their top edges. The top and bottom boards are connected and strengthened between the posts by ties or cross bars, one or more of which, when the distance between the posts is long, may extend to the ground. The intermediate boards are attached to the ties. When a high fence is required the ties may be extended upward, and may have additional boards attached to them. When bar posts are required their upper ends may be sustained in place by being attached to the top board or picket rail. When a picket fence or a close board fence is required, the pickets or boards are attached to the bottom or top boards or rails, the ties serving as a part of the boards or pickets.

MEDICAL OR PHOSPHATED CANDIES.—Charles S. Allen, of New York city.—This invention consists in combining any of the salts and acids of phosphorus with candies, sugars, and saccharine compounds in a solid form for medicinal purposes. One method of carrying out the invention is as follows: To one ounce, avoirdupois, of any candy drops—preferably ordinary small lemon drops—use eighty minims of officinal dilute phosphoric acid evaporated to one sixteenth its bulk, in which acid dissolve double its weight of best white sugar. Allow this phosphoric acid sirup to cool, then stir in the lemon drops so that they are evenly covered with the acid sirup; now roll the wet lemon drops in pulverized sugar and throw them on a sieve to separate any excess of sugar not properly adhering to the drops. Three of these drops represent one dose of the officinal phosphoric acid dilute. By varying the proportions of acid, any required number of lemon drops may represent a dose. In order to make cordial drops containing phosphoric acid, hollow confectionery drops are made in the usual manner, and the interior is filled with the above described sirup of phosphoric acid. In order to make a compound containing phosphate of iron, two ounces of white sugar are dissolved in as small a quantity of boiling water as possible, twenty-six grains of phosphate of protoxide of iron are added, and mixed thoroughly. The heating is continued until a portion dropped in cold water becomes hard, but not brittle. The candy is then poured into molds of the usual form. The proportions of sugar and iron can be made to vary if necessary. The above method can be adopted for any phosphate which is insoluble in water. The exact quantities of the ingredients herein mentioned and the specific forms of phosphorus may be varied at the will of the manufacturer.

TOP PROP FOR CARRIAGES.—David M. Valentine, of New York city.—This is a new detachable carriage top prop, and has for its object, by being detachable, to permit the ready and neat application of the covering and to avoid the cutting of too large or misplaced holes. The ordinary props now in use have to be fastened in place before the cover can be stretched, and project, therefore, against the latter. The cover must be perforated to fit the prop and permit it to protrude. This necessitates the preparatory perforation, which frequently turns out to be misplaced. From this cause unsightly holes often appear through carriage tops in the vicinity of the props, and often the holes do not insure a proper fit. Another form of prop is that whose plate is fastened on the outside of the cover subsequent to the latter's application, and which greatly mars the appearance of the carriage. The fastening plate of this improved top prop is, by screws or other means, secured to the supporting frame or seat. The prop is screwed into the plate through the cover. The cover is or need not be perforated for the admission of the prop until after it has been properly stretched over the carriage top. The prop is then applied, receiving afterward the thimble, the bows, and the head nut. In order to prevent the prop from working loose by spontaneously unscrewing, it can be locked to the plate by a pin, key, or other means after having been put to its place, or else a prismatic flanged washer, having prongs that pierce the plate, may be placed upon the cover and around the prop to receive a prismatic sleeve that slides on a portion of the prop, which is also made prismatic.

STEAM BOILER FURNACE DOOR WAYS.—William S. Wood, of Newtown N. Y.—This invention has special reference to the door ways of steam boiler furnaces; and it consists of a hollow arch partially surrounding the doorway, which separates the doorway from the front "uptake" of the boiler. The arch is divided by one or more partition plates. Through a tube a current of water or air is forced into one of the compartments of the arch, and through another tube the water is conducted from the arch. As steam boilers were formerly "set," the end of the boiler was supported by the front plate, or was flush therewith; and the uptake from the boiler flues was made of sheet iron, and attached to the outside of the front plate or end of the boiler. The present mode of setting a steam boiler is to support it on stands, and drop it back from the arch plate, thus leaving the uptake inside the front plate, thereby greatly improving the appearance of the whole arrangement without contracting the smoke channels or interfering with the draft of the furnace. The fuel doorway must, of course, be separated from the uptake, and it has hitherto been arched with brick; but, as the heat from the furnace is intense at this point, such arches are soon destroyed, making almost constant repairs or renewals necessary, which it is claimed is obviated by the present method.

CENTER BIT.—William H. Richards, of Deerfield Corners, N. Y.—This is an improved center bit, so constructed as to bore the hole and countersink it for the screw head and plug at one operation, and which may be used for many different sized screws. It consists in the combination of a countersink lip or wing with the center bit. With this bit the hole is left, with a shoulder above the countersink. The hole thus formed allows the plug to rest upon the bottom or shoulder of the first or plug countersink, which gives the glue a much better hold than when the hole is bored with an ordinary bit.

VENTILATOR FOR WINDOWS.—George W. Pell, of New York city.—This is an improvement in that class of ventilators which are adapted to be introduced into a space under the lower sash, which is raised up a short distance for the purpose, and which takes the air in under the sash and discharges it upward in a direct course to the ceiling. It consists of a long tin or other sheet metal case constructed in two parts, telescoped together so as to be lengthened or shortened to adapt it to windows of any width, shaped on the bottom and at the ends to fit the window sill and sides, and provided with a ledge on the upper and outer side for the sash, and adapted to make a symmetrical apparatus extending across the whole breadth of the window, and affording all the capacity required without projecting into the room in such manner as to be objectionable in appearance. The air passages, being extended the whole breadth of the window, afford all the capacity required, and yet are quite narrow transversely, so as not to project into the room so far as to be objectionable. The case being made of sheet metal or other thin substance, there is no material offset at the point where the two sections meet, as in the case of the use of two thick boards of wood. The air passages may be provided with fine wire gauze partitions to exclude insects and the like.

CARRIAGE WHEEL.—Charles W. Fillmore, of Marengo, Ill.—The invention consists, first, of a retainer or metallic plate sustained in recesses of the hub and serving at intervals to reinforce the spokes, and admit of driving them home tightly and firmly. It consists, secondly, in the construction of the metallic band on each side of the spokes with a vertical flange, perforated horizontally so as to enable it to be held by pins on the retainer.

FIRE KINDLER.—David W. Thompson, of St. Joseph, Mo.—This invention relates to a sheet metal, cylindrical or otherwise shaped, case, to be filled with brick dust or other porous absorbent of combustible liquids, the case being perforated so as to allow the liquid to pass in as it is absorbed and pass out as it is burned, and the case being also provided with a handle, secured therein in a novel manner.

HEDGE TRIMMER.—Joseph S. Crum, Scottville, Ill.—The invention consists in a hedge trimmer so constructed as to allow the relation of the several parts to be readily changed and the hedge to be thereby turned and formed into any preferred shape.

PETROLEUM FORGE.—Herrman S. Saroni, of Cincinnati, Ohio.—The invention consists in impinging a constant flame from a gas burner against non-combustible material, to form a forge fire, and in providing means, connected therewith, for generating the gas as it is wanted.

ROTARY PUMP.—David L. Jones, of Nebraska City, Neb.—The invention consists in forcing water upward through a tube by means of one cylinder, having a diametrical slide valve rotating eccentrically within a second cylinder, each provided with apertures and combined with a discharge tube having a stationary valve. This forms a very cheap, simple, and effective water elevator.

SASH LOCK AND STOP.—John E. Scott, Baltimore, Md.—The invention consists in forming a sash lock by means of a spring pressed rod, which can be drawn back and reversed so as to lock the sash at any point of elevation and also when closed.

[OFFICIAL.]

Index of Inventions

For which Letters Patent of the United States were granted

FOR THE WEEK ENDING APRIL 30, 1872, AND EACH BEARING THAT DATE.

