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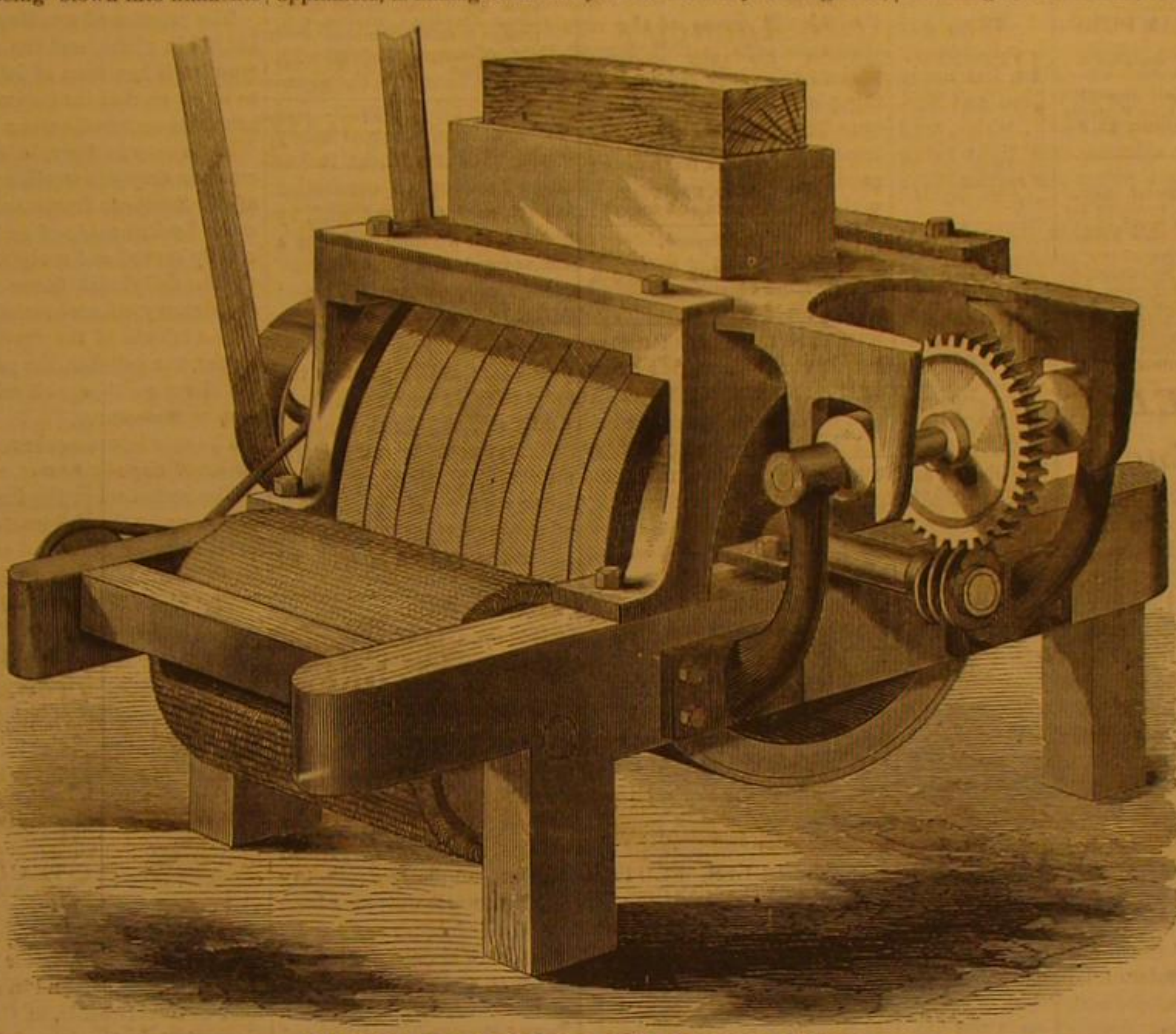
Improvement in Machine for Making Paper Pulp.

The use of some of the softer sorts of wood for producing fibrous pulp suitable to paper making is quite common, but the means of disintegrating the material and preparing it for the paper maker have not been altogether satisfactory. One consists mainly in softening the wood by steam and then discharging it from a gun or tube, it being blown into filaments by the force of the explosion. Others comminute the material by mechanical processes. The machine represented in the engraving is intended to produce the desired result in this latter way. It consists of a cylinder mounted on a frame, the cylinder being covered with a jacket of rasping, filing, or cutting material, formed by successive circles of steel or chilled iron segments as seen in the engraving. At one end of the cylinder shaft the power is attached, and at the other end the shaft carries a worm that engages with a gear turning on a shaft in bearings attached to the frame. On this gear shaft are two cams, or eccentrics, that, turning between jaws or "struts" of a sliding frame, give a gradual reciprocating motion to a hopper or receiver for holding the block of wood to be comminuted by the machine. The lower surface of the wood bears upon the rasping or cutting surface of the cylinder, and its gradual reciprocatory motion insures equality of abrasion, without leaving the ridges which otherwise would correspond with the interspaces of the cylinder coating. A weight of spring, or any other suitable device, can be attached, if desired, to the block for the purpose of graduating its amount of pressure on the cylinder.



BURGHARDT'S WOOD PULPING MACHINE.

Somewhat below the center of the rasping cylinder is hung a a smaller cylinder covered with card clothing or stiff bristles, and receives motion from the shaft of the main cylinder by means of pulleys and belt, as seen in the engraving, or gears; the motion being in reverse of that of the rasping cylinder, and more rapid. This card-clothed cylinder is intended to remove the "fluff" or fiber from the teeth of the cutting cylinder, and to keep them clear. The material is deposited beneath the machine in any convenient receptacle. The fiber, as it comes from the machine, appears, under the microscope, and also when tested by the touch, to be well adapted for mixing with other paper stock. It is neither sawdust nor coarse threads, but a floss-like fiber similar to short-stapled cotton or flax.

Patent pending through the Scientific American Patent Agency. For further information, address Frederick Burghardt, care J. M. Burghardt, Great Barrington, Mass.

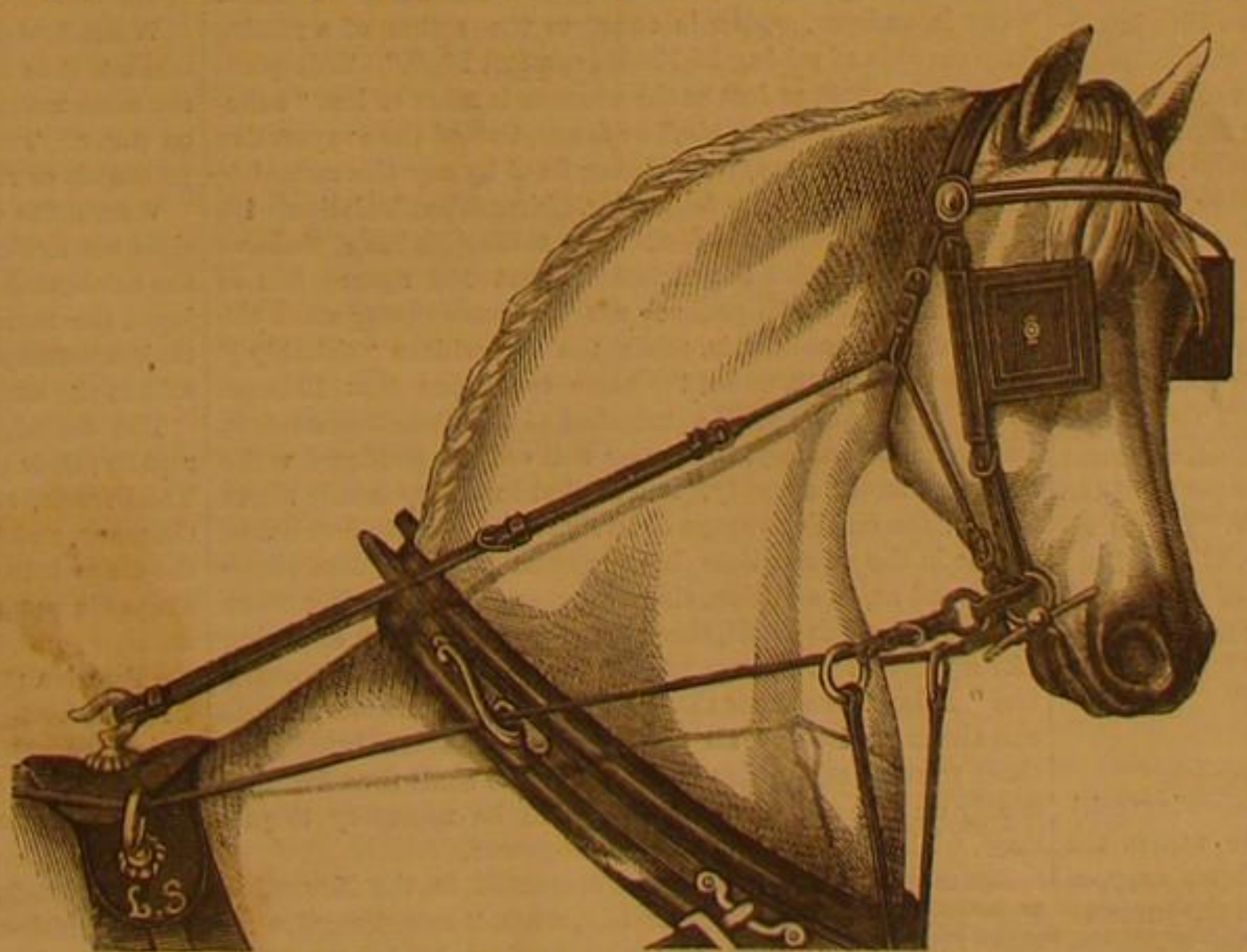
Driving Reins for Horses.

Horses are excellent servants but bad masters; and, like steam, water, and all other powerful aids to man, must be kept under control to be useful instead of dangerous. Many devices have been contrived to control a vicious or frightened horse, but some of them are too complicated, and when, as is frequently the case in a runaway, the driver, as well as the horse, loses his presence of mind, the proper manipulation of the device s neglected until the mischief is done. It is evident that, in such cases, a simple rein, to which the driver instinctively clings, would be much better than any independent and complicated arrangement. Such is that shown in the engraving.

Instead of the rein being connected directly with the ring of the bit, it is attached to the ring of the check strap, passing through the bit ring and connected to the junction of the throat strap and head brace, and so is, of itself, a portion of the headstall. The rein passes from this strap through the martingale ring, the collar guides, and the terrets, as usual.

The operation is easily understood. By pulling on the reins the bit is lifted against the corner of the horse's mouth, instead of merely pressing against his lower jaw. The leverage thus exerted is so great, that even hard-bitted horses may be held by the strength of any woman, or of a boy of ten or twelve years. It is simple and neat, and as it has no unusual appliances, is managed as easily as the ordinary driving rein, from which it hardly differs in appearance. It costs no more than the ordinary style. Its operation can be easily understood by a reference to the engraving.

The patent is dated Aug. 11, 1868. Orders should be sent to G. W. Barnes & Son, 315½ Bowery, New York city, where specimens may be seen.



BARNES' PATENT SAFETY HEADSTALL.

THE GREAT POLISH SALT MINES.

A correspondent, writing from Cracow, says that the famous salt mine of Wieliczka, which brings a net annual revenue to the Austrian government of upwards of £600,000, is threatened with total destruction by a stream of water which made its appearance on the 19th of January, while the workmen were digging in one of the lower shafts in search of potash. All the means hitherto adopted of preventing the water from inundating the mine have been unsuccessful; it flows at the rate of 120 cubic feet a minute, and has already almost filled the lower passages, rapidly dissolving the salt with which it comes in contact. A government engineer has arrived from Vienna, and a channel is being built under his directions for confining the water and leading it out of the mine, but it is feared that the salt columns which support the transverse shafts may be undermined before the work can be completed.

These salt mines the most renowned in the world, are situated about 8 miles from the city of Cracow, having their mouth or principal entrance in the pleasant village of Wieliczka, which lies on the slope of a wooded hill, and is very picturesque. The superintendents of these mines reside here, and their dwellings, together with the government offices and large storehouses for salt, occupy a pretty eminence, and are conspicuous from a distance. A great many people from various countries visit these remarkable excavations, and are well rewarded for their trouble. Every year for many centuries having added to their depth and extent, the mines are now of immense and almost inconceivable magnitude. In order to visit them the traveler must procure a permit from the government, which is easily done, the proper officer being on the spot. The opening or square shaft, through which the descent is made, is covered by a building or office; and here the visitor is dressed in a long coarse linen blouse, to protect his clothing while underground. A door is opened and he goes down by stairs, preceded by boys, who carry lamps only to make the darkness more visible. Or, if he is so disposed, he can descend by the windlass and ropes suspended in the center of the shaft. More frequently visitors descend by the stairways and come up by the ropes.

No salt is seen for a depth of more than 200 feet; then the veins begin to appear in a bed of clay and limestone. 50 feet further down the stairs terminate, and the salt is everywhere; nothing but salt; overhead, under foot, on every side are dark grey masses of solid salt, whose points and surfaces sparkle in the lamp light. Galleries now branch off in all directions. Lights twinkle, and groups of laborers are seen hacking the floors, or removing in wheelbarrows blocks that have already been cut out. Passing on through one of these galleries a chapel is reached, which is only the first and oldest of many apartments thus designated, differing only in size and decorations. It is called the chapel of St. Anthony, and is supported by columns of salt left in quarrying the solid rock. It has an alter, crucifix, statues of saints large as life, all of pure salt. The air in this part of the mines, near the surface, is much more moist than that of the deeper excavations, so that the process of dissolving goes on slowly, and in consequence some of these statutes of salt are gradually losing their shape. The head of one is nearly gone, the limbs of another, while deep furrows are observable in many places upon their bodies, making them present a very grotesque appearance when lighted up or exhibition. The smoke of the torches and lamps, added to the dampness of the air, blackens the surface of all objects not recently cut, so that these statutes might be mistaken for black marble.

Onward and downward goes the visitor, through halls, chambers, tunnels innumerable. Stairs descend lower and lower, and similar apartments re-appear, till he loses all sense of distance or direction, blindly following his conductors, who point out from time to time localities or objects of peculiar interest where all is surpassingly wonderful. Every thing is solid salt, except where some insecure roof is supported by huge timbers, or a wooden bridge is thrown over some vast chasm from which thousands of tuns of salt have been quarried and removed. The air grows drier and purer the deeper you go; the points and faces of the rock more crystalline and brilliant. One enormous hall, out of which has been cut a million hundred weight of salt, has the appearance of a theater. It is over 100 feet high, and the blocks, taken out in regular layers, represent the seats for the spectators.

In another spacious vault stand two obelisks of salt, which commemorate the visit of the Emperor Francis I. and his empress. Further on you come to a lake more than 20 feet deep, intensely salt, of course, which is crossed in a heavy square boat. In this you paddle through a tunnel which connects two immense halls. While in the middle of the tunnel the walls behind you and before you are brilliantly lighted up, and a gun is discharged, which, with its echoes and reverberations, almost deafens you. Both air and water tremble visibly under the strange and frightful concussion, and you are only too thankful to reach the end of your voyage and stand once more on solid salt. Francis Joseph's ballroom is another of the wonders of this subterranean world. It is an immense apartment, both in hight and extent, and on some festive occasions is used in dancing. It is lighted by six large chandeliers, which resemble cut glass, but are in reality of crystalline rock salt, statues of Vulcan and Neptune, sculptured from salt, also adorn this hall, which, well illuminated, exhibits a marvelous splendor, the light being reflected from innumerable brilliant points and angles of the glittering rock.

Down, down, down hundreds of feet further, through labyrinths of shafts, galleries and chambers, crooked passages, vaulted archways, and openings which have no name and seemingly on end. Groups of miners, naked to the hips, are everywhere busy with the implements of their darksome labors; pick, mallet, and wedge are employed incessantly in blocking out and separating the solid mass. Their manner of work is the same simple process in use centuries ago, perhaps by the remotest ancestors of these very men, in these very mines, for they are immensely old. The blocks are marked out on the surface of the rock by grooves. One side is then deepened to the required thickness, and wedges being inserted under the block, it is soon split off. It is then divided into pieces of a hundred pounds each, and in this shape is ready for sale. It is removed in carts or barrows to the shaft, where it is hoisted up, stage after stage, to the surface. Horses and mules are employed, and it is said that some of these animals are born and raised in the mines.

The number of laborers constantly at work is from 1,000 to 2,000. They all live outside the excavations at the present day, although traditions exist of times when the families of some of the miners had their abodes in these fearful depths, and where children were born and reared to the occupation of their parents, seldom or never visiting the outside world. The thing is neither impossible nor incredible, as the air in the lowest part of the mines is considered more salubrious than in their upper regions. But the practice was long ago discontinued, if it ever existed to any extent.

The miners, who are fine muscular and healthy men, are divided into gangs for work, and relieve each other every six hours. A gang will quarry in that time about 1,000 lbs. weight. The temperature is very even all the year round, and the preservative power of the air is such that wood never decays, but retains its qualities for centuries. People with pulmonary affections are said to have been much benefited by inhaling freely the atmosphere of the mines.

When and how this wonderful deposit of salt was originally discovered is unknown. It was worked in the 12th century, and how much earlier none can tell. Some traditions are held by the ignorant and superstitious peasants of the country, which ascribe the discovery to miraculous or supernatural agency. Others say that a certain Queen of Poland, on visiting the spot, commanded her subjects to dig there, assuring them that there was a most precious treasure beneath them. After a while a crystal of salt was found, which, as an earnest of the abundance afterwards discovered, this princess had set in a ring as a royal gem, and wore to the day of her death.

The extent of the deposit has not yet been fully ascertained. It commences, as we have before stated, about 200 feet below the surface, and has a solid depth of nearly 700 feet, and rests on a bed of compact limestone, such as forms the peaks of the Carpathian Mountains, which it seems to follow. It has already been explored to the continuous length of 2½ miles; and it is estimated that the aggregate length of all the innumerable excavations of these mines amounts to more than 400 miles.—*Mining Journal.*

COAL OR SUN.

The *Mining Journal*, of London, makes the following criticisms upon the proposition of Capt. Ericsson to utilize the direct heat of the sun as a motive power, which we copy on account of their suggestive character, rather than the justness of its views in regard to Capt. Ericsson's invention. Knowing confessedly nothing of the means employed, the *Mining Journal* has put itself into the position deprecated by Solomon, that of "one who answereth a matter before he heareth it," and it may be that the developments promised us by Capt. Ericsson in the coming spring will prove that it "is a folly and a shame unto it." The *Journal* says that at the outset of his proposition, Mr. Ericsson appears to have fallen into the error of considering "concentration" and "condensation" of the sun's rays as convertible terms. This, however, is not so. Every schoolboy who has blistered his hand with a burning glass knows very well the practical meaning of "concentrating" the sun's rays. The "condensation" of them—that is, the fixing of their calorific forces in some latent and portable form, whence they can afterward be liberated and utilized—is a very different matter indeed. The one is simply mechanical, the other is chemical, and the only agency with which we are at present acquainted capable of performing this latter very important operation is the leaf of the living tree or plant, which, under the influence of the sun's rays, separates the constituents of the carbonic acid floating in the atmosphere, absorbing the elemental carbon and liberating the oxygen.

This operation is of a refrigerating nature, but the caloric of the sun's rays, instead of being dissipated in effecting the separation above described, becomes fixed or latent (that is, hidden or concealed), in connection with the elemental carbon, and the resultant accretion is what we commonly term carbon—that is, elemental carbon *plus* the latent heat of the sun's rays, which has been expended upon it in separating it from the oxygen with which it was previously combined in the carbonic acid, and which latent heat has taken the place of that gas, through the agency of that undefinable something which we call the vital energy of the plant, but about which we know very little. Thus, in solid carbon we have the calorific forces of the rays truly "condensed." When this substance is first formed it is, of course, mixed with various volatile juices and earthy matters, formed in the growing plant, and which it has derived from other sources. But once formed, this solid carbon is capable of a great many transformations without parting with the latent heat it has received, and which it still retains, stored up in connection with it. Thus it is changed into peat, coal, diamond, and, by assimilation from the carbonaceous food we take, it forms a large portion of the flesh and bones of animals.

This solid carbon can only be made to give up the latent heat stored in connection with it by its being brought into contact with oxygen at a certain temperature and under certain conditions. We effect this operation by placing the solid carbonaceous matters in some suitable receptacle, such as a common fire-grate, or boiler furnace, and having raised the initial temperature to a sufficient point by some extraneous means, we then allow a stream of atmospheric air to pass through the materials. The oxygen from the air then uniting again with the elemental carbon, liberates the stored-up latent heat, which we utilize for the production of force in various ways, the elemental carbon passing away with its original companion, the oxygen, as carbonic acid.

This hypothesis, which we admit is open to discussion, is the history and meaning of the "condensation" of the calorific influences of the sun's rays, and of the means by which, after they have been stored up for unknown ages, we may again derive use and comfort from them. But now the question comes—Has Mr. Ericsson indicated a cheaper or more portable plan for the storing the calorific forces of the sun's rays than that worked out for us in the natural way? We venture to think not; and that our coal owners need not at present fear him as a rival, while those who are annually expending large sums in utilizing the forces of heat must wait for a long time before they find a cheaper method of doing so than by consuming our ordinary fuel. Mr. Ericsson does not tell us that he has discovered some other cheap and portable vehicle by which the sun's rays can be absorbed, and stored in a latent shape, and thence by simple and cheap means liberated again at will for use. It is evident that he has no idea of chemical "condensation," but only of some mechanical "concentration," the economics of which it may be worth while to consider a little. He states that "in weather *suitable* for the action of sun machines, the action of the sun, in a superfices of 100 square feet, can evaporate 489 cubic inches of water in an hour, which is equal to the action of a motive force capable of raising 29,750 lb. one foot high." This quantity will be more or less as the weather is more or less "suitable." The word "suitable," as descriptive of the evaporative power of the sun's rays, not being fixed by any thermometric scale, it is impossible to follow Mr. Ericsson's calculation with the exactness we should desire, but, taking his basis, we have as our starting point the statement that 100 square feet of "concentrators" will produce nearly 1-horse power when the weather permits—that is, when the sun shines "suitably;" whence it follows, under the same conditions, that 10-horse power will require 1,000 square feet of the same instruments. But as, unfortunately, the power will only be produced while the sun shines "suitably," and as that luminary is only above the horizon on the average of twelve out of twenty-four hours, and as in the winter time his presence is much less propitious, and as, in addition, there are many days together when he does not shine at all, then, in order to produce anything like a uniform power, we must have an area of "concentrators" at least five times that which would be necessary if the sun shone "suitably" all the twenty-four hours round, and there were no such things as clouds. We shall thus find that nearly an acre of "concentrators" will be necessary to produce, with any regularity, 100-horse power.

But even this could not be guaranteed in the November Fogs and winter months generally, when it might require an area equal to a large estate to produce 100-horse power. fancy for a moment the blank despair of some enthusiastic manufacturer, living in a crowded town, who desired to drive his cotton mill by "concentrated" sun's rays, being told that to do so he must purchase an acre of "concentators," which we presume must be some sort of reflector, of metal or glass; that he must then purchase an acre of ground on which to erect them; that he must cover that acre with a network of steampipes, fittings, and boilers; that each "concentrator" would require expensive machinery always to keep it facing the sun at the proper angle; that all this machinery would have to be worked prior to any power passing into his accumulators, which would be massive and extraordinary machines, at least five times as large as an ordinary 100-horse power engine; that, further, he would have to keep a small army of men, with cotton-waste and wash-leather, constantly cleaning his acre of "concentrators," to have them in readiness to reflect the rays of the sun; and that into it all, in the event of a succession of dark or cloudy days supervening, he could not even then be guaranteed the continuous demand of his 100-horse power—and then we may form some slight idea of what Mr. Ericsson thinks he can offer in competition with our ordinary fuel.

In further proof, however, that the time of the "sun machine" is not yet, we should note that our ordinary fuel has driven the windmill out of the market, the motive power of which is as cheap as sunlight; and as, horse power to horse power, the outlay to establish a combination of windmills will be less than to establish a combination of "sun machines," it necessarily follows that these latter will not be brought into practical use until not only our coal is exhausted, but the wind ceases to blow.

TOBACCO PIPES.

The practice of smoking tobacco has spread over the whol-habitable globe, and the consumption of this narcotic, enormous as it has been of late years, is rapidly on the increase; so much so, that the manufacture of tobacco pipes has in many countries acquired quite a considerable importance.

Pipes vary in form, in composition, and in value, from the common clay pipe worth a fraction of a cent, or the "corn-cob" of our Southern freedman, which costs nothing, to the aristocratic hookah made of solid silver or gold-plated copper, elaborately carved and sculptured, from which flexible tubes convey the delightful flavor of the "Latakia" to the luxurious and dreamy oriental reclining on his silken couch.

The talents of the draftsman, the potter, the sculptor, the turner, the polisher, the painter, the gilder, and the gold and the silver smith, are all called into requisition by the modern pipe manufacturer.

The substances used are meerschaum, porcelain, various varieties of clay, briar root, and several dark colored woods.

The period when the first pipe was smoked by man is hidden to us by the impenetrable veil of by-gone ages, but no doubt can be entertained as to its having been done by the aboriginal American. Ancient stone pipes of fanciful shapes have frequently been ploughed up, in various parts of this continent, such as North-Western New York, Cayuga county, etc., and have been found by ourselves, buried amid the remarkable ruins of the pre-historic cities of Central America.

MEERSCHAUM PIPES.

The richest and most beautiful pipes are manufactured from varieties of a clay-like substance, *magnesite* or *sepiolite*, better known as "meerschaum" which translated into English means sea scum or sea froth; this name being due to its low specific gravity and light color. Sepiolite is of a fine earthy texture, smooth to the touch, and is found in masses in stratified alluvial deposits among serpentine. It is a product of the decomposition of carbonate of magnesia, its composition is silica 60·8, magnesia 27·1, water 12·1 in 100 parts.

Meerschaum is found in Asia Minor in the plains of Eskihi-Sher or Eski-Schehir, in Greece, at Egribos in the island of Negropont, in the isle of Samos, at Kiltschik in Natolia, in the Crimea, at Hrubschitz in Moravia, in Morocco, at Vallecas in Spain (where it is used as a building stone), at Baldissero in Piedmont, in Cornwall, in France (in the departments of the Gard, of Seine et Marne, and of the Seine), but the most remarkable quarries worked at present are situated at Brussa at the foot of Mount Olympus.

When first dug up it is damp, soft, and greasy. The Tartars use it as soap to wash linen, and the Arabs of Algeria in the same manner in the Moorish baths. In masses it floats on water. The color is grayish-white, white, or with a faint yellowish or reddish tinge.

Vienna, the capital of Austria, was for many years the principal marketfor Asiatic meerschaum. It was from thence that the celebrated pipe makers of Ruhla in Saxony, who long enjoyed the monopoly of this branch of manufacture, obtained their necessary supplies. These Saxon pipes were generally sold at the annual fairs at Leipzig.

The demand for "meerschaums" having increased quite rapidly, their price was enhanced and monopoly soon ceased. The French, stepping in, started a serious competition to the Germans, and have at this present day taken a large share of the trade into their own hands. The home manufacture of France is not only self-sufficient, but large numbers of pipes are now exported from thence to foreign countries. Many of the Parisian pipe makers draw their supplies of raw material directly from the mines. Taste and elegance of design, which are general characteristics of the manufactures of the French, are very conspicuous in their pipes. Those made at Nimes, from magnesite of the department of the Gard, are also held in high estimation. A large business in meerschaum pipes is done in Austria at this time.

Each finished pipe offered for sale is placed in a separate velvet or silk-lined case; and all genuine meerschaums are mounted in silver—sometimes in gold—and are furnished with amber mouth-pieces.

The meerschaum itself is shipped in lumps of considerable size packed in wooden boxes. The value of these pipes depends on their size, on their workmanship, on the purity of the material employed, and on the richness of the mountings; their cost is however always comparatively high and may reach fabulous or "fancy" prices.

The meerschaum bowls are prepared by soaking first in tallow, then in wax, and finally by carving and polishing.

We need hardly remark to our smoking readers—and their name is legion—that the high price of meerschaum pipes has led to the introduction of many cheaper substitutes and imitations, some of which are not easily detected by an unpracticed eye. None of these can however compare in lightness, or porosity to the genuine material.

PORCELAIN PIPES.

These pipes are manufactured in Germany, from whence they are forwarded to all parts of the world. They are made from very pure china-clay, or kaolin, and are coated with a bright enamel. Porcelain pipes are either plain or painted, in which latter case, their price is proportionate to the artistic labor expended on them, which is often of a high order.

The porcelain pipe is an emblem of old "fatherland" to every Teuton, when he thinks of the "long ago" and the "old friends far away."

CLAY PIPES.

Clay pipes are manufactured in England, France, Belgium, Holland, Spain, Italy, etc. Many varieties are known, all of which may be classed under two heads; namely, pipes with stem and bowl united, and pipes in which the bowl alone is made of clay and the stem of some other substance.

Among the first we find, clay pipes, white, light, and smooth; clay pipes with ribs and raised lines; clay pipes, white inside and colored outside; clay pipes with external molded designs; and in general, the "common run" of all democratic or workingmen's clay pipes.

In the second category we have pipe bowls representing heads of men, of women, of children, of animals, of fantastic subjects, or the busts of the living heroes of the day. We have in revolutionary times in Europe often seen clay pipes symbolising political doctrines or caricaturing those in power.

In England the large majority of pipes are made from clay dug at Purbeck in Dorsetshire. The best French pipes are those of Saint Omer, Givet, Marseilles, Nimes, and some other localities.

The production of clay pipes is immense, as may be judged from the fact that one manufacturer alone offers three thousand different models for sale. All clay pipes are made in molds from well-prepared clay, their value varying according to the difficulties of workmanship. The cheapest sell as low as fifty cents per gross of 12 dozen; the highest seldom exceed $1·20 per gross. Clay pipes are best packed in boxes with oat straw as a filling.

TURKISH AND ALGERIAN PIPES.

In many parts of Turkey and of Algeria, pipes are made from clay or pulverized cement of a reddish brown color. The bowls of these pipes are of different shape from those in use in the north of Europe, being wide or nearly funnel-shaped at their orifice. Some of these pipes are quite plain and exceedingly cheap. Others are covered with the impress of small flowers with raised centers, stamped on them by means of a seal, before baking. Others again, are diversely gilded in arabesque or moorish designs. The bowls of some Algerian pipes we examined, were made from some kind of very heavy wood, studded with imbedded beads and ornamented with brass wire.

The stem of a Turkish pipe consists of a long rod of the wild cherry tree pierced in the center by means of a red hot iron. The "trappings" and ornaments about these pipes are often elaborate and not devoid of a certain degree of peculiar elegance; the mouth-piece is invariably amber.

HOOKAH OR HOUKAR—NARGHILAR.

This gigantic pipe, resembling a censer, from which numerous pliant tubes diverge, permitting different persons in various portions of a room to enjoy a simultaneous "smoke," is essentially a sociable, oriental luxury. The smoke of the tobacco is generally cooled and deprived of some of its acrid principles by being passed through water in this apparatus. Hookahs or narghilars, being often made of solid richly carved silver, are expensive and seldom manufactured out of Turkey or Algeria. In a well established Mahomedan's mansion, this article is never wanting. A special servant, the "houkar boudar" has no other duty than that of attending to his master's houkar which is kept lighted and filled, ready for use, at all hours of the day or night.

BRIAR PIPES.

The old fashioned wood and horn pipes have of late years been superseded by the well-known "briar" pipe made from the hard, comparatively incombustible, wood of various species of briar, and of many other trees.

These pipes are manufactured in Germany and in France, but more particularly in this latter country where Saint Claude in the Jura has the monopoly of the commoner kinds, and the city of Paris, that of the more expensive carved ones. Briar pipes are packed in pasteboard boxes holding from two to three dozen. Their forms are very varied and their mouthpieces of either horn or amber. Their cost in Europe varies from $5 to $25 per gross, according to their degree of finish. Some of the elaborately sculptured Paris briar pipes, sell as high as from $1 to $2 each, in which case the bowl in generally lined with an internal coating of meerschaum.

The manufacture of both meerschaum and briar pipes has of late been introduced into the United States, and appears to be in a thriving condition.

In our next number we will give an account of the method of manufacturing the ordinary clay tobacco pipes, with a description of the furnace used to bake them.

Watch-Glasses—How they are Made—A Look at the Manufactory—The Different Operations.

At Sarrebourg, a small town near the Vosges Mountains, which numbers about 2,300 inhabitants, there is a manufactory of watch-glasses which owes its origin to the well-known glass-works of Valerysthal in its vicinity, whence the blown glass is obtained. It is well known that watch-glasses are of two kinds. One kind is simply cut out of blown globes, and receives no other preparation, so to speak, than that of a trimming of the border, and a more or less imperfect smoothing. This kind includes all the common concavo-convex glasses which are applied to common watches on account of their cheapness. Their convexity is a great inconvenience. The other kind consists of flat glasses. These are formed from the primitive convex glasses by operations which render them more costly, it is true, but then they are much more convenient. At Sarrebourg these are called *verres cheves*. *Chever* is an old French word which signifies to bulge or hollow out, but has now no other use than that to which allusion has been made. If the flat watch-glass had been prepared from glass having a plane surface we could comprehend the designation *cheve* which has been given to it, for the *cheve* glass is not absolutely flat, and to form it a bulging out from its border would have to be made. But it is not so worked; on the contrary, the convexity of the common watch-glass has to be diminished in order to obtain a flat glass; hence, it seems that the expression used designates precisely the reverse of what it ought to indicate. The manufacture of flat glasses, although not complicated, requires a series of operations which the fragile nature of the material must render very delicate. We will now pass them in review.

FIRST OPERATION.—The first operation is that of cutting out. It consists in cutting according to the pattern the blown globes supplied by the glass-works. To effect this, a concavo-convex watch-glass of the size wanted is applied to the surface of the globe, and, both being held in one hand, the glass is broken all round by striking little sharp blows with a pipe tube made red hot. As the glass does not crack according to an exact circumference, merely an irregular bowl is thus obtained, the angles of which are afterwards taken off coarsely by grating away the material with common flat chisels deprived of edge. This first work is done by women, who are paid at the rate of twenty-five centimes per gross; each worker can cut eight gross per day.

SECOND OPERATION.—The glasses cut out in the rough form (calottes), and having already undergone a first trial, which classes them according to their qualities, are placed one by one on molds of refractory clay, and submitted to softening in a muffle heated to redness and constantly open. The workman takes each mold successively with small pincers, places it for a few seconds in the muffle, and, withdrawing it almost immediately, applies a pad of paper upon the softened glass, and by rapid pressing in all directions, causes it to lose its convexity and to take the form of the mold which is more or less flat but slightly arched at the circumference. This operation is called *chevage*, whence the name of *cheve* given to glass which has undergone it, and *cheveur* to the workman who practices it. The molds are carefully made to shape by turners, and classed according to their dimensions, which correspond to those which trade adopts for watch-glasses. As to the muffles, several of them are put in the same oven side by side, and each is attended to by a workman (*cheveur*), who produces on an average six gross per day. The pay for shaping is sixty centimes per gross.

THIRD OPERATION.—Once flattened and classed according to their thickness and dimensions, the glasses are submitted to dressing. The operation of dressing, which is performed by women, consists in shaving each glass by clipping away with flat and wide chisels that part of the border which gets beyond the circumference given by the mold. This work demands more delicacy than the ordinary cutting out, for here the breakage is more expensive, since the glass has already received two workings. It is paid at the rate of 20 to 25 centimes per gross, according to the thickness of the glass.

FOURTH OPERATION.—We now come to the bezeling. Stuck with pitch upon a wooden chuck, which the workman holds in his hand, the glass undergoes a first reducing by means of a grindstone and sand, with a view of preparing the bezel edge which has to fit in the circle of the watch. Then it is placed in a lathe and the bezel is finished off with pumice-stone. The bezeler receives one franc twenty-five centimes to three francs per gross, according to the thickness of the glass; he delivers from one to two gross per day.

FIFTH OPERATION.—From the hands of the bezeler the glass is carried to the smoothing shop, where it is submitted to the action of a smoothing wheel mounted upon a horizontal axis, and upon which pumice-stone powder with water is poured from time to time. This wheel, which has a diameter of four decimeters when new, is formed of two cheeks of wood, between which is wrapped and strongly pressed together pieces of waste cloth. There are eighteen similar smoothers placed in movement by one water wheel. This operation is paid at the rate of two francs twenty-five centimes per gross.

SIXTH OPERATION.—In short, the glass is finished, but it is dull, and would not in this state be accepted by the trade; hence, the operation of polishing, which consists in polishing and brightening at a wheel with English rouge or with tin-ashes (oxide of tin obtained by calcination). This wheel, which bears the name of "mushroom," is formed with cloth like the previous one, but it is mounted upon a vertical axis which the workman commands with his foot. The pay for this operation is 1 franc per gross for thin glasses, and 1 franc 25 centimes for thick glasses.

Thus, the different operations are the cutting out, the flattening, the dressing, the bezeling, the smoothing, and the polishing. On arriving at the store, where they are prepared for sending out, the glasses are again examined one by one and tried in a gage which finally classes them, and rejects, to be returned to the workshops, those which have not the proper size. There are then six payments for fashioning, which represents for a gross a total varying from 5 francs 55 centimes, to 7 francs 50 centimes, to which should be added the price of the blown globes, which is about 1 franc 50 centimes the kilogramme.—*Phrenological Journal*.

For the Scientific American.

"WASTE" AND "ECONOMY" OF FUEL.

NO. 3.

ON "PRIMING" IN STEAM BOILERS.

The economy in fuel realized by the use of tubular boilers in comparison with non-tubular, is in the ratio of 1·35 to 1·; but this advantage is often more than neutralized by the greater liability of the first to incrustation and to priming, especially in the case of vertical boilers.

Priming is the result of violent ebullition in boilers with restricted "water ways," where the free circulation is impeded and is made manifest by irregular or intermittent action and by large quantities of water being carried off in mechanical suspension by the steam produced.

The waste of fuel caused by priming is not readily determined. In many cases where nine pounds of water are fed into a boiler and supposed to be converted into steam, not more than five are really thus converted, and the remainder, or hot water, is carried off as such in admixture with the steam. The loss in the above case may be calculated as follows:

Supposing the pressure in the boiler to be 90 pounds per square inch, the temperature will be 320° Fah., and by Regnault's formula (320—32) × ·305 + 1123·7, we find 1211·54 to be the total number of units of heat contained in one pound. If the feed water has been introduced at 60° Fah., then the amount of heat derived from the fuel would be 1211·54—(60—32) = 1183·54 units of heat for every pound of working steam generated.

Five pounds of steam will contain 5917·70 units, and the water at boiling point (320° Fah.) will contain 320—32 = 288 units per pound, or 1152 units for the 4 pounds, this being equivalent to a net loss of 19·47 per cent of the fuel practically consumed.

It is found difficult to maintain the pressure in cases of priming and the vacuum is seriously injured by it, so that this occurrence must always be regarded as most undesirable and as a source of pecuniary loss.

Priming being most frequently due to defective boiler construction, can generally be remedied only by making rational changes in the interior distribution of parts, or by the substitution of one system of boiler for another.

A less generally understood method of counteracting the injurious effects of water in steam is by "superheating." This may be done either by direct action on the whole of the steam generated, or by the admixture of a certain determined quantity of superheated steam just sufficient to cause the evaporation of the suspended water and its conversion into working steam of the desired tension. The calculation of this quantity and of the temperature to which it will have to be raised depends on many and various causes.

Knowing the quantity of free water contained in a given weight of steam, it will always be easy to determine the best superheating temperature necessary to be applied to any given number of pounds of steam in order to convert "wet" into "dry," or in other words, to convert suspended water into good working steam of the requisite tension. For this purpose proceed as follows:

Subtract the total number of units of heat (b) contained in the mixture of steam and water, from the computed total of units (a) which would be contained in the same weight of working steam of the required tension; divide the result by the number of pounds of steam (c) which it is desired to superheat; multiply this quotient by the specific heat of steam 0·847 and add the number of degrees (d) of Fahrenheit thermometer corresponding to the given tension. This last addition furnishes the "theoretical" superheating temperature (x) needed, but is "practically" too low as no allowance has been made for losses.

By our formula we would have $\frac{a-b}{c} \times 0{\cdot}847 + d = x$

Whenever the superheating can be realized by means of the waste heat of the furnace, a very material gain in the amount of fuel consumed will always be noticeable; when, however, (as is often done) the superheating is effected by the combustion of an extra quantity of coal the benefit derived from it is comparatively inconsiderable.

Some other day we may again refer to the practical advantages and disadvantages of superheated steam, and to the subject of superheaters in general and their various applications. This is an interesting subject which the experiments of Wethered, Partridge, Pilgrim, Lafond, and many others have failed to completely elucidate in its multitudinous aspects.

The practical conclusion derived from the above considerations is: If your boiler primes, either "swap" it off for another, or superheat your steam moderately, but beware of anti-priming doctors and their remedies.

CULTIVATION OF SUGAR IN LOUISIANA.—A correspondent from Louisiana writes us that the great want of that State is labor. Notwithstanding the planters are making use of all the labor-saving machinery which they can get, they still lack laborers. Farm hands get from $14 to $30 per month with board; carpenters $75 to $125, blacksmiths from $45 to $60. He says if that State can get the labor, it alone will produce all the sugar needed for home consumption. He invites northern people to turn their attention to the opportunities for profitable investment now offering there, and says there are land and work for all who will come.

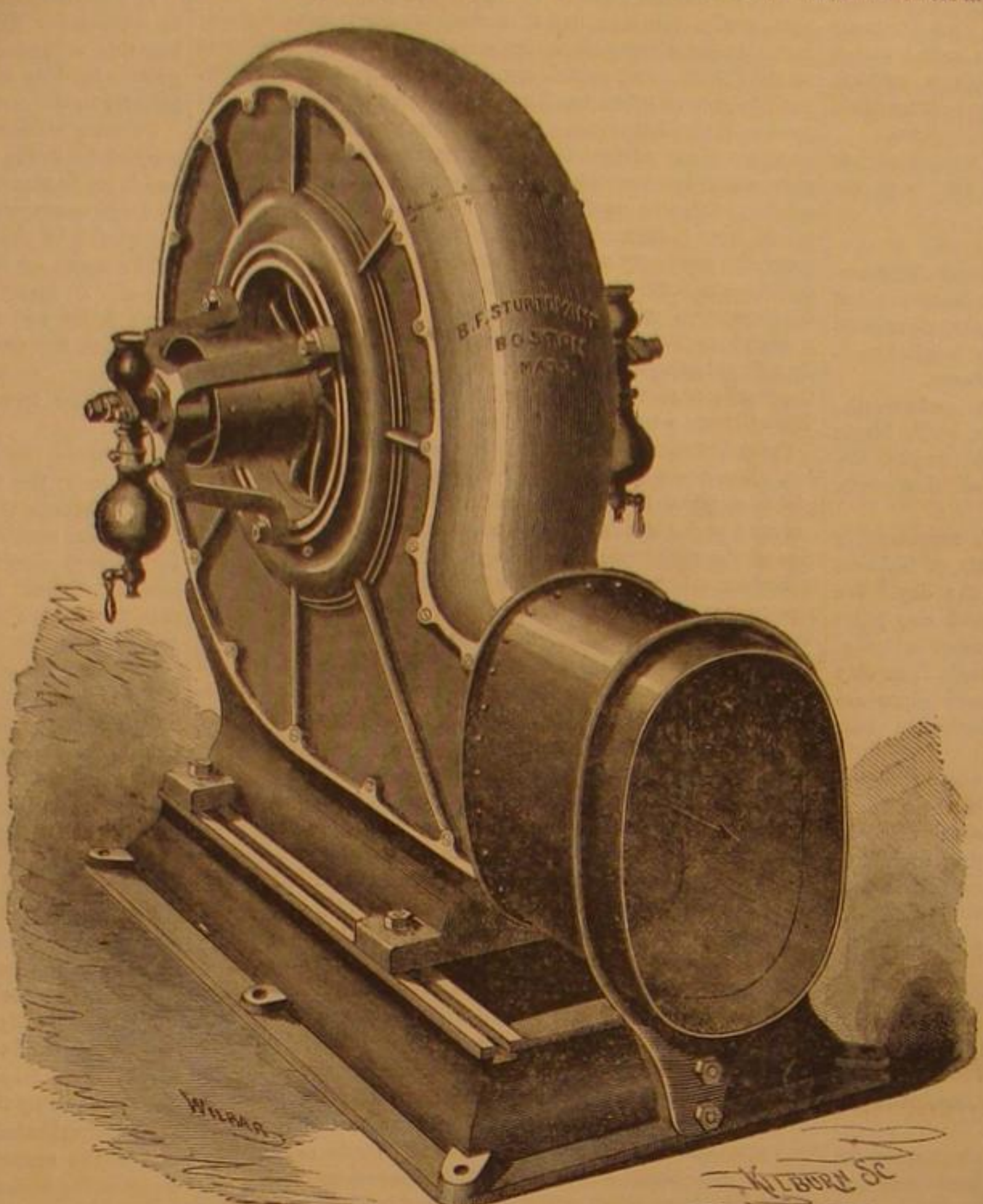
LARGE quantities of celestine, sulphate of strontia, a mineral of a beautiful delicate blue color, well known to mineralogists, have been found at Mokattam in Egypt, in limestone beds.

Improvement in Rotary Blowers for Furnaces, Forges, etc.

Experience has proved that in the case of large founderies and forging establishments, where a strong, steady, and well sustained blast is required, great care is necessary in constructing blowers. Delays caused by breaking and the consequent repairs are not infrequently more expensive than the original cost of the blower. The machine should, therefore, be made of the best material; lubrication should be deemed of the first importance; parts liable to the greatest wear should be furnished in duplicates easily put in place, and the workmanship should be of the best quality. Such, it is claimed, are the qualifications of the blower shown in the accompanying engravings, a claim that is supported by such men as the engineers of the Charlestown, Mass., Navy Yard; Wm. Mason, the well-known inventor and manufacturer, Taunton, Mass.; Pratt, Whitney & Co., the celebrated tool builders, Hartford, Conn.; O. Ames & Sons, North Easton, Mass.; and by the Rathbone Stove Works, Albany, N. Y.; National Foundery Pipe Works, Pittsburgh, Pa.; Hinkley & Williams' works, Boston, Mass; and a hundred others in all parts of this country and Great Britain, and in Continental Europe. In short, the Sturtevant blower is too generally known and appreciated to require special commendation.

The piston blower or blast engine is complicated and expensive to keep in order, and neither it, nor the ordinary fan blower, gives generally more than one pound pressure to the square inch, while this blower yields one and a half pounds, and is noiseless, perfectly balanced, and not liable to get out of order.

The case of the blower is composed of a series of circular arched sections, forming the periphery, and secured to the side plates by screws, these side plates being braced on on the outside by radial ribs to render impossible any expansion or springing by the pressure of air within. A central aperture is left in these side plate, as ordinarily, which is surrounded by a dovetailed concentric groove for receiving the bolt heads by which the tripod supports to the bearings of the shaft are held. This enables the arms of the tripod or brackets to be adjusted to accommodate the direction of the belt. About this circle or annulus, is formed a scroll-shaped recess intended to diminish resistance.



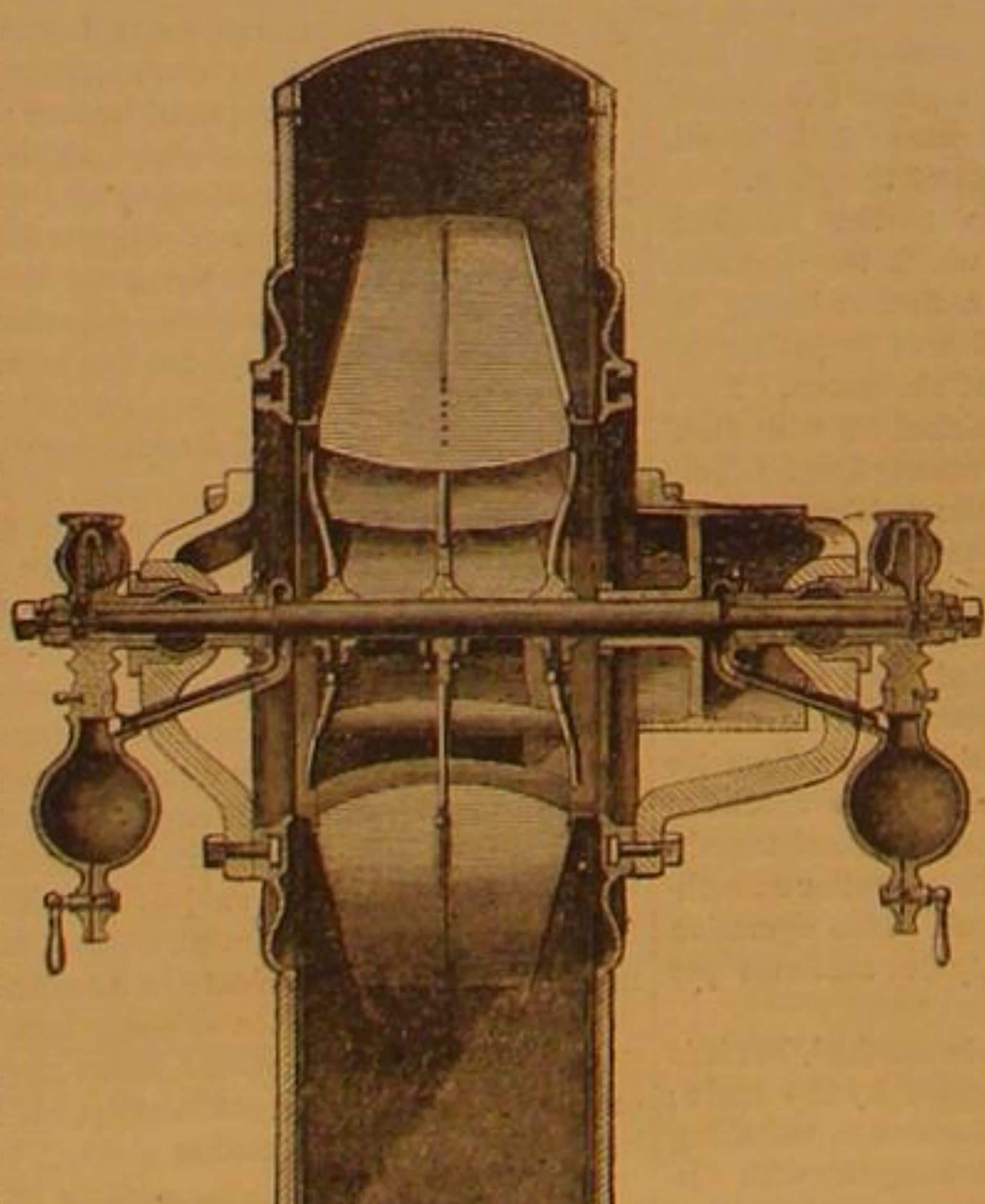
Entered according to Act of Congress in the year 1868, by B. F. Sturtevant, in the Clerk's Office of the District Court of the District of Massachusetts.

STURTEVANT'S PATENT PRESSURE BLOWER.

The fan or wheel is made with curved floats, to revolve in the direction of their convexity, and of the form of the cross section of a frustrum of a cone. They are connected to curved annuli, or plates, fixed to two yoked wheels, one on either side the fan, intended to form a partition between the air in the case and that in the wheel and to direct the air properly out of the periphery of the wheel. The large air space around the periphery of the wheel affords room for the free discharge of the air from the wheel and prevents noise, which is generally occasioned in common fan blowers by the wheel running in too close a proximity to the inside of the case. Each of the radial arms running from the wheel shaft is fastened to the base of one float, the apex of which is connected to the next arm by a stay or rod, thus holding the floats or blades in place, and preventing longitudinal expansion under high speeds.

The shaft is supported in tubular bearings, sustained in the projecting brackets by means of ball joints, by which the bearings are enabled to accommodate themselves to the shaft while in revolution. The shaft is inclosed in a tubular bushing set up by a screw at its end to adjust the fan transversely. This may be removed to replace the bearing when too much worn. This bushing is bored or cored longitudinally, sufficiently far to meet radial openings opening into an annular chamber, which is fed with oil by the oil cup and wick seen in the enlarged vertical section of bearing and oiler. Around the bearing is a recess in the box which is stuffed with sponge, designed to absorb a portion of the oil that passes from the reservoir at the smaller or outer end of the journal to the larger or inner end. This is sufficient to lubricate the bearing, if, from inattention, the oil cup or reservoir is not kept properly supplied. At the inner extremity of the journal an annular recess in the box receives the superfluous oil and conducts it by a pipe or passage to a receiver under the oiler, from whence it may be drawn off and saved, and prevented from reaching the inside of the case and fouling it, an annoyance that greatly impedes the velocity of the blast in ordinary blowers. This result is further secured by the driving pulley, the web of which is solid and effectually prevents the passage of the oil to the inside of the case. Where the blower case is seated on a bed, as in the engraving, an adjusting screw is attached by which it may be moved to take up the belt. The eduction pipe of the case extends into a stationary flange or collar supported by a standard erected on the base. The pipe for the conveyance of the air to the furnace or forge is fitted upon the collar, and thus the movement of the blower case may be made without disturbing its position. These blowers are used extensively for producing a draft to carry away the dust, hot air, and impure odors from manufacturies of various kinds.

Patented in the United States, England, France, Belgium, and other foreign countries; the home patents being dated Oct. 29, 1867, and Feb. 2, 1869. All orders should be addressed to B. F. Sturtevant, patentee and sole manufacturer, 72 Sudbury st., Boston, Mass.



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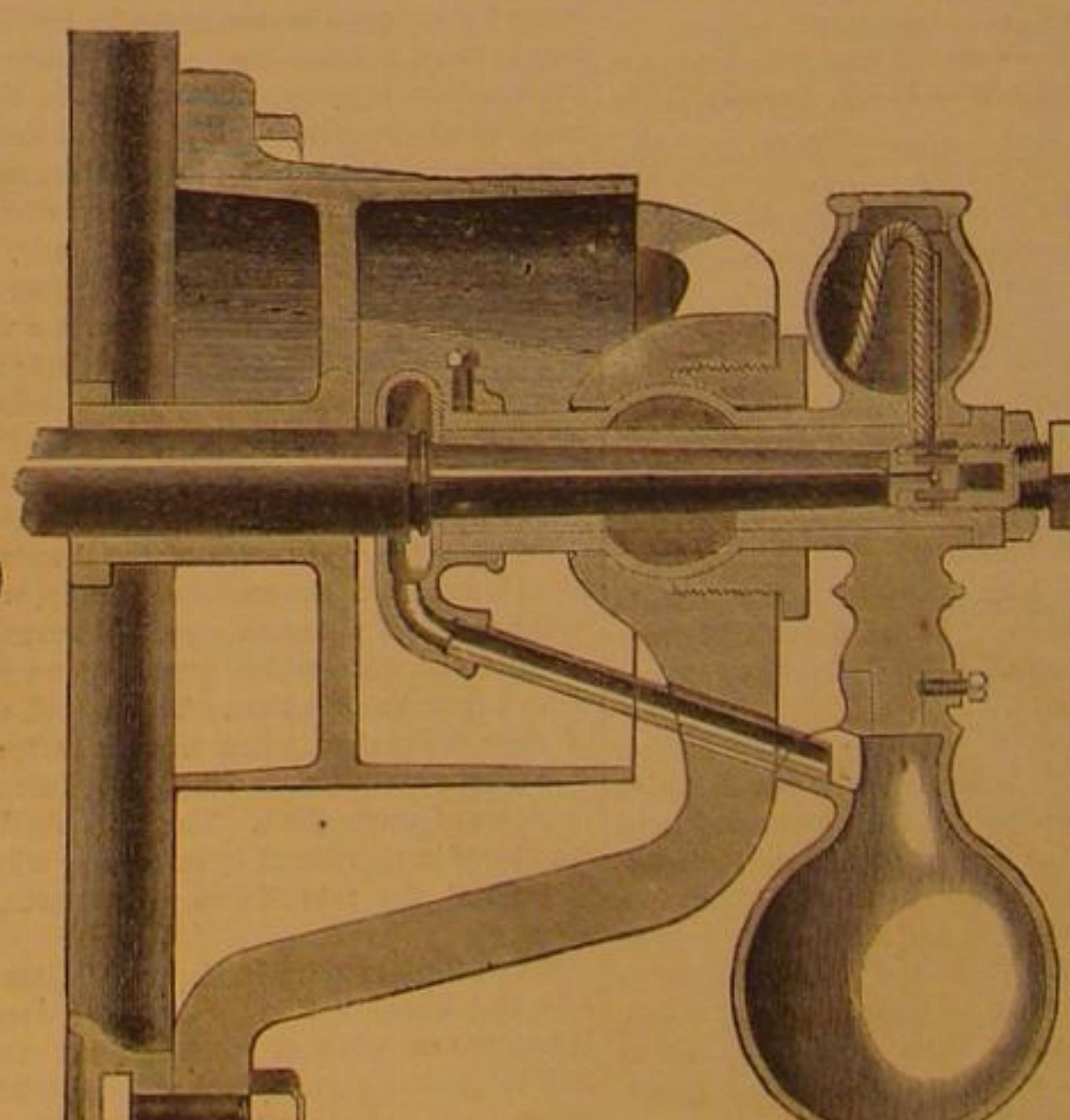
TRANSVERSE VERTICAL SECTION.



Entered according to Act of Congress, in the year 1868, by B. F. Sturtevant, in the Clerk's Office of the District Court of the District of Massachusetts.

VERTICAL SECTION OF BEARING AND OILER.

Lenses versus Drills.

Mr. John Thompson, of Philadelphia, writes us in regard to the substitution of lenses for drills in perforating rock for blasting and other purposes. He thinks them specially applicable to the Darien excavations for the proposed ship canal, as that locality, being tropical, he thinks, affords greater facilities than more northern localities for the object in view. We have not room for the dissertation upon burning glasses, by which he ingeniously supports his novel proposition, but recommend it to the consideration of those who are interested in the great work alluded to. Could not the same principle be applied to fusing the gold in quartz rock, so that it would run out of a hole and be caught in buckets like maple sap? If any of our readers try the experiment, we shall be pleased to learn the result.

A Natural Mechanic.

From the Rev. Chester Briggs, Columbus, Ohio, we have received a communication inclosing a photograph, the facts of which may interest our readers. It seems that a colored boy about 18 years old, and a slave from birth until liberated by the late war, has built, during his evenings, after laboring daily as a woodchopper, a model of a locomotive and tender combined, about four feet in length and well proportioned. The model is of wood, built by the aid of a few tools—ax, saw, auger, and knife—in the woods, without patterns, drawings, or any instruction whatever. Judging from the photograph, the expression of favorable opinion as to workmanship, and the natural qualifications of the young man, given by experienced mechanics who have examined the model, is fully sustained. The machine is a working model, although, of course, without steam, and is perfectly proportioned in every part.

Mr. Briggs desires to interest liberal men in the case, and procure for this representative of an oppressed race, an education which shall fit him for the sphere for which he seems natûrally designed. We commend the case to the lovers of the race. Communications may, we presume, be addressed to Rev. Chester Briggs, Columbus, Ohio.

A new animal, to which Prof. Huxley, of England, has given the name of Bathybius, has been discovered during the operations of laying recent submarine telegraph cables, and other submarine engineering operations. It is gelatinous in consistence, and seems to reside at the bottom of the Atlantic, extending over miles of surface, yet a continuous living mass. It is believed by physiologists to be a gigantic protozoan, and the lowest form of animal life to be found upon our globe. It is also supposed to possess the power of drawing subsistence direct from the mineral world like plants. It is, no doubt, destined, in its classification, to become a bone of contention among naturalists, occupying, as it does, the boundary line between the vegetable and animal world. We may, therefore, expect the Bathybius to occupy a conspicuous place in zoological literature from this time forth.

A New Single-Wheel Velocipede.

The single-wheel velocipede, which we noticed as an imaginary propeller in our issue of February 13, has received a palpable body and a "local habitation and name" by the enterprise of the inventor of the machine herewith represented. Queer and odd as may be the appearance of the concern, Mr. Hemmings says that his son of thirteen years old propels one of these machines of five feet diameter at a pace that keeps up with good roadsters and does not allow them to pass him. As will be seen by the engraving, the grayhound is not able to keep up with the rider of this novel velocipede, but his master is compelled to reverse his motion and throw the driving friction wheel back of the center of gravity.

The main wheel has a double rim, or has two concentric rims, the inner face of the inner one having a projecting lip for keeping the friction rollers and the friction driver in place, each of these being correspondingly grooved on their peripheries. The frame on which the rider sits sustains these frictions wheels in double parallel arms, on the front one of which is mounted a double pulley, with belts passing to small pulleys on the axis of the driving wheel. This double wheel is driven, as seen, by cranks turned by the hands. The friction of the lower wheel on the surface of the inner rim of the main wheel is the immediate means of propulsion. A small binding wheel, seen between the rider's legs, serves to keep the bands or belts tight. The steering is effected either by inclining the body to one side or the other, or by the foot impinging on the ground, the stirrups being hung low for this purpose. By throwing the weight on these stirrups, the binding wheel may be brought more powerfully down on the belts. Over the rider's head is an awning, and there is also a shield in front of his body to keep the clothes from being soiled by mud and wet. When going forward, the driving wheel is kept slightly forward of the center of gravity by the position of the rider. By this means the power exerted is comparatively small.

A patent for this unique vehicle is now pending through the Scientific American Patent Agency. Further particulars may be obtained by addressing Richard C. Hemmings, at 294 Wallace street, New Haven, Conn.

HEMMINGS' UNICYCLE OR FLYING YANKEE VELOCIPEDE.

TREMPER'S THREE-WHEELED VELOCIPEDE.

The velocipede mania seems to possess all classes, and our inventors are not slow in replying to the demands made upon their ingenuity by improving and perfecting the new vehicle.

The one herewith illustrated appears to be simple enough to be built cheaply, safe enough to commend itself to beginners, swift enough to suit the daring, and convenient enough to meet the demands of short and tall, obese and lean, young and old.