Advertising device, I. B. Ziegler 126,367
Alarm, fire and burglar, W. Henckler 126,294
Amalgamating precious metals, apparatus for, E. J. Fraser 126,196
Andirons, Dee and Murray 126,273
Anthracene, apparatus for preparing, Fenner and Versmann 126,277
Bag tie, T. H. Russell 126,157
Bedstead, S. Oberholzer 126,226
Bee feeder, E. J. Peck 126,229
Bellows, flexible side for, A. F. Jones 126,214
Blinder for horses, R. Lehmicke 126,218
Boat, canal, H. J. Hatch 126,204
Boats, propulsion of, L. H. Watson 126,168
Boiler, steam, D. Sullivan 126,163
Boiler, wash, N. L. Rigby 126,233
Bolt threading machine, S. H. Wright 126,170
Boots and shoes, riveting, G. V. Sheffield 126,159
Box, R. B Davis 126,272
Brick machine, F. L. Hall 126,291
Bridle bit, S. S. Petersheim 126,231
Bridle for horses, M. A. Penn 126,326
Brush holder, painter's, J. Lemoine 126,219
Bucket, water, C. Ballinger 126,249
Buildings and roofs, iron, C. H. Parker 126,323
Burners, supporting bowls under gas, S. Gardner 126,140
Bustle, G. R. Taber 126,161
Car brake, J. C. Hosmer 126,208
Car coupling, J. Dinsmore 126,135
Car coupling, G. F. Stone 126,344
Car rack, T. S. Hudson 126,298
Car wheel, A. C. Fletcher 126,280
Cars, hanger for railway, T. S. Hudson 126,299
Carbureter, J. R. Cross 126,189
Card holder, B. Brower 126,259
Carpet fastener, J. W. Saumenig 126,334
Carriage shackle eye, die for forging, H. M. Beecher 126,252
Carriage top, H. M. Colton 126,130
Carriage top, shifting, O. E. Mallory 126,313
Chair, C. M. O'Hara 126,322
Cheese vat, W. H. Obitts 126,321
Chute and fish way, J. D. Brewer 126,257
Cloth, machine for cutting, A. Heller 126,207
Cloth, machine for deseaming, T. E. Chase 126,264
Collar, dog, Daly and Barry 126,135
Comb blanks, device for softening, W. and H. W. Noyes 126,154
Compound, lubricating, B. French 126,282
Cop tubes, machine for making, R. Douglas 126,192
Core spindles, joint for, W. F. Perkins 126,230
Corset spring fastener, E. Kunze 126,217
Crane, towel, R. A. Smith 126,338
Cultivator, G. Fawcett 126,276
Cultivator, J. Rue 126,156
Cultivator, Toms and McMullan 126,165
Dental purposes, gold for, R. S. Williams 126,242
Dish, carving, E. P. Bernard 126,253
Dock, floating, S. Janicki 126,146
Door check, Peters and Elsaman 126,328
Earth closet, Roberts and Graham 126,155
Electrical alarm apparatus for bank safes, Butler and Parmelee 126,263
Electrical lining for safes, etc., W. B. Guernsey 126,289
Electrical torch for lighting gas, W. W. Batchelder 126,251
Electro magnetic alarm, W. B. Guernsey 126,287
Electro magnetic burglar alarm, W. B. Guernsey 126,288
Enameling articles with rubber, etc., P. Finley 126,195
Enameling jewelry, etc., G. Krebs 126,308
Engine, reversible rotary, W. H. Ward 126,355
Engine, rotary, Hardy and West 126,203
Envelope, W. F. McCrary 126,316
Excavating machine, D. Brown 126,178
Fan, automatic, W. DeL. Hall 126,292
Fastener, shutter, F. X. Brenner 126,176
Fence, J. H. Van Dorn 126,167
Fence, R. H. White 126,362
Fibrous materials, treating sugar cane, etc., for obtaining, T. Harang 126,293
Fibrous plants, machine for treating, W. B. Shedd 126,337
Filter, reversible, J. D. Parrot 126,325
Fire kindler, W. Altick 126,245
Fire kindler, D. W. Thompson 126,347
Flour bolt knocker, E. B. Lowe 126,312
Forge or blow pipe, petroleum, H. S. Saroni 126,158
Gasalier, S. B. H. Vance 126,241
Gauge, steam pressure, E. H. Ashcroft 126,247
Glass cutter, P. Jennet 126,302
Grain binder, E. H. Clinton 126,129
Grains for mashing, treating cereal, C. H. Fringe 126,283
Grate, furnace, R. C. Graves 126,285
Grater, corn, G. C. Rickards, Jr 126,333
Grater, vegetable, T. W. Houchin 126,144
Hame for harness, W. H. Bustin, (reissue) 4,883
Harrow, W. J. Cordill 126,186
Harvesters, cutting apparatus for, Schoonover and Bacon 126,336
Harvester, pitman connection for, W. Loucks 126,220
Heater, car, G. F. Stone 126,343
Hedge trimmer, C. W. Aikin 126,243
Hemmer, H. A. Ellis 126,139
Hinge hooks, blind, W. H. McIntosh 126,150
Hitching strap, B. Hunter 126,145
Hoisting apparatus, L. S. Mason 126,222
Hook, hat and clothes, T. Bowerman 126,256
Horse radish for use, preparing, J. D. Husbands, Jr 126,212
Hub, C. W. Fillmore 126,278
Hulling coffee, etc., pestle for, J. Guardiola 126,200
Hydrant, Race and Mathews, (reissue) 4,887
Hydrants, etc., non-freezing, J. H. Hall 126,202
Ice machine, Johnston and Whitelaw 126,205
Inkstand, W. C. Tilden 126,348
Jack head, N. Thelen 126,346
Jack lifting, W. H. Greenwalt 126,286
Key hole guard and door securer, G. Wheeler 126,360
Knife cleaner, J. T. Barnstead 126,172
Lamp chimney and burner, M. H. Collins 126,184
Lamp, hanging, G. Bohner 126,254
Lantern, C. J. Sykes 126,345
Lap board, Ireland and Andrews 126,213
Latch, gate, B. F. Dickey 126,191
Lathe center, tool for grinding, D. Slate 126,160
Lathe, potter's, H. B. Morris 126,318
Laths, machine for bolting, J. M. Stowell 126,162
Letter box, Mill and Chubbuck 126,151
Liquids from barrels, raising, E. Cook 126,267
Lock for doors, J. R. Baker 126,248
Loom, R. Mueller 126,319
Lounge, folding, W. B. Coates 126,266
Lubricating loose pulleys, I. F. Brown 126,261
Lubricator, car axle, S. Ustick 126,352
Lubricator for car axle box, S. Ustick 126,349
Same ..... same 126,350 126,351
Lubricator for steam engines, R. W. Deely 126,274
Manure distributor, D. E. Cripe 126,187
Movement, mechanical, L. Goodall 126,284
Medical compound, H. Whitely 126,263
Metal cutting machine, A. S. Bunker 126,179
Metal, machine for dividing plate, Waterman and Perkins 126,357
Mill, cider, Aikin and Drummond 126,244
Mill for crushing sugar cane, etc., H. B. Stevens 126,341
Millstone drive, W. A. Gustine 126,143
Molding and carving machine, A. S. Gear 126,198
Molding machine, A. S. Gear, (reissue) 4,885
Molding machine, wood, A. S. Gear, (reissue) 4,886
Moss for ornamental baskets, preparing, J. W. Shiveley 126,237
Needle, G. Cooper, (reissue) 4,884
Nut, lock, J. A. Morrison 126,223
Oil from vegetable and other matters, extracting, E. S. Hutchinson 126,300
Pail or chest, tobacco, J. Steele 126,340
Pail, paper, P. C. Schuyler 126,335
Paints, water color, M. J. Green 126,142
Pasteboard, machine for lining, G. L. Jaeger 126,301
Pavement, wood, W. W. Ballard 126,171
Pegging machine, O. G. Healy 126,205
Pegs for shoes, O. G. Healy 126,206
Pencils, attaching rubber erasers to lead, T. H. Müller 126,224
Pen holder, D. M. Somers 126,339
Pipe mold, E. Walsh 126,354
Planter and cultivator, combined, T. M. and J. Brooks 126,258
Planter and cultivator, A. Little 126,147
Planter and fertilizer, M. Barbour 126,250
Planter, cotton, J. H. Nale 126,320
Plow iron, welding, C. G. Cross 126,188
Plow, wheel, A. J. Borland 126,255
Poke, cattle, O. and C. H. Sweet 126,239
Preserving meats and vegetables, A. S. Lyman 126,148
Press, cotton, G. Falkner 126,194
Printing cylinders, attaching blankets to, A. Overend 126,228
Printing press, fly frame for, A. Overend 126,227
Pump, rotary, D. L. Jones 126,306
Punch, belt, J. E. Gates 126,141
Railway rail, J. L. Booth 126,175
Railway switch, W. E. Lewis 126,316
Rake, horse hay, R. H. Martindale 126,314
Register, counting, A. M. White 126,361
Ruler, B. Brower 126,260
Saddle tree, harness, P. H. Wiedersum 126,364
Safe, W. Corliss 126,131, 126,132, 126,133, 126,134
Sash holder, E. U. Kinsey 126,216
Saw handle, machine for making, E. S. Piper 126,232
Screw, wood, E. S. Wills 126,366
Sewing machine for boots and shoes, M. J. Stein 126,238
Sewing machine shuttles, bobbins for, T. Reeve 126,332
Sewing machines, knee brace for, F. E. Mills 126,152
Shafting, coupling for, J. Charlton 126,183
Shafts, tracking attachment for, J. B. Negly 126,225
Shearing machines, feeding plates to, F. Westwood 126,169
Shears, hoof, M. C. Malone 126,221
Shoe, S. C. Crowe 126,190
Sifter, ash, J. S. Holcomb 126,296
Skins with natural hair, preparation of artificial, J. R. & F. C. Trussaud 126,166
Sodium, manufacture of sulphide of, A. K. Eaton 126,275
Spark arrester, A. M. Rodgers 126,234
Splints, machine for cutting, C. E. Ramus 126,331
Spool holder, J. B. Gibbs 126,199
Squares, machine for marking carpenters', H. K. Jones 126,307
Stave machine, L. R. Fulda 126,197
Stone, artificial, J. W. Hopkins 126,297
Stone, artificial, manufacture of, O. Loew 126,311
Stove and water heater, cooking, C. Comstock 126,185
Teeth, base plate for artificial, J. A. Bidwell 126,174
Telegraph, W. B. Guernsey 126,290
Telegraph, printing, G. M. Phelps 126,329
Telegraph printing, G. B. Scott 126,336
Telegraph, printing, H. Van Hoevenbergh 125,353
Telegraphing, etc., collecting electricity for, W. H. Ward 126,356
Thill coupling, S. Hubbell, Jr 126,309
Trap, fly, P. V. Burgess 126,180
Trap, automatically closing waste, J. Daniels 126,271
Tree and plant protector, W. F. Eaton 126,193
Tubes, device for cutting off, W. H. Downing 126,197
Type setting machine, O. L. Brown 126,262
Umbrella, E. Wight 126,365
Valve, Chapman and Spaulding 126,182
Valve, automatic relief, J. E. Prunty 126,330
Valve, safety, Jewell and Steele 126,304
Valve, self-facing check, Rue and Knight 126,235
Ventilators, operating car, G. W. Perry 126,327
Wagon bodies upon rubber springs, supporting, W. A. Nichols 126,153
Wagon brake, H. G. Hadden, Jr 126,201
Wagon hound, J. Fishbaugh 126,279
Wagon platform, I. Bronson 126,177
Wagon tire tightener, J. Kafader 126,215
Wagons, neck yoke for, T. Jr., and I. Byrd 126,181
Wagons, reach for, Stöhr and Sackmann 126,342
Warper, W. Welch 126,358
Washers, cutter for cutting, E. S. Hidden 126,296
Washing machine, E. Carter 126,128
Washing machine, J. W. Hunt 126,211
Washing machine, J. La Burt 126,309
Washing machine, L. Parre 126,324
Washing machine, S. Wernts 126,359
Washing machines, adjustable pitman for, McGinnes and Carter 126,317
Watch case spring, P. Maret 126,149
Water closet lever, pull for, H. H. Craigie 126,268
Water closet valve, H. H. Craigie 126,270
Water cooler, R. S. Jennings 126,303
Water elevator, steam, W. Arthur 126,246
Water raising apparatus, valve for, H. H. Craigie 126,266
Water wheel, M. Hungerford 126,210
Whiffletree hook, S. J. Foreman 126,281
Wire spirally, coiling, T. J. Mayall 126,315
Wrench, pipe, D. C. Stillson 126,161
Wringer, clothes, E. G. W. Bartlett 126,173
Yard, building, A. W. Thompson 126,240

DESIGNS PATENTED.

5,819.—COOKING RANGE.—J. Beesley, Philadelphia, Pa.
5,820.—BROOM HANDLE.—J. Dion, Chicago, Ill.
5,821.—CAR LINING, ETC.—C. Husband, Taunton, Mass.
5,822.—HAT RACK, ETC.—I. H. Kinch, Pleasantville, N. Y.
5,823 to 5,825.—CARPETS.—A. M. King, Kidderminster, Edgland.
5,826.—SODA WATER APPARATUS.—C. Lippincott, Philadelphia, Pa.
5,827.—REVOLVING PICTURE CASE.—R. R. Marsh, Detroit, Mich.
5,828.—CARPET.—C. T. Meyer, Lyon's Farms, N. J.
5,829.—FLOOR CLOTH.—J. Meyer, Lansingburgh, N. J.
5,830 to 5,832.—GARDEN CHAIRS.—W. and R. Mushet, Dalkeith, Scotland.
5,833.—JEWEL BOX.—G. Schoenemann, New York city.
5,834.—MILITARY CAP.—J. Schuller, Brooklyn, N. Y.
5,835.—BADGE.—T. W. Sweney, Reading, Pa.
5,836.—PLATE FOR LOCK.—G. W. White, New York city.