It is a three-wheeled affair, the front wheel being the driver, as usual, but placed so closely to the axle of the hind wheels as to give as complete command over the motions of the machine in turning corners as the two-wheeled velocipede. From the axle of the hind wheels rises a bow-shaped brace, to which is bolted one end of the reach, which is of two parallel pieces of wood, bolted together and embracing between them an upright standard, or pipe, terminating in a forked brace in which the driving wheel turns, and having directly over the wheel's rim, where the forked braces unite, a brake-shoe, or pad. The weight of the driving wheel and part of that of the rider are sustained by a spiral spring, as seen, which serves as a buffer in passing over obstacles. The steering bar—a prolongation of the forked brace—passes up through the hollow standard and is furnished with handles, as usual, on the top. The seat or saddle is sustained by two cast-steel springs secured to the front of the reach by means of a cross strap, or block, and bolt, so that it is easily adjusted further front or rear. So the upright tube may be adjusted in the reach to suit the length of legs or arms of the rider.

This velocipede was designed by John Tremper, who may be addressed at Wilmington, Del.

VELOCIPEDE NOTES.

The velocipede has now fairly conquered the entire world. San Francisco has entered the lists, and we understand has produced some improvements that will, when they are made public, reflect credit upon the ingenuity of its inventors. So much for the Far West. What of the Far East. The Shanghai *News-Letter* states that velocipedes have ceased to be a novelty in the streets of that city, and even the untaught Chinese ponies have become so used to them that they are no longer frightened. A correspondent sends us also a copy of the Japan *Gazette*, published at Yokohama, which states that a gentleman well known in that settlement lately took a trip to Yeddo on a velocipede and returned in safety, meeting with no annoyance on the way. Rumor says that many persons have sent home for these locomotives, and that some are on their way out. Civilization no longer advances solely with the locomotive and telegraph. It has called to its assistance the velocipede.

We find in "Howitt's Visits to Remarkable Places," published in 1841, a description of a velocipede seen by the author during a visit to Alnwick Castle, Northumberland, England, as follows:

"Among the curiosities laid up here are also two velocipedes—machines which, twenty years ago, were for a short period much in vogue. One young man of my acquaintance rode on one of these wooden horses all the way from London to Falkirk, in Scotland, and was requested at various towns to exhibit his management of it to the ladies and gentlemen of the place; he afterwards made a long excursion to France upon it. He was a very adroit velocipedian, and was always very much amused with the circumstance of a gentleman meeting him on the highway by the river side, who, requesting to be allowed to try it, and being shown how he must turn the handle in order to guide it, set off with great spirit, but turning the handle the wrong way, soon found himself hurrying to the edge of the river, where, in his flurry, instead of turning the handle the other way, he began lustily shouting 'woh! woh!' and so crying plunged headlong into the stream. The Duke's horse, which is laid up here for the gratification of posterity, was, I believe, not so very unruly; yet I was told its pranks caused it to be disused and here stabled. It is said that the duke and his physicians used to amuse themselves with careering about the grounds on these steeds; but one day, being somewhere on the terrace, his grace's Trojan steed capsized, and rolled over and over with him down the green bank, much to the amusement of a troop of urchins who were mounted on a wall by the road to witness this novel kind of racing. On this accident the velocipede was laid up in lavender, and a fine specimen of the breed it is. I asked the old porter if the story was true, but he only smiled and said, 'Mind! I did not tell you that. Don't pretend to say, if you write any account of this place, that you had that from me.'"

We herewith reproduce an engraving of an ice velocipede from *Harper's Weekly*. The frame of this velocipede is built like those which are commonly in use in this city. It has but one wheel, steered with a bar as in the land machine, but armed with sharp points to prevent its slipping. Instead of the two wheels behind are two sharp steel runners, like those attached to the ice boats. This velocipede is propelled with astonishing rapidity.

The *Troy Times* gives the following description of a vehicle which has appeared in that city: "The latest vehicular invention (but still like a great many inventions of the earliest known) is the property of a Milesian of this city. He calls it a 'wheelosipede.' It has the advantage of only needing one wheel, and is not only the most useful of this description of vehicle, but absolutely the safest. The operator rests his feet upon the ground, and guides the arrangement by means of a pair of bars. It is capable of being used in building operations, for the conveyance of earth, sand, and such materials, and will doubtless supersede in the end, all the bicycles and other descriptions of velocipedes."

A machine somewhat like the one described by our Trojan cotemporary, has been seen several times in the streets of this city. It has, however, three wheels, one in front and two behind. It is propelled precisely in the same manner as the above, but in turning the front wheel is raised from the ground by the operator throwing his weight more upon the bars than he does at other times. It needs no bridging of gutters; in fact, it is capable of surmounting such obstacles as curbstones, etc., and is coming rapidly into use by porters in delivery of goods.

But while some laugh, as they will at everything new, there are many who regard the velocipede in its improved form as worthy of permanent favor, and who, like ourselves, predict that it will secure it. Whoever visits one of the large halls devoted to instruction in the art of managing these beautiful little vehicles, will, we think, after beholding the ease with which they can be propelled at a rate double or treble that at which a person could walk, admit the decided gain in the application of muscular power attained by them. The following letter, from a scientific gentleman of Philadelphia, is *appropos* to this point and contains good suggestions:

MESSRS. EDITORS:—So far as I have seen or heard of these machines, the real power of the human frame is not brought out by them. They therefore do not afford the measure of use, nor exercise, nor pleasure which they might with a different application of force. Any one who will take a seat in a chair and move his lower limbs as they are exerted in the present velocipede, will see how little power there is in the muscles that are thus brought into play. Nature is a good teacher, and she does not teach us to expect much from that movement. The momentum derived from the *weight* of the human body, is a large force; but it is entirely wasted while the man sits down. The arrangement ought to be such as to place him in a standing position, between the fore and aft wheels, his feet playing upon treadles which connect with the axle of the front wheel, his hands upon a cross-bar with the same connection, serving both as a rest and a guide to direct the course. This would be a natural walking motion, but with a vast increase of ease and speed over an ordinary walk, unaided by the rotation of wheels.

If too long continued, it would indeed become merely a treadmill; and, therefore, to afford a pleasant change, the power of the *arms* should be brought in. This force is also lost in the present machines. Let there be, then, a seat provided, into which, after the operater has made his first mile or two by his feet, he may settle down, throwing his feet off the treadles, and, grasping another cross-bar having the crank movement, work himself along, and guide himself pretty much as the children's machine is propelled. When tired of this, the rider would be ready to stand up again.

This double gear would add somewhat to the expense, but a man can afford to pay pretty well for a horse that never eats, and the progress of manufacture must bring down the price. Let this noble recreation, in which a man can be rider, horse, and groom, be open to every suggestion of improvement.

W. E. D.

Another correspondent from Hudson City, New Jersey, has been searching the Scriptures for information upon the velocipede movement, and finds that the cherubs mentioned in the first chapter of Ezekiel were velocipedestrians, and moreover that their machines were of the one-wheeled variety. Acting upon the hint thus obtained he proposes a one-wheeled velocipede, and communicates his ideas to us as follows:

Messrs. Editors:—I notice that all the world have got their heads turned with this new velocipede movement. "I, too," have conceived an idea—a one-wheel idea—suppose a wheel any hight, with broad tire, say twelve inches, of india-rubber, set vertical to a weight hung from the axle to counterbalance the weight of the person sitting over the wheel. The weight might be a sort of pocket, and would answer to carry necessary articles; the other adjuncts might be the same as are usually applied to velocipedes. Of course I do not contend for speed, as a light weight would, I presume, be preferable for that; but for comfort, stability, and ease I fancy it would be the *ne plus ultra*.

I am aware of some drawbacks, but not more for this wheel than for any other of the same kind. I have not made up my mind as to the best method of going up hill. I fear some difficulty. As for going down hill, there would be no trouble. Indeed, I flatter myself it would be "quite a velocipede." Another trouble would be, how to turn a corner. Difficulties of this sort would, I am sure, be got over by dexterity.

It is a rule laid down by some, that nature is the best teacher; if so, a one-wheel movement is rather *outre*. I really cannot call to mind any one thing in nature that would instance a single movement, they are all in pairs or corresponding parts. Still, we are not left without example of a one-wheel movement two thousand years ago, shadowed forth in the dreams of Ezekiel, a true velocipede and locomotive, for the life was in the wheel (see Ezekiel i.); but Ezekiel must have seen the difficulty of turning a corner, for he makes his wheels go straight forward.

This one-wheel movement of Ezekiel is certainly a very bold idea, unless we are to suppose such a thing actually was in use, or that he had seen such a thing. Dreams, as a usual thing, partake of the ideas impressed on the mind by actual existences,and in all the visions (excepting the wheel) the actual existences of nature or art are represented only in contorted or exaggerated fancy. It is true history nowhere mentions a one-wheel movement, but that is not strange; history does not detail the minutiæ of every day life. But if there were no such thing, then, when we consider the many different modes of progression adopted by the ideal, such as clouds, vapors, foam of the sea, the winds, etc.; or the chariots, animals, etc., of less poetic fancy from which he could have chosen a symbol, we are left in wonder at the adoption of so singular a movement for the cherubs.

Even admitting the astronomical allegory, which undoubtedly it is, it does not lesson the singularity of placing living symbolical beings, having feet for progression, upon one wheel instead of two.

W. K. Wyckoff of Ripon, Wisconsin, also writes us that he has demonstrated the working principle of a new velocipede having two wheels which will not overturn even when not in use. It has an adjustable chair seat, for ladies as well as gents, also children, *not astride*. Power is *all* applied both with hands and feet—a shifting axle that can be changed without dismounting, from alternate or reciprocating movements to continuous or simultaneous. Guided with the body of the rider. He wants some one to take hold of the improvement with him.

Messrs. Crawford & Co., of Philadelphia, have opened a school at the N. E. corner of Eighth and Callowhill streets. They write us that they use a bicycle, steered by the hind wheel, it, instead of the fore wheel, being pivoted and connecting with the steering lever by rods running back and connecting with a lever which turns this hind wheel. These rods cross under the saddle, thus rendering the operation of the steering lever the same in direction as in other machines. By this arrangement at least two important advantages are gained; 1st, the front wheel is held steady and does not have a tendency to swing in alternate directions in obedience to the pressure of the feet upon the stirrup rod, in consequence of which fact the lever is much more easily held steady, and beside the wheel never turns against the legs of the rider.

The latest use for which the velocipede has been proposed is that of the *Republican* published at Stillwater, Minn. It says, "We are going to have one if it takes the last cent. We find it necessary to have something of the kind to drum up a few delinquents on our books, and we are too poor to buy a horse, hence this recourse to our ingenuity.

"Needn't laugh, reader, we are going to do it, for we know we can. Any one that can run a newspaper without money can do it, and we have done the latter, any way."

PATENTEES who desire to have the patent claims, as they are issued, can obtain them by inclosing $5 to the Commissioner of Patents at Washington.

Correspondence.

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

How the "Scientific American" is Regarded at the South---Manufacturing at Petersburgh, Va.

Messrs. Editors:—The annoucement in your paper, of January 30th, that you intend to devote attention during the year to the subject of architecture and building, and the article with illustrations in your last must be very acceptable to the readers of the Scientific American, and will render it all that the artisan in any department can desire. During the last twenty-four years, the paper has disseminated a vast deal of valuable information, which would not have otherwise reached the mechanics of the country. Its present size and large circulation are proofs that your efforts to make it the paper of the age are fully appreciated. The writer was among the first subscribers, and I have oftentimes found in a single number ideas and information of far more value to me than the price of a years' subscription. Members of my family, not interested in mechanical science, find also interesting reading in it. This being the general verdict, I cannot be accused of attempting a puff, and being unknown to you, have no interest to do so. But I do want to impress upon the minds of the mechanics, here South in particular, the advantage it will be to them to take such a paper as the Scientific American, if they wish to improve and keep posted in all that pertains to the industrial arts of our country.

Many of your readers are interested in the publication of statistical information of manufactures, such as the report of the President of the Augusta (Ga.), Manufacturing Company, given in full in your paper last month. I noticed it created a little stir here among the manufacturers. Stockholders in the cotton factories went into an examination of balance sheets, etc. There are seven or eight cotton manufacturing establishments in this city and immediate vicinity, which run about 25,000 spindles. Most of them appear to have done well, as I have found by inquiry, and while in search of information to meet the challenge of comparison from Georgia, I visited the Petersburgh Cotton Mill, which has the reputation of being one of the most complete and well-conducted cotton factories in the South. It has been in operation nearly three years, and is filled throughout with improved machinery of American build (except a few pieces). It works admirably, and the excellence of the goods made does credit to the skill and superior taste of our American machine builders. I was told that a gentleman interested in importing foreign machinery, after seeing this factory, said it was folly to send abroad when such results can be obtained from our own make; and I was permitted to copy from the Petersburgh Cotton Mill books the statement which follows. Your readers will readily see that the profits and the success of the Augusta company is not an isolated case. I did not ask permission to state the aggregate amount made by this Petersburgh mill, as those interested, from figures here given, will clearly see that the Petersburgh Cotton Mill has done better in proportion to size of mill.

I find the cotton cost the Augusta Company 19·98c. per lb., and as for wages paid, it cost them to manufacture 7·4c. per lb., or 2$\frac{1}{4}$c. per yard. Their loss from waste was a little over 13 per cent.; their repairs cost over $\frac{1}{8}$c. per lb.

I also find the cost of cotton used by the Petersburgh Cotton Mill, during same six months, to be 19·99 cents per lb., and as for wages paid cost to manufacture per lb 6·3 cents, and per yard, 1·53 cents; the loss from waste 10$\frac{5}{8}$ per cent; cost of repairs, $\frac{1}{9}$ cent per lb.; expense account I find smaller in proportion at the Petersburgh Cotton Mill; taxes and other outside items it is fair to presume, are equal at both places. The Augusta Company, as reported, run 505 looms, employing 507 hands, and turn off an average of 49 yards to a loom daily. This Petersburgh mill has 100 looms, employing 98 hands, and has averaged 46 yards to loom per day. The difference in production of looms is accounted for thus: The Petersburgh Cotton Mill makes fine sheetings, shirtings, and drilling, closer picked, and command a higher price consequently per lb. It may appear singular to see the price paid for cotton so near the same; it is owing partly to both parties using cotton grown near their respective factories; and although the Augusta Company got a better grade of cotton there at same cost, their loss in waste for working it exceeds that of the Petersburgh Cotton Mill by nearly three per cent, which is no small item when cotton is high. From the foregoing statements it must be evident that the Petersburgh mill has a larger margin for profits, with the exception of ·01 part of a cent per lb. in cost of cotton, every item in the process of manufacture is below that of the Augusta Company's report. I state this not in a disparaging spirit, as this statement shows the Petersburgh Cotton Mill must have a great advantage from having all new machinery in use. With this fact before us, I am not disposed to pluck the laurels from the brow of our Augusta friends.

Manufacturing South can be made a decided success. The fine water powers in this place, Richmond and Fredericksburgh, together with our climatic advantages, are unsurpassed, and offer rare inducement to men of capital and enterprise to settle in this old State of ours.

VIRGINIA.

Petersburgh, Va.

Gas from Gasoline more Dangerous than Coal Gas.

Messrs. Editors:—A correspondent (page 86, current volume), wants, "in justice to the gas machine men," an article on gas machines, or gas from gasoline. As I myself am the patentee of such a machine, and a very successful one, too, I might be supposed to belong to this class of men, and, therefore, cannot be suspected of being prejudiced against the gas machine. However, in justice to the truth, I must confess my conviction that the gas from gasoline produced by the so-called gas machines, is more dangerous than coal gas; this conviction is founded on theory and experience. The latter I need not describe; we see almost every day in the papers the results of explosions produced by the intermixture of air with the more volatile products of petroleum, supposed to be removed by the distillation, but which are seldom sufficiently removed to make the so-called kerosene perfectly safe, or what is worse, they are, for their cheapness' sake, intentionally introduced by the dealers or retailers. The explosions produced by coal gas are comparatively very rare.

The causes that gasoline vapors are more dangerous than coal gas are the following:

1. It takes a less quantity of gasoline vapor to make with air an explosive mixture than it takes of coal gas.

2. As gasoline vapor is heavier than air, it will fall to the ground and collect there; coal gas, however, is lighter than air, therefore it will ascend, and be more likely to escape through the air holes of the cellar, which are always at the top, and therefore give no occasion to the heavy gasoline vapors to escape, therefore they will collect.

3. Coal gas will be detected by a strong smell, even when the smallest quantity is present a fraction of one per cent makes its presence known, therefore, long before the mixture with air has become inflammable. Gasoline gas has not the disagreeable smell, the smell is also weaker, and is so customary in localities where this gas is used that its presence does not arouse any suspicion.

4. The coal gas has a strongly diffusive power in relation to atmospheric air, and will therefore be soon removed from the source where it escapes; gasoline gas, on the contrary, has little of this diffusive power, and may form an invisible layer of say one foot high at the bottom of the cellar, which may remain there for hours, when the air is not stirred, very slowly mixing with the air, and ready to explode at the moment of contact with light.

We must, therefore, conclude that to diminish the danger of explosions when gasoline gas is used, open air holes must be made at the bottom of the room, and when coal gas is used, at the top, in order to provide an effective means of escape to explosive mixtures of gas and atmospheric air. In both cases, however, openings are also required to admit air at the opposite ends of the room, in order to replace the escaping gas by fresh air, in short, all rooms where there is danger of collecting inflammable gases or explosive mixtures of these gases with atmospheric air, should be thoroughly ventilated.

P. H. Vander Weyde, M. D.

New York city.

To Ascertain the Power of a Microscope.

Messrs. Editors:—If your correspondent G. W. M., by his question on the 108th page of your issue of February 18th, means to ask how to find what is the power of a given microscope, the following method may assist him: Place a small object of known length, say from 1-20th to 1-50th of an inch on the stage of the microscope, and looking at this through the instrument with one eye, with the other look at a foot rule held at the level of the stage. With a little practice both may be seen at once, when, by dividing the space apparently occupied by the object on the scale, by the known length of the object, the magnifying power will be obtained.

If the power is very high, the best object to use is a glass micrometer, which may be purchased for a dollar or two, of any optician, with lines ruled on it to hundredths or thousandths of an inch.

The power of a telescope may be found in a similar manner by nailing a square of white paper an inch in diameter on a board fence or the side of a building. This square, seen through the telescope, will cover a considerable space on the fence as seen by the unoccupied eye.

This distance reduced to inches will show the power of the instrument as before. A little difficulty is sometimes found in seeing both objects at once, but this is soon overcome, and the method has the great advantage of not requiring the separation of the lenses or any knowledge of the mode of their combination, which varies with different opticians.

Middletown, Conn. W. E. Hulbert.

A California Saw Mill.

Messrs. Editors:—Possibly the following may be of interest to your readers; at least it will give them an idea of our sawing business here. Our engine is 14 inches diameter by 18 inches stroke, running 130 revolutions per minute with 90 pounds of steam; built extra strong with large bearings; fly wheel 8$\frac{1}{4}$ feet diameter, weight 3,350 pounds, carrying a 16-inch rubber belt direct to saw arbor. Boilers, two in number, 42 inches diameter by 20 feet long, with two 14-inch flues. Smoke stack 30 inches diameter and 40 feet high.

This engine drives one 60-inch and one 50-inch double circular saws, one edger, one siding saw, one cutting-off, one picket, one lath saw, Hendy's gang saws (four to six) running horizontal and cutting into the solid log from one to four inches, one Putnam planing machine, beside grindstones, sawdust carriers, engine lathe, and wood-turning lathe. With full head of steam all the above machinery can be driven at the same time.

The edger and planing machine are driven from a shaft coupled on the end of the main saw arbor. We use Dunbar's piston packing and the Giffard injector. Our object in arrangement of machinery was to have as few parts as possible, and everything direct acting. We cut 6,000,000 feet of lumber per year and have done so for the past two years. Five-sixths of it were redwood, and one-sixth pine which is very hard. The redwood is quite soft, something like eastern pine. We use Spaulding's patent tooth saws, excellent for the sort of timber cut here.

T. Reeves.

Little River Mill, Little River, Mendocino Co., Cal.

The Crank and Rotary.

MESSRS. EDITORS:—My proposition to you in my first communication was substantially as follows: 50 square inches of piston area and 80 lbs. of steam, 24-inch stroke, 100 revolutions per minute, creating 4,000 lbs. exertive force, less the friction, at the point of half stroke. What number of square inches of piston area will equal the above, if applied six-sevenths of the entire circle, under same pressure of steam and same leverage of crank? In your editorial comments on page 54, current Vol. SCIENTIFIC AMERICAN, I find, first, that if I had been a constant subscriber to the SCIENTIFIC AMERICAN I would not have attempted to enter upon a path which has proved a failure to so many others, etc. In reply to this I would say that I now have, bound and unbound, in my house more volumes of the SCIENTIFIC AMERICAN, than the editor would be able to stand under if they were piled upon his shoulders. Second, that I imagine a rotary engine. Here I beg to differ from you; I have a perfect engine all finished. Third, the steam must impinge upon the crank with equal force at every point in its revolution; here again I differ with you. I said six-sevenths of the entire circle. There again you say this cannot be done with the crank. If I apply the force 12 inches from center of main shaft and continue that force as stated above, is it not virtually a crank? You seem to have no faith in the crank's ever being economically superseded; I think different. If you have a propulsive force at the point of half stroke in the above described engine, you certainly have no force at either of the dead centers. Suppose 4,000 lbs. exertive force is applied to the crank pin at half stroke (12-inch crank) now drop this crank pin just half way towards the center of main shaft, and still keep the same force applied. Is it now any better than 2,000 lbs. would be at its original position, and again has not a crank more power, going from the center to the point of half stroke, than it has going from the half stroke to the opposite center? I consider eight twenty-fourths of the entire circle of the crank of very little value; three twenty-fourths going to the center and one twenty-fourth from it; this makes one-third very little power one-third medium, and one-third most energetic. You saw fit to publish my first communication, and criticised it most severely. Why not publish this one and give me a chance to be heard? In due time I expect to call at your office with my engine, and I anticipate no difficulty in convincing you that the favorable notice which you have promised is richly my due.

J. W. H.

Decorah, Iowa.

[We are ready to be convinced, and sincerely hope our correspondent may succeed in his attempt.—EDS.

Is the Yearly Number of Earthquakes Increasing?

MESSRS. EDITORS:—I have inquired of the *Tribune* if earthquakes were increasing, and how many such phenomena did occur during the past two years. It is mum. The same inquiry put to the *Evening Post* brings out an indefinite and unsatisfactory reply. You said in your January number that 1868 would be remembered as "the earthquake year." So says the *Boston Traveler*, etc. Now MM. Perry and Ansted record 3,240 earthquakes in fifty years, from 1800 to 1850, which is on the average nearly sixty-five each year. At this annual ratio some over 1,000 must have occurred in the sixteen years from 1850 to 1866. As over 7,000 are tabulated previous to 1850, the number down to 1866 must be considerably over 8,000. I now inquire how many earthquakes occurred in 1867? How many in 1868? What is counted as an earthquake, the whole number of shocks including the first principal shock, or is each distinct shock recorded as one earthquake? Nineteen shocks occured in California—were these nineteen earthquakes or one earthquake? Is there no record of the number occurring in America since its discovery and settlement? Is there no beam of information in the United States on this subject? Prof. E. Merriam, when living, kept a yearly record of these mundane convulsions: is there any kept since his death? My meager records give over thirty-five hundred shocks as occurring during the years 1867 and 1868. Are earthquakes increasing or not? What says the scientist? Light is wanted by

D. T. T——R.

Rouses Point, N. Y.

[No very definite and reliable data as to the exact number of earthquakes which annually occur can well be obtained. Any slight convulsion of the earth's surface must be counted as an earthquake, but when a rapid succession of these occur, we believe they are counted as one. The reason why 1868 will be remembered as the "Earthquake Year" is because the convulsions were so general, violent, and disastrous, rather the number which took place, which may or may not have been greater than during many previous years not particularly noted for earthquakes.—EDS.

Good Remedy for Seasickness.

MESSRS. EDITORS:—In your number of Nov. 25, 1868, are seven rules by which seasickness may be avoided, which you credit to the *Medical Gazette*. If I had to go through the programme laid down in that article I think I'd stay at home, as the pleasure of a sea voyage would be materially diminished. I've been a traveler for twenty years, by sea when necessary, and always more or less seasick the first day or two out, with the exception of one voyage. A day or two before leaving Paris, in Dec. 1867, a friend asked me if I was subject to seasickness. I answered, "Yes, a little." "Well," said he, "try my remedy for it. It may prevent it entirely, and is at least worth trying." He handed me a dozen "little pills" of the homeopathic "persuasion," and said, "Here are two doses, take one dose when you get under way at sea and, if nausea comes on, take the second. If the two doses don't stop it there will be no use in taking more." I stuck the little paper of pills in my vest pocket and came over to England and spent the Christmas holidays at an English "home." If you ever spent Christmas in England, you know that the second rule laid down by the *Medical Gazette*, namely, to "eat a hearty meal before going aboard," has to be practiced pretty often during Christmas week. I thought myself in fine condition to be very seasick and expected to pay old Neptune dearly for the good things taken at my friend's table. I sailed from Liverpool on the 29th Dec., and when fairly in the channel took my first dose of "little pills." The wind was fresh and New Year's morning dawned with as terrific a gale as ever swept the Atlantic. Another met us on the 6th of Jan. 1868. Every passenger on board but myself was more or less sick. I escaped entirely through both storms, and if the "little pills" were not the cause I am at a loss what to ascribe it to. They were *sugar of milk medicated* with *petroleum*—nothing more. If voyagers try the *Gazette's* seven rules and they fail, I would advise a trial of the "little pills" next time, for it will take all one voyage to go through the rules.

Yellville, Ark. E. A. PHILLIPS.

The Blue Color of the Skies.

MESSRS. EDITORS:—Rays of light, however brilliant they may be, are invisible when they pass through a dark room, or any other dark place, unless they are arrested, held, and refracted by some substantial thing. Now, the space intervening between the earth and the sun, and all other spheres, is an absolute void, excepting the distance reached by the earth's atmosphere. Through this immense space, and through all space not occupied by matter, the sun penetrates with its bright rays; yet, utter darkness—intense blackness—occupies and prevails in all this void, because there is no matter or thing therein to arrest, hold, and refract rays of light. Were it possible that one could be placed at a point midway between the earth and the sun, nothing could be seen other than spark-like spheres bedecking a black firmament in all directions. All these, even the sun, would appear only as bright balls of light, with or without radiation, just as light appears to the mariner through the darkness of night. The appearance of this darkness—this blackness, is modified to our sight here by the halo caused by refracted light from objects immediately surrounding us on the surface of the earth and from vapors in the earth's atmosphere; and it is this modified blackness which causes the apparent blue color of the skies.

RICHARD A. WHITMORE.

Poisonous Odors.

L'Union Medicale is very positive on the subject of the deleterious action exercised by the perfume of flowers, especially such as lilac, jessamine, hyacinth, tuberose, on persons who have the imprudence to leave them at night in the bed-chamber. The more or less fictitious cases of suicide and assasination, which have been related under this head, should not induce us to doubt the reality of the asphyxiating power possessed by strongly smelling flowers. Certain odoriferous fruits share the same deleterious property.

We read in the *Union Bourguignon* of Dyon, that a grocer who had slept in a small rooom, in which the contents of three chests of oranges had been piled up, was found asphyxiated in the morning, and was only resuscitated by the most energetic treatment.

Our readers will also recollect a case not long since reported of death resulting from the odor of quinces, which occurred from sleeping in a room where a large quantity of them were kept.

Extinguishing Kerosene Lamps.

MESSRS. EDITORS:—I see in answer to correspondents, No 8, present Vol. you advise your readers that "to extinguish a kerosene lamp safely, turn the wick down until the flame is low and blow under the glass." You will find it requires pretty strong blowing and some practice, in order to do it quickly.

Permit me to submit the following which is free from danger, and is instantaneous: Turn the wick up so as to produce a large flame, but not high enough to smoke; then blow squarely *across* (not down) the top of the chimney.

In explanation: A strong current of air across the top of the chimney produces a corresponding current up through the chimney; the latter current lifts the flame off from the wick and instantly extinguishes it.

Atlanta, Ga. J. C. DODGE.

Power Required is as the Square of Velocity.

MESSRS. EDITORS:—T. W. Bakewell, on page 119, current Vol., says it would require eight times the steam to propel a boat from New York to Liverpool in five days that it would if 10 days were occupied," in the preceding sentence, however, he says, "it would require only four times the coal or steam." These two statements are so diametrically opposed, that however plain the solution may be to him, it is difficult for any reader to ascertain his real meaning. He admits that resistance for any given distance increases as the square, and of course four times is correct. The source of his error is that while he counts double the velocity of piston and wheel, he omits the important item of the time occupied, being only one-half, which he would not have done had he been a more accurate

MATHEMATICIAN.

The Hydrogen Gas Theory.

MESSRS. EDITORS:—Under heading "The Hydrogen Gas Theory," on page 86, current volume of SCIENTIFIC AMERICAN, you take issue with the views expressed by your correspondent (W. H. L.), and your principal ground or argument for so doing is that hydrogen gas is not explosive or in other words, cannot be ignited without the presence of oxygen. So far I believe you are entirely right for combustion is nothing more than the chemical combination of two or more substances, and cannot take place independently of atmospheric air, oxygen gas, or any of the other bodies usually called supporters of combustion. But, admitting that there can be hydrogen gas in steam boilers at any time, there must be also oxygen gas, for the hydrogen gas must necessarily have been generated from the water or steam, and its equivalent of oxygen must have been created at the same time, for it is well known that water cannot be decomposed and one of its component gases extracted from it, as it were, without at the same time liberating or generating its equivalent of the other gas, that is, for every part (in weight) of hydrogen gas generated, there must also be generated eight parts of oxygen or *vice versa*.

The theory advocated by your correspondent—the explosion of boilers by the presence of hydrogen gas—does not seem at all improbable to me, and this I say with due deference to your opinion. My reasons are these:

Electricity is manifested during changes of state in bodies, such as evaporation, condensation, etc. There must be, then, more or less electricity evolved by the generation of steam in the boiler. Electricity, on the other hand, has the power, is in fact, one of the most powerful means under known circumstances of decomposing water; it does not, therefore, seem unreasonable to suppose such conditions may exist in the case of a boiler with a heavy head of steam on, perhaps very little water in, and an intensely hot fire under, and that a large quantity of electricity may be evolved, and a certain quantity of water or steam thereby decomposed. If this should be the case (and it might probably be experimentally ascertained) the smallest leak in one of the flues or in the boiler itself, might cause the oxygen or hydrogen gases to be ignited, and the necessary consequence would be a terrific explosion.

The above views, although presented in a crude manner, may perhaps account for those extraordinary cases of boiler explosion, which to the present time have remained, as far as I know, without satisfactory explanation.

St. Louis, Mo. R. DESBONNE.

Product of a Charcoal Furnace.

MESSRS. EDITORS:—It may be a matter of interest to your readers to know what can be done, or, more properly, what has been done by a charcoal furnace.

Our furnace, at this place, a hot-blast charcoal furnace, meaures 40 feet in height and 9½ feet in the bosh. During the month of January last, it made 784 tuns of pig-iron, of 2,268 lbs. to the tuns. This, I believe, is about 25 per cent more than any other charcoal furnace has ever produced in the same length of time. If I am in error in regard to the comparative amount, I hope to be corrected and informed of the name of the furnace and the date of manufacture.

This result has been attained without in any way forcing the furnace and on 106 bushels of coal to the tun of iron produced.

EDWIN HARRISON.

Irondale, Mo.

What is the Reason?

MESSRS. EDITORS:—What is the reason that a 3½ or 4-inch crank pin is strong enough for an outside connected engine, while an inside connected one requires a six-inch pin, and often breaks them of that size? Who knows?

EGBERT P. WATSON.

New York city.

A Report on Ordnance.

The report of the Joint Committee on Ordnance, made in the Senate by Mr. Howard, condemns both the Rodman system of gun making, adopted in the army, and the Dahlgren system, which is used in the navy. These systems, the report says, while partially successful with smooth bores, have uniformly failed as rifles. Several of the Rodman guns have burst spontaneously while being finished in the founderies. The Committee recommend that no more of them be purchased, but that experiments be made to determine upon some more reliable system of fabrication. The failure to secure better guns heretofore, the Committee attribute to the fact that officials have been gun inventors and have secured by their influence the adoption of their inventions without regard to merit. The report is accompanied by a bill which places all experiments and the selection of arms for both army and navy in the hands of an Ordnance Commission, to be composed of three army and two navy officers, and two civilians eminent for their attainments on the subject. The bill abolishes the Ordnance Department of the army by merging it in the artillery. This report assumes unusual importance in view of the fact that the Ordnance Department has asked for appropriations to purchase over 1,900 heavy guns made on the Rodman plan, for armament of the fortifications.

VALUE OF PATENTS IN ENGLAND.—An English circular states that an American patentee of a device for dressing millstones by a revolving diamond, has realized over one million dollars; and the estimated value of the patent for the next ten years is put down at five millions. This statement is put forth by a patent agency in London for the purpose of exciting English business, and may therefore be accepted with some grains of allowance, but we do not doubt that there are many American inventions that would pay well in England and France if properly managed.

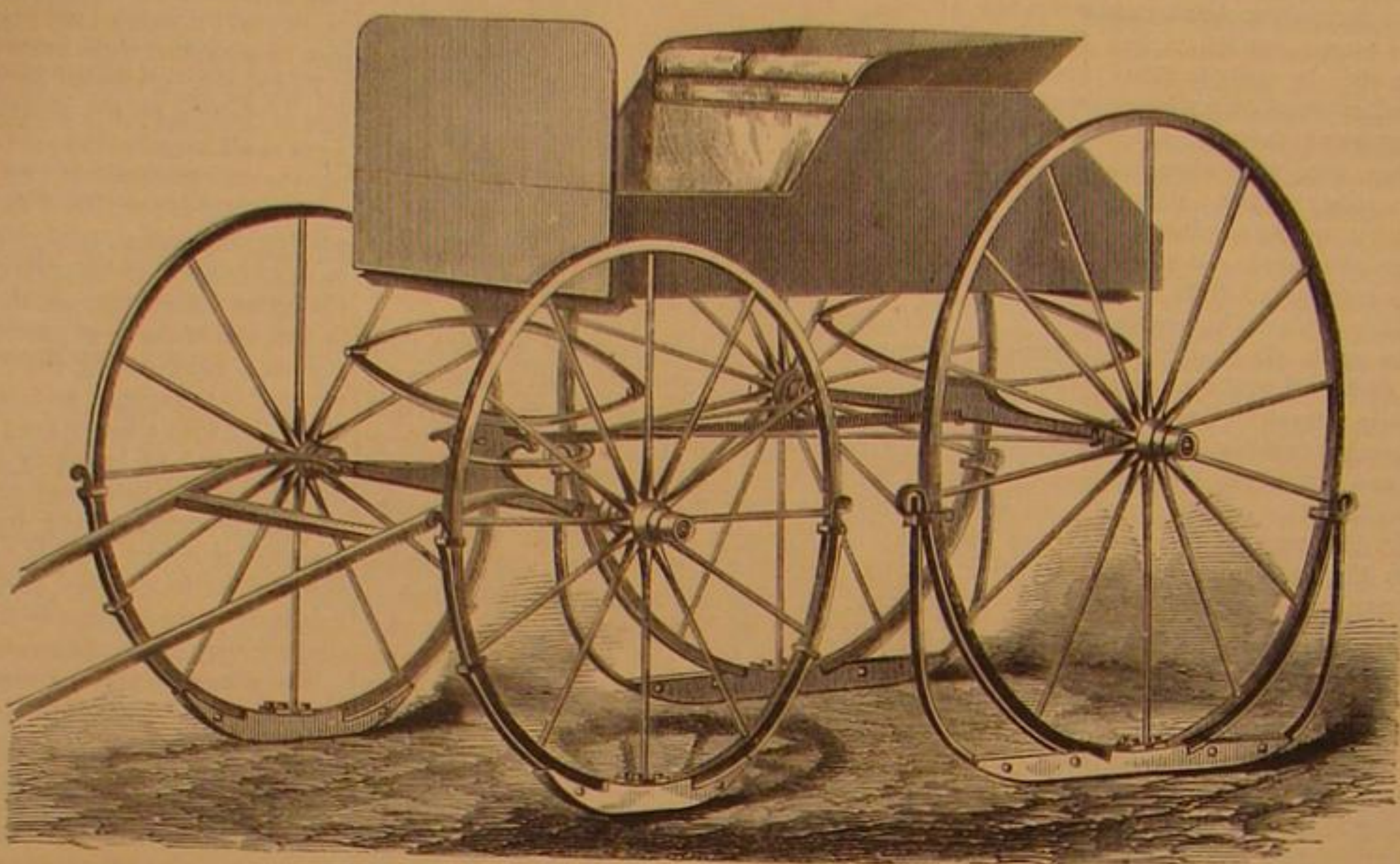
IT is announced that the trains on the Central Pacific Railroad have been delayed in the Sierra Nevada mountains by one of the most terrific snow storms known in that region. The snow belt extended over eighty miles; the usual distance is about fifty. The snow-sheds withstood the storm, where completed, and furnished full protection to the road.

Improved Device for Converting a Wheeled Vehicle into a Sleigh.

It is not uncommon to see a sled attachment to wheeled vehicles suspended to the axletree and held from turning by means of a strap or chain-lock; but as in this case the resistance to transverse motion must be borne entirely by the axle, which is only a single point, the strain is too great at this single point.

The engraving gives a view of a plan that seems to avoid this objectionable feature. It consists simply of a shoe attached to each wheel by means of spring straps held to the felloes of the rim by ordinary clips,and secured at their centers by a plate embracing one spoke, secured by bolts or screws to the projections of the shoe, which lap on each side of the wheel rim. For purposes of appearance and additional security from turning, spring braces,as seen on the hind wheels, may be added, although, if the shoes are made long enough, there can be no danger of their turning, or of the wheel revolving. It will be plainly seen that the strain is divided by being placed on the rim rather than the axle of the wheel. The device can be readily attached or detached as may be desired, and when detached is so compact and portable that it can be carried in the boot, or under the seat of the vehicle, to be ready for use when needed.

This device was patented through the Scientific American Patent Agency, December 29, 1868, by Joseph Stonebanks, who may be addressed at College Point, Queens county, N. Y.



STONEBANK'S PATENT SLEIGH ATTACHMENT.

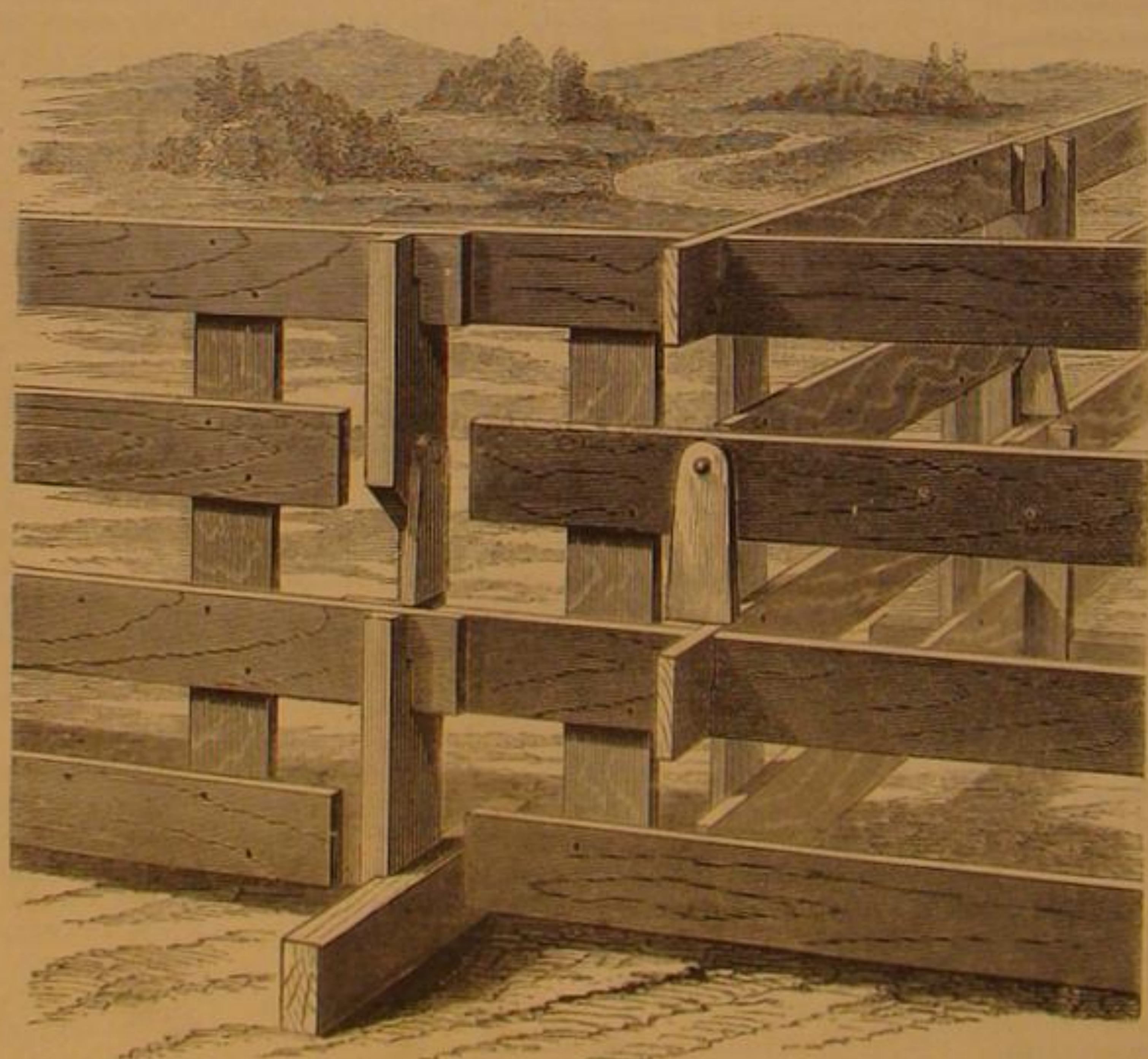
Improvement in Portable Fences.

For herding cattle and other stock, and for other purposes, a temporary and movable fence is a great desideratum; one that can be easily placed in position and taken down,light,strong,and portable. Such is that shown in the accompanying engraving. It may be made, as represented, of horizontal strips, or in the form of a picket fence, as desired; in the latter case, the stringers being mortised,or cut, as are the first and third bars in the horizontal strip fence.

The posts are uprights, of board or plank, recessed at the top and at a point to receive one of the lower bars, and nailed or screwed to a horizontal piece resting on the ground. The bars of the fence sections are mortised or halved,and fit into the corresponding recesses of the posts, as plainly seen in the engraving. They are firmly held by means of simple buttons secured to the bars, one to each section. The sections may be set either in straight lines or at angles of any grade, as required, to inclose a plot of ground rectangular, or of any form approaching a circle.

The portability and the ease of management of this fence is quite obvious.

Patented through the Scientific American Patent Agency, Dec. 29, 1868. Communications should be addressed to Coolidge & Rollins, Jersey Mills, Pa.



COOLIDGE & ROLLINS' PATENT PORTABLE FENCE.

Discoveries in the North Sea.

The results of the dredging expedition recently made by Dr. Carpenter and Professor Wyville Thomson in the North Sea are very interesting. In the first place they discovered that at 200 fathoms,at least, animal life exists. At nearly a mile deep it is abundant; at that depth animals are as well developed as at the surface, beside they are not confined to the lower groups; the whole of the invertebræ are well represented. They also found that the temperature is not dependent on depth; even in places quite contiguous to each other the temperature was not uniform. In the deep waters between the Faroe and Shetland Isles, and to the westward, they find a formation being deposited which is exceedingly like chalk, and contains similar or identical fossils. The fauna differed somewhat with the temperature. The bottom of the sea to the westward of the islands named consisted of ooze, or shining mud, of the consistency of thick treacle, of a pale grey colour; this was full of sponges of the most extraordinary kinds, and of very singular forms. During six weeks the explorers only got five days of good weather.

TRANSMUTATION OF METALS.

Long ago when chemistry had not yet attained the full stature of a science, the belief that there existed in nature a substance—a veritable philosopher's stone—which would transmute all the baser metals into gold, was generally entertained by the alchemists. It is no wonder that such an opinion should have obtained. Phenomena just as remarkable were known to occur, and still daily occur, in the experience of every chemist.

The alchemist, although knowing nothing of the elements as we now recognize them,regarded the baser metals as containing the same elementary substance as gold, associated with impurities which they had not yet learned to separate from them, and at this day no chemist is so bold as to dispute the *possibility* that the noble metals are composed of substances to be found yet in the baser ones. The late lamented Prof. Faraday professed his belief in the possibility of transmutation, and even asserted that he had experimented with a view to discovering a method whereby it might be accomplished.

Although in the present state of science no chemist can say that lead and gold do *not* contain the same elements, the general belief is that they do not; and we do not assert that any believe that the baser metals can be converted into gold or even into other metals, by direct chemical reaction. There is good reason to believe, however, that many substances, which hitherto have been treated as elementary in character, simply because it has yet been impossible to *prove* them otherwise, will yet be found to be compounds.

The peculiar property, called by chemists, allotropism, is one of the foundations of this belief. That substances essentially the same should be capable of existing in several distinct conditions possessing qualities not only widely different, but sometimes directly opposite, is contrary to all analogy, and it is admitted as a fact only because it *appears* at present to be true. Charcoal, plumbago, diamond, are called allotropic forms of carbon, because all that chemical science has hitherto been able to accomplish is to show that they contain the substance we call carbon. Whether carbon is a compound remains to be proved. That it is not a compound seems, according to all present knowledge, impossible to prove.

But carbon is not alone in its manifestation of this remarkable property. Sulphur, phosphorus, silicon, boron, oxygen, are in the same category. Hydrogen, hitherto suspected of being a metal, comes out now in its true colors, and has received the new name of hydrogenium in consequence.

Ammonium, known to be a compound, also has the characters of a metal, as is most strikingly shown by its amalgamation with mercury. Such a fact, known as it has been for a long time, to chemists, must have had its influence in restoring the belief that the transmutation of metals is possible.

We believe that we express the common opinion entertained by chemists in general, when we say that this consummation is no longer regarded as a chimera, but as something to be expected.

We are, doubtless, on the eve of great discoveries. The attention of chemists has been somewhat diverted from the study of inorganic chemistry by the alluring field of organic research,from which a most abundant and rich harvest of knowledge has been already reaped. We see signs of a reaction in this respect, and shall look for great results during the next decade.

The investigations of the real cause of the phenomena of allotropism we believe to be a promising one, and the discovery of that cause would mark the commencement of an era in science brilliant beyond the power of conception.

Patent Office Contract Swindle.

We have before us a printed statement by Messrs. James, Norris & Peters, to explain their action as a Committee appointed by the Secretary of the Interior to examine into the truth of the charges made by the Commissioner of Patents in relation to the swindling stationary contracts to which we referred in a recent number. The committee attempt to exculpate themselves by referring to the peculiar order of the Secretary, which limited them to certain particulars and without the power to coerce the attendance of witnesses, or to pass such as did appear under oath. As might be expected under such circumstances, the report of the committee amounted to nothing, and it was simply a waste of time to set them at work merely to find out that Ex-Commissioner Theaker, and Acting Commissioner Stout were paying Dempsey & O'Toole about the same prices for similar articles supplied by Philip & Solomon. The Committee did not go into an investigation of the market value of the articles supplied in the schedule. Neither did they undertake to find out that the articles had all been delivered. It seems to have been the intention of the Secretary of the Interior to make a farce of this investigation, and he appears to have known how best to reach that result.

Patent Case---Giffard's Injector.

A case is now on trial at Philadelphia, before Judge Cadwalader, for an infringement of the Giffard injector patent, against Samuel Rue and others.

The bill sets forth that Henry Giffard invented an improvement in a feed-water apparatus for steam boilers, and on the 24th of April, 1860, obtained a patent for the sale of it in the United States. On July 7th, 1860, he sold the patent to the plaintiffs, Sellers,who thereupon had exclusive right to it, and they complain that the defendants have wrongfully obtained a patent for a similar injector,which is simply an infringement upon their patent, and are manufacturing and selling the same; for which reason they prayed the Court to grant an injunction against the defendants to restrain them from proceeding in the manufacture and sale of the said articles. The defendants answered and maintained that the patent under which they claimed was genuine, and the article they sold was an invention entirely distinct from that of the plaintiffs. This is an interesting case, and we shall watch for the decision.

Stephen Pearl Andrews, of New York, asks our opinion of his so-called science of "Universology," the title of a book he is about to publish. From what we gather from his prospectus—the only means of information at hand—we can give no opinion, as that merely states that the author has discovered the foundation of all science, or the science of sciences, and also the elements of a universal language. What benefit either of these discoveries—if made—can be to the race, we cannot conjecture. We hope the book itself will be clearer than its prospectus.

Commissioner Foote, in his endeavors to bring about reforms in the Patent Office, should not forget that the greatest source of annoyance to applicants for patents, at the present moment, is the vexatious delay attending the examination of cases. The Patent Office cannot realize the highest hopes of its patrons until examinations are more energetically disposed of.

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Contents:

(Illustrated articles are marked with an asterisk.)

TRIALS AND TRIUMPHS OF INVENTORS.

"Necessity is the mother of Invention," saith the proverb. In many cases, the meaning of this pithy sentence has been reversed and Invention has proved the mother of Necessity. Of all the long line of illustrious men, whose works still live, and will continue to exert their beneficial effects upon the welfare of mankind, none have been so sorely tried, none have achieved more glorious victories, than inventors. High birth, extensive learning, or even wealth, have not purchased immunity from superstitious persecution, from contumely, nor from poverty and neglect.

The age has past when a Galileo was brought before an ecclesiastical bar to answer for heresy, because, forsooth, he had demonstrated a great truth which conflicted with the superstitions of the time; but the difficulties resulting from limited means and facilities, from deficient material, and the demands upon time and mental energy in the struggle for subsistence still remain to embarrass and fetter the modern inventor. Many are unequal to the contest and cease further effort, leaving, doubtless, valuable ideas partially developed, which from thenceforth become to them like household treasures forever buried out of sight.

We have seen many such in our experience and expect to see many more. We sympathize with, while we admire them; for be it remembered, that fidelity to an idea once conceived is a mark of true greatness. Your great inventor makes pecuniary reward always secondary. The successful demonstration of the truth of his conception is the paramount motive with him. It was, we think, the great architect, Inigo Jones who remarked regretfully in his old age, that he never had done his best; that there had always been some limiting circumstance of cost, or site, or dimensions, or whim on the part of others, that had confined his powers, so that the beautiful and masterly conceptions of which he felt himself capable had never been produced.

We have said that many inventors are unequal to the contest with adverse circumstances. That this is so does not prove them all weak. Many are strong, but cruel circumstances are stronger. Pallissy, whose fame rests no more upon his successful imitation of the Italian pottery, than his long struggle through sixteen years of unprecedented trial, would have succumbed to blindness had that been added to his other misfortunes of imprisonment and poverty. Though he burned his chairs for fuel to bake his experimental wares, and suffered pangs which only those can feel who hear the unanswered cries of loved ones for bread, and yet held out stoutly, he might have given up in despair, if an angry nerve had risen in rebellion against overtaxed energy, and added the physical pain of *tic doloreaux* to his sum of afflictions. Arkwright, first barber, finally a knight of the realm, capable of separation from a wife who, lacking faith in his ideas, and lacking household comforts which a more close application to shaving would have procured, broke his models, might have yielded to other obstacles.

It is worthy of note, however, that those who have been most sorely tried and who have been able to endure to the end, have triumphed most signally. Of such many illustrious modern examples, as well as those of a past age, might be cited. One learns something of the value of pluck in reading the histories of these great men, who engaged not only in a conflict with untoward circumstances, with doubting cavillers, and personal afflictions, have with one hand held them all at bay, while with the other, they have wrested from Nature a response to their demands. Even the demand upon physical courage has been met by this class of men as much as by any other. There are men who walk our streets with faces scarred by explosions, with mutilated limbs, and broken constitutions, resulting from voluntary risks taken in the pursuance of some new truth that should benefit their race.

What space would be required to record the sublime achievements of these much tried and long suffering benefactors of mankind. The civilization and even Christianization of the world has been forwarded as much by their aid as by any other human means.

It is to them we owe our cheap Bibles as well as cheap transportation; the means of rapidly distributing the bread of life to those that sit in darkness.

In the future the names of these shall stand like fixed stars perpetually shining, while those brilliant meteors which have dazzled the gaze of past and present ages, by the red blaze of military glory, shall have gone out forever.

THE DARIEN SHIP CANAL---WATER COMMUNICATION BETWEEN THE ATLANTIC AND PACIFIC.

Hon. Caleb Cushing has returned from the capital of Colombia, the most northern of the South American republics, whither he was sent by the Department of State, and the draft of a treaty he there negotiated for the right of way, etc., of a ship canal across the Isthmus of Darien, or Panama, is now before the Senate for ratification.

The project of uniting the two oceans by a cut across the Siamese-twin ligature that unites the two great western continents and divides the two great oceans is not a new or a modern one. In 1528 a route for a canal was examined by two Flemish engineers by the orders of Philip II. of Spain, but finding insuperable difficulties the project was abandoned. The advantage of a short cut between the rich silver mines of Mexico and the home treasury were palpable and recognized by the Spanish government; but the enterprise was lacking, and the absorption of the public revenues of the kingdom by constant wars made the attempt impossible.

In England the project was revived in the latter part of the 17th century. In 1826 Domingo Lopez of New Granada explored a route for a canal 44 miles in length between Panama and Portobello. Another survey was made in 1827 under the orders of Gen. Bolivar by two English engineers, Lloyd and Falmark, who concluded their labors in 1829. The only result of their labors was proving the possibility of either a canal or railroad between Panama and Chagres.

In 1843 the French government sent out MM. Garella and Courtines to make explorations. They reported in favor of a canal passing under the dividing ridge of the Ahogayegua by a tunnel 125 feet high from water level and 17,390 feet long. With the disastrous expedition of Lieut. Strain, probably all or most of our readers are familiar. The sum of these and other explorations, having a similar object in view, has been to show the possibility, if not the feasibility, of a canal across the isthmus. Through this connecting link, however, the backbone of the great double continent stretches, and at no, as yet ascertained, point offers what is termed a "pass," a depression sufficiently depressed to admit of a canal without very heavy rock cutting. In the case of a railroad, slight and even considerable grades may be surmounted, and where the carrying of these grades is too costly a tunnel may be driven through; but a railroad tunnel scarcely twenty feet wide is possible, while one to accommodate ships, like that proposed by Garella is a feat at which even modern engineering may stand aghast. A canal, however, is proposed, and one without tunnels.

Several months ago Secretary Seward came to New York City and held a conference with some of the most enterprising business men of the city in relation to this subject, which resulted in the formation of an association with Mr. Peter Cooper at its head, intended, if the reports were favorable, to be organized into a company. Returning to Washington Mr. Seward sent Mr. Cushman to Bogota, and the result is a treaty by which the republic of Colombia concedes to the United States the exclusive right to construct an inter-oceanic canal across the Isthmus of Darien at any point which may be selected by the United States. The Colombian government cedes six miles of land on each side of the canal, one half for its own benefit and the other for that of the party undertaking the construction of the work. The Colombian government is to receive ten per cent of the net income for the first ten years, and the canal is paid for twenty-five per cent of the net profits. The treaty is to be ratified by the United States within ten months.

We ascertain from Mr. Cooper that the entire length of the proposed canal will not exceed thirty miles, with a good harbor at each terminus and only about seven miles of rock cutting. There are several points on either shore which may be selected, but none have yet been decided upon. Whether either of those already surveyed will be selected or a new survey made, is not yet determined. We are assured, however, that upon the ratification of the treaty, measures will at once be taken to begin what will, when completed, be the greatest work, in importance, of this century.

HORTICULTURAL PROTECTION.

The sole ground upon which the modern patent systems of our own and other countries stand, is the right of the inventor to share more largely than any other individual in the benefits of his invention. The world at large may enjoy to any extent the fruit of his labors, but it must reward him for the benefits he has conferred upon it. Such reward is not a gift but the wages of his toil. He has earned, and is therefore entitled to it. The principle upon which copyrights are given to authors is the same. There is, however, a class, who conferring most substantial benefits upon the public, are yet unprotected in their rights to compel those using the results of their labors to make them an adequate return. We allude to horticulturists.

That they might no longer be deprived of protection, a committee of ten were appointed by the Lake Shore Grape Growers Association to draw up and present a memorial to Congress, which was accordingly done in December 1868, praying that letters patent might be granted on new horticultural varieties, and that purchasers of said varieties be allowed to propagate for their individual use only, during the time of the right granted, and that a gift of plants propagated from said variety by any other excepting the originator, be considered a breach of law similar to that of a sale.

This was opposed by Mr. P. Barry, in a letter to the *Rural New Yorker*, Jan. 9th, 1869, who asserts that by the nature of the case, the originators of new varieties are already sufficiently well protected, and that the determination of the patentability of a variety would be impracticable. He asks, "Who would be the judge as to whether an article would be worthy of a patent? I have known people to claim old and well-known fruit as seedlings. I have known instances, I might say by thousands, of people supposing they had produced or discovered a valuable fruit, when, in fact, it was utterly worthless."

Now, as Mr. Barry is himself a horticulturist, and has shown by the paragraph just quoted that *he* is able to discriminate between good and bad, and old and new, we respectfully submit that he is himself a competent judge as to whether an article would be worthy of a patent, and we make no doubt that when the United States desires to obtain a competent examiner for this department, numerous applicants equally as well qualified will be forthcoming.

Mr. Barry regards it as being in the power of the originator of a valuable species to propagate it at once largely, and thus to secure the benefit of his discovery by large sales at the outset. Now it has often been, within our personal knowledge, that new varieties have been obtained by surreptitious means, and when the originator supposed himself ready to enter the market, after large expense and trouble, he has found himself anticipated by others and his hopes of profit suddenly blasted. Many such men, are unable from lack of means, to widely disseminate a new variety until some unscrupulous and wealthy nurseryman has been able to scour the field, thus robbing him of his reward with perfect impunity.

It is also contended that the granting of patents to this class of claimants would retard the introduction of new varieties to some extent, and this is regarded as being a strong argument against the proposed plan. We admit that the granting of patent rights and copyrights does retard the general seizure and appropriation of the fruits of other men's toil; in this respect it is like the laws imposing penalties for theft, highway robbery, and burglary. As well might a man propose the expurgation of all these laws from our statute books, as to adduce such an argument against the justice of protecting a class of earnest workers who are contributing so much to the welfare of mankind as horticulturists.

People are not generally aware how long and arduously a man must work in this field before he arrives at a result worth perpetuating; what numberless experiments must be peformed; what years of anxious waiting and constant care must elapse before he can hope to secure any reward; what endless and trying disappointments lie between him and the goal he would reach.

We believe the enactments of the law desired by the petitioners a matter of simple right and justice, and we are pleased to learn that the committee to which the bill was referred has reported favorably upon it. Now let Congress act upon it speedily and put an end to the system of "grab," which has hitherto been the course which the public has pursued towards this important and numerous class of benefactors.

We believe no man uninfluenced by mercenary motives can view this question in any other light than one of simple and common justice. The stimulus which would be given by such a law to the origination of choice varieties to take the place of those which have run out, would be prodigious, and would confer incalculable benefit, not only upon a worthy and industrious class of people but upon the country at large.

COLORING OF MARBLE AND OTHER BUILDING STONES.--- A NEW PROCESS.

The coloring of marble has been practiced a long time, but heretofore its results have not been altogether satisfactory. It has always been considered a difficult process, and the piece of marble to be colored required great care in its selection, that it might be free from spots or veins. Heat, to open the pores of the stone so as to prepare the stone to receive the colors, has been considered essential. It is true that many of the colors used would strike into the texture of marble while cold, but they would not sink to a desirable depth and the color remained upon the surface.

The colors required and the vehicles employed to convey them to the stone have been numerous and various. Horses or dogs' urine with lime and potash, lye from wood ashes, alcohol, oily liquors, spirits of turpentine, and wine, are menstruums which have given some of the best results. The coloring matters used have been drawn from the animal, vegetable, and mineral kingdoms. Among them may be enumerated, extracts of saffron, buckthorn berries, alkanet root, dragons' blood, logwood, cochineal, gamboge, vermillion, yellow prussiate of potash, etc., etc.

The art of marble staining has been generally kept a secret by those who have achieved the greatest success in it, and has proved a lucrative employment.

We have said that the results attained have not proved en tirely satisfactory. Either the colors have proved fugitive or changeable after a time, so as to impair the effect of the com binations in which they were placed, or the stone would not bear polishing after the process, or was only a surface color, liable to wear out when used for floors, steps, or in other situations whereit was liable to attrition.

The superior advantages of a method which should impregnate the entire mass, as much in the interior as the exterior, and before polishing as well as after, are too obvious to be dwelt upon.

Such a process is claimed by Dr. J. A. Weisse, of this city, who has for a long time been experimenting in this field. We have not been put in possession of the details of this process, but we are able, from personal observation, to testify as to the results obtained. The stones are colored through and through, not only marble but even granite having been subjected to the process with entire success. We are informed that the process is based upon the discovery of a new mordant, which has such an attraction for stone that when a large block has only its base immersed in the solution, it will in a short time become permeated through the entire mass, increasing its specific gravity, and filling its pores so that the absorption of water is rendered very much less when subsequently exposed to the weather, than previous to the operation. When it is remembered that the absorption of water, and its subsequent expansion by frost is one of the greatest causes of disintegration in our climate, it will at once be seen that an important collateral gain is obtained by the new process. Marbles colored by this process in the rough, afterward take a most beautiful polish, and specimens of dolomite polished previous to coloring have their polish hightened by it.

An effort has been made in this process to imitate the means by which the valuable colored building stones naturally receive their color. No attempt is made to produce a given pattern, or to imitate any particular effect. The general tone of the color is produced and the variations of the tints are determined by the structure of the stone itself. In this way the effects are all natural. We have before us a piece of marble picked up in a common marble yard, of a cheap variety, one side polished the other rough, which has been colored by this process, and which the best judges invariably pronounce to be genuine Sienna marble.