TRADE MARKS REGISTERED.

790.—MUSTARD AND SPICES.—G. S. Adams, New York city.
791.—HORSE BLANKETS.—S. W. Baker, Providence, R. I.
792.—TWINES, ETC.—Cable Flax Mills, Schaghticoke, N. Y.
793.—BAKING APPARATUS, ETC.—T. J. T. Cummings, Fort Wayne, Ind.
794.—CATTLE FOOD.—G. Gordon, New York city, and Montreal, Canada.
795.—PIANOS.—Ohio Valley Piano Company, Ripley, Ohio.
796.—SILVER WARE.—Rogers & Brother, Waterbury, Conn.
797.—MEDICINE.—N. Smith, Syracuse, N. Y.
798.—ICE.—Swett & Crouch, Chicago, Ill.

SCHEDULE OF PATENT FEES:

On each Caveat	$10
On each Trade-Mark	$25
On filing each application for a Patent, (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Examiners-in-Chief	$10
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (three and a half years)	$10
On an application for Design (seven years)	$15
On an application for Design (fourteen years)	$30

For Copy of Claim of any Patent issued within 30 years $1
A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from $1
upward, but usually at the price above-named.
The full Specification of any patent issued since NOV. 20, 1866 *at which time the Patent Office commenced printing them* ..... $1·25
Official Copies of Drawings of any patent issued since 1836, *we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.*
Full information as to price of drawings in each case, may be had by addressing

MUNN & CO.,
Patent Solicitors. 37 Park Row. New York.

APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending, for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

21,029.—CLOTHES WRINGER.—I. A. Sergeant. July 10, 1872.
21,603.—TEMPERING STEEL.—P. G. Gardiner. September 11, 1872.
21,077.—SEPARATING WOOD FIBER.—A. S. Lyman. July 17, 1872.
30,999.—STOCK FOR HOLDING CUTTERS.—L. Gibbs. July 10, 1872.
21,036.—GRAIN SEPARATOR.—B. T. Trimmer. July 10, 1872.
21,026.—CAR COUPLING.—B. C. Sampson. July 10, 1872.

EXTENSIONS GRANTED.

19,979.—SEWING MACHINE.—C. F. Bosworth.
19,984.—COOLING AND DRYING MEAL.—J. Deuchfield.

EXTENSIONS REFUSED.

Lewis Miller.—Harvester.—Divisions No. 767, 768, 769, and 770 of the reissue, dated July 19, 1859, of original patent dated May 4, 1858.
William H. Seymour and Henry Pease.—Harvester.—Dated May 25, 1858.

Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing

MUNN & CO., 37 Park Row.

FOREIGN PATENTS---A HINT TO PATENTEES.

It is generally much better to apply for foreign patents simultaneously with the application in the United States. If this cannot be conveniently done, as little time as possible should be lost after the patent is issued, as the laws in some foreign countries allow patents to any who first make the application, and in this way many inventors are deprived of valid patents for their own inventions. It should also be borne in mind that a patent is issued in England to the first *introducer*, without regard to the rights of the *real* inventor; therefore, it is important that all applications should be entrusted to responsible agents in this country, who can assure parties that their valuable inventions will not be misappropriated. The population of Great Britain is 31,000,000; of France, 37,000,000; Belgium, 5,000,000; Austria 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address

MUNN & CO.,
37 Park Row, N. Y.

☞ Circulars, with full information on foreign patents, furnished free.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]
From April 3 to April 17, 1872, inclusive.

ARTIFICIAL BREASTS.—C. G. Carrao, Boston, Mass.
DISTILLING APPARATUS.—J. C. Thompson, J. W. Olson, Brooklyn, N. Y.
EXTRACTING OIL, ETC.—E. S. Hutchinson, Baltimore, Md.
LAMP.—T. Hartley, Philadelphia, Pa.
LINING ROTARY FURNACE.—S. Danks (of Cincinnati, Ohio), London, Eng.
MAKING IRON BARS, ETC.—C. J. Cammon (of Toulouse, France), N. Y. city
MAKING SHEET IRON.—J. Sinclair, F. H. Lange, Wheeling, W. Va.
POSTAL CARD.—E. McClintock, Milwaukee, Wis.
PRESERVING SUBSTANCES.—J. J. McComb, New Orleans, La.
ROTARY FURNACE, ETC.—S. Danks, Cincinnati, Ohio.
SEWING MACHINE.—D. McC. Smyth, Orange, N. J.
SIEVE.—R. J. Mann, Burlington, Iowa.
SPINNING MACHINERY.—T. Nutting, of Rhode Island.
SPRING MOTIVE POWER.—J. J. McComb, of New Orleans, La., F. M Mahan, Memphis, Tenn.
THEODOLITE.—U. F. Biggs, Oakland, Md.
STEAM TRAP.—J. H. Blessing, F. Townsend, G. P. Jackson, New York city

Practical Hints to Inventors.

MUNN & CO., Publishers of the SCIENTIFIC AMERICAN have devoted the past twenty-five years to the procuring of Letters Patent in this and foreign countries. More than 50,000 inventors have availed themselves of their services in procuring patents, and many millions of dollars have accrued to the patentees whose specifications and claims they have prepared. No discrimination against foreigners; subjects of all countries obtain patents on the same terms as citizens.

How Can I Obtain a Patent?

is the closing inquiry in nearly every letter, describing some invention, which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them: they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

European Patents.

MUNN & Co. have solicited a larger number of European Patents than any other agency. They have agents located at London, Paris, Brussels Berlin, and other chief cities. A pamphlet pertaining to foreign patents and the cost of procuring patents in all countries, sent free.

MUNN & Co. will be happy to see inventors in person, at their office, or to advise them by letter. In all cases, they may expect an *honest opinion*. For such consultations, opinion, and advice, *no charge is made*. Write plain; do not use pencil, nor pale ink; be brief.

All business committed to our care, and all consultations, are kept *secret and strictly confidential*.

In all matters pertaining to patents, such as conducting interferences procuring extensions, drawing assignments, examinations into the validity of patents, etc., special care and attention is given. For information, and for pamphlets of Instruction and advice,

Address

MUNN & CO.,
PUBLISHERS SCIENTIFIC AMERICAN,
37 Park Row, New York.

OFFICE IN WASHINGTON—**Corner F and 7th streets**, opposit Patent Office.

A New and Valuable Book.

THE

SCIENCE RECORD

FOR

1872

Being a Compendium of the Scientific Progress and Discovery of the Past Year. 400 pages, octavo. 100 Engravings, Steel Plate and Wood. Handsomely bound in muslin, $1.50; extra binding, half calf, $2. Postage 24 cts. Munn & Co., Publishers, 37 Park Row, New York, Office of the SCIENTIFIC AMERICAN.

This new and elegant work presents, in convenient form, notices of the leading subjects and events, pertaining to science, that have occupied public attention, during the past year. The progress of the more important public works is duly chronicled, with illustrative engravings. The LEADING DISCOVERIES, facts, and improvements, in Chemistry, Mechanics, Engineering, Natural History, and the various Arts and Sciences, are recorded and illustrated. Sketches of prominent scientific men, with illustrations, are given, and among the portraits are those of Faraday, Murchison, Darwin, Agassiz, Huxley, and Herschel. The Mont Cenis Tunnel, the Hell Gate works, the Brooklyn Suspension Bridge, the Hoosac Tunnel, the St. Louis Bridge, the United States Patent Office, and other works are illustrated. A large amount of useful information, tables, descriptions of improvements, with engravings, are likewise presented. The book is one of much interest and value, and should have a place in every library. Sent by mail to all parts of the world, on receipt of price as above, with the postage. Address

MUNN & CO.,
Office of SCIENTIFIC AMERICAN,
No. 37 Park Row, New York.

Advertisements.

RATES OF ADVERTISING.

Back Page - - - - - - $1·00 a line,
Inside Page - - - - - - 75 cents a line
or each insertion.

Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

PAINTER'S MANUAL—A complete and practical guide to best methods and latest improvements in house and sign painting, graining, varnishing, polishing, kalsomining, lettering, staining, gilding, glazing, silvering, glass staining, analysis of colors, harmony and contrast, paper hanging, &c. 50 cts. of booksellers, or by mail, on receipt of price.
JESSE HANEY & CO., 119 Nassau St., New York.

Just Published,
VAN NOSTRAND'S CLASSIFIED
CATALOGUE OF AMERICAN & FOREIGN SCIENTIFIC BOOKS.
Fifteenth Edition, for May, 1872.
With Index to Authors. Eighty pages. 8vo.
☞ Sent by mail, post paid, on receipt of ten cents.
D. VAN NOSTRAND,
23 MURRAY AND 27 WARREN ST., N.Y.

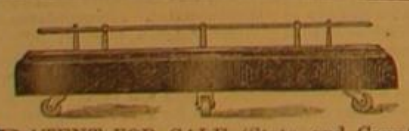
Burning & Lubricating

MANUFACTURERS OF
Lard & Grease Oils,
Miners' Lamp Oil,
Sperm Signal Oil,
Machinery Oils,
Tallow Oils,
Paraffine Oil,
Head-Light Oil,
W. Va. Oils,
Spindle Oil,
Wool Oils,
COTTON WASTE,
CAR CANDLES,
AXLE GREASE,
AND ALL KINDS OF
Machinery Oils & Greases,
For Mills, Factories, Machine Shops and Railroads.
☞ Send for List and Prices.

LARD OIL WORKS OF

GEST & ATKINSON,

Eggleston Avenue & Fifth Street,
CINCINNATI, OHIO.



PATENT FOR SALE (State and County Rights) on an improved Fire Place Fender. On rollers in place of feet. Further information can be had by addressing the patentee,
C. C. ALGEO, Pittsburgh, Pa.

PLATINUM H. M. RAYNOR,
25 Bond St., New York.
For all Laboratory and Manufacturing purposes.

ESTABLISHED 1840.
FAIRMAN & CO., Manufacturers of Fairman's Patent Improved **Lathe Chucks**, 77 North Front Street, Baltimore, Md. Send for Price Lists.