The colors produced include the entire range of tints, and the veins and spots which develop themselves in marble, which previous to the operation is pure white, are surprising and beautiful. The cheapest grades of stone are thus rendered ornamental and desirable, and the combinations rendered possible by this discovery must arrest the attention of architects. We do not exaggerate when we say that some of the most excellent specimens of natural stones, celebrated for their beauty, seem dull in their colors when placed by the side of those prepared by this process. Their adaptation to church architecture, as well as the adornment of private dwellings, will be admitted by all who inspect them.

MANUFACTURE OF ARTILLERY POWDER IN ENGLAND.

The manufacture of this powder has hitherto taken place in the Royal Laboratory, Woolwich, and in comparatively small quantities; arrangements will, however, soon be perfected at Waltham Abbey, which will admit of its supply to any reasonable amount. The ingredients of gunpowder are sulphur, saltpeter, and charcoal. These undergo various processes of refinement, and are then mixed in definite proportions, and incorporated in a mill for several hours. At the conclusion of this operation the mixture is termed "mill cake," and has all the properties of gunpowder. In order to convert "mill cake" into granulated powder, it is necessary to pass the cake through a breaking-down machine, which crushes up all the large pieces, and reduces the powder to the form of "meal," in which condition it can easily pass between the plates in the subsequent process of pressing. The powder having arrived at this stage, is ready either for granulation or being converted into pellets. To be granulated, it passes from the breaking-down machine to the press; is there converted into "press cake," which is subsequently broken up by other machines into whatever size of grain is required. For pellets the "meal" is slightly damped with water to give the required hardness; the amount of moisture being about five per cent. It is then spread out on a molding plate, fitted with a number of small molds, each about one and one-fourth inches deep, so as to contain just sufficient "meal" to form a single pellet. The hydraulic piston, fitted with corresponding stops, then descends and presses the powder into the form of pellets. The next operation is drying, and the pellets are subsequently drummed, so as to round the edges, which otherwise might break off in transport and render the powder dusty. When completed, the pellets are in the form of disks, each being almost the size of a sixpence, and about half an inch thick, with a small cavity stamped in one face. They weigh from 85 to 95 grains, and their density is about 1·68 as compared with water.

The chief advantages expected to result from the employment of pellet powder may be enumerated as follows:—(1) Decrease of pressure in the gun; (2) greater uniformity in velocity; (3) less waste in manufacture, as the powder does not require granulation.

The introduction of pellet powder is of too recent a date to enable us to speak positively of its cost of manufacture as compared with ordinary powder. It is, however, clear that we must have a large description of gunpowder; and the question yet remaining to be solved is, whether it is cheaper to make this in the form of pellets or of a very large grained powder. The process of manufacture is the same for both up to the stage of "meal;" and as the production of pellets is attended with no waste, all the "meal being used up, we are inclined to believe that in the long run it will prove a cheaper article than a granulated powder, which yields a comparatively small amount of finished powder from an equal weight of cake, although the first cost for machinery may be greater in the case of pellet manufacture. Pellet powder is somewhat weaker than our ordinary rifle L. G., and experiments have given the proportions in the following table:

Gun.	Charge.	Nature of Powder.	Weight of Projectile.	Initial Velocity.	Remarks.
	lbs.		lbs.	feet.	
12-inch rifled	70	ordinary	600	1,312	A short gun in comparison with its caliber.
Ditto	67	ordinary	600	1,180	
Ditto	76	Pellet	600	1,180	
11-inch rifled	70	ordinary	530	1,255	
Ditto	73	Pellet	530	1,230	
10-inch rifled	60	ordinary	400	1,290	
Ditto	61	Pellet	400	1,300	
9-inch rifled	43	ordinary	250	1,340	
Ditto	45	Pellet	250	1,340	

In 1865–6 the Russian government instituted a series of experiments which resulted in the adoption of prismatic powder for their heavy ordnance. The Russian experiments were chiefly carried on by means of Rodman's pressure piston, and the results appeared to show—1. That the use of elongated cartridges is attended by a considerable reduction of pressure. 2. That with a proportional charge and diameter of cartridge, the pressure increases with the caliber or size of bore—that is to say, the same proportions which gave a pressure represented by 2,800 atmospheres in a gun of 6-inch caliber, gave 3,000 atmospheres in an 8-inch caliber. 3. The initial pressure of prismatic powder is considerably less than that of ordinary powder. Thus in an experiment with the 8-inch B. L. rifled gun, firing shot of 174 pounds English, the initial pressures were said to be as 1 to 2 when the velocities of the shot at the muzzle were equal. On the whole, however, it was found that a larger charge of prismatic had to be used to give the same velocity as ordinary powder, and the cost per round was thus increased about 15 per cent, although the actual price of the prismatic powder was only one halfpenny per pound more than the ordinary.

The Russian prismatic powder is chiefly made at Ochta, and undergoes a process somewhat similar to that followed in the case of the pellet. The broken down "mill cake" is first converted into an irregularly-rounded granular powder, the size of the grains varying from one-thirteenth to one-eighth of an inch in diameter. It then receives an addition of about 7 per cent of water, and is pressed into hexagonal prisms with a force of about 2,160 pounds per square inch, each prism containing 7 holes. On issuing from this press the prisms are of sufficient density and hardness to bear any ordinary handling. The next operation is the drying process; the prisms are removed to a lofty chamber heated with hot air to the temperature of about 100 Fah.; there, arranged on shelves, they are dried for about a fortnight, by which the moisture is reduced from 7 to less than 1 per cent. The powder is then considered fit for use, and is packed in cartridges of the required size. Care is taken in packing these cartridges to fit the hexagons evenly together so that the holes with which they are perforated may run parallel to the axis of the cartridge; the latter is made of cotton cloth or silk of such a size that the hexagonal prisms are all bound tightly together. The dimensions of each prism are as follows: Diagonally, 1·55 in.; faces, 0·77 in.; depth, 0·96 in. Seven holes of 0·2 in. diameter, arranged at a distance of 0·4 in. from centre to center; density, 1·66; weight, when dried, 600 grains. The prismatic powder lately adopted by Prussia is, we believe, similar to that tried in Russia.

IMPROVEMENTS IN ENAMELING IRON WARE.

The *Ironmonger* contains the following account of the improvements which have been made in this important branch of industry:

"Since the first introduction of this manufacture, now more than twenty years ago, and originating, if we are not in error, in Staffordshire, very considerable improvements have been made, both in the quality of the glassy covering and in the thinness and evenness of its application, and the force of adherence given to it, as applied upon the metallic surface, whether of cast or wrought iron. At first the coating was very thick, not far short of an eighth of an inch, very rough, and mammillated, far from free from minute cracks, and becoming discolored with rapidity over the fire, and quickly acted upon with acids, such as are used even in cookery. In fact, the glaze was a very fusible glass, so rich in lead and oxide of tin, and the temperature of application was so low, that adhesion was imperfect.

"Some promising improvements have been comparatively recently made, but unfortunately only partially described. M. Ballouhey has described (in 'Wagner's Jahres-bericht,' 1868) his method of enameling cast and wrought iron. The enameling, or glazing, by known methods of cast and wrought iron has been now for some time introduced, and the applied process consists in covering the previously well-cleaned surface of the metal when strongly heated with an easily fusible enamel or glass in the state of fine powder, so as to melt it upon the metallic surface, or burning-in the laid-on enamel or glass in a muffle or oven, whereby generally a better adherence is produced. A mixture of strongly basic silicates is used, so that this enamel cover cannot be very durable, but is easily affected by acid and saline liquids. In order to protect the iron in a more durable and complete manner, M. Ballouhey proposes a process quite different from this usual one. He brings the surface of the metal, which is provided with a protecting covering, in contact with a mixture of such substances as are used for the manufacture of ordinary white glass, and then heats the whole till the temperature of vitrifaction is reached. The iron in this case oxidizes superficially. The produced oxide of iron, probably having chiefly the composition of 'forge scales,' combines with the silicic acid of the glass, and an iron glass sub-coat of silicate of iron is obtained, which forms with the metal beneath one body. This protecting cover may be made either thin or thick; it is, however, preferable to make it only very thin, because it will then better resist inequalities of expansion without cracking or scaling off. Trials are said to have been made to glaze, according to this method, iron plates to be used for covering iron-built vessels, in order to protect the iron against the influence of the air and sea-water, and against the attacks of marine molluscs and the growth of plants.

"Now, although we are disposed to believe this last method embraces a real advance in enameling of iron, we are not so sure about the continued adhesion of the glaze; and, in any case, we pronounce the imagined application of such enameled sheets to the sheathing of iron-built ships a perfect delusion. The ingenious thought of so modifying the nature of the glaze, that the high heat needed to flux it shall superficially cover the previously cleaned face of the iron with an excessively thin coat of black oxide before the glaze has had time to melt, and the employment of a glass of such a nature as shall seize upon the outer face of this thin *parenchyme* of oxide, and convert it partially into silicate, so that, as a result, this coat shall act as a *tertium quid*, and a solder, in fact, between the metallic iron and the external glass of the glaze, is very probably found not difficult to realize. But the final success in producing a really durable enamel on a metal plate depends upon the fulfillment of one or other of two conditions: Either the glaze must be more or less flexible and *extensible* in all directions, so as to give with the expansion and contraction of the metal—just as the japan coating does upon an iron tea-tray; or glaze the must have a co-efficient of expansion within the range of temperature to which the enameled article is to be exposed, precisely the same as that of the metal, iron, or cast iron, etc., which it covers. Precisely, we say, for the extensibility of any glass of whatsoever composition is so small, so nearly insensible, in fact, that unless so, the cracking, and finally parting company of the glaze from the metal surface is only a matter of a short time and the degree of change of temperature undergone.

"Now, this will not be nullified by any more effectual soldering of the glaze to the face of the metal, by a thin interposed film of forge scale oxide, which, perhaps, passes insensibly, though through a very shallow range in depth of the iron, from ($FeO+Fe_2O_3$) on the outside to metallic iron in the interior, and from a basic glass of earthy and alkaline bases outside all, into silicate of iron, and of earthy bases at the junction with the glaze. Let the glaze itself expand more or less than does the iron, and it must and will split off sooner or later. The coating of glaze, if it cannot get loose at the metallic face, will do so in some stratum above that, slitting through the silicate of iron, or the glaze itself somewhere, and in planes more or less approximating to those of the iron plate.

"The first condition for success, then, in improving this manufacture, is to be found in the production of a glaze of exactly equal co-efficient of expansion with the iron; and for this end nothing would suffice, or be so rapid in yielding practical fruit, as a train of exact experiments upon the expansion of long rods of enamel of various, but known, composition, all being of such a nature as otherwise to permit their being fused on to iron. The material once obtained as respects this point, adhesion might be procured from glasses of probably very various composition, and from others than such basic glasses as require the production of the coat of oxide on the iron, or silicates of iron as the cementing intercoat. But yet it seems to us that this silicate of iron coat promises well, and would be advisably kept to. The main difficulty in every case, hitherto, has been to get the glazed coating fused and spread, without so far oxidizing the iron, by the prolonged and high heat to which it is exposed, that when again cold, the coating shall not fall off, bringing a thin scale of oxide of iron along with it.

"Now, it appears to us that this might be almost completely avoided, and all difficulty as to oxidization of the iron avoided, and just as much or as little oxidization as we require given to it, by burning-on the glaze in one of Siemen's gas furnaces. We can there employ a pure, oxidizing, neutral, or a deoxidizing flame to heat up and nearly bring to the fusing point the material spread on the iron for the glaze; when the latter approaches incipient fusion, we can use the oxidizing flame, and so just get that extremely thin film of *hammerschlag*, or black oxide (like that on the surface of the sheets of fine Russian sheet iron of commerce) which we here want. Or possibly, sheets already oxidated up to that point might be put at once into such a furnace, and by a pure neutral flame the glaze be burnt on, *i. e*, fused and caused to adhere.

"Many useful applications for this ware, were it once perfect as a manufacture, might be found. For lining the interior of water pipes and cisterns, it was proposed and tried in this country before 1852, but failed because the necessary conditions for durable enamel did not exist. Upon the outer surface of thin iron roofing tiles it may be a valuable addition, and might enable iron slating or tiling to be used in damp countries as well as at present in dry ones, and with the advantage of having brilliant and party col ration through the enamel given to the tiling. So far no real use has been made of enameled iron ware but for culinary or like vessels, and the manufacture of these in France and Belgium, as the Exhibition at Paris of last year showed, yields a far better and handsomer product than ours in England.

"Enameled cast-iron name plates, or single letters, for streets, etc., were proposed at least thirty years ago, or even earlier, and have been employed greatly in Germany and

France, and to some extent in Great Britain. So far as our observation goes, they have nowhere proved permanent; frost and oxidation are rival destroying agents. Wherever such enameled iron plates are to be seen, after some years of exposure, they are more or less defaced.

"The labels of the streets of Paris, we believe, are lettered upon plates of porcelain.

"The application of glass-faced plates, however, to sheathing ships is perfectly Utopian. Ships' iron sheathing, like that of copper or its alloys, must not only sustain more or less fully the chemical action of the sea-water and air, but the mechanical friction of the water when the ship moves, and all the violent and constant accidental abrasions to which its surface is subject in the navigating of every ship. Enameled iron cannot do either; and as to fouling, the glazing itself is a first-rate *nidus* for the deposit of marine vegetable and animal organisms, quite as good, if not better, than the coat of rust, which is the usual and indispensable forerunner of fouling. If iron ships are not to be sheathed with certain suitable copper alloys (copper alone is most suitable), insulated by wood from the iron body of the ship, then sheath with wood alone; but whatever is to be employed, enameled iron ought not to be."

APPLICATIONS BEFORE CONGRESS FOR THE EXTENSION OF PATENTS.

LIST OF CASES PENDING BEFORE THE SENATE.

O. F. Winchester, President of "The Winchester Repeating Arms Co," for an act to authorize the Commissioner of Patents to receive an application for the extension of the letters patent of that company. Committee on Patents report a bill granting relief asked for.

Stephen R. Parkhurst, for the extension of his patent for ginning cotton and burring wool. No action.

Martha M. Jones, widow and administratrix of Samuel T. Jones, deceased, for the confirmation of a patent which was granted February 23, 1866, for the manufacture of the white oxide of zinc. Committee recommended an amendment to House Bill.

Jeremiah Carhart, extension of his patent for improvements in reed musical instruments, such as melodeons, parlor organs, etc., and that Congress confirm the reissued patent of Aug. 18, 1857. Action suspended.

Mrs. George B. Simpson, for compensation for use by the Government of the invention by her husband, known as the sub-marine telegraph cable. Reported adversely.

A bill for the relief of Saml. Peirce. (Curved oven plates). Reported adversely.

Samuel A. Miller, extension of his patent for an improved compound anchor. Reported favorably.

Thomas Crossley, to be authorized to make application for an extension of his patent—the time having expired in which such application should have been made according to law—machines for printing woolen and other goods. Reported favorably.

E. M. Chaffee, extension of his patent for his discovery of a process for grinding india-rubber. Reported adversely.

Richard M. Hoe, extension of his patent for an improvement in printing machines. Case reported for action of the Senate without recommendation.

Edward D. Tippett, praying an appropriation to enable him to complete his invention for perpetual motion.

Jonathan S. Turner, extension of his patent for an improvement in alarm clocks. Favorable report.

A Bill to extend the letters patent, originally granted to John Young, washing machine. Reported without amendment and recommend passage.

A bill to extend the patent granted to G. S. Blodgett and P. T. Sweet, for oven for baking, for seven years. Pending.

Memorial of Mahlon Loomis, praying an appropriation to enable him to demonstrate his discovery of telegraphing. Committee asked to be discharged.

Alpheus C. Gallahue, extension of his patent for an improvement in machines for pegging boots and shoes. Favorable action, and bill reported and passed.

Christian Sharp, extension of his patent for a breach-loading rifle. Pending.

A bill for the relief of George Fowler, and the estate of De Grasse Fowler, deceased, or their assignees. Pending.

A bill for the relief of Isabella C. Youngs, wife of Theophilus Youngs. (For "an improvement in surface condensers for steam engines"). Pending.

A bill for the relief of Wright Duryea. ("Card Exhibitor"). Reported favorably.

The following additional applications for extension are pending before the House Committee on Patents:

John J. Weeks, for improvement in harvesters.

Jonathan and George W. Prescott, for stuffing for mattresses.

Harrison M. Brown and William E. Bassett, for grain and hay harvesters.

Horace S. Emery, for improvement in the endless chain horse power.

Robert Burns Goodyear, improvement in power looms.

Mrs. Elizabeth N. Jackson, for the annunciator.

Fred. M. Norcross, for planing machines.

Mrs. Catharine Bourshell, for improvement in railroad car wheels.

Elias Howe, Jun., for sewing machines.

William S. Chapman, for improvement to prevent the rattling in carriages called the "anti-rattler."

Samuel Gardner, for machinery for crushing ores, pulverizing, and stamping.

John Murphy, for improvement in processes in treating gutta-percha.

S. N. Marsh, for extension of patent on truss.

Horace Smith and D. B. Wesson, improvement in firearms.

Anson Atwood, improvement in railroad car wheels.

J. Atkins, improvement on rakes to grain harvesters.

Reuben Comins, improvement in railroad bridges.

John Chilcott and Henry Ward Beecher, for improvement in the cutting out of boots.

A. Clark, for fastening forks upon the handles.

William Trapp, improvement in barrel machinery.

Henry Jenks, improvement in the process of manufacturing wire grating.

Josiah Copeland and J. M. Read, for an improvement in boot crimps.

WE learn that a fog-whistle, to be worked by a 10-horse power engine, is being constructed for Thatcher's Island, off Salem, Mass. It will be ready by the 1st of June. This will be the largest and most powerful fog-whistle in the world.

Editorial Summary.

UNDERGROUND RAILROAD.—A company has been organized in London to tunnel from the Post Office to the marble arch entrance on Hyde Park. Mr. Hawkshaw, the engineer of the proposed line, states that it shall be constructed without any interruption of the street traffic between the hours of six in the morning and ten at night. Any diggings made during the night will be covered in, and the paving replaced before six in the morning. The trains are to be drawn by wire ropes from fixed engines at each end, so that the air of the tunnel will not be poisoned by the smoke and vapors of locomotives; and, as there can be no collisions, trains will start every two minutes. In the opinion of competent engineers, the substitution of locomotives for ropes was a mistake, whether regarded from the scientific or the economic point of view. The proposed new tunnel road will have nine stations, and the estimated cost is seven million dollars. Improved means of communication in cities is one of the greatest necessities of the day. We want, if possible, to get rid of the surface roads.

THE STEAMER PEREIRE.—The salvation of the French steamer *Pereire* from utter destruction upon the occasion of the accident in the recent attempted voyage from Havre to New York, seems little less than a miracle. On January 20th she encountered a tremendous hurricane, and at about two o'clock on the following afternoon, an immense wave "formed of about seven hundred tuns of water, fell like an avalanche on the deck." Twenty-four out of the thirty-six furnaces were extinguished, four persons were killed, and twenty-one seriously injured. Some of the fatal accidents took place on deck. One young lady was killed while reading in the saloon—the water struck her on the back of the neck, and broke the spinal column." That the steamer was saved and brought back to port after shipping this immense wave, speaks volumes for the staunchness of her construction.

GOOD TESTIMONY.—W. Haddon Marriott, of Baltimore, writes us as follows: "When I reached home this evening I was agreeably surprised to find awaiting me my letters patent, which upon examination I find to be in every *particular* satisfactory, and therefore, I must tender you my sincere thanks for the promptness, *uprightness*, and *thorough ability* which you have shown in executing the trust confided to you. I shall not only recommend you to such of my friends as need your invaluable advice and assistance, but shall deem it a *privilege* to be able to point them to *honest, upright* men, so rare now-a-days, who will not betray their confidence. To show *my* confidence in you, I am about to place in your hands another, I think, far more valuable case, trusting to your justly given and undisputed ability."

PAINTING ZINC.—A difficulty is often experienced in causing oil colors to adhere to sheet zinc. Boettger recommends the employment of a mordant, so to speak, of the following composition: One part of chloride of copper, 1 of nitrate of copper, and 1 of sal-ammoniac, are to be dissolved in 64 parts of water, to which solution is to be added 1 part of commercial hydrochloric acid. The sheets of zinc are to be brushed over with this liquid, which gives them a deep black color; in the course of from 12 to 24 hours they become dry, and to their now dirty gray surface a coat of any oil color will firmly adhere. Some sheets of zinc prepared in this way, and afterwards painted, have been found to entirely withstand all the atmospheric changes of winter and summer.

COPPER SMOKE.—The smoke from the copper-smelting works of Swansea, Wales, has long been a nuisance to the neighborhood, and the frequent occasion of litigation. Mr. Vivian, one of the principal owners, has at length devised a plan for condensing the sulphureous vapors, thereby converting them into oil of vitriol. This discovery will restore to agriculture thousands of acres of land which the noxious vapors have rendered sterile, and will relive the inhabitants of the murky cloud which has nearly smothered them. The oil of vitriol thus manufactured will be useful in the preparation of the compounds necessary to redeem the land from the unfruitful state into which it has fallen.

TWO lads of this city, aged respectively 8 and 10 years, who recently mounted the cow-catcher of the locomotive Leonard W. Jerome, intending to take a short ride along the Eleventh avenue, supposing the engine would stop after moving a short distance, were carried to Peekskill, forty miles away. They were in a position where the engineer could not see them, and upon their arrival at Peekskill, one of them fell off upon the ground senseless, and the other was too weak to walk. After being cared for, the boys were returned to this city. We venture to say they will hereafter give the cow-catcher a wide berth.

TREMPER'S VELOCIPEDE.—In another column we publish the illustration and description of the above velocipede. The inventor says he is 69 years old and that he can "ride his machine an hour or two with a good walking motion, reading the SCIENTIFIC AMERICAN, with comfort, and turn inside a circle four feet diameter, steering with one foot only. The machine can be used as a one-wheeled velocipede; that is, with the rider over the driving wheel and the hind wheels used only as steadiers."

THE contrast between the mildness of the winter in the United States and elsewhere, and the violence of the storms at sea, is attracting attention. Is there any connection between these phenomena? If any other than the universal law of compensation throughout all the operations of nature, what is it?

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; beside, as sometimes happens, we may prefer to address correspondents by mail.

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 advertisemets at $1 00 a line, under the head of "Business and Personal."

☞ *All reference to back numbers should be by volume and page.*

W. W., of Ontario, Ca.—Vulcanized rubber may be softened by heat, so as to become plastic.

A. J. R., of Mich.—We cannot give time to the solution of such problems as you send us; you should apply to an hydraulic engineer.

H. F. S., of La.—The use of a weak solution of ammonia in the water will be found useful in removing the odors caused by perspiration.

M. L. B., Ill.—We have not heard of any proposition made to Congress for an appropriation to aid in the development of a system of telegraphing without wires. The best work on heat you can get is Prof. John Tyndall's. "Heat considered as a Mode of Motion."

D. B. K., of R. I.—We know of no work on "rosette turning," or the engraving engine. H. C. Baird, 406 Walnut st. Philadelphia, Pa., or D. Van Nostrand, corner of John st. and Broadway, New York, may accommodate you.

F. H. B., of———answers the question of "T. K., of Mich." on page 124, current volume, as to how many pounds will be required to depress eight springs etc. by "one pound only."

A. P. W., of Ill., asks the rule for determining the relative resistance of a steel plate of a given thickness and one composed of many layers but of the same aggregate thickness. As the word "resistance" is of a general and not a specific significance, and he does not say whether the resistance is against pressure, percussion, torsion, extension, or otherwise, we cannot reply to his question. Why cannot inquirers write what they mean?

C. O. H., of Iowa.—"What number of revolutions should I run a 24-inch circular saw cutting oak into stove wood?" 9,000 feet per minute is a good general rule for the speed of the periphery of circular saws. At this rate your case would stand thus in round numbers: 9,000 divided by 6 feet, circumference of saw, equals 1,500, number of revolutions of saw per minute.

H. M. C., of Wis.—Copper and brass may be coated with zinc by boiling them in a solution of sal-ammoniac with zinc turnings.

J. R., of Mass.—Cotton may be detected in linen as follows: Immerse a piece of the suspected tissue in boiling solution of hydrate of potash and water contained in a glass or porcelain capsule, equal parts by weight, for three minutes, then remove it and dry between blotting paper; the cotton threads will show either white or very light yellow, while the linen fibers will be a dark yellow; a small lens will aid in the examination.

B. M. R., of Va.—Plumbago or "black lead" as it is sometimes called is a compound of iron and carbon, not an oxide of iron as you suppose. It is the best material for lessening friction between wooden surfaces where oil is not admissible, and is generally used by piano makers and tuners for that purpose.

B. M. G., of Mo.—Portable glue is made by adding one part of brown sugar, by weight, to two parts of good glue in solution straining and cutting into pieces while yet soft. It is much more soluble than the common glue, and is useful for many purposes, as fastening paper to drawing boards, etc.

R. T. McM., of Del.—Mock ivory may be made by mixing isinglass and strong brandy into a paste with finely powdered eggshells. It should be cast in molds previously well oiled, and be left to dry. It is said to resemble real ivory when hard.

E. E., of Indiana.—Dross is the oxide which forms upon the surface of metals when melting, often mixed with other impurities. Zinc when deposited on the surface of iron in the process of galvanizing assumes the crystalline appearance of which you speak. Sal ammoniac is the name of the salt, used by tinsmiths in soldering and in tinning iron.

C. F. B., of N. Y.—The strength of malleable cast iron and wrought iron, vary with the perfection of the methods employed in their manufacture, and the quality of the iron. Malleable cast iron often approximates closely in strength to wrought iron. Its strength also varies with the size of the casting. As a rule small sized castings have the greatest tensile strength. You will see therefore that an exact ratio of strength between these materials cannot be established.

J. P. McG., of Tenn.—The complete deodorization of coal oil, has not yet been fully accomplished. Coal oil will mix with certain saline solutions, and some other hydro-carbons. The solvents of sulphate of quinia are numerous. Cold water dissolves it sparingly. Thirty parts of boiling water dissolve it entirely. Sixty parts of cold alcohol dissolve it completely. Ether dissolves it with difficulty. All, or nearly all, the dilute acids dissolve it with great facility. We believe it is also soluble to some extent in glycerin.

A. S., of Conn.—Shellac is dissolved by alcohol, muriatic, and and acetic acids. Solution of potash also dissolves it and combines with it chemically. The insect commonly called the "deathwatch" is a species of beetle, of the genus anobium. It is the larvæ of this insect that causes the sound resembling the tick of a watch; it is the sound of their mandibles as they gnaw upon the wood in which they are concealed.

R. O. S., of Ky.—A good black ink is made by the following recipe. Bruised Aleppo nutgalls 12 lbs. boiled an hour in copper, with six gallons of water, adding enough to compensate for evaporation. Strain and boil one half hour the same galls with four more gallons of water. Strain and boil the galls again with 2½ gallons of water; strain again and mix the several liquors. Now heat and add while hot 4 lbs. of coarsely pulverized copperas, 3½ lbs. of bruised gum arabac, and stir until all is dissolved. Let it settle and finally strain through a hair sieve. The addition of a little creasote or carbolic acid will prevent mold. The addition of 1 lb. of sugar will make this a good copying ink.

T. J. L., of Pa., referring to an article in a previous number of the SCIENTIFIC AMERICAN, on "Steam Igniting Combustible Substances," asks if the action of the steam is not purely mechanical, as when a jet under high pressure impinges on some easily ignitable substance, thus producing friction, consequently heat. In reply we ask "would a jet of atmospheric air under similar circumstances produce ignition?" The mechanical conditions are the same, but the heat is wanting.

P. S. B., of Mass., asks for "iron cements." We understand he desires the recipes for making cements for uniting iron, as pipes, etc. The best quick setting cement we know, may be made by mixing powdered sal ammoniac, 1 part; powdered sulphur, 2 parts; iron filings 80 parts, all by weight, with sufficient water to make a paste of the required consistency. The red lead cement for face joints is made of white and red lead, equal parts, mixed with raw linseed oil to the proper consistency.

J. P. J., of R. I.—Riveted splices of belts are much to be preferred to those secured by lacings. In the latter case the belt is more or less injured by the use of the belt awl. Always use a punch in preference to the barbarous awl.

NEW PUBLICATIONS.

We are in receipt of the "Tribune Almanac," the "World Almanac," and the "Merchants and Bankers' Almanac." The two first are published, respectively, at the offices of the New York *Tribune* and the New York *World*, and the latter at the office of the *Bankers' Magazine* (P. O. box 4,574), New York. These annuals are replete with valuable information in their respective spheres, and are useful to those who wish to keep posted in the politics and financial condition of the country.

Where to Emigrate and Why. With Maps and Illustrations. New York: Frederick B. Goodard, 432 Broome street.

This book contains information as to the climate, agricultural, and manufacturing resources of all parts of the United States. It will prove a valuable help to those who meditate the purchase of property in locations with which they have had hitherto little acquaintance. Applications must be made to the publisher.

Woodward's National Architect. Containing 1,000 Original Designs, Plans, and Details to Working Scale, for the Practical Construction of Dwelling Houses for the Country, Suburb, and Village, with Full and Complete Specifications, and an Estimate of the Cost of each Design. By George E. Woodward and Edward G. Thompson, Architects, New York. George E. Woodward, 191 Broadway.

The principal author of this handsome quarto is Mr. Geo. E. Woodward, already favorably known to the public through his previous works in rural architecture. The present work is the result of long experience and matured skill, and we can give it no higher praise than to say that the promise given on its title page is amply fulfilled. The plates are executed in the highest style of the art, and are studies which young architects will do well to supply themselves with. The work is superbly got up, and supplies a want felt by many at the present time, when the taste and demand for suburban residences is rapidly increasing. Really good designs for such structures have been scarce, as is evidenced by the want of variety, among those which can be commended, and the utter ugliness of most of them. We give the work our unqualified commendation.

Zell's Popular Encyclopedia and Universal Dictionary. Edited by L. Colange. Philadelphia: T. Ellwood Zell, Nos. 17 and 19 South Sixth street.

The first seven numbers of this work have come to hand. It is a quarto, printed and illustrated in handsome style, and seems to be ably edited. The difficult task of condensation, has, if we may judge from the numbers before us, fallen into good hands. Its price is ten cents per number, and when completed and bound, it will prove a valuable work of reference to those who cannot afford the more expensive and complete works of the kind.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

The Ring saw mill, at West Bath, Me., was entirely burned up a few nights since. The *Boston Weekly Spectator* says of this mill that it occupied the site of what was probably the oldest tide mill in the country. The first saw mill was built in 1741, and was a double mill, built in the oldest style. It stood but a few years before it was destroyed by fire. The second mill was built in 1749, and is known to have stood less than fourteen years, as in 1763, a third mill was built, and still a fourth one was built on the same site in 1782, which stood twenty-four years. The fifth and last mill was built in 1806, and embraced all the then latest improvements.

The *Harrisburg* (Pa.) *Guard* says an experiment is being made with a new kind of fuel on some of the steamboats running on the Missouri river. It is a compressed coal, the process of preparing which originated in England, and is claimed to be greatly superior to common lump coal. It is now in use on board the steamships of the West India and Pacific Mail Company, and has been found to "make steam" faster, and to admit of more compact stowage than ordinary coal.

An exchange says: "Titusville, Pa., is to have a velocipede school shortly, and the oil operators are all going to take lessons, with a view to riding from well to well. They hope thereby to avoid the mulecipedes and old hossipedes formly in vogue there."

Quite a number of northern manufacturers are reported to be looking about Weldon, North Carolina, with a view of establishing factories there if the result of their examination is favorable.

Seed of the Cinchona tree, from which quinine is made, is to be distributed gratuitously by M. F. Maury, of Lexington, Va., for a trial through the mountain regions of the Southern States.

The *North American* says, "The new oil well at Franklin, which has been creating a sensation lately, has "pegged out," and is now only yielding two or three barrels daily.

The Temascal tin mine in California now gives occupation to twenty-five hands, mostly Englishmen from Cornwall, anh the prospects for a rich and permanent yield are said to be in the highest degree favorable.

A Frenchman intends to try the experiment of growing poppies for the purpose of extracting opium during the coming season in Louisiana.

Crude oil is said to command from \$6·50 to \$6·75 per barrel at the principal points in the oil regions.

A manufacturing concern at Chicopee, Mass., makes over two hundred and seventy-five different styles of locks varying in price from twenty-five cents to one dollar.

A statement recently made to the Board of Trade, at Providence, R. I., shows that in case of fire the fire engines of that city would exhaust the water supply in three hours.

The shoe manufacturers at Bridgewater, Mass., cannot answer their orders they accumulate so fast.

A new bridge across the Allegheny river, at Brady's Bend was completed on Feb. 2d.

Cincinnati announces a combined velocipede, musical, and elocutionary entertainment.

Vermont has already commenced the production of her annual crop of maple sugar.

The paper mills at Russell and Huntington, Mass., are now running on half time.

The Texas newspapers are intending to found a mill to make their own paper.

Reports from Wisconsin state that the winter has been extremely favorable for lumbering, and large quantities have been got out.

Returns from Louisiana make the value of the sugar manufactured in 1868 twenty millions of dollars.

The lemon and lime trees of Florida are reported to have been largely killed out by the frosts in that State. The orange trees will recover.

The travel last year between France and England was less than between Boston and New York.

The New York ice merchants, notwithstanding the mildness of the winter, have gathered a full crop, and the supply of ice for the coming summer will be abundant.

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.

Recent American and Foreign Patents.

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

Faucet for Filling Barrels.—S. C. Catlin, Cleveland, Ohio.—This invention relates to a new and improved faucet for filling barrels with liquids from tanks or reservoirs.

Mosquito-net Frame.—U. W. Armstrong, Evansville, Ind.—This invention relates to an improvement in constructing frames for supporting mosquito-nets, and consists in the method of uniting the horizontal rods to the uprights of the frame.

Steam Hammer.—Alexander Miller, Racine, Wis.—This invention relates to an improvement in steam power hammers, whereby all guides and slides are dispensed with.

Flood Gates.—John J. Kimball, Naplerville, Ill.—This invention relates to a new and useful improvement in gates for controlling the flow of water.

Apple Corer and Cutter.—C. D. Read, Lowell, Mass.—This invention relates to a new and improved machine for coring and cutting apples, whereby much time and labor is saved; and this invention consists, in attaching to a central coring tube a number of cutting knives radiating from its center, and also in a sliding spindle operating centrally therewith.

Churn.—Robert Murphy, Jasper, N. Y.—This invention is an improvement on that for which letters patent were issued bearing date July 5th, 1864, in which the cover of the churn was provided with a rim at its lower end, which, while closing the seam between the cover and body of the churn, also served the purpose of a hoop. The present improvement consists in placing in the lower end of the cover a circular flange, and in making a corresponding groove in the upper end of the body of the churn, so that when the cover is placed in position its flange shall fit within the said groove and make a tight joint.

Tubular Bolt.—David F. Fetter, New York city.—This invention has for its object to furnish a bolt in which a large proportion of metal may be utilized, while it will be fully as strong as those heretofore employed. The invention consists in making the bolts hollow, so that they are lighter, cheaper, and still as strong as the solid bolts heretofore used.

Potato Sorter.—Lewis Perrine and Peter G. Conover, Freehold, N. J.—This invention relates to a machine for sorting potatoes in the field, and in other places; and it consists of a hollow cylinder with open ends, and open, slatted, or perforated sides, so arranged that the same may be revolved by hand, or otherwise, with the meshes or apertures through the sides sufficiently large to allow the smaller potatoes to pass through the orifices, while the larger potatoes will pass through the cylinder and be discharged from its end.

Reefing the Courses of Lower Sails of Square-rigged Vessels.—Nathaniel Ingersol, Salem, Mass.—The object of this invention is to provide a simple and practicable means for reducing or reefing the "courses," so-called, or lower sails of a square-rigged vessel.

Connecting Artificial Teeth to Base or Palate Plates.—Henry Crane, D. D. S., New York city.—This invention has for its object to furnish a simple, convenient, effective, and reliable mode of connecting artificial teeth to base or palate plates.

Attachment for Steam Heaters.—Almon N. Allen, Pittsfield, Mass.—This invention has for its object to furnish an improved means for moistening the air of rooms heated by steam, so as to remove the dryness of the air of said rooms and make them more comfortable and healthful, and, at the same time, prevent the shrinkage of the wood work of the room.

Corn and Cotton Seed Planters.—R. R. McGregor, Covington, Tenn.—This invention has for its object to furnish a simple, convenient, and reliable machine for planting corn and cotton seed, which shall be so conructed and arranged that it may be easily adjusted to plant corn or cotton seed, and which will do its work accurately and well in either capacity.

Iron or Steel Columns.—George Walters and Thomas Shaffer, Phoenixville, Pa.—This invention has for its object to furnish an improved column of great strength and rigidity, and which shall, at the same time, be easily and conveniently constructed and put together, and which may be made of any desired size and style.

Machine for Polishing Thread.—Samuel and Robert A. Semple, Mt. Holly, N. J.—This invention has for its object the construction of a machine for polishing sewing thread, and consists in the application of rapidly revolving reels carrying grooved felted brush, or smooth rollers or bars, to the action of which the thread is subjected while being fed from the bobbi reel to the spindles on which it is to be wound.

Medical Compound.—J. W. M. Kirkpatrick, Hamburg, Arkansas.—This invention consists in the combination of several ingredients, whereby an effective specific for the treatment of fever and ague is obtained.

Oscillating Steam Engine.—L. Andersen, Chebanse, Ill.—This invention relates to improvements in oscillating steam engines, the object of which is to simplify the construction of the same. It consists in the arrangement of the valve and parts.

Submarine Telescopic Lantern.—Henry Thompson, Mobile, Ala.—This invention relates to improvements in submarine lanterns, the object of which is to provide a more useful lantern than any other now employed for the same purpose.

Sash Fastener.—Wm. A. Goranflo, Allentown, Pa.—This invention relates to improvements on sash fasteners, the object of which is to provide a simple and cheap device that will readily adjust itself to act as a lock when the sash is shut down, and may be unlocked and adapted for a fastener for holding the sash at any desired point by a slight movement by the hand.

Splitting and Skiving Machine.—Wm. Best, Abington, Ill.—The object of this invention is to provide a simple and effective adjustable machine for splitting and skiving leather, for harness-makers' use. It consists of a grooved block, provided with a splitting knife in the usual manner, in the groove of which, under the knife, is provided an adjustable slide, which may be adjusted to split the leather in any thickness, or to split or "skive" it to any desired taper.

Washing Machine.—Wm. S. Todd, Mechanicsville, Iowa.—The object of this invention is to provide a simple, effective, and easily-operated washing machine. It consists of an oscillating tub or basket within, and concentric with a fixed tub; the oscillating tub being constructed with vertical and radial rubbing slats, and actuated by a lever having a toothed segment, which engages with a pinion or smaller toothed segment mounted on the upper end of the shaft or central post of the inner tub.

Construction of Railway Cars.—B. P. Power and John Coyne, Baltimore, Md.—The object of this invention is to obtain a railway car which cannot be easily crushed or destroyed by running off the track, or set on fire by any accident.

Dumping Wagon and Car.—Thos. H. Gary, Bristol, Md.—This invention relates to that class of wagon bodies and cars, which can be tilted so as to dump the load in the rear; and the improvement consists in a new apparatus by which the wagon or car can be operated more easily than heretofore.

Binding Attachment for Reapers.—Wm. De C. May, Baltimore, Md. This invention has for its object the construction of an apparatus, which shall automatically receive the gavel from the sickle, place a wire band around it, tie the band, sever the wire, and drop the gavel upon the ground or into a box provided for the purpose; and to that end the invention consists in a simpler, lighter, less expensive, and more perfectly operating apparatus, than has heretofore been brought into use for the same purpose.

Gas Stove.—Wm. C. Trowbridge, New York city.—This invention relates to certain improvements on that kind of gas stove in which heated hydrocarbon liquids are consumed. The invention consists, first, in a new arrangement of pipes for conducting the oil to the flame, with an object of collecting impurities and sediments, before the oil or the vapors reach the small orifice of the burner. In the apparatus now in use, this orifice is frequently clogged by the impurities of the oil, and the effectiveness of the stove thereby impaired. The invention also consists in constructing the stove of open work for the purpose of admitting air, to facilitate perfect combustion.

Sheet Metal Balusters for Roofs, Balconies, etc.—Geo. Fischer, New York city.—This invention relates to a new manner of making the metallic metallic balusters which are used on roofs, balcony-rails, etc., and which were heretofore made of cast metal, as it was found too expensive to form the separate moldings from strips of sheet metal, and as furthermore in the latter case the joints, where the ends of the several strips were soldered, could not be successfully concealed. The present invention consists in forming sheet metal balusters by spinning the same in several parts from plates, and by connecting the several parts in a suitable manner. Thereby the finest specimens can be produced in absolute purity, no joints being on on the sides, and no flaws from imperfect casting, marring the beauty of the design.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

56.—Breech-loading Firearms.—Sam'l Remington, Ilion, N. Y. January 5, 1869.

38.—Improved Machine for Plaiting and Dividing Textile Fabrics.—J. Stevens, Orange, N. J. January 5, 1869.

32.—Distillation of Hydrocarbon Oils.—C. Hall, Smith's Ferry, Penn. January 5, 1869.

83.—Boxes, etc., from Paper Pulp, and Apparatus Employed therein.—R. Smith, Shelbrooke, Canada. January 11, 1869.

90.—Water Meter.—G. Sickels and J. H. Thorndike, Boston, Mass. January 12, 1869.

92.—Knitting Machinery.—William Franz and William Pope, Crestline Ohio. January 12, 1869.

101.—Elastic Rubber.—L. Sterne, New York city, J. A. Jacques and J. A. Fanshawe, Tottenham, England. January 13, 1869.

175.—Wheels for Railway Carriages, Locomotives, and other Vehicles.—John Raddin, Lynn, Mass. January 19, 1869.

22.—Distillation of Hydrocarbon Oils.—Charles Hall, Smith's Ferry Pa. January 5, 1869.

83.—Manufacture of Boxes, etc., from Paper Pulp, and Machinery therefor.—Richard Smith, Shelbrooke, Canada. January 11, 1869.

90.—Water Meter.—G. Sickels and J. H. Thorndike, Boston, Mass. January 12, 1869.

90.—Knitting Machinery.—Wm. Franz and Wm. Pope, Crestline, Ohio. January 12, 1869.

101.—Elastic Rubbers.—L. Sterne, New York city, and J. A. Jaques and J. A. Fanshawe, Tottenham, England. January 13, 1869.

175.—Wheels for Vehicles.—John Raddin, Lynn, Mass. January 19, 1869.

114.—Reaping and Mowing Machinery.—Cyrenus Wheeler, Jr., Auburn, N. Y. January 14, 1869.

115.—Stop Motion and Regulator for Steam Pumps.—C. S. Westland, Providence, R. I. January 14, 1869.

129.—Fastener for Doors and Windows.—John Dickinson, New York city. January 15, 1869.

171.—Mode of and Apparatus or Mechanism for Driving Piles.—P. S. Justice, Philadelphia, Pa. January 19, 1869.

186.—Manufacture of Illuminating Gas and of Sponge, and Furnaces for Melting said Sponge and other Metals.—John Absterdam, New York city. January 20, 1869.

222.—For the Manufacture of various Useful or Ornamental Articles.—J. M. Merrick, Jr., Massachusetts, U. S. January 25, 1869.

235.—Centrifugal Machines for Draining Sugars and other Substances—H. W. Lafferty and Robert Lafferty, Gloucester, N. J. January 25, 1869.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING FEBRUARY 16, 1869.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT OFFICE FEES:

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Patent Solicitors, No. 37 *Park Row, New York.*

86,896.—Plow.—J. Bader, Sr., Perrysburg, Ohio.

86,897.—Chair for Coupling Railway Rails.—H. L. Beach, Montrose, Pa.

86,898.—Washing Fluid.—James Bell, Sonora, Cal.

86,899.—Invalid Chair.—A. P. Blunt, and Jacob S. Smith, Washington, D. C.

86,900.—Rein Holder.—A. T. Boon and L. Mills, Galesburg, Ill. Antedated Jan. 1, 1869.

86,901.—Secretary Bedstead.—E. E. Briggs and M. G. Briggs, Boston, Mass.

86,902.—Hook for Tackle Blocks.—Wm. Carter, Philadelphia, Pa.

86,903.—Steam Drill.—G. F. Case (assignor to himself and "The Windsor Manufacturing Company"), Windsor, Vt.

86,904.—Harvester Rake.—H. J. Case (assignor to himself, W. H. Stevenson, and S. D. Wackman), Auburn, N. Y.

86,905.—Cultivator.—M. Caywood and J. Caywood, Peoria county, Ill.

86,906.—Velocipede.—J. C. Clime (assignor to himself and Wm. Audorf), Philadelphia, Pa.

86,907.—Combined Oven and Stovepipe Drum.—John W. Clough, Montville, Me.

86,908.—Permutation Lock.—S. L. Cole and Wm. G. Ayres (assignors to themselves and H. W. Colver), Brooklyn, N. Y.

86,909.—Fastening for Bedsteads.—A. S. Dalbey, Richmond, Ind.

86,910.—Hoop Skirt.—T. D. Day, New York city.

86,911.—Fastening for Sheet Metal.—T. J. Diedrich and F. Diedrichs, Philadelphia, Pa.

86,912.—Machine for Crozing Staves.—H. Elliott (assignor to himself and Amos A. Stevens), Boston, assignors to H. Elliott and J. Sherman, Jr., Farmington, Mass.

86,913.—Beehive.—G. J. Flansburgh, Bethlehem, N. Y.

86,914.—Machine for Making Nuts.—G. H. Fuller, Unionville, Conn.

86,915.—Beehive.—J. C. Gaston, Cincinnati, Ohio.

86,916.—Spring-Bed Bottom.—J. C. Gaston, Cincinnati, Ohio.

86,917.—Material for the Manufacture of Paper.—J. J. Gillet-Damitte, H. D. Dubois, and A. Boissonneau, Paris, France.

86,918.—Wash Boiler.—J. Green, New York city.

86,919.—Game Counter.—A. A. Griffing, Lexington, Mass.

86,920.—Busk for Corsets.—E. Heaton, New Haven, Conn. Antedated Feb. 3, 1869.

86,921.—Composition for Wax Flowers and Fruit.—A. A. Hinkley, Boston, Mass.

86,922.—Dental Jaw Brace.—George Hill Hurd, Memphis, Tenn.

86,923.—Gridiron.—G. B. Isham, Burlington, Vt. Antedated Jan. 20, 1869.

86,924.—Farm Fence.—W. Jasper, Columbia, Ohio.

86,925.—Grain Spout.—G. H. Johnson (assignor to himself and G. W. Tifft, Sons, and Company), Buffalo, N. Y.

86,926.—Elevator Leg.—G. H. Johnson (assignor to himself and G. W. Tifft, Sons, and Company), Buffalo, N. Y.

86,927.—Elevator Leg.—G. H. Johnson (assignor to himself and G. W. Tifft, Sons, and Company), Buffalo, N. Y.

86,928.—Operating Discharge Valves for Grain Bins.—G. H. Johnson (assignor to himself and G. W. Tifft, Sons, and Company), Buffalo, N. Y.

86,929.—Building Brick or Hollow Block.—G. H. Johnson and G. Milsom, Buffalo, N. Y.

86,930.—Railroad Switch.—C. W. Jones, Philadelphia, Pa. Antedated Feb. 1, 1869.

86,931.—Winding Rachet for Time-Pieces.—W. H. Lamb, San Francisco, Cal.

86,932.—Brick Elevator.—T. Mann, San Francisco, Cal. Antedated Feb. 1, 1869.

86,933.—Curtain Fixture.—Moses S. Marshall, Somerville, Mass., assignor to Boston Champion Fixture Company.

86,934.—Horse Hay Fork.—N. F. Mathewson, Barrington, R. I.

86,935.—Metallic Fence Post.—W. A. Middleton, Harrisburgh, Pa.

86,936.—Sash Lock.—J. W. Moffitt, Harrisburgh, Pa.

86,937.—Car Axle.—Henry Mooers, Toledo, Ohio.

86,938.—Clip for Harness Traces.—J. D. S. Newell, Tensas parish, assignor to himself and D. B. Penn., New Orleans, La.

86,939.—Process of Extracting the Coloring Matter of Madder.—A. Paraf (assignor to Julius Gerson), New York city.

86,940.—Base-Burning Stove.—J. S. Perry, Albany, N. Y.

86,941.—Corn Planter.—G. W. Phillips and B. C. Richardson (assignors to themselves and S. H. Seaman), Oconomowoc, Wis. Antedated Feb. 11, 1869.

86,942.—Grain Separator.—F. W. Robinson, Richmond, Ind.

86,943.—Stovepipe Damper.—David Sanders (assignor to H. Mallory), Milwaukee, Wis.

86,944.—Process of Treating Iron and Steel.—E. Savage, West Meriden, Conn. Antedated Jan. 30, 1869.

86,945.—Saw Set and Punch.—H. Schauer, Allegheny City, Pa.

86,946.—Shutter Worker.—C. W. Shattuck, Fitchburgh, Mass.

86,947.—Ditching Plow.—I. S. Sheets, Troy, Ohio.

86,948.—Apparatus and Process of Evaporating Liquids.—J. J. Sherman, Albany, N. Y.

86,949.—Fluid Meter.—G. Sickels, Boston, Mass.

86,950.—Combined Seeding Machine and Cultivator.—M. D. Smith, Independence, Iowa.

86,951.—Manure Drag.—J. S. Spangler, D. Madlem, and H. D. Spangler, Ephrata, Pa.

86,952.—Revenue and Postage Stamp.—C. F. Steel, New York city.

86,953.—Feeding Mechanism for Carding Machine.—B. W. Tangee, Woodville, R. I. Antedated January 30, 1869.

86,954.—Feeding Mechanism for Carding Machines.—B. W. Tangee, Dorrville, R. I.

86,955.—Attaching Heels to Boots.—C. D. Ulmer, Boston, Mass.

86,956.—Boring Faucet.—A. Weed, Boston, Mass.

86,957.—Treadle for Sewing Machines.—Anna Weissenborn, New York city.

86,958.—Boot and Shoe Shave.—Walter Wilbur (assignor to himself and Sylvester F. Root), New Salem, Mass.

86,959.—Carriage Axle.—John F. Wilbur and True Tuttle, Pownal, Me.

86,960.—Lawn Mower.—Maximilian S. G. Wilde, Somerville, assignor to himself and James H. Noble, Pittsfield, Mass.

86,961.—Casting Building Blocks.—John D. Wise (assignor to himself and Charles Diebold), German township, Ohio.

86,962.—Compound for the Manufacture of Artificial Marble.—Job Abbott, Canton, Ohio, administrator of the estate of Wilhelm Meyer, deceased.

86,963.—Manufacture of Artificial Marble.—Job Abbott, Canton, Ohio, administrator of the estate of Wilhelm Meyer, deceased.

86,964.—Steam Heater.—Almon N. Allen, Pittsfield, Mass.

86,965.—Steam Engine.—L. Andersen, Chebanse, Ill.

86,966.—Mosquito Net Frame.—U. W. Armstrong, Evansville, Ind.

86,967.—Wrench.—John N. Arvin, Valparaiso, Ind.

86,968.—Type Breaker.—Charles Baer (assignor to himself and Philip Heinrichs), New York city.

86,969.—Splitting and Skiving Machine.—William Best, Abingdon, Ill.

86,970.—Self-closing Faucet for Filling Barrels.—S. C. Catlin, Cleveland, Ohio. Antedated February 8, 1869.

86,971.—Breech-loading Firearm.—Isaiah B. Conklin, Baltimore, Md.

86,972.—Mode of Connecting Artificial Teeth with Dental Plates.—Henry Crane, New York city.

86,973.—Yarn Guide and Clearer.—A. C. Dakin, Clinton, and J. D. Butler, Lancaster, Mass. Antedated February 6, 1869.

86,974.—Steam Engine.—J. M. Davidson, Napoleon, Ark.

86,975.—Weather Strip for Windows.—Andrew Jackson Devoe, Hackensack, N. J.

86,976.—Hollow Bolt.—David F. Fetter, M. D., New York city.

86,977.—Construction of Sheet-metal Balusters.—George Fischer, New York city.

86,978.—Spring But.—Theodore Fredericks, Newark, N. J.

86,979.—Dumping Wagon.—Thomas H. Gary, Bristol, Md.

86,980.—Explosive Compound.—Edwin Gomez, New York city.

86,981.—Device for Opening and Closing Double Doors.—George Carver Gooch and Thomas Buckland Jeffery, Chicago, Ill.

86,982.—Sash Holder.—Wm. A. Goranflo, Allentown, Pa.

86,983.—Blank for Cutlery Handles.—Isaac G. Hotchkiss, Naugatuck, Conn.

86,984.—Apparatus for Reefing Sails.—Nathaniel Ingersoll, Salem, Mass.

86,985.—Flood Gate.—John J. Kimball, Napierville, Ill.

86,986.—Medical Compound.—J. W. M. Kirkpatrick, Hamburg, Ark.

86,987.—Lamp Shade.—A. D. Laws, Bridgeport, Conn.

86,988.—Rock Drill.—Richard C. M. Lovell, Covington, Ky.

86,989.—Compound for the Manufacture of Vinegar.—Hiram C. Luce and William L. Rabe, Bloomington, Ill.

86,990.—Stump Extractor.—A. J. McCrea, Bethlehem, N. J.

86,991.—Combination Picture Case and Cane.—Horatio D. McGeorge, Rochester, N. Y.

86,992.—Corn and Cotton Seed Planter.—R. R. McGregor, Covington, Tenn.

86,993.—Toy Spring and Arrow.—W. S. McNeil (assignor to himself and Archibald McNeil), Bridgeport, Conn.

86,994.—Stump Extractor.—Charles Metzger, George R. Roraback and George Flint, De Soto, Mo.

86,995.—Pad for Breast Collars.—R. E. Miles, Louisville, Ky.

86,996.—Steam Hammer Engine.—Alexander Miller, Racine, Wis., assignor to Wm. H. Thompson, Rock Island, Ill.

86,997.—Caster.—Joseph Miller, Olean, N. Y.

86,998.—Attaching Knobs to their Spindles.—W. T. Munger, Branford, assignor to P. and F. Corbin, New Britain, Conn.

86,999.—Churn.—Robert Murphy, Jasper, N. Y.

87,000.—Stamp Canceler.—Robert T. Osgood, Orland, Me.

87,001.—Potato Assorter and Sifter.—Lewis Perrine and Peter C. Conover, Freehold, N. J.

87,002.—Railway Car.—Benjamin P. Power and John Coyne, Baltimore, Md.

87,003.—Beehive.—James P. Praul, Pleasant Hill, Ill.

87,004.—Apple Corer and Cutter.—C. D. Read, Lowell, Mass.

87,005.—Machine for Polishing and Dressing Thread.—Samuel Semple, Jr., and Robert A. Semple (assignors to Samuel Semple and Sons), Mount Holly, N. J.

87,006.—Toy Savings Bank.—James Serrill, Philadelphia, Pa. Antedated January 26, 1869.

87,007.—Concrete Pavement.—Thornton Smith, Washington, D. C.

87,008.—Recess Cutter for Setting Hinges.—Daniel Snow, Cleveland, Ohio.

87,009.—Shoe Supporter.—C. W. Soule, Abington, Mass.

87,010.—Pile Driver.—Alfred Smith and J. W. Galbraith, Sedalia, Mo.

87,011.—Swaging Roll.—John F. Thomas, Ilion, N. Y.

87,012.—Submarine Telescopic Lantern.—Henry Thompson, Mobile, Ala.

87,013.—Washing Machine.—William S. Todd, Mechanicsville, Iowa.

87,014.—Gas Heater.—Wm. C. Trowbridge, New York city.

87,015.—Frost Protector for Posts.—Samuel T. Varian, Plainfield, N. J.

87,016.—Metallic Column.—George Walters and Thomas Shaffer, Phœnixville, Pa.

87,017.—Metallic Seal.—Joseph Wappenstein, Cincinnati, Ohio. Antedated February 8, 1869.

87,018.—Corn Planter.—Daniel D. Wood, Paris, Ill.

87,019.—Cultivator.—B. F. Young, Toulon, Ill.

87,020.—Motive Power for Sewing and other Machines.—Jacob Zuckermann, San Francisco, Cal.

87,021—Bung Tap for Casks.—George W. Banker, St. Louis, Mo.

87,022.—Animal Trap.—T. J. Belford, Worthington, Ohio.

87,023.—Rotary Steam Engine.—J. Marcus Boorman, Scarborough, N. Y.

87,024.—Lamp Burner for Locomotive Head Lights.—D. T. Briggs, Albany, N. Y.

87,025.—Folding Desk and Seat.—Aaron Chandler, Davenport, Iowa, and Samuel F. Estell, Richmond, Ind.

87,026.—Wagon Seat.—Isaac H. Chappell, Decatur, Ill.

87,027.—Churn.—Moses Clifton, Peoria, Ill.

87,028.—Corn Planter.—Gilbert T. Cooley, Wooster, Ohio.

87,029.—Apparatus for Redistilling Whisky and other Spirits.—H. G. Dayton, Maysville, Ky.

87,030.—Clamp for Sheet Piling.—Spencer B. Driggs, New Brunswick, N. J.

87,031.—Composition for Pavements, Roofing, etc.—Edward Duempelman and J. E. Dotch, Washington, D. C.

87,032.—Construction of Table Cutlery.—A. E. Elmer, (assignors to the Windsor Manufacturing Co.), Windsor, Vt.

87,033.—Velocipede.—Samuel F. Estell, Richmond, Ind.

87,034.—Steam-Engine Governor.—Joseph Farcot, St. Ouen, (Seine), France.

87,035.—Hay Knife and Pruner Combined.—Daniel Fasig, Rowsburg, Ohio.

87,036.—Compound for Removing Mildew from Linen, etc.—Mary Faurot, Scranton, Pa.

87,037.—Plant Setting Device.—John C. Fuller, Phœnix, N. Y.

87,038.—Magazine Firearm.—William Gardner, Toledo, Ohio. Patented in France, Aug. 5, 1868.

87,039.—Self-Lighting Attachment for Gas-Burners.—Samuel Gardiner, Jr., New York city.

87,040.—Gate.—S. A. Gould, Aberdeen, Ind.

87,041.—Process of Cooling the Atmosphere in Rooms and other Enclosures.—Edwin H. Grant, Washington, D. C.

87,042.—Process for Manufacturing Soda and Alumina.—G. A. Hagemann, Natrona, Pa.

87,043.—Machine for Molding Clay.—Samuel Hambleton, and G. P. Herthel, Jr., St. Louis, Mo.

87,044.—Friction Calender for Paper and other Fabrics.—Wm. W. Harding and Wm. H. Soley, Philadelphia, Pa.

87,045.—Hay Raker and Loader.—George F. Holmes, Cortland, N. Y.

87,046.—Machine for Making Nuts.—William Horsfall Sing Sing, N. Y.

87,047.—Thill Coupling.—Manley Howe, Boston, Mass.

87,048.—Harvester.—Louis H. Johnson, Rochester, Minn.

87,049.—Cheese Cutter.—Geo. C. Jones and Perez B. Jones, Alna, Me.

87,050.—Roofing Composition.—Lewis B. Joy (assignor to himself and B. S. Brown), Buffalo, N. Y.

87,051.—Horse Hay Fork.—J. G. Kimberlin, West Dryden, N. Y.

87,052.—Grain Drill.—Benj. Kuhns, Dayton, Ohio.

87,053.—Machine for Cutting and Channeling Stone.—E. G. Lamson, Windsor, Vt.

87,054.—Caster and Cake Basket.—J. W. Larimore, Chicago, Ill.

87,055.—Vehicle.—J. M. Lunsford, Fortville, Ind.

87,056.—Grain Binder.—Wm. De C. May, Baltimore, Md.

87,057.—Thread Cutter and Spool Combined.—Wm. C. McIntire, Washington, D. C.

87,058.—Breech-Loading Firearm—L. A. Merriam, New York city.

87,059.—Bag Holder.—Peter Meyers, Stoutsville, Ohio.

87,060.—Horse Hoe.—Wm. Muir, Wauconda, Ill.

87,061.—Rock Drilling Machine.—Robert Nutty, New York city.

87,062.—Pegging Awl.—G. B. Paine, Montpelier, Vt.

87,063.—Seamless Shoe.—Chas. W. Palmer, Lynn, Mass.

87,064.—Thermometer Churn.—J. R. Pilkay, Carlisle, Pa.

87,065.—Gate Latch.—Wesley Redhead, Des Moines, Iowa.

87,066.—Hay Spreader.—E. D. Reynolds and O. B. Reynolds, North Bridgewater, Mass.

87,067.—Nail Cutting Machine.—M. J. Rice, Birmingham, England, assignor to Dennis M. Fitch, New York city.

87,068.—Car Brake and Starter.—Isaiah Rider, Indianapolis, Ind.

87,069.—Axle-Box Lubricator.—Cornelius M. Ried, Greensborough, Ala.

87,070.—Tooth Brush.—Christopher Roberts, Newark, N. J.

87,071.—Corn Harvester.—Jas. A. C. Rose, Carrollton, Ill.

87,072.—Clasp for the Hair.—Chas Rowland, Washington, D. C.

87,073.—Steam Engine.—W. G. Savage, Knoxville, Iowa.

87,074.—Drill Teeth Setting.—P. I. Schmitt and Peter Schmitt, Waterloo, assignors to Siegel, Schmitt, and Company, Carlinville, Ill.

87,075.—Process of Repairing Crucibles.—Wm. F. Sherman, Bucksport, Me.

87,076.—Rotary Steam Engine.—Levi Sumner and James Youmans, Davenport, Iowa.

87,077.—Elevated Railway.—W. A. Sutton, New York city, and Eugene Crowell, San Francisco, Cal.

87,078.—Harness Pad.—H. C. Swift, Fond du Lac, assignor to himself and Geo. W. Graves, Oshkosh, and said Swift assignor to Geo. Cameron, Oshkosh, Wis.

87,079.—Lubricator.—Hugh Thomas, New York city

87,080.—Cultivator.—J. B. Tipton, Peoria, Ill.