WANTED—AGENTS for "The Popular Science Monthly," a new Periodical of a Popular character. $5 per annum. A liberal commission given.
D. APPLETON & CO., Publishers,
549 & 551 Broadway, N. Y.

NOTICE OF INFRINGEMENT.

The "ALDEN PROCESS,"

(so called) and the Evaporating Apparatus manufactured and sold by the ALDEN FRUIT PRESERVING CO., are infringments upon the patent granted to Francis H. Smith and Marshall P. Smith, of Baltimore. All persons are therefore warned against purchasing and operating the same under penalty of the law. For pamphlet containing full information, address MARSHALL P. SMITH, Lock Box 825, Baltimore, Md.

BURDON IRON WORKS.—Manufacturers of Pumping Engines for Water Works, High and Low Pressure Engines, Portable Engines and Boilers, of all kinds, Sugar Mills, Screw, Lever, Drop, and Hydraulic Presses, Machinery in general. HUBBARD & WHITTAKER, 10 Front St., Brooklyn, N. Y.

PATENTS BOUGHT AND SOLD—Capital procured for business purposes—Joint Stock Companies Organized. For terms, &c., address
E. H. GIBBS & CO., 11 Wall St., New York.

A TREATISE ON THE

METALLURGY OF IRON:

CONTAINING OUTLINES OF THE HISTORY OF IRON MANUFACTURE, METHODS OF ASSAY, AND ANALYSES OF IRON ORES, PROCESSES OF MANUFACTURE OF IRON AND STEEL, ETC., ETC.

By H. BAUERMAN, F. G. S.

WITH AN APPENDIX ON THE MARTIN PROCESS FOR MAKING STEEL, BY ABRAM S. HUNTT.

Illustrated with numerous Wood Engravings.

CONTENTS.—Introductory and Historical Sketch—Outline of the Chemistry of Iron—Composition and Distribution of Iron Ores—Assay and Analysis of Iron Ores—Preparation of Iron Ores—Roasting or Calcination of Iron Ores—Of the Fluxes used in Iron Smelting—Of the Blast Furnace and its Accessories—Capacity and Production of Blast Furnaces—Of the Consumption of Fuel and Distribution of Heat in the Blast Furnace—Varieties and Composition of Pig Iron—Methods of Making Wrought Iron directly from the Ore—Refining or Conversion of Gray into White Cast Iron—Production of Wrought Iron in Open Fires—Reverberatory Finery or Puddling Precess—Forge and Mill Machinery—Reheating and Welding—Methods of Producing Steel—Analysis of Cast and Wrought Iron and Steel—Martin Process for Making Steel.

D. VAN NOSTRAND,
Publisher and Importer of Scientific Books,
23 Murray Street, and 27 Warren Street,
New York.

*** Sent free by mail on receipt of price.

$57.60—AGENTS' PROFITS PER WEEK. Will prove it or forfeit $500. New Articles, patented July 18. Samples sent free. Address
W. H. CHIDESTER, Box 369, Jersey City, N. J.

FUEL ECONOMIZER.

THE DRAUGHT REGULATOR AND HEAT CONSERVATOR, Patented by Mr. W. Twitchell, of Syracuse, N. Y., can be applied to any stove or heater, saves from one third to one half of the coal, by utilizing all the heat produced, securing a constant even temperature, with less than one half the trouble in keeping fires, converts the simplest direct draught stove into one more satisfactory in results than the most elaborate and expensive kinds. For circulars, or any information relative to the above, address S. H. TWITCHELL, 27 Bedford Av., W'msb'g, L. I.

ELECTRIC APPARATUS for BLASTING and Submarine Work, manufactured solely by GEORGE E. LINCOLN & CO., Room 9, 32 Summer St. Boston, Mass.

Consisting of:
Electric Batteries of various sizes,
Electric Fuses of any required length
Electric Fuse Heads, detached,
Connecting Wire, Leading Wire, &c., &c.
Send for Circular.

BLAKE'S PATENT STEAM PUMP.

SEND FOR CIRCULAR.

51 CHARDON ST., Boston, Mass.
79 LIBERTY ST., New York.

MACHINERY, NEW and 2d-HAND.—Send for Circular. CHAS. PLACE & CO., 60 Vesey st., New York.

PROPELLER PUMPS

Of any capacity and elevation, without Valves. For clean water, sand, sawdust, &c. W. B. BUCK, Sec., 67 N. Front St., Philadelphia, Pa.

MAGIC For the Parlor. Send a Stamp for a price list. HARTZ CONJURING REPOSITORY, No. 743 Broadway, New York.

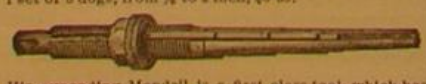
AUSTRALIAN COLONIES.
BENCRAFT & SMITH, Solicitors and Patent Agents, Melbourne, Victoria. Agencies in all the Colonies.
References—*New York:* John Stephenson & Sons.
Melbourne: United States Consul.
Powers of attorney to Charles Chichester Bencraft.

ENGINES & BOILERS

30 PER CENT UNDER COST, AND GUARANTEED. What do you need? E. E. ROBERTS & CO., Consulting Engineers, 15 Wall Street, New York.

GREAT REDUCTION IN PRICES

OF LE COUNT'S PATENT HOLLOW LATHE DOGS, and his Machinist Clamps of both Iron and Steel.
1 set of 8 dogs, from ¾ to 2 inch, $6·50.



His expanding Mandril is a first class tool, which has long been needed by every Machinist.
Send for latest circular.
C. W. LE COUNT, South Norwalk, Conn.

STEEL CASTINGS

TO PATTERN; tensile strength equal to wrought iron; will rivet over, bend, or case harden. Heavy work at low prices. PHILIP S. JUSTICE, 14 North 5th st., Phila.; 42 Cliff st., New York.

OTIS' SAFETY HOISTING Machinery.

OTIS, BROS. & CO.
No. 348 BROADWAY, NEW YORK.

WORCESTER FREE INSTITUTE.—This institution offers theoretical and practical instruction in those branches of knowledge that underlie the industrial arts. Each student devotes ten hours a week and the month of July to practice in the line of his chosen profession. For catalogues, address
PROF. C. O. THOMPSON, Worcester, Mass.

Niagara Steam Pump.

CHAS. B. HARDICK,
23 Adams st., Brooklyn, N. Y.

STAVE MACHINERY

And WOODWORTH PLANERS for 12 years a specialty.
T. B. RICKER & SONS, Harrison, Me.

PATENT BAND SAWING MACHINES

Of the most approved kinds to saw bevel as well as square without inclining the table, by FIRST & PRYIBIL, heretofore at 432 10th avenue—now removed to a more spacious place, 461 to 467 West 40th street, cor. 10th avenue, New York, where we manufacture various sizes of our well known sawing, moulding, double spindle boring and mortising Machines, general and oval turning Lathes, Shafting, Pulleys, &c. &c.
Prices for Band Saw Machines (of which at the present time, April 1st, 136 of our make operate in New York City alone), are $250, $275, $350, and $400. To the largest a feed can be attached to reslit boards. A machine to reslit heavy timber is in construction. Have on hand a large stock of best French Band Saw Blades.

$10 To $20 Daily Paid Canvassing Agents. Exclusive territory. New monopoly. Sells in every family to entire satisfaction. Agents wanted.
MYERS M'F'G CO., 104 John St., New York.

Moseley Iron Bridge and Roof Co.,
WRO'T-IRON BRIDGES, WRO'T-IRON HOUSES,
CORRUGATED IRON,
CORRUGATED IRON SHUTTERS, DOORS, PARTITIONS, &c.
Office, 5 Dey Street, New York.

PATENTEES,

WHO WISH TO REALIZE PECUNIARY benefit from their inventions, either by sale of their rights, or partnership with capitalists, are invited to send for our explanatory circular. Many valuable labor saving inventions are lying dormant which might realize a fortune for their owners, if brought properly before the public. E. E. ROBERTS & CO., Consulting Engineers, 15 Wall Street, New York

---

You ask WHY we can sell First Class 7 Octave Pianos for $290? We answer—It costs less than $300 to make any $600 Piano sold through Agents, all of whom make 100 per ct. profit. We have no Agents, but ship direct to families at Factory price, and warrant Five Years. Send for illustrated circular, in which we refer to 200 Bankers, Merchants, &c. (some of whom you may know) using our Pianos in 40 States and Territories.
U. S. Piano Co., 865 Broadway, New York.

STEAM PUMPS WRIGHT'S Bucket Plungers are the best. Send for circular. Valley Machine Co., Easthampton, Mass.

HARTFORD
Steam Boiler
INSPECTION & INSURANCE CO.

CAPITAL.....$500,000

ISSUES POLICIES OF INSURANCE, after a careful inspection of the Boilers, covering all loss or damage to

Boilers, Buildings, and Machinery,

—ARISING FROM—

STEAM BOILER EXPLOSIONS.

The business of the Company includes all kinds of

STEAM BOILERS,

STATIONARY, MARINE, AND LOCOMOTIVE.

Full information concerning the plan of the Company's operations can be obtained at the

HOME OFFICE, in Hartford, Conn.,

or at any Agency.
J. M. ALLEN, President. C. M. BEACH, Vice Pres.
T. H. BABCOCK, Secretary.

BOARD OF DIRECTORS:

J. M. Allen.....President.
Lucius J. Hendee.....President Ætna Fire Ins. Co.
F. W. Cheney....Ass't Treas. Cheney Bros. Silk Mfg. Co.
John A. Butler.....Pres. Conn. River Banking Co.
Charles M. Beach.....of Beach & Co.
Daniel Phillips.....of Adams Express Co.
G. M. Bartholomew.....Pres't American Nat'l Bank.
R. W. H. Jarvis.....Pres't Colt's Fire-Arms Mfg. Co.
E. M. Reed.....Sup't Hartford & N. Haven Railroad.
Hon. Chas. M. Pond.....Tres. State of Connecticut.
T. O. Enders.....Sec. Ætna Life Ins. Co.
Leverett Brainard.....of Case, Lockwood & Co.
GEN. WM. B. FRANKLIN, Vice Pres't Colt's Pat. Fire-Arms Man'f'g Co.
Austin Dunham.....Pres. Willimantic Linen Co.
Geo. Crompton.....Crompton Loom Works, Worcester.
Earl P. Mason...Pres't Prov. & Wor. R. R., Providence.
Wm. Adamson, of Baeder, Adamson & Co., Philadelphia.

New York Office.....**239 Broadway.**
THOS. S. CUNNINGHAM, Manager.
R. K. McMURRAY Inspector.

AGENTS WANTED to sell articles needed by every one. Address PLUMB & CO., Phila., Pa.

Canadian Inventors,

Under the new Patent Law can obtain patents on the same terms as citizens.
For full particulars address
MUNN & CO.,
37 Park Row, New York.