87,081.—Belt Clasp.—C. Towns, Cleveland, Ohio.

87,082.—Folding Card Globe.—Dennis Townsend, Fiddletown, Cal.

87,083.—Elevator.—Otis Tufts, Jr., Boston, Mass.

87,084.—Machine for the Manufacture of Ice.—P. H. Vander Weyde, M. D., Philadelphia, Pa.

87,085.—Ventilating Stove.—J. S. White, Prescott, Wis.

87,086.—Railway Car Truck.—T. L. Wilson, Darlington, England, assignor to G. Merrill and J. W. Hobart, St. Albans, Vt.

87,087.—Machine for Coating Cloth with India-Rubber and other Substances.—G. S. Dwight, New York city.

REISSUES.

73,309.—Fire-Proof Safe.—Dated January 14, 1868; reissue 3,298.—E. D. Draper, Hopedale, and E. W. Glover, Medford, Mass.

83,070.—Packing Can.—Dated October 13, 1868; reissue, 3,299.—N. P. Lindergreen, Boston, Mass.

54,382.—Solution for Preventing Combustion.—Dated May 1, 1866; reissue 3,300.—J. McGill, Boston, Mass.

82,744.—Railway Rail Joint.—Dated October 6, 1868; reissue 3,301.—E. G. Paterson, Pithole City, Pa.

75,206.—Rail for Railways.—Dated March 3, 1868; reissue 3,302.—P. Pettebone, Wyoming, and J. E. Patterson and A. W. Brown, Wilkesbarre, assignees of E. R. Shepard, Scranton, Pa.

16,318.—Horse Rake.—Dated December 23, 1856; reissue 3,303.—A. R. Reese, Phillipsburg, N. J., assignee of J. J. Squire.

39,235.—Rock Drill.—Dated July 14, 1863; reissue 3,304.—A. J. Severance, Middlebury, Vt., assignee by mesne assignments, of R. Leschot.

80,516.—Feed-Water Heater for Boilers.—Dated July 28, 1868; reissue 3,305.—S. Stucky, New Albany, Ind.

DESIGNS.

3,367.—Center Piece.—H. Berger, New York city.

3,368.—Carpet Pattern.—Robert R. Campbell (assignor to Lowell Manufacturing Company), Lowell, Mass.

3,369.—Trade Mark.—G. F. Gantz (assignor to G. F. Gantz and Company), New York city.

3,370.—Trade Mapk.—H. H. Glidden and Elon P. House, Springfield, Ill.

3,371.—Printers' Types.—J. Herriet (assignor to David W Bruce), New York city.

3,372.—Lamp Chimney.—T. Houghton, Philadelphia, Pa.

3,373.—Latch.—W. L. Humason, New Britain, Conn.

3,374.—Trade Mark.—W. C. Hutchings, Hartford, Conn.

3,375.—Ice Pitcher.—N. Lawrence (assignor to Reed and Barton), Taunton, Mass.

3,376.—Sheet-Metal Can.—C. Pratt, New York city.

3,377.—Pump.—H. H. Babcock, Watertown, N. Y.

3,378 and 3,379.—Floor Oil Cloth Pattern.—H. Christie Morrisania, N. Y., assignor to W. M. Brasher and Company Two Patents.

3,380.—Lamp Chimney.—G. W. Fry, Pittsburgh, Pa.

3,381.—Satchel Lock.—D. Neumann, New York city.

3,382.—Floor Oil Cloth Pattern.—James Paterson, Elizabeth, N. J.—assignor to W. M. Brasher and Company, Brooklyn N. Y.

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U. S. Patent Office,
Washington, D. C., Feb. 4, 1869.
M. M. Rhodes and J. C. Rhodes, of Taunton, Mass., having petitioned for the extension of a patent granted them on the 8th day of May, 1855, for an improvement in Machine for Leathering Tacks, it is ordered that said petition be heard at this office on the 26th day of April next.
Any person may oppose this extension. Objections, depositions, and other papers, should be filed in this office twenty days before the day of hearing.
ELISHA FOOTE, Commissioner of Patents.

U. S. Patent Office,
Washington, D. C., Feb. 4th, 1869.
T. A. Lupton, of Winchester, Va., having petitioned for the extension of a patent granted him on the 8th day of May, 1855, and reissued on the 23d day of October, 1866, for an improvement in Grain Harvesters, it is ordered that said petition be heard at this office on the 26th day of April next.
Any person may oppose this extension. Objections, depositions, and other papers, should be filed in this office twenty days before the day of hearing.
ELISHA FOOTE, Commissioner of Patents.

U. S. Patent Office,
Washington, D. C., Feb. 6, 1869.
E. M. Stevens, J. B. Crosby, and J. W. Pearson, of Boston, Mass., having petitioned for the extension of a patent granted them on the 22d day of May 1855, for an improvement in Seed Planters, it is ordered that said petition be heard at this office on the 3d day of May next.
Any person may oppose this extension. Objections, depositions, and other papers, should be filed in this office twenty days before the day of hearing.
ELISHA FOOTE, Commissioner of Patents.

U. S. Patent Office,
Washington, D. C., Feb. 8th, 1869.
John M. Heck, of Holyoke, Mass., having petitioned for the extension of a patent granted him on the 15th day of May, 1855, for an improvement in Dressing Sewing Thread, it is ordered that said petition be heard at this office on the 26th day of April next.
Any person may oppose this extension. Objections, depositions, and other papers, should be filed in this office twenty days before the day of hearing.
ELISHA FOOTE, Commissioner of Patents.

U. S. Patent Office,
Washington, D. C., Feb. 11, 1869.
George W. Hildreth, of Lockport, N. Y., having petitioned for the extension of a patent granted to him on the 19th of June, 1855, and reissued on the 1st day of May, 1860, for an improvement in Mode of Hanging Bells, it is ordered that said petition be heard at this office on the 24th day of May next.
Any person may oppose this extension. Objections, depositions, and other papers, should be filed in this office twenty days before the day of hearing.
ELISHA FOOTE, Commissioner of Patents.

U. S. Patent Office,
Washington, D. C., Feb. 12, 1869.
Charles A. Durgin, of New York city, having petitioned for the extension of a patent granted him on the 22d day of May, 1855, for an improvement in Sewing Machines, it is ordered that said petition be heard at this office on the 3d day of May next.
Any person may oppose this extension. Objections, depositions, and other papers, should be filed in this office twenty days before the day of hearing.
ELISHA FOOTE, Commissioner of Patents.

U. S. Patent Office,
Washington, D. C., Feb. 13, 1869.
Sarah J. Stimpson, of Baltimore, Md., executrix of the estate of James H. Stimpson, deceased, having petitioned for the extension of a patent granted to the said James H. Stimpson on the 15th day of May, 1855, for an improvement in Butter Coolers, it is ordered that said petition be heard at this office on the 26th day of April next.
Any person may expose this extension. Objections, depositions, and other papers, should be filed in this office twenty days before the day of hearing.
ELISHA FOOTE, Commissioner of Patents.

U. S. Patent Office,
Washington, D. C., Feb. 12th, 1869.
Thomas J. Silsby, of Boston, Mass., administrator of the estate of Arad Woodworth, 3d, deceased, having petitioned for the extension of a patent granted the said Arad Woodworth, 3d, on the 15th day of May, 1855, for an improvement in Machinery for Spinning, it is ordered that said petition be heard at this office on the 26th day of April next.
Any person may oppose this extension. Objections, depositions, and other papers, should be filed in this office twenty days before the day of hearing.
ELISHA FOOTE, Commissioner of Patents.

U. S. Patent Office,
Washington, D. C., Feb. 13, 1869.
Thomas J. Knapp, of Philadelphia, Pa., having petitioned for the extension of a patent granted to him on the 15th day of May, 1855, for an improvement in Adjustable Tenoning Tool, it is ordered that said petition be heard at this office on the 26th day of April next.
Any person may oppose this extension. Objections, depositions, and other papers, should be filed in this office twenty days before the day of hearing.
ELISHA FOOTE, Commissioner of Patents.

U. S. Patent Office,
Washington, D. C., Feb. 15, 1869.
Jacob A. Conover, of New York city, having petitioned for the extension a patent granted to him on the 15th day May, 1855, for an improvement in Machine for Splitting Wood, it is ordered that said petition be heard at this office on the 3d day of May next.
Any person may oppose this extension. Objections, depositions, and other papers, should be filed in this office twenty days before the day of hearing.
ELISHA FOOTE, Commissioner of Patents.

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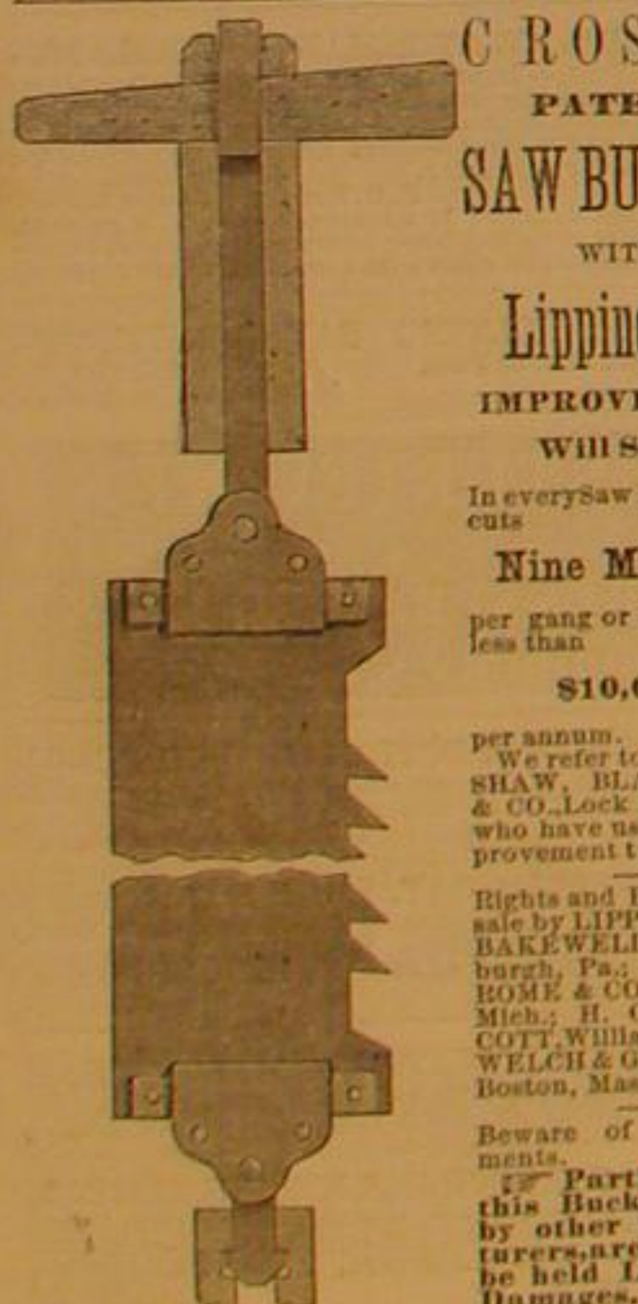

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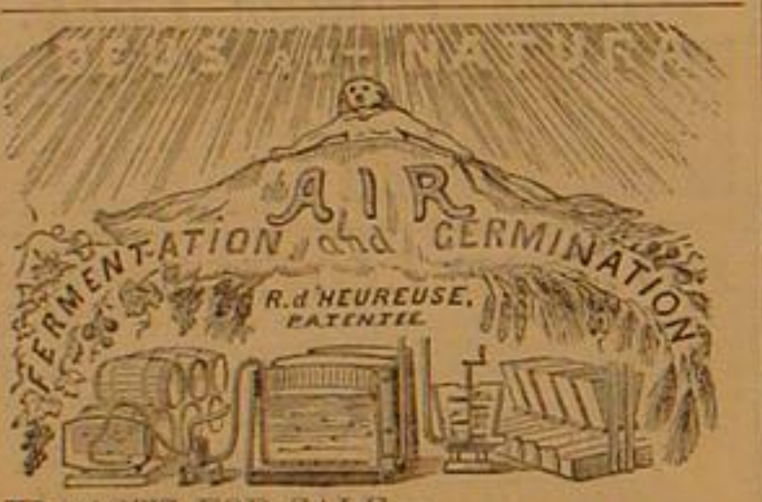

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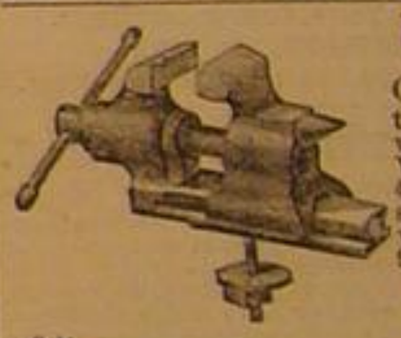

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Vol. XX.—No. 11. [NEW SERIES.] | NEW YORK, MARCH 13, 1869 | $3 per Annum. [IN ADVANCE.]

Improvement in Tweer Irons for Forges.

A hot blast with a cool tweer face are points so apparently irreconcilable, that at first it would seem impossible to combine them except by means of a complicated device. But it has been accomplished in the device shown in the accompanying engraving, the simplicity of which is equaled only by its efficiency and durability, it having for two years been in successful use both in this country and England.

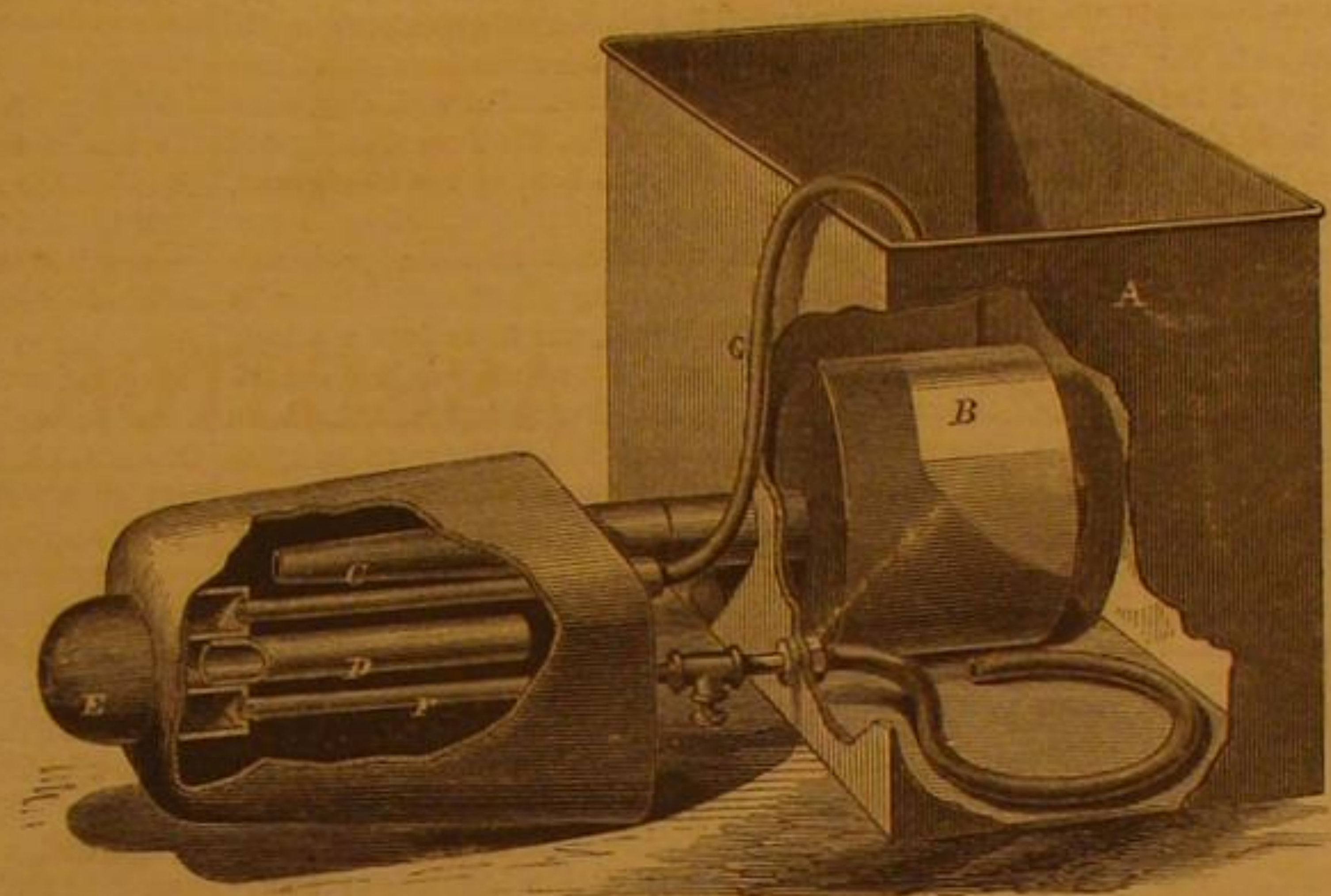
We gave an illustrated description of a tweer on a similar plan, in No. 26, Vol. XV, of the SCIENTIFIC AMERICAN, but since that publication it has been greatly improved by the inventor. The advantages of a hot blast in the working of iron and steel are too well known to be questioned or described; we will therefore confine ourself to a description of the implement itself.

A is a tank, either of plate iron, zinc, or of wood, of any convenient form (a barrel will do), placed back of the forge, or in any convenient situation, so the level of the water it contains is above the tweer. The length of pipes connecting with the tweer is not material. The blast enters the drum, B, and passes through the pipe, C, impinging on the face of the tweer and reaching the fire through the pipe, D, and nozzle, E. This nozzle is a hollow casting, as seen, and is filled with water from the tank by means of the pipe, F. The steam that is generated in the nozzle is conveyed back to the tank by the pipe, G, and condensed. When the forge is to be left unlighted, as on nights, and Sundays, or holidays, and freezing is apprehended, the water may be drawn from the nozzle by means of the cock on the pipe, F, between the tweer and tank. In this case the flexible extension of the pipe, F, seen coiled on the floor of the tank, is raised and its end allowed to hang over the edge of the tank, so that no more water can pass from the tank to the tweer. A jointed pipe of iron may be used instead of the flexible pipe, if desired.

It will be seen that the water entering the tweer nozzle is kept in a constant state of circulation by means of the steam created by the heat, and the face of the tweer nozzle is kept cool while a hot blast is passing through it. The tweer box is about fourteen inches long, ten wide, and eight deep, giving an ample chamber for the heating of the air before it reaches the fire.

The London *Ironmonger*, of Sept. 30, 1868, speaks in very high terms of the actual working of the device. It has also received the unsolicited commendations of a large number of practical smiths in this country and England. All concur in the statement that the iron can be heated in one third the time usually required, with a corresponding saving of fuel, and that the heat is softer and more "suant," not burning the surface before the interior is reached.

Patents for the United States were obtained through the Scientific American Patent Agency, Aug. 7, 1866, Sept. 17, and reissued Dec. 17, 1867. Letters patent for Great Britain, France, and Belgium, have also been obtained by John Bayliss, who may be addressed at the corner of Lexington avenue and Fifty-fourth street, New York city, where the tweer may be seen in constant operation. Orders may be also addressed to Hollis, Kirkup & Co., No. 24 Dey street, New York city.



BAYLISS' PATENT IMPROVED TWEER.

Adjustable Lathe Tool Post.

No machinist can deny the advantage of such a tool post to his lathe or planer as will allow the cutting tool to be presented to the work at any desired angle, without the necessity of "blocking up," or a resort to similar make-shifts. Such a one is certainly presented in the accompanying engraving. We have been much gratified in an examination of the model; it seems to meet every requirement, except the positions of hight and forward and back movement, and even these it partly compensates for.

The tool stock, A, is bolted to the carriage in the usual way, and is moved forward and back, and raised and lowered in the ordinary manner. The rise, B, of the stock is bored from the under side, leaving a semicircular seat, as seen, for the reception of the bottom, C, of the tool post, turned to fit the seat. This arrangement constitutes a ball-and-socket joint. The washer, or flange, D, plain on its upper surface as that on any common tool post, is hollowed on its under side to fit the semicircular apex of the rise of the tool stock, making another ball and socket joint. The set screw serves, as usual, to hold the tool in any position; and the dotted lines show various positions of the post, C, and tool, E. No machinist can fail to see the great advantage this adjustable tool post has over those ordinarily used, either for the lathe or the planer. There can be no doubt about the holding of the cutter in any position, as the frictional surfaces present a very large area, and if they had a bearing only of simply a circular line, we think no resistance the tool at its point would meet would be sufficient to overcome it. It can be applied to any lathe or planer now in use, and we are so favorably impressed with this device, that if we were in our old business, we should not hesitate to give it a fair trial.

By a careful examination of the device every progressive machinist will see that it is one of the simplest as well as one of the most useful of contrivances yet presented to his attention.

Patented May 12, 1868, by Wm. H. Leach, assignor to himself and Bradford Stetson. Orders should be addressed to the agents of the patentees, Horace McMurtrie & Co., 80 Milk st., Boston, Mass.

LEACH'S PATENT TOOL POST.

PRODUCTION OF BEAUTY IN ART.

Mr. Richard Westmacott, R.A., in a recent lecture upon the above subject, said that the production of beauty in art depends much upon truth of proportion, and truth of proportion is governed by certain fixed laws, which, within certain limits, cannot be violated. For instance, there are certain proportions between parts of the bones in all human beings, which are, practically speaking, always the same, though masked more or less, sometimes, by the fleshy covering. He would illustrate this by first drawing a circle and bisecting it by a line. Then he would divide this line inside the circle into three equal parts, denoted by the ends of lines 2, 3, and 4. In drawing a well-proportioned face, 3 would be the line of the eyes, 2 of the parting of the hair, and 4 of the end of the nose. By this rule the eyes always come at the center of the egg-shaped outline, between 1 and 5. This canon law of art holds good in the best of Grecian faces, and when it is departed from a little here and there, the faces will lose much of their ideal beauty, and look more like portraiture. The lecturer stated certain other rules as to the proportions of other parts of the human frame. He said that while in Rome, he and others devoted much attention to this subject of proportions, and talked it over at numerous meetings. Although every artist ought to know these rules, they should not follow them blindly, as it is impossible to produce fine works of art by mathematical laws alone. The sculpture of Egypt and Assyria was not fine art, for those who executed the work were bound down by such conventional rules that no improvement was possible. The early Greeks, who, so far as he could ascertain, did not in any way get their first lessons in art from Assyria or Egypt, did not recognize portraiture as a branch of sculpture. Their statues were all devoted to high religious and national purposes. Alexander the Great was the first to apply it to portraiture, and he did so out of personal vanity, in his desire to equal Jupiter Ammon. Until his time none but the features of the gods had been stamped upon the coinage, and he seemed afraid to interfere with the custom at once, for, the first time he altered the heads upon the coins, he stamped upon them a kind of confusion between his own head and that of Jupiter Ammon. From that time art steadily declined. The early Greeks first began art study 600 or 700 B.C., and in a little more than 150 years, made enormous progress, for, at about 450 B.C., in the time of Phidias, Grecian art was perfection. Some of the works of this period are now in the British Museum, and he wished that, at stated hours, a lecturer or other competent teacher were present there to point out the beauties of these works of antiquity. It is one thing for the public to possess art treasures, and another thing to be able to appreciate them. The grand and noble school of Phidias, which was "perfection," was succeeded by that of Praxiteles, whose figures were life itself, but who gave art a sensuous direction. He first introduced the partly draped female figure, but, under considerable fear that the priests or the government would interfere. But they did not, and soon the drapery disappeared altogether, though works of fine art were still used only for the adornment of temples and other high purposes.

Lastly, Alexander the Great, out of personal vanity, introduced portraiture, and from that time art declined, and has not altogether recovered since. Roman art was very poor, though, in all directions, Rome is and was rich in the finest art specimens, nearly all being the work of the Greeks. So little did the Romans understand the beauty of these works, that one of their emperors threatened, that if his subjects broke any of them in the carriage they should be compelled to make others like them. Had they attempted such a feat, the result would have been of a very distressing character.

The lecturer said that, although native Roman art was always at a low ebb, it would not be fair to omit the statement, that several individuals in that nation gave encouragement to art. Among these were Cæsar and Hadrian, the latter of whom tried to introduce Egyptian religion and sculpture into Italy. When, after the time of Alexander, art began to decline in Greece, the sculptors migrated into other parts of Europe. In the year 323 Constantine carried the seat of his empire, and a taste for art along with it, to Constantinople, and ornamented that city in a manner almost beyond conception. But Alaric, and other invaders, overthrew the empire, and destroyed most of the beauties of Constantinople. After the time of Alexander, the

Great, art declined all over Europe. It never revived; for what is commonly called the revival of the fine arts in Europe, was, in reality, a new birth. The early Christians, in their works of art, had a strong and obstinate prejudice against imitating, in any way, the beauty of form displayed in the works of the pagan Greeks, and they had neither the taste nor the ability for the accurate imitation of nature. Hence, 300 years after Christ, art in Europe was in a much lower state than it had been 300 years before his time. At last a quarrel broke out between the Eastern and Western Churches respecting the introduction of beautiful works of art into their temples. The Eastern Church objected to the innovation, and to this day, the art displayed in the Greek Church is of the most barbarous description. The Latin Church, however, gradually improved, and possessed specimens of very good art workmanship in the eleventh and twelfth centuries. These works are now plentiful in Italy, at Pisa and Florence. About the twelfth century Gothic architecture was introduced, but had not sufficient vitality, from intrinsic imperfections, to last more than 250 years. An attempt is now being made to re-introduce it into England, but the idea the lecturer thought to be as absurd as an attempt to bring ancient Assyrian art into fashion. An idea prevails in the minds of many people that the Gothic is an essentially Christian style, whereas, it was completely unknown till Christianity had been in the world for 1200 years. Its figures are usually absurd and grotesque, representing busts supporting brackets and roofs, and water spouts carved to resemble monks or nuns. Its recumbent figures have their drapery arranged in straight lines like organ pipes, and the folds are just the same in the prostrate as in the standing figures. People speak of the "purity" of the Gothic, but the fact is that many Gothic carvings in old English churches are so blasphemous and indecent that the wood has had to be re-screwed in its place, face downward, or against the walls, and sometimes the representations have had to be planed off or plastered over. He did not care about giving names, yet could mention many English churches wherein these works can now be seen. As a milder specimen of grotesque Gothic carving, he called attention to a picture upon the wall of a pew door from a church. It represented a bishop with the head of a fox watching birds and nondescript animals, while below his feet was a monkey roasting a sucking pig. No modern church would ever disgrace itself by such works of art. In fact, it is scandalous to say that, in these days, we must go back to the Goths to learn what art should be, and if people have a passion for imitating ancient art, they need not choose a bad school to copy, but go to the Greeks, who had a good one. St. Peter's, and other churches in Rome, abound with very interesting specimens of ancient art, but the subjects are such as, in many cases, should never be introduced into a place of worship. They are not of a religious character, and he was glad that, in England, churches are not now adorned with similar figures to those prevalent in churches in the south of Italy.

MANUFACTURE OF PARAFFINE.

From All the Year Round.

Few persons who are accustomed to use the pure white candles, delicate as wax in their hue, and known popularly by the name of "composites;" and the clear oil, almost as transparent as water, which is called "paraffine;" have any idea that both are produced from a dull, compact coal, totally devoid of the luster which gives to that mineral the appellation of the "black diamond." And yet this seeming miracle is achieved by the aid of chemistry—that strange science which changes and transmutes substances and reveals properties, hidden and mysterious, at the will or instigation of the student. The process by which the change is effected is complicated and laborious; but, freed from its technicalities, it may be easily explained.

The coal yields four different articles, all of which are largely employed in daily life, and have given rise to a considerable commerce. There is, first, the paraffine oil for burning, at present manufactured by thousands of gallons, which, in many parts of England, where gas is still unknown, is the staple commodity of illumination. Then a second quality of the same oil, considerably cruder and coarser, which, on account of its cheapness and general aptitude, is largely employed for lubricating machinery. Naphtha comes next upon the list—a light volatile fluid, much used by traveling showmen to light up their stalls and tents. Lastly, there is solid paraffine—a pure, white, shining, tasteless substance, scarcely distinguishable from wax, which is manufactured into candles. These substances, though widely differing in color, properties, and consistency, are all manufactured by nearly the same process, the difference consisting merely in the number of times that a particular operation is repeated.

Boghead mineral is the name of the coal employed in the manufacture of paraffine; and this is conveyed from the pits direct into the heart of the works, by means of branch lines of railway. Arrived here, the coal is passed through a huge iron crushing machine, and broken into small pieces, to facilitate the labor of subsequent stages. The first result to be achieved is to extract the crude oil from the coal. This is effected by means of retorts, into which t e mineral is put, and the oleaginous matter extracted by burning. These retorts may, for our purposes, be described as huge upright iron pipes passing through furnaces. The coal is filled into the pipe or tube by the top, which is then closed with an air-tight valve; and the bottom of the pipe is led into a pool of water to prevent the entrance of air from below. A low red heat of uniform temperature is maintained constantly in the retorts. As the coal is acted upon by the fire, it descends gradually in the tube and becomes entirely decomposed. The essential or oleaginous property of the mineral passes off in vapor, and the refuse falls through the bottom of the pipe into the pool of water, and is raked away. The vapor or steam, as it is generated by the decomposition of the coal, is carried off by a pipe in the side of the retort. This pipe again communicates with a series of pipes placed upright in the open air, and arranged on the same principle as the bars of a common grid-iron, after the fashion that prevails in gasworks. The vapor, in traveling through this labyrinth of pipes, cools, is condensed into liquid, and is run off into an immense reservoir sunk into the ground. The crude, oily liquor thus collected is a thick, black, greasy fluid, not unlike tar, which moves with a sluggish motion when stirred, and gives off inflammable vapors at the usual atmospheric temperature. This coarse oil, both in its properties and appearance, closely resembles natural petroleum, and is equal to the rock oil, which, as we have seen, was obtained in Derbyshire.

The raw material thus prepared by simple burning is kept stored in the tank, and is only drawn off when required. To the observer nothing seems stranger than that this heavy, black, tarry liquid should produce oil as pure as water, and solid paraffine as white as marble. And yet the marvel is wrought daily, and on a scale which supplies distant markets of the world with oil. It is a mere question of refining. The black liquor is, as it were, boiled, washed, and bleached, re-boiled, re-washed, and re-bleached, until the last particle of its darkness and impurity is purged away. The first step in the work of refinement is in some respects similar to the previous process of decomposition. The crude tarry liquid is put into stills, which we may call huge boilers of gigantic strength, with movable doors or lids. When the stills have been filled, the doors are closed, and the joints are stuffed with clay, so as to render the interior perfectly air-tight. Fires are then lighted in the furnaces below the boilers, and kept up to a steady heat, till the fluid inside distills over and is transmitted again into vapor. This vapor, as in the former instance, permeates through another series of condensing pipes, and, during its transit is re-transmuted into liquor, and flows into a second reservoir. Collected in this tank, the oil shows abundant evidence of the severity of the ordeal through which it has been put. It passed into the stills black and of the consistency of treacle; it has come out of a dark-green color and of the consistency of pea soup. A large portion of the coal-black has, in fact, been boiled out of it, which is now to be found in the bottom of the boilers in the shape of a lustrous compact residue resembling coke, for which it makes a very good substitute.