MANUFACTURING SITES—Cheap. Water and Rail Facilities. Address JAMES STRATTON, Secretary Board Trade, Bordentown, N. J.

EDWARD H. HOSKIN,
CONSULTING AND ANALYTICAL CHEMIST,
Lowell, Mass.

Capron's Improved Turbine WATER-WHEEL.
POLISHED & DETACHABLE BUCKETS
CHEAPEST & BEST WHEEL MADE.
CAPRON WATER WHEEL CO. HUDSON, N.Y.

FOR SALE OR LEASE—AN IRON MINE, in Morris County, N. J., two miles from Canal, one fourth of a mile from Railroad. The Ore is Magnetic and **FREE FROM SULPHUR & PHOSPHORUS**, particularly desirable for the manufacture of Steel Rails, etc. Ore can be raised in large quantities immediately. Steam Engine, Pumps, etc., in perfect working order. Miners' houses, etc., on the premises. Satisfactory reasons for disposing of this property. Address J. LOVELL CANFIELD, Pres't, Nos. 55 & 57 White St., New York.

E. M. MAYO'S BOLT CUTTER—Patented in 1867—Revised and improved in 1871 and 1872. Send for Illustrated Circular Cincinnati, Ohio.

THE ONLY MODE of Disposing of Patents. See Patent Right Gazette. Address U. S. Patent Right Association, 94 Chambers Street, P. O. Box 4544, New York.

FOOT LATHES, Back Geared and Plane Chucks, Slide Rest, &c. Just the article for Sewing Machines and Shoe Factories. T. SHANKS, Baltimore, Md.

Wood and Iron Working Machinery,

Gauge Lathes for all kinds of handles and Cabinet Maker's work. Chair Machinery, etc.; Upright Drills; Key Seat Machines; Stave and Shingle Machinery, etc. etc
Address, for catalogue,
T. R. BAILEY & VAIL, Lockport, N. Y

HAND SAW MILL.—Do work of 3 men. Rip 3 inch lumber with ease. Thousands in use. Agents wanted everywhere. HILLS & HOAG, 32 Courtlandt Street New York.

SCIENTIFIC AMERICAN

For 1872.

A year's numbers contains over 800 pages and makes two volumes, worth as a book, references, ten times the subscription price

ENGRAVINGS

by our own artists, will not only be given, of all the best Inventions of the day, but especial attention will also be directed to the description and illustration of

LEADING MANUFACTURING ESTABLISHMENTS, MACHINES, TOOLS AND PROCESSES.

Inventors and Patentees

will find in each number an official List of Patents, together with descriptions of the more important Inventions. We shall also publish reports of decisions in Patent Cases and points of law affecting the rights and interests of Patentees.

THE NEW VOLUME OF

SCIENTIFIC AMERICAN

commenced JANUARY FIRST; therefore, now is the time to organize Clubs and to forward subscriptions. Clubs may be made up from different post offices.

TERMS FOR 1872.

One copy, one year		$3.00
One copy, six months		1.50
One copy, four months		1.00
CLUB RATES	Ten copies, one year, each $2.50	25.00
	Over ten copies, same rate, each	2.50
One copy of Scientific American for one year, and one copy of engraving, "Men of Progress,"		10.00
One copy of Scientific American for one year, and one copy of "Science Record,"		4.00
Ten copies of "Science Record," and ten copies the Scientific American for one year		35.00

CLUB PREMIUMS.

Any person who sends us a yearly club of ten or more copies, at the foregoing club rates, will be entitled to one copy, gratis, of the large steel plate engraving, "Men of Progress."

Remit by postal order, draft or express.

The postage on the Scientific American is five cents per quarter, payable at the office where received. Canada subscribers must remit, with subscription, 25 cents extra to pay postage.

Address all letters, and make all Post Office orders or drafts payable, to

MUNN & CO.,
37 PARK ROW, NEW YORK.

BAIRD'S BOOKS
FOR PRACTICAL MEN.

My new revised and enlarged Catalogue of PRACTICAL AND SCIENTIFIC BOOKS, complete to April 1, 1872, 96 pages, 8vo., will be sent, free of postage, to any one who will favor me with his address.

HENRY CAREY BAIRD,
INDUSTRIAL PUBLISHER,
406 WALNUT STREET, Philadelphia.

Bean's Treatise on Railway Curves.

JUST READY:

A Treatise on Railway Curves and Location. By E. W. Beans, C. E. Tucks.....$1.50

H. C. B. also publishes

A Practical Treatise on Railway Curves and Location, for Young Engineers. By Wm. F. Shunk, C. E. Tucks.....$2.00

Railroad Engineers' Pocket Companion for the Field. By W. Griswold, C. E. Tucks.....$1.75

Pocket-Book for Railroad and Civil Engineers. By Oliver Byrne. Tucks.....$1.75

Railway Property: A Treatise on the Construction and Management of Railways. By John B. Jervis, C. E. 12mo.....$2.00

Long-Span Railway Bridges. By B. Baker. 12mo.....$2.00

New Theorems, Tables, and Diagrams for the Computation of Earth-Work. By John Warner, A. M. 8vo.....$5.00

☞ The above, or any of my Practical and Scientific Books, sent free of postage at the publication prices.

HENRY CAREY BAIRD,
INDUSTRIAL PUBLISHER,
406 Walnut st., Philadelphia, Pa.

WOOD WORKING MACHINERY

MOLDING, MORTISING, TENONING & SHAPING MACHINES;
BAND SAWS,
SCROLL SAWS
Planing & Matching MACHINES, &c.,
For RAILROAD, CAR, and AGRICULTURAL SHOPS, &c., &c.
☞ Superior to any in use.

J. A. FAY & CO.,
CINCINNATI, OHIO.

SOLUBLE GLASS

SILICATES OF SODA AND POTASH. FIRE, WATER and MILDEW PROOF. Manufactured by
L. & J. W. FEUCHTWANGER, 55 Cedar St., N.Y.

SCHENCK'S WATERPROOF SHIPPING TAGS 90 ANN ST NEW YORK P.O. BOX 2564

Machinery,

Wood and Iron Working of every kind. Leather and Rubber Belting, Emery Wheels, Babbitt Metal, &c.
GEO. PLACE & CO., 121 Chambers & 103 Reade Sts. N.Y.

Machinists' Tools.

The largest and most complete assortment in this country, manufactured by
NEW YORK STEAM ENGINE COMPANY,
121 Chambers & 103 Reade Streets, New York.

Wilder's Patent Punching Presses,

In great variety, for RAILWAY SHOPS, AGRICULTURAL MACHINE SHOPS, BOILER MAKERS, TINNERS, BRASS MANUFACTURERS, SILVERSMITHS, &c.,
Are warranted to be the best Presses yet produced in this country in several important respects. Send for our new Descriptive Catalogue and Price List.
NEW YORK STEAM ENGINE CO.,
121 Chambers & 103 Reade St., N.Y.

Cold Rolled Shafting.

Best and most perfect Shafting ever made, constantly on hand in large quantities, furnished in any lengths up to 24 ft. Also, Pat. Coupling and Self-oiling adjustable Hangers.
GEORGE PLACE & CO.,
121 Chambers & 103 Reade Streets, New York.

Sturtevant Blowers

Of every size and description, constantly on hand.
GEORGE PLACE & CO.,
121 Chambers & 103 Reade Streets, New York.

THE ROLLING MILLS, known as
THE CALVERT IRON & NAIL WORKS,

Situated in the city of Baltimore, upon the line of the Baltimore and Ohio Rail Road, and near the European wharves, will be sold at

PUBLIC AUCTION,

On the premises, on May 16, 1872, at 12, noon.

These mills are nearly new, built in the best manner, and in order for immediate operation, making bars from ⅜ in. to 4 in. diameter. Besides the Rolling Mills are two large Brick Buildings, with 80 H. P. Engine and Shafting, and ample accommodations for the manufacture of nails. Since the destruction by flood of the Avalon Works, there has been no nail factory in Maryland, and one is greatly needed. The property will be offered in one lot, land, buildings and machinery; and if not sold in this way, will be sold in detail, by catalogue.
For circulars, containing full information, address
ALEXANDER BROWN & SONS,
or
MARSHALL P. SMITH,
Baltimore, Md.

Reynolds'
TURBINE WATER WHEELS.

The Oldest and Newest. All others, only imitations of each other in their strife after complications to confuse the public. We do not boast but quietly excel them all in staunch, reliable, economical power. Beautiful pamphlet free. GEO. TALLCOT, 96 Liberty st., New York.
Gearing, Shafting.

PERFECTION OF SPEED ON WATER WHEELS secured by the Hydraulic Rotary Governor. Return, after testing, if you can afford to run without it. Address J. S. ROGERS, Tr., 19 John st., Boston.

PATENTS SOLD BY MOODY & CO., 183 Broadway, New York. ☞ Send for "The Patent Bulletin."

NEW PATTERNS.

MACHINISTS' TOOLS—all sizes—at low prices. E. & R. J. GOULD, 97 to 113 N. J. R. R. Ave., Newark, N. J.

PORTABLE STEAM ENGINES, COMBINing the maximum of efficiency, durability and economy, with the minimum of weight and price. They are widely and favorably known, more than 900 being in use. All warranted satisfactory or no sale. Descriptive circulars sent on application. Address
J. C. HOADLEY & CO., Lawrence, Mass.
or, Cortlandt st. New York.

WASHOE TOOL MANUFACTURING CO.,
Cor. of Park and College Places, New York.

☞ Manufacturers of the CELEBRATED "WASHOE" ADZE EYE PICKS, adapted for RAILROAD, COAL, and MINING COMPANIES.

☞ AWARDED THE FIRST PREMIUM, AT THE FAIR OF THE AMERICAN INSTITUTE IN 1868, OVER ALL COMPETITORS. Comparison invited. Competition challenged. Send for circulars.

CINCINNATI BRASS WORKS. — Engineers and Steam Fitters' Brass Work, Best Quality at lowest Prices. F. LUNKENHEIMER, Prop'r.

NEW YORK STENCIL WORKS,

87 NASSAU ST., NEW YORK.
Stencils of all kinds; Brass Labels for Manufacturers; Steel Stamps and Dies, and Stencil materials. Terms reasonable, and good work guaranteed.

ROPER HOT AIR
ENGINE COMPANY, 124 Chambers St., New York.

Whalen Turbine. No risks to purchaser. Send for Pamphlet, free. SETH WHALEN & BRO., Ballston Spa, N.Y.

WROUGHT IRON BEAMS & GIRDERS

THE Union Iron Mills, Pittsburgh, Pa. The attention of Engineers and Architects is called to our improved Wrought-Iron Beams and Girders (patented), in which the compound welds between the stem and flanges, which have proved so objectionable in the old mode of manufacturing, are entirely avoided, we are prepared to furnish all sizes at terms as favorable as can be obtained elsewhere. For descriptive lithograph address Carnegie, Kloman & Co. Union Iron Mills, Pittsburgh Pa.

LIGHTNING ROD POINTS AND NUTS, in every style. Samples free.
J. R. GILCHRIST, Mt. Pleasant, Iowa.

RECORDS
OF
MARION
UNITED STATES WATCH CO'S WATCHES.

Watch No. 1089, U. S. Watch Co., Stem-Winder—variation, *2 Seconds* in *14 Months.*
L. E. CHITTENDEN, *late Reg. U. S. Treas.*

Watch No. 1124, U. S. Watch Co., Stem-Winder—variation, 6 seconds in seven months.
A. L. DENNIS, *Pres. N. J. R. R. & T. Co.*

Watch No. 1037, U. S. Watch Co., Stem Winder—variation, only 5 seconds per month.
HENRY SMITH, *Treas. Panama R. R. Co., 88 Wall St., N.Y.*

Watch No. 2617, U. S. Watch Co.—variation, 15 seconds in twelve months.
I. VROOMAN, *Engineer N. Y. C. & H. R. R.*

Watch No. 4026, U. S. Watch Co.—variation, 3 seconds in two months.
JOSHUA I. BRAGG, *Conductor, N. J. R. R.*

Watch No. 21,039, U. S. Watch Co., Stem Winder—variation, 7 seconds in four months.
S. M. BEARD, *firm Beards & Cummings, 128 Front Street, N.Y.*

Watch No. 10,548, U. S. Watch Co., Stem Winder—variation, 5 seconds per month.
Z. C. PRIEST, *Ass't Sup't N. Y. C. & H. R. R.*

Watch No. 24,008, U. S. Watch Co., Stem Winder—variation, 6 seconds in five months.
CHAS. H. WOLF, *firm Chas. H. Wolf & Co., Pearl St., Cincinnati, Ohio.*

Watch No. 1143, U. S. Watch Co., Stem Winder—variation, 20 seconds in eight months.
JAMES B. RYER, of Kelty & Co., 722 & 734 *Broadway, N. Y. City.*

Watch No. 1123, U. S. Watch Co., Stem Winder—varied 1 second a week, for fourteen months.
H. LASSING, *Manager Knickerbocker Life Ins. Co., 161 Broadway, N.Y. City.*

Watch No. 2656, U. S. Watch Co.—variation, 13 seconds in three months.
JACOB WEART, *Collector of Int. Rev., 5th Dist., N. J., Jersey City.*

Watch No. 1658, U. S. Watch Co.—variation, 3 seconds in three months.
JOHN LINDSTROM, 344 *Atlantic Street, Brooklyn, N. Y.*

Watch No. 1894, U. S. Watch Co.—variation, 6 seconds in six months.
H. COTTRELL, 123 *Front Street, N. Y.*

Watch No. 1706, U. S. Watch Co.—variation, 7 seconds in five months.
JNO. W. SMITH, *State Agent, Amsterdam Ins. Co., Dubuque, Iowa.*

Watch No. 1064, U. S. Watch Co., Stem Winder—variation, 17 seconds in fifteen months.
WILLARD DERBY, *of Derby, Snow & Prentiss, Jersey City, N. J.*

Watch No. 1081, U. S. Watch Co., Stem Winder—variation, 25 seconds in six months.
JOHN D. EMERY, 5 *College Place, N. Y.*

Watch No. 1154, U. S. Watch Co., Stem Winder—variation, 21 seconds in nine months.
HORACE HATCH, M. D., 25 *West 26th Street, New York.*

Watch No. 12,006, U. S. Watch Co., Stem Winder—variation, ½ second per day, for three months.
Judge CHAS. H. YOOMANS, *Hackensack, N. J.*

Watch No. 1944, U. S. Watch Co., Stem Winder—variation, 5 seconds per month, for three months.
E. C. KEYS, *Pittsburgh, Pa.*

Watch No. 12,012, U. S. Watch Co., Stem Winder—variation, 13 seconds in five months.
GEO. LOVIS, *Gen'l Eastern Passenger Agt., Toledo, Wabash & Western Railway.*

Watch No. 2226, U. S. Watch Co., Stem Winder—variation, 10 seconds per month.
OSCAR M. SANFORD, *Utica, N. Y.*

Watch No. 1176, U. S. Watch Co., Stem Winder—variation, 5 seconds in three months.
HENRY DELANCY, *Eng. Phil. & Erie R. R.*

Watch No. 1905, U. S. Watch Co., Stem Winder—variation, 7 seconds in eleven months.
A. H. KING, *Vice-Pres. N. J. Car Spring & R. Co., 7 Park Pl., N. Y.*

Watch No. 2291, U. S. Watch Co., Stem Winder—variation, 5 seconds per month.
E. O. WHIPPLE, *Con. U. & D. R. R., Utica, N. Y.*

Watch No. 12,003, U. S. Watch Co., Stem Winder—variation, 6 seconds in two months.
W. S. DUNN, *with H. B. Claflin & Co., New York.*

Watch No. 20,019, U. S. Watch Co., Stem Winder—variation, 1 second in six months.
GEO. W. MCDONALD, *Supt. Brooklyn Water Works.*

Watch No. 1788, U. S. Watch Co.—variation, 20 seconds in 5¼ months, from Greenwich time, London, England.
HENRY MONROE, *Equitable Life Ins. Co., 120 Broadway, N. Y.*

Watch No. 2755, U. S. Watch Co.—variation, 1 second in one month.
JAS. D. WEAVER, 111 & 113 *William Street, N. Y.*

Price Lists furnished the trade on application, inclosing business card. For sale by the trade generally. Ask your jeweler to see the MARION

WATCHES.

BEWARE of worthless imitations with which the country is flooded. To avoid imposition, see that the words MARION, N. J., are engraved on the plate over the Main-Spring Barrel. All others are spurious.

WHOLESALE ROOMS OF THE **United States Watch Co.**

GILES, BRO. & CO.,
53 and 55 State Street, Chicago, Ill.

GILES, WALES & CO.,
No. 13 Maiden Lane New York.

1832. SCHENCK'S PATENT. 1871.
WOODWORTH PLANERS

And Re-Sawing Machines, Wood and Iron Working Machinery, Engines, Boilers, etc. JOHN B. SCHENCK'S SONS, Matteawan, N. Y. and 118 Liberty st., New York.

UNIVERSAL WOOD WORKER,

HORIZONTAL AND UPRIGHT BORING MACHINES.
MCBETH, BENTEL & MARGEDANT. Hamilton, O.

WOOD-WORKING MACHINERY GENerally. Specialties, Woodworth Planers and Richardson's Patent Improved Tenon Machines. Nos. 24 and 26 Central, corner Union st., Worcester, Mass.
WITHERBY RUGG. & RICHARDSON.

MACHINISTS.

Illustrated Catalogue and Price List of all kinds of small Tools and Materials sent free to any address. GOODNOW & WIGHTMAN, 23 Cornhill Boston, Mass.

Milling Machines.

STANDARD, UNIVERSAL, INDEX AND PLAIN, in every variety, of unequalled design and first class workmanship. Send for illustrated catalogue to the BRAINARD MILLING MACHINE COMPANY, 80 Milk Street, Boston. Works at Hyde Park.

AGENTS WANTED. Agents make more money at work for us than at anything else. Particulars free. G. STINSON & Co., Fine Art Publishers, Portland, Me.

RICHARDSON, MERIAM & CO.
Manufacturers of the latest improved Patent Daniels' and Woodworth Planing Machines, Matching, Sash and molding, Tenoning, Mortising, Boring, Shaping, Vertical, and Circular Re-sawing Machines, Saw Mills, Saw Arbors, Scrol. Saws, Railway, Cut-off, and Rip-saw Machines, Spoke and Wood Turning Lathes, and various other kinds of Wood-working Machinery. Catalogues and price lists sent on application. Manufactory, Worcester, Mass. Warehouse, 107 Liberty st. New York. 17 1

SHINGLE AND BARREL MACHINERY.—Improved Law's Patent Shingle and Heading Machine, simplest and best in use. Also, Shingle Heading and Stave Jointers, Stave Equalizers, Heading Planers Turners, etc. Address TREVOR & Co., Lockport, N.Y.

PUMPS.—For Description, Price Lists etc., of the Best Centrifugal Pump ever invented, with Overwhelming Testimony in its favor, send for new illustrated pamphlet (40 pp.) to Messrs. HEALD, SISCO & CO. Baldwinsville, N. Y.

MODELS FOR THE PATENT OFFICE, and experimental machinery of all kinds. HOLSKE MACHINE CO., 779 Cherry St., New York, near Jefferson St. A special shop for Patent Models. Many years experience. Refer to Scientific American Office.

PATENT IMPROVED
VARIETY MOLDING MACHINERY
And Adjustable
CIRCULAR SAW BENCHES.
For Machines and information, address
J. P. GEOSVENOR, Lowell, Mass.

5000 AGENTS WANTED.—Samples sent free by mail, with terms to clear from $5 to $10 per day. Two entirely new articles, saleable as flour. Address S. H. WHITE, Newark, New Jersey.

DAVIS' PATENT
RECORDING GAUGE.
Adopted by the Board of U. S. Supervising Steamboat Inspectors. Simple and Cheap. NEW YORK STEAM GAUGE COMPANY, 46 Cortlandt Street, New York.

BUY BARBER'S BIT BRACE.

BUERK'S WATCHMAN'S TIME DETECTOR.—Important for all large Corporations and Manufacturing concerns—capable of controlling with the utmost accuracy the motion of a watchman or patrolman, as the same reaches different stations of his beat. Send for a Circular.
J. K. BUERK,
P. O. Box 1,037 Boston, Mass.
N. B.—This detector is covered by two U. S. Patents. Parties using or selling these instruments without authority from me will be dealt with according to law.

THE WOODWARD
STEAM PUMP.

Woodward Pat. Improved Safety Steam Pump and Fire Engine, Steam, Water, and Gas Fittings of all kinds. Dealers in Wro't-Iron Pipe, Boiler Tubes, etc. Hotels, Churches, Factories, and Public Buildings heated by Steam, Low Pressure. Woodward Co., 34 and 36 Center st., N.Y.

LATHE CHUCKS—HORTON'S PATENT from 4 to 36 inches. Also for car wheels. Address E. HORTON & SON, Windsor Locks, Conn.

Andrew's Patents.

Noiseless, Friction Grooved, or Geared Hoisters, suited to every want.
Safety Store Elevators, Prevent Accident, if Rope, Belt, and Engine break.
Smoke-Burning Safety Boilers.
Oscillating Engines, Double and Single, 1-2 to 100-Horse power.
Centrifugal Pumps, 100 to 100,000 Gallons per Minute, Best Pumps in the World, pass Mud, Sand, Gravel, Coal, Grain, etc., without injury.
All Light, Simple, Durable, and Economical. Send for Circulars.
WM. D. ANDREWS & BRO.,
414 Water street, New York.

RIVERVIEW Military Academy, Poughkeepsie, N. Y. A thorough-going school for boys.

P. BLAISDELL & Co.,

MANUFACTURERS OF FIRST CLASS MACHINISTS' TOOLS. Send for Circulars.
Jackson st., Worcester, Mass.

AGENTS & Peddlers for our Press & Strainer. Presses and strains jams, jellies, herbs, vegetables, lard, tallow, meats, cheese, etc.; quick and profitable. Over 60,000 sold in a few localities. Every family wants it. Circulars free. LITTLEFIELD & DAME, 102 Wash'n St., Boston, Mass.

VALENTINE'S IMPROVED
Fourneyron Turbine.

This celebrated WATER WHEEL, the most powerful in use, constructed on scientific principles by WM. J. VALENTINE, Ft. Edward, N.Y. **No fancy prices.**

WE warrant every Steam Gauge bearing our name and numbered above 12,000 FOR TWO YEARS.
☞ See Circulars.
UTICA STEAM GAUGE CO., Utica, N.Y.

STEEL CASTINGS,

UNDER HAINSWORTH'S PATENT.

We are making **Steel Castings, Smooth, True, Free from Porosity,** capable of receiving **Very High Polish.** Can be **Forged** or **Welded** easily as **Bar Steel,** and **Stronger** as **Forged Steel.** Send for Circular.
PITTSBURGH STEEL CASTING CO. Pittsburgh, Pa.

WOODBURY'S PATENT
Planing and Matching

and Molding Machines, Gray & Wood's Planers, Self-oiling Saw Arbors, and other wood working machinery.
S. A. WOODS, 91 Liberty street, N. Y.
Send for Circulars. 91 Sudbury street, Boston

Advertisements.

Advertisements will be admitted on this page at the rate of **$1·00** *per line for each insertion. Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.*

The value of the SCIENTIFIC AMERICAN *as an advertising medium cannot be over-estimated. Its circulation is ten times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading-rooms of the world. We invite the attention of those who wish to make their business known to the annexed rates. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. If it is worth 25 cents per line to advertise in a paper of three thousand circulation, it is worth $2.50 per line to advertise in one of thirty thousand.*

VULCANIZED RUBBER

Adapted to Mechanical Purposes. New York Belting and Packing Co., 37 & 38 Park Row.

ASPHALTE ROOFING FELT.

A WELL tested article of good thickness and durability, suitable for steep or flat roofs; can be applied by an ordinary mechanic or handy laborer. Send for circular and samples to E. B. MARTIN, 70 Maiden Lane and 9 Liberty Street, N.Y.,

---

A RARE CHANCE FOR MACHINISTS.—The proprietors now offer for sale, at a great sacrifice, all the special tools used in manufacturing the celebrated Chelsea Lathes, consisting of jigs, drills, boring bars, reamers, taps, counterbores, hollow mills, etc., together with patterns, drawings, and several very valuable Patent Rights. The tools are nearly new and in first class condition. The Patents are on Feed and Cross Feed of Lathes, Friction Pulleys, Shaft Couplings, and embrace other valuable improvements. The business of manufacturing the Chelsea Lathes has been established seven years. Varieties made, and to which the tools are specially adapted, are Engine Lathes of various sizes, Foot Lathes, and Hand Lathes, for which orders are being daily received. Any one contemplating purchase will do well to make a personal examination.
CHARLES OSGOOD & CO., Norwich, Conn.

THE AMERICAN HATTERS' CONFORMERTERS and Conformers; invented and manufactured by SAMUEL CLARK, 20 West 13th St., N.Y. Used by the best and principal hatters in the City and Country; and recognized by them as being very greatly superior to any other construction. A boy will never fail to fit a hat with them; consequently they are great for producing business. The price is no consideration, compared to their quality.
☞ Send for a circular.

LEFFEL IMPROVED DOUBLE TURBINE WATER WHEEL.
6000 IN USE.
NEW WHEEL BOOK 144 PAGES, FOR 1872
SENT FREE
JAMES LEFFEL & CO. SPRINGFIELD, O.
109 LIBERTY ST. NEW YORK CITY.

SCOFIELD GRATE-BAR CO., 95 Liberty St., New York, manufacture and sell Corrugated Grate-Bars, Steel Wire Brushes and Steel Scrapers, for cleaning Boilers, and Nutt's Patent Valve Refitting Machine, and Northup's Valve, Gas and Water Cock Refitting Machine. Send for circulars, descriptive & price lists.

CIRCULAR SLIDE VALVE.—May be fitted to any slide valve Engine. Power gained and fuel saved. One half more power without change of boiler or cylinder. This new invention is now ready for general introduction. Users of steam with scant power have here what they need. Must be made to order. Castings for any size at usual price. In ordering, give size of steam chest and valve seat, steam ports and exhaust, and bars between. Circulars free. Box 804, Burlington, Iowa.

Niles Tool Works,

OFFICE, 131 WEST SECOND ST.,
CINCINNATI, OHIO.

Machinists' Tools.

CARPENTER & JOINER'S HANDBOOK — These Books in cloth, gilt title, by mail, 75c. each. Worth 3 dollars to anybody, or will refund money. H. W. HOLLY, 191 Fulton St. N.Y.

The Art of SAW FILING.

STEREOPTICON
Complete, with views, at a bargain. Call and see it.
HENRY W. BULKLEY,
98 Liberty St., New York.

H. W. JOHNS' **ASBESTOS ROOFING**

FIRST PREMIUM (MEDAL) AWARDED IN 1870 AND IN 1871. Endorsed by Certificate from AMERICAN INSTITUTE as "The Best Article in the Market."
Also, manufacturer of **Asbestos Boiler Felting**, Roofing and Sheathing Felts, Acid, Water and Fire Proof Compositions, Boiler Scale Preventive, and dealer in ASBESTOS, ASPHALTUM and GENERAL ROOFING MATERIALS.
☞ Descriptive Pamphlets, Price Lists, &c., by mail.
{ Established in 1858. } H. W. JOHNS,
78 William St., New York

B. F. STURTEVANT.

PATENTEE AND SOLE MANUFACTURER OF
HOT BLAST DRYER
FOR DRYING ALL KINDS OF MATERIAL.
72 SUDBURY STREET BOSTON MASS.
SEND FOR CATALOGUE. ILLUSTRATED WITH 40 ENGRAVINGS

Swain Turbine.

"Our Low-Water Wheel from this on"

WILL DO TEN PER CENT MORE WORK on small streams, in a dry season, than any wheel ever invented. Gave the best results, in every respect, the Lowell Tests.
For Report of tests at Lowell, with Diagrams and ples of Power address
THE SWAIN TURBINE CO.,
North Chelmsford, Mass.

PATENT COLD ROLLED SHAFTING.

The fact that this Shafting has 25 per cent greater strength, a finer finish, and is truer to gage, than any other in use, renders it undoubtedly the most economical. We are also the sole manufacturers of the CELEBRATED COLLINS PAT. COUPLING, and furnish Pulleys, Hangers, etc., of the most approved styles. Price lists mailed on application to
JONES & LAUGHLINS,
130 Water street, Pittsburgh, Pa.
☞ Stocks of this Shafting in store and for sale by FULLER, DANA & FITZ, Boston, Mass., GEO. PLACE & CO., 126 Chambers street, N. Y.

CLOTHING **FREEMAN & BURR,** CLOTHING

WAREHOUSES. 138 and 140 Fulton St., New York. WAREHOUSES.

THE IMMENSE STOCK, both of Goods in the piece and the same made up for immediate wear, embraces all the most desirable Styles and Fabrics, Manufactured in qualities and colorings adapted to the requirements of all.

SPRING SUITS, $10 to $50. SPRING OVERCOATS, $5 to $30. BOYS' SUITS, $5 to $25.
SPRING SUITS, $10 to $50. SPRING OVERCOATS, $5 to $30. BOYS' SUITS, $5 to $25.
SPRING SUITS, $10 to $50. SPRING OVERCOATS, $5 to $30. BOYS' SUITS, $5 to $25.

TO ORDER BY MAIL. FREEMAN & BURR'S NEW SYSTEM FOR SELF-MEASURE, of which thousands avail themselves, *enables* parties in all parts of the country to order direct from them, with the certainty of receiving the most PERFECT FIT attainable. RULES FOR SELF-MEASURE, Samples of Goods, Price List, and Fashion-plate, sent FREE on application. TO ORDER BY MAIL.

A. S. CAMERON & CO.,

ENGINEERS,

Works, foot of East 23d street, New York city.

Steam Pumps,

Adapted to every possible duty.
Send for a Price List.

RANSOM SYPHON CONDENSER perfects and maintains vacuum on Steam Engines at cost of one per cent its value, and by its use Vacuum Pans are run with full vacuum without Air Pump. Send to G. S. WILSON, 51 Chardon St., Boston, for a personal call, or the Company, at Buffalo, N. Y., for a circular.

Diamonds and Carbon

Shaped or crude, furnished and set for boring rocks, dressing mill burs, emery wheels, grindstones, hardened steel and paper calender rollers, and for sawing, turning or working stone. Also, GLAZIERS' DIAMONDS.
JOHN DICKINSON, 64 Nassau Street, New York.

Diamond Pointed STEAM DRILLS.

THE adoption of new and improved applications to the celebrated Leschot's patent, have made these drills more fully adaptable to every variety of ROCK DRILLING. Their unequalled efficiency and economy are acknowledged, both in this country and Europe. The Drills are built of various sizes and patterns; WITH AND WITHOUT BOILERS, and bore at a uniform rate, of THREE TO FIVE INCHES PER MINUTE in hard rock. They are adapted to CHANNELLING GADDING, SHAFTING, TUNNELLING, and open cut work; also, to DEEP BORING FOR TESTING THE VALUE OF MINES AND QUARRIES. TEST CORES taken out, showing the character of mines at any depth. Used either with steam or compressed air. Simple and durable in construction. Never need sharpening. Manufactured by
THE AMERICAN DIAMOND DRILL CO.,
No. 61 Liberty St., New York

IMPORTANT IMPROVEMENT ON THE DIAMOND POINTED STEAM DRILL!—Stevenson's Spring Core Retainer, patented Dec. 12, 1871, which prevents all choking of the drill and secures a perfect core, can be applied to the Diamond Pointed Steam Drill at small expense. Rights to use may be had on application to HARDING, HAYDEN & CO., 225 Washington St., N.Y.

STEAM HAMMERS
FERRIS & MILES
24TH & WOOD STS PHILA

VENEERS

AND

HARDWOOD LUMBER.

BUTTERNUT, FRENCH AND AMERICAN WALNUT, ASH AND CHERRY BURLS; HUNGARIAN ASH, BIRDSEYE & BLISTER MAPLE, etc. etc.
☞ Mahogany, Rosewood, Cedar, etc., in boards, plank, and logs. Large and choice stock at low prices.
GEORGE W. READ & CO.,
170 & 172 Center St., New York.
Mill and Yard, 186 to 200 Lewis, bet. 5th & 6th Sts. E.R.
Send for Catalogues and Price List.

WIRE ROPE.

JOHN A. ROEBLING'S SONS,
MANUFACTURERS, TRENTON, N. J.

FOR Inclined Planes, Standing Ship Rigging Bridges, Ferries, Stays, or Guys on Derricks & Cranes, Tiller Ropes, Sash Cords of Copper and Iron, Lightning Conductors of Copper. Special attention given to hoisting rope of all kinds for Mines and Elevators. Apply for circular, giving price and other information. Send for pamphlet on Transmission of Power by Wire Ropes. A large stock constantly on hand at New York Warehouse No. 117 Liberty street.

Working Models

And Experimental Machinery, Metal, or Wood, made to order by J. F. WERNER, 62 Center st. N.Y.

The Union Stone Co.,

Patentees and Manufacturers of
EMERY WHEELS & EMERY BLOCKS,
In Size and Form to Suit various Mechanical Uses;
GRINDERS, SAW GUMMERS, DIAMOND TOOLS, and WOOD'S PATENT KNIFE-GRINDER,
For Planing, Paper Cutting, Leather Splitting, and other Long Knives.
OFFICE, 29 KILBY STREET, Boston, Mass.
BRANCH OFFICES { 98 Liberty Street, New York. 502 Commerce Street, Philadelphia.
☞ Send for circular.

MORRIS, TASKER & CO.,
MANUFACTURERS OF
American Charcoal Iron Boiler Tubes.
Wrought-Iron Tubes and Fittings,
FOR GAS, STEAM, WATER AND OIL.
☞ Steam and Gas Fitters' Supplies, Machinery for Coal Gas Works, &c. &c.
NO. 15 GOLD ST., NEW YORK.

Damper Reg. Pat. Gage Cocks. Water Feed Reg's.

Send for circulars. MURRILL & KEIZER, Balt., Md.

IRON PLANERS, ENGINE LATHES, Drills, and other Machinists' Tools, of superior quality, on hand, and finishing. For sale low. For Description and Price address NEW HAVEN MANUFACTURING CO., New Haven, Conn.

STANDARD AMERICAN BILLIARD TABLES
NEW DESIGN

H. W. COLLENDER Successors PHELAN & COLLENDER.
738 Broadway, New York.
ILLUSTRATED PRICE-LIST SENT BY MAIL.

Brass & Copper

SEAMLESS TUBING
FOR LOCOMOTIVE, MARINE, AND STATIONARY BOILERS.
Merchant & Co.,
507 Market Street, Philadelphia

LUBRICATORS.

DREYFUS' celebrated Self-acting Oilers, for all sorts of Machinery and Shafting, are reliable in all seasons, saving 75—95 per cent. The Self-acting Lubricator for Cylinders is now adopted by over 80 R. R. in the U.S., and by hundreds of stationary engines. Send for a circular to NATHAN & DREYFUS, 108 Liberty St., N.Y

PYROMETERS, For Ovens, Boilers, flues, Hot-blast pipes, Oil stills, Super-Heated Steam, &c.
Address HENRY W. BULKLEY,
98 Liberty Street, New York.

TODD & RAFFERTY, Manufacturers of Steam Engines, Boilers, Flax, Hemp, Tow Bagging, Rope and Oakum Machinery. Steam Pumps and Governors always on hand. Also Agents for the New Haven Manufacturing Co.'s Machinists' Tools. ☞ We invite especial attention to our new, improved, Portable Steam Engines. Warerooms, 10 Barclay st. Works Paterson, N.J.

Steam Super-Heaters.

For latest improvements,
Address HENRY W. BULKLEY, ENGINEER,
98 Liberty Street, New York.

COLT'S ARMORY TESTING MACHINE—Strength of Materials.—The Colt's Arms Company, of Hartford, Conn., is prepared to measure the strength of all materials by its testing machine, which is capable of determining strains from 1 oz. to 100,000 lbs., in specimens from 7 inches to 8 feet in length, and with cross-sections up to 1 square inch in area. The price of testing half a dozen specimens of the same material, $25. See Scientific American, March 16, 1872. For further information, apply direct to the Company.

☞ T. V. Carpenter, Advertising Agent. Address hereafter, Box 773, New York city.

L. W. Pond---New Tools.

EXTRA HEAVY AND IMPROVED PATTERNS.

LATHES, PLANERS, DRILLS, of all sizes; Vertical Boring Mills, ten feet swing, and under. Milling Machines, Gear and Bolt Cutters; Hand Puncher and Shears for Iron.
Office and Warerooms, 98 Liberty st., New York; Works at Worcester, Mass.
A. C. STEBBINS, New York, Agent.

American Saw Co., Manufacturers of

And Perforated Circular and Long Saws. Also Solid Saws of all kinds. No. 1 Ferry st., corner Gold street, New York. Branch Office for Pacific Coast, No. 606 Front street, San Francisco, Cal.

BUILDING PAPER

FOR SHEATHING, PLASTERING, ROOFING, DEAFENING, AND CARPET LINING.
Samples & circulars sent free, by ROCK RIVER PAPER CO., Chicago; or,
B. E. HALE & CO., 22 & 24 Frankfort St., N.Y.
Sole Agents for Eastern States.

Agents Wanted — $75 to $250 per month, everywhere male and female, to introduce the GENUINE IMPROVED COMMON SENSE FAMILY SEWING MACHINE. This Machine will stitch, hem, fell, tuck, quilt, cord, bind, braid and embroider in a most superior manner. Price only $15. Fully licensed and warranted for five years. We will pay $1000 for any machine that will sew a stronger, more beautiful, or more elastic seam than ours. It makes the "Elastic Lock Stitch." Every second stitch can be cut, and still the cloth cannot be pulled apart without tearing it. We pay Agents from $75 to $250 per month and expenses, or a commission from which twice that amount can be made. Address SECOMB & CO., *Boston, Mass.; Pittsburgh, Pa.; Chicago, Ill or St. Louis, Mo.*

PORTLAND CEMENT,

OF the well known manufacture of John Bazley White & Brothers, London, for sale by
JAMES BRAND, 55 Cliff st., N.Y.

MACHINERY,
Safes, and Mechanical Supplies.
A. S. & J. GEAR & CO.,
56 to 62 SUDBURY STREET, BOSTON, MASS.

MICROSCOPES,

For Scientific Investigations and the Entertainment of the Family Circle. Illustrated Price List sent free on application. McALLISTER, Optician, 49 Nassau St., N.Y.

IRON STEAMSHIP BUILDERS.

NEAFIE & LEVY,

PENN WORKS,

MARINE ENGINES, BOILERS, AND BUILDERS OF COMPOUND ENGINES,
PHILADELPHIA, PA.

SPECIAL NOTICE.

ON THE 15th OF APRIL WE SHALL MAKE A GENERAL ADVANCE OF 15 PER CENT ON THE PRICE OF "THE TANITE EMERY WHEEL." *On and after the above date Tanite Emery Wheels will be sold at the* NETT LIST *price, instead of 15 per cent Discount from same, as heretofore. There will be a corresponding advance to the trade.*

The increasing demand for, and reputation of, THE TANITE EMERY WHEEL warrants its manufacturers in at last making an advance from the price list which they have held rigidly fixed from the very infancy of the Company. Constant care and unremitting attention, the employment of the greatest mechanical and chemical skill, and the most assiduous study of the wants of Mechanics and Manufacturers, have enabled THE TANITE COMPANY to bring their *speciality* to the *highest point of perfection.* Constant outlays are required to meet the novel wants connected with this branch of industry; and this, with the necessity of maintaining and even increasing the high reputation of these goods, calls for a moderate increase in price. COMMON GOODS *can be made for ordinary prices, but* STANDARD GOODS, *of uniform quality; on whose perfection, both chemically and mechanically, not only the economy of the buyer, but the bodily safety of his hands depends; can only be furnished at full or high prices.* IT IS CHEAPER, SAFER, AND BETTER TO DEAL WITH A COMPANY WHO MAKE A DISTINCT SPECIALTY BOTH OF SOLID EMERY WHEELS AND OF EMERY GRINDING MACHINERY, THAN TO RISK THE POOR ECONOMY OF BUYING CHEAP AND UNSATISFACTORY GOODS.
Address THE TANITE COMPANY,
Stroudsburg, Monroe Co., Pa.

STROUDSBURG, MONROE CO., PA., March 18, 1872.
The Prices of the Tanite Co.'s Emery Grinding Machinery are *this day* advanced, as follows:

The Tanite Co.'s Saw Gummer	$15
" " " No. 1 Emery Grinder	80
" " " " " " on Table	50
" " " No. 2 "	50
" " " " on Table	75
" " " No. 3 " "	110
" " " Diamond Tools	15

The general and great advance in the price of Metals and Supplies, together with recent improvements in and additions to these Machines, necessitates the above advance. Notwithstanding this advance, the above Machines are the cheapest in the market. Take notice, that ☞ we make no charges for boxing and shipping, and no charges for Extra Rests. ☜ Each Emery Grinder is supplied (in addition to the two ordinary Rests) with one of our improved adjustable Face Rests, and one of our improved adjustable Side Rests. These Rests can be set at any angle.
Address, THE TANITE CO.,
Stroudsburg, Monroe Co., Pa.

THE TANITE CO.'S GOODS are kept in Stock, and sold at *Factory Prices*, by CHAMPLIN & ROGERS, *214½ East Madison St., Chicago*, who are also Exclusive Western Agents for the New York Tap and Die Co.'s goods, and Dealers in Railway, Mill, and Machinists' Supplies.

PAT. SOLID EMERY WHEELS AND OIL STONES, for Brass and Iron Work, Saw Mills, and Edge Tools. Northampton Emery Wheel Co. Leeds, Mass.

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard sts. Philadelphia and 59 Gold st. New York.