The next stage in the process of purification is of a different character. The dark-green liquor is transferred to tanks, and a certain quantity of strong sulphuric acid is added. The acid is employed in order still further to bleach the oil, and purge it of some more of the impurity with which it is so largely impregnated. To effect this object it is essential that the oil and the acid should be mixed up or assimilated as much as possible—a work of some difficulty, on account of the tendency of the former to float on the top, by reason of its lighter specific gravity. This tendency is neutralized by the action of a revolving stirrer fitted with blades, which, when put in motion, beats and agitates the two liquids, and causes them to mingle equally. For four hours is this operation continued, until, under the biting influence of the acid, the dark-green oil changes to pale-green, and gives token of having parted with much of the grosser substances that had rendered it dull and opaque. The stirrers being at length stopped, the liquor is allowed to settle, and the organic impurities that have been separated from it by the action of the vitriol, collect in the bottoms of the tanks. The lees in this case assume the shape of a coarse acid tar, which is also used as a substitute for fuel.

The oil, thus far cleansed of its foulness, is now transferred to clean tanks, mixed with a strong solution of caustic soda, and again subjected to the beating of the stirrers. The action of the alkali extracts a good deal more of the coloring matter, and changes the pale-green to yellow. At the end of a second period of four hours the liquor is allowed to settle, is drawn off from the lees as before, is pumped into the stills and is re-distilled, and is again brought back to be put through the acid and alkali bleaching process; the result being its assumption of a clear, pale, yellow color. When in this stage of its preparation the oil contains the elements of no less than four different products, each valuable as articles of commerce, to separate which is the next care of the manufacturer.

The separation is effected merely by distilling the oil at various temperatures. At the lowest temperature the lightest and most volatile parts of the oil pass off in the shape of vapor. Upon being cooled, by passing through pipes, this vapor yields a liquid which, upon being distilled by itself, gives a light, transparent, inflammable fluid known by the name of naphtha, the specific gravity of which is considerably less than that of the naphtha derived from coal-tar. This naphtha is largely employed as a substitute for turpentine in india-rubber works, where it is employed to dissolve the materials used in that branch of manufacture. At the temperature next to the lowest, those parts of the oil that are next to naphtha in point of volatility are taken off, distilled, and condensed, and yield paraffine or lamp oil. The processes of purification and distillation are repeated with this oil till it has assumed the requisite degree of purity, and become transparent and almost free from smell. A gallon of this oil weighs about eight and a quarter pounds, and is, in point of illuminating power, nearly equal to one gallon and a quarter of American petroleum. A yet higher temperature than that which is necessary for the production of the burning oil produces a thick, heavy, lubricating oil, used in vast quantities in the Lancashire factories for oiling the machinery, and also by watch and clock and philosophical instrument makers. This oil, when it comes from the still, is largely impregnated with solid paraffine, and when it cools it assumes the consistency of grease, the paraffine having coagulated into crystals. Before the lubricating oil can be made available for what it is intended, these crystals must be separated from it; and here again another operation, but one of a simple nature is requisite. The oil is poured into thick canvas bags, which are placed in hydraulic presses. Pressure is then applied with such force that the oil is squeezed out of the bags, leaving the crystals within. The oil thus squeezed out is the lubricating oil, and is ready for the market; the crystals are the paraffine in embryo which has so often been admired in the shape of candles.

When turned out of the bags the paraffine is in its coarsest state, and is of a dirty yellow color. This hue is the result of the quantity of oily matter which the substance, in spite of its frequent purgings, still retains. Its perfect and final purification is effected by the repetition of a single process, continued till the requisite clearness is obtained. The paraffine is dissolved in heated naphtha, and is kept in solution for a considerable time, after which it is allowed to cool and again assume its crystalline form. The process of squeezing in the press is repeated, and when shaken out of the bags this time the paraffine is seen to have changed from yellow to dirty white, and is consequently so much purer. The operations of dissolving and straining are repeated till perfect pureness and whiteness are obtained. This result achieved, the odor of naphtha which clings to the substance is driven off by steam, and the paraffine, in a liquid state, is run into molds, which form it into thick round cakes. In this shape it is sent off to the candlemakers.

Engineering under Ground.

We learn from the *Artizan*, London, that a new length of the line of the underground railroad of that city has been completed at a cost of $3,500,000 per mile, the bulk of which has been applied towards compensation for damages. The length of new line is nearly three miles, and has six stations—one at Westminster bridge; one in the Broadway, at St. James's park; one at Victoria, where it joins the Chatham and Dover line; one at Chelsea, near Sloane square; one at South Kensington; and one in the Gloucester road, West Brompton. Of the whole length of line about one-third is tunnel and the rest open cutting.

No very special engineering difficulties were met with in the construction of the line except the continued presence of water, as some parts of the works are below low-water mark. The greatest depth below the surface to the rails is not more than 32 ft., the quickest curve is 440ft. radius, and the greatest incline 1 in 250ft. Considerable difficulty was experienced during the construction of the line, from water, both from the sewers and from the surface drainage. On one very wet day in the early summer no less than six sewers burst at once, and gave the pumps enough to do to keep their contents, with the surface drainage, from flooding all that was then built of the line. To this day, and as long as the line is in use, there must always be permanent pumping stations for the mere surface drainage, there being no outlet toward the river without raising it to a higher level. This water difficulty, however, is very ingeniously met by Messrs. Fowler and Johnstone, the engineers of the line. The side walls both of the arched tunnels and open cuttings are made of extra thickness, and, above all, are connected beneath the ground by an inverted arch of concrete nearly three feet thick. This effectually prevents the water rising up through the floor of the line, and equally prevents the surface water from draining off. For this surface drainage, therefore, special provision is made, by means of pipes laid in the center of the line, which carry the water on to the pumping stations, where it is raised and sent away into the Thames. Passing under the middle of the Broadway the line is carried, not in a tunnel, but in a broad, lofty, square chamber, with a flat roof, on massive wroght-iron girders. This is a beautiful piece of work, both in its design and finish, and is of the most unexceptionable character from beginning to end. While passing along the Broadway special precautions were taken to guard against any possible vibration affecting Westminster Abbey. The walls on the Abbey side are here made seven bricks thick. Behind this comes the Victoria sewer in a tube of iron, and behind all a bed of peat seven feet thick. The peat checks all vibration, but as the nearest point at which the line passes is more than 90ft. from the Abbey walls, its deadening properties are scarcely required.

After Westminster bridge the first station is St. James's park, and leaving this the line continues in an open cutting to Buckingham row, where it enters a tunnel of about 500 yards in length. Here the water occasioned so much difficulty that engines had to be kept going night and day, pumping at the rate of nearly 4,000 gallons a minute. The tunnel at this point passes but a few feet below the surface of the ground, yet it forms the foundation of the brewery belonging to Elliot, Watney & Co. above. This building is now carried on a series of girders, but the work had to be done with great care, for the superincumbent weight was immense, and the soil below poor and treacherous. After finishing this portion of the line a fresh difficulty arose with the King's Scholar's Pond sewer, the largest sewer next to that of the Fleet in London. This had to be entirely diverted and reconstructed in an iron tube, 11 feet wide by 14 feet high. So very limited was the space at command that this sewer had to be built over the up and down line in a deeply arched form in order to make room for the funnels of the locomotives. This most difficult of all the tasks on the line has been admirably executed by Mr. T. A. Walker, the resident engineer, who has had charge of the works throughout. A few yards from this point is the station at Victoria, which, like all the others on the line, is open, or rather only closed in with light glass and iron roofs. From this point the line passes on to Sloane square, a wide and lofty station, but the architectural effect of which is much marred by the Ranelagh sewer being taken in a huge cylinder of cast iron right across its very center at the springing of the arches. Continuing westward, the next station is near the site of the Exhibition building of 1862, and to this a new road will be made by a continuation of the Exhibition road from Kensington. The last station is at Gloucester road, West Brompton, where the junction is effected with the Metropolitan Extension. The District line then branches to the south and forms a double junction with the West London, by means of which a communication is gained with most of the southern lines.

American and European Woolen Manufactures.

BY E. R. MUDGE, U. S. COMMISSIONER TO THE PARIS UNIVERSAL EXPOSITION OF 1867.

We cannot be said to occupy a national position in the woolen manufacture except in card or clothing wool fabrics, our success in other departments being exceptional. Our work has been in the direction demanded by the prime necessities of our people and the peculiar character induced by the nature of our raw material. Our peculiarly national wool manufacture is comprised in the production of all the varieties of card-wool tissues from flannels inclusive to the finest-faced broadcloths, which are only exceptionally included. Within this range, comprising plain, fancy, domet, and opera flannels, blankets, woolen shawls, satinets, the infinite variety of fancy and silk-mixed cassimeres, sackings, repellants, tricots, beavers Esquimaux, escredons, cloakings, our success has been complete, and our progress within the last five years truly astonishing. In nearly all these productions we can vie with any nation in excellence, soundness, and taste of manufacture, and in some of them in cheapness. These goods, it must be remembered, furnish all the absolutely necessary card wool-clothing for our population, and all that the great majority of our people are inclined to wear at any time, a very small part of the population of the cities wearing occasionally, only, the fine and high-priced black cloths. A small part of our population, it is true, prefer to purchase cloths of foreign make to distinguish themselves from the masses, but they are of the same class who in France, under the empire, when cotton stockings were prohibited, preferred smuggled cotton stockings to silk, because they could be only obtained at double the cost of the latter. Fashion all over the world demands the use for common wear of the medium mixed and fancy cloths in place of those of high finish. These we can produce from the admirable medium wools grown upon our own soil, and thus the American clothing-wool manufacturers and wool-growers are able to perform their part in one of the first duties of a nation, that of clothing its own people. In the class of goods referred to there is no need whatever of foreign supply, and none would be sought abroad if there were among us that national sentiment in favor of home production which prevails among the nations of Europe. Notwithstanding the freedom of exchange among European nations, the national sentiment is found to be the most efficient encouragement of domestic production. The lustrous German cloths so freely sold here find no sale in England. The London tailors who visited the Exposition reported that there was nothing on exhibition which would compare with the cloths of England. How different is the practice with the tailors and retail dealers in this country who persistently foster the unpatriotic prejudice in favor of foreign goods, because they can obtain larger profits on the foreign article than on the domestic, as the cost and quality of the former are less generally known than of the latter.

To specify more minutely the comparative qualities of American goods: In the whole range of fancy cassimeres, including the mixed goods of silks and wool, in style, taste, perfection of manufacture, and strength of material, we excel the English, and nearly approach the manufactures of France. The same may be said of the whole range of flannels, colored and plain, and of the Esquimaux and Moscow beavers, which we have imitated from the Germans. In the low cost pilots, used as substitutes for the beavers, sightly to the buyer, but trashy in wear, it must be admitted that we can hold no comparison with the English. In all the grades of woolen shawls which can be fabricated of American wool we successfully vie in fabric and cheapness of price with the Scotch, who are confessedly at the head of this branch of manufacture. In the class of all-wool goods of light weight, made in all varieties of colors, denominated sackings and cloakings, and largely sold for women's wear, the fabrics are now sold in this country, at prices reduced to a gold standard, cheaper than any similar fabrics are sold in Europe. Goods of this character, displayed in the American quarter of the Exposition, and marked at their net gold prices, attracted great attention for their cheapness, and constant applications were made for their purchase.

In some other branches of the woolen industry, beside that of card wool, especially those where we have equal facilities with the European manufacturer in obtaining raw material, our productions bear a favorable comparison. American carpets are fully equal, if not superior, to the English carpets of similar grades. In the American Brussels and tapestry carpets there is no inferiority in designs, colors, or texture. In fact they are woven here and in England by the same machinery. The American retail purchaser is invariably compelled to pay a higher price for a foreign carpet of the same grade; that is, he can purchase a better American carpet at the price of the foreign article. The American ingrain carpet, which is much more largely consumed, is unquestionably superior to the English. This is evinced by the fact that the yarns used in English carpets are not sufficiently strong to admit of their being woven in power looms, as is done in this country. There is a prevailing prejudice against American dyes in carpets as well as in other fabrics. No prejudice could be more unfounded. The same chemical agents and the same processes are used here as abroad. We have in our establishments the best dyers that the better prices of labor paid here can seduce from Europe. One manufacturer of opera flannels exhibits patterns of eighty different hues on one card. In the present state of the art of tincture in Europe and this country bad dyeing results not from want of skill, but the intentional use of cheap materials, and the risk of getting evanescent dyes is much greater in purchasing cheap imported goods than in buying the products of well-known American manufacturers, who only use inferior dyes when purchasers insist upon cheaper goods.

Imperfect Boilers.

Under the head of "Why Boilers Sometimes Explode," we compiled a statement from the *Locomotive*, published in Hartford, Conn., and published it on page 75 current volume. The statements there made were of a sufficiently alarming nature, but we copy the following in addition from the same publication for February:

"During the month of January, 275 visits of inspection were made, and 536 boilers examined—445 externally, and 166 internally—and in addition, 37 have been tested by hydraulic pressure. In these boilers 403 defects were discovered—51 of them being regarded as particularly dangerous. Furnaces out of shape, 21, and 1 dangerous. Fractures, 60, and 12 dangerous. Burned plates, 22, and 2 dangerous. Blistered plates, 48, and 6 dangerous. Cases of incrustation, 68, and 3 dangerous; the scale was so thick in these three cases as to keep the water entirely from the fire sheets, and they were consequently badly burned and weakened, and hence were positively dangerous. Cases of external corrosion, 53, and 6 dangerous. Where boilers are bricked in, we find this latter difficulty frequently, and if the joints of the steam pipes, running from and over the boiler, are not tight, the leakage dripping down on to and through the brick covering, silently, but surely makes trouble. Internal grooving, 7. Water gages out of order, 22. Blow-out apparatus out of order, 3. Safety valves over-loaded, 29, and 6 dangerous. Pressure gages out of order, 70, and 5 dangerous. Boilers without gages, 27—all of which we regard as dangerous; and one boiler is reported without either safety valve or gage!

"The comments made by our various inspectors are as follows:

"One says: 'The dangerous defects noted in my report were two safety valves—one of them the lever was corroded in the socket so fast that it could not be moved without bending or breaking, and the pin could be got out only by drilling. The other valve had, in addition to its own proper weight of 160 pounds, another weight of 90 pounds on the lever. The pressure of steam required to lift this valve would be 140 pounds to the square inch.'

"These safety valves were each put in good working order, and properly weighted. Another defect was a very bad blister over the fire, which was repaired at once; and three mud drums were found so far gone that the inspector could drive his hammer through in various places; these also were put in good order.

"Another inspector writes that, in his territory, he finds a great many low-water indicators out of order and inoperative. And further, that in some places so much reliance is placed upon them that the gage cocks are seldom used; and in many instances, have become entirely useless from corrosion.

"Now, we most emphatically advise all parties to see to it that their safety valves and gage cocks are in the very best condition—no matter how many patent attachments there may be—by no means fail to see that those most important appliances—steam gage, safety valve, and three-gage cocks—are in perfect working order.

"One inspector reports thirty-three steam gages incorrect; the variations are not large, except in two instances, where one indicated fifteen pounds, and the other twenty-one pounds less than the actual pressure carried.

"Our Home Office inspector contributes the following, which we commend to the careful perusal of paper manufacturers:

"'The proprietors of paper mills, as a general thing, pay too little attention to the condition of the check valves of their bleach boilers. Where these check valves are out of order, the pulpy matter passes over into the steam boiler. And we have sometimes found it at and about the water-line, in places three inches thick. The lime also, which passes over, is deposited in the form of scale upon the sheets and flues, rendering them liable to be burned, beside causing great waste of fuel from its non-conducting character. The valves must not be left until there are positive indications that they are in a leaky condition, but they should be examined frequently and be replaced by new ones, in case there is serious leakage. Never trust to grinding by inexperienced persons for a tight valve—there are very few who can grind in a valve properly, and in many cases the leakage will be greater after the attempt. We have not referred to the danger resulting from vitriol, used in bleaching, being carried over into the boiler, as it must be obvious to every user, that such a mixture cannot be otherwise than injurious. The only way to keep things in a good and safe condition, is to pay attention to all the parts and appliances about the boiler.'

"Had we space, much could be said of other defects, detected by the month's work, but the record speaks for itself. Some persons have been disposed to intimate that the company has an object in 'making an array of alarming facts and figures;' but we can assure such that our monthly reports do not begin to show the actual facts in the case. Any person who will examine the correspondence which we have with our various agents and inspectors, will be convinced that our reports are far from being exaggerated."

The Phosphoric Light.

So far as principle goes, it is dependent on the fact that when ordinary wax-like phosphorus is burnt in air white and solid phosphoric acid is produced, and this combustion is attended by the production of an intense light. Every schoolboy knows that the light emitted when phosphorus is burnt in pure oxygen is still more brilliant. Mr Winstanley sought to utilize this fact with the design of obtaining a powerful light for photographic purposes, and carried out the idea in the following way: A quantity of the wax-like variety of phosphorus was placed in a suitable vessel; through this vessel a current of common coal gas was passed, the direction of the stream being so regulated that it could pass over the phosphorus and then escape through a jet fitted for the purpose. When the coal gas is passed over the phosphorus at ordinary temperature, and then ignited at the jet, it, of course, burns with its usual flame; but when the phosphorus is heated it commences to volatilize, the luminosity of the flame greatly increases owing to the combustion of the phosphorus vapour, and fumes of phosphoric acid are produced.

Mr. Winstanley pointed out that, though this phosphoric gas flame gave a light of much greater brilliancy than that of ordinary ignited coal gas, yet the intensity of the light could be greatly augmented by feeding the phosphoric flame with pure oxygen. When this was done, the report says: "The brightness of the flame was enormously augmented, and the ample room in which the experiment was conducted became brilliantly illuminated." We congratulate Mr. Winstanley on his ingenious and successful experiment, and hope that further results may flow from such well-directed efforts.

There are just two points that we must for humanity's sake touch upon here. Those of our readers who have not had much experience in the more dangerous class of chemical experiments little know what a disagreeable substance phosphorus is to manipulate with; and it is only good and careful experimenters like Mr. Winstanley who may venture to use this new gas flame. We must confess to a great antipathy to employ any more phosphorus than is actually necessary, as in our juvenile days we received a burn of such severity that the strong scar still remains to warn us when chemical proclivities would tempt us to forget our former experience and meddle with this dangerous body. We would, therefore, caution the more inexperienced of our readers against meddling with our new but treacherous ally.

Again: the product of the combustion of phosphorus with free access of air is a highly irritating acid, or, rather a white smoke, which becomes a powerful acid on coming in contact with the moisture always present in the air. A little of this smoke, when allowed to escape into the atmosphere of an apartment, gives rise to a most disagreeable choking sensation. This latter objection to the use of the phosphoric flame could of course be to a great extent removed by the employment of a suitable chimney communicating with the air external to the apartment. We may add that any disagreeable fumes escaping removal by the chimney can be quickly rendered harmless by a little liquid ammonia placed in a shallow dish near the apparatus.

Having said so much about Mr. Winstanley's plan, we now come to the suggestion of a friend, to try the effect of volatilizing magnesium by heating the metal very strongly in a stream of hydrogen, and then to ignite the gas as it issues from the vessel containing the heated metal. It was anticipated that in this way a brilliant magnesium light would be obtained, owing to the combustion of the metallic vapor along with the gas. It is obvious that zinc might be employed in the same way, since it is about as volatile as magnesium.

In the first instance, we placed some metallic magnesium in powder near the end of a tube of very hard and infusible glass, the portion of tube immediately beyond the metal having been drawn out to a fine jet. A current of hydrogen gas was then passed through the tube and ignited at the jet; of course the gas then burnt with its usual nearly colorless flame. The glass tube was now heated close to the jet so as to melt the magnesium; but the only difference observed in the flame was a tinging with yellow. The blast of a powerful gas table blowpipe was now brought to bear on the tube, and the temperature so raised as to render the glass tube very pliable; the gas flame had now become of a bright yellow color, with occasional flashes of bright white light—probably due to particles of the magnesium having been carried forward by the current of gas. The yellow color was found, on examination with the spectroscope, to be due solely to the presence of sodium. The amount of magnesium vapor which ultimately reached the flame was extremely small.

Having failed on a small scale, we repeated the experiment with the aid of a powerful wind furnace and a stout metallic tube, but the result we obtained was little superior to that already mentioned; so that, for all practical purposes, Mr. Winstanley's plan fails in the case of magnesium.

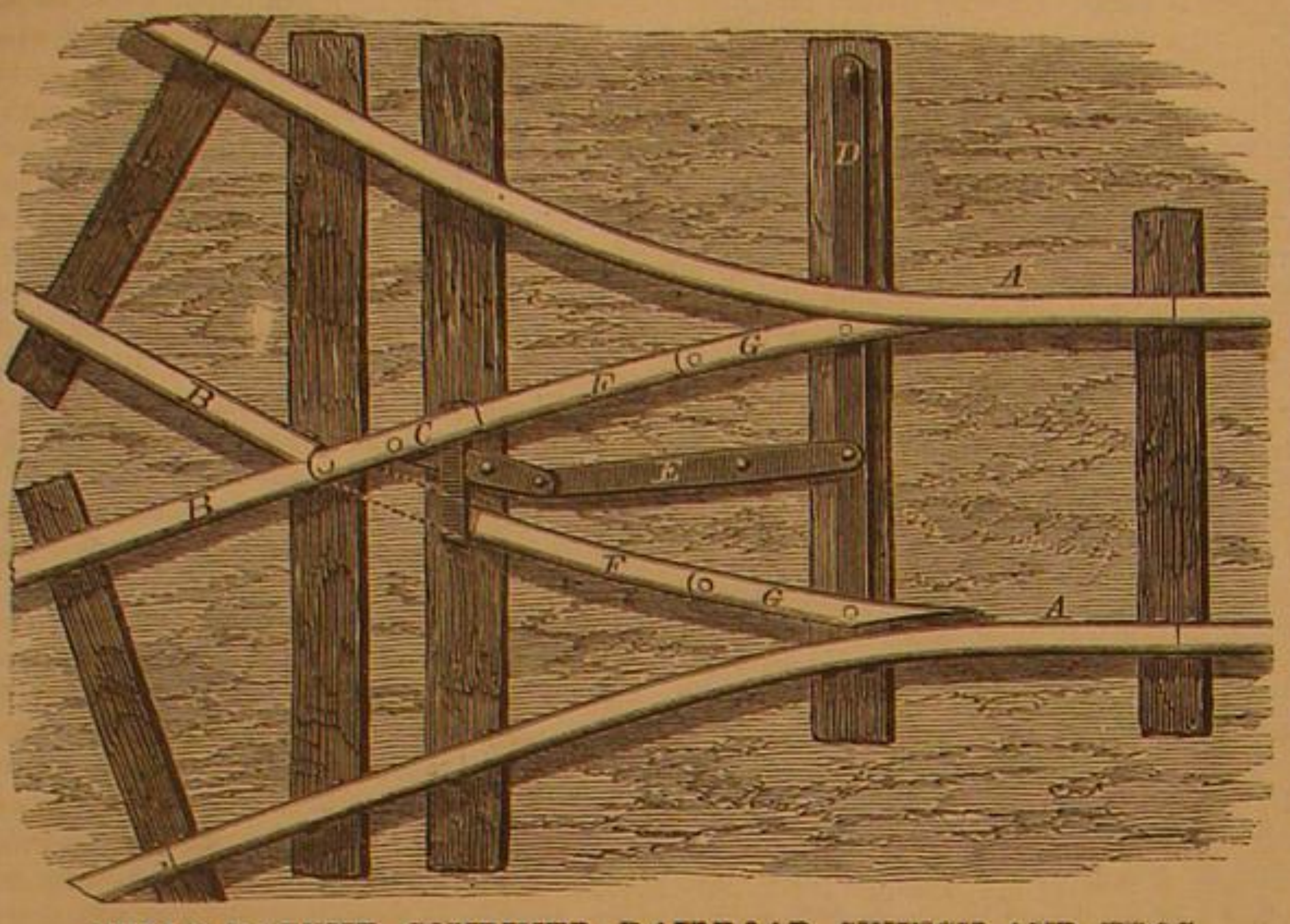
The principle of the method followed in the above instances has received less attention than it appears to deserve at the hands of those interested in the production of cheap and brilliant artificial lights, and we hope now to see it extended in some useful direction.—*British Journal of Photography.*

Poison for the Heads of the People.—The results of an analysis of a new hair lotion described by its vender as "perfectly innocuous," shows that this precious mixture is composed of rose-water, sulphur, and sugar of lead, the latter in sufficient quantity to cause paralysis, or painter's colic. The directions were that a "dessertspoonful should be daily brushed in the roots of the hair, until the whole head was moistened!"

Conduct is at once the aim and test of all our learning, our thinking and striving.

Improvement in Railroad Switches.

The object of the invention herewith illustrated is to provide a combined switch and frog for railroads, the parts of which are operated simultaneously, and which offers a perfectly smooth track for the passage of trains. It may be easily explained and readily comprehended. A A represent the rails of a main line, so curved as to form the outer rails for two diverging branches. B, B, are the inner rails of the branch lines, having pivoted, at the vertex of their angle, a swinging frog or section of rail, C. This may be moved so as to make a connection with either of the branch lines by means of an ordinary switch, to which it is connected by the transverse sliding bar, D, and the intermediate jointed bar, E, as plainly seen in the engraving, which is a plan view. F, F, represent fixed sections of rail to which the points or switches, G, are pivoted, which are also connected with the sliding bar, D. It is evident that as this bar is moved the points and swinging frog must be simultaneously moved, insuring perfect connection with either branch from the main. The advantages, as claimed, are these: The wheels are not required to run upon their flanges, as in passing over the frogs ordinarily used, thus making the track much smoother, the wheels having a fair bearing on the tread as it has on other portions of the track, thereby lessening the danger of breaking them. As commonly made the frogs of a road wear out very fast. The connecting switch bar can be placed either above or under the sleepers as is that of the ordinary switch.



BELL'S PATENT COMBINED RAILROAD SWITCH AND FROG.

Patent pending through the Scientific American Patent Agency, by B. C. Bell, who may be addressed at Duncan's Mill, Sonoma Co., Cal.

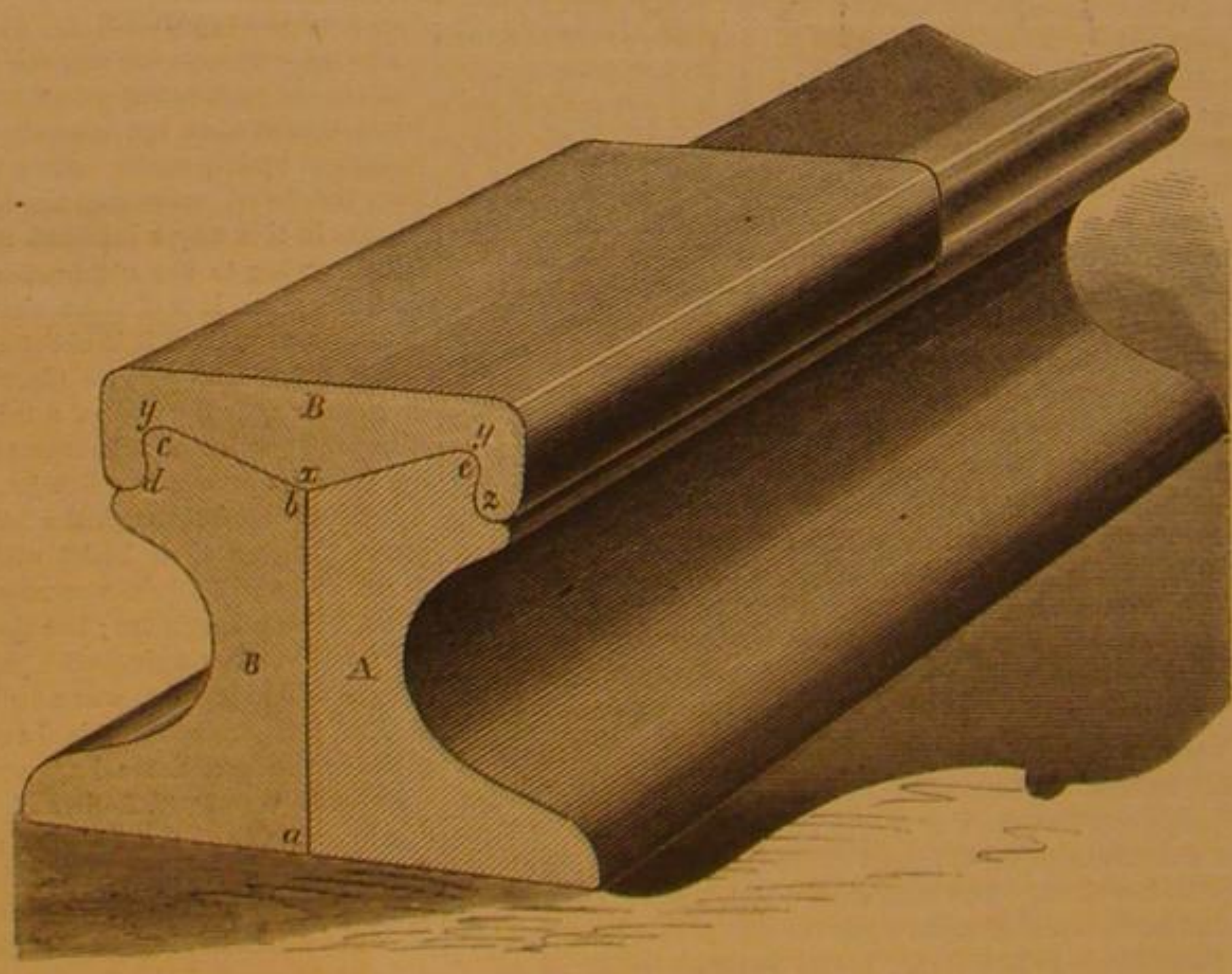
Improved Capped Double Rail.

The following is the inventor's description of a novel rail which was patented January 5, 1869: The base of the rail is made in two parts, A and B. These two parts are exactly alike, having, each, one perpendicular side from *a* to *b* which are placed together. The upper side from *b* to *c* is beveled, the outer corner, *c*, being higher than the inner corner, *b*, so that, when the two pieces, A and B, are placed together, the center of the rail is depressed, the upper sides forming an angle. The outer corners, *c*, are rounded, and the sides of the rail bent inwards, forming a curved groove, *d*; the lower part of the base spreading out the same as an ordinary T-rail.

The cap, B, is made of such a shape as to conform to the shape of the base when put together; that is, the under side being beveled from the center, *x*, to near the sides, where are formed curved grooves, *y*, *y*, corresponding in size with the curved corners, *c c*, of the base-pieces A and B. The sides of the cap, B, are turned down and bent inward.

The rail is placed together in the following manner: One of the base-pieces is secured in its place, when the cap, or top, is placed on, the other base-piece inserted in the cap, and the two bases pressed together, and secured, as in ordinary rails. The rail, when together, is in appearance similar to those in present use. In this rail, the leading objects are to have a rail with a movable top, and fulfilling the following conditions: The top to be easily removed by simply pressing the lower part of one base-piece from the other, the spikes having first been withdrawn from one of the bases. Yet at the same time when in its place it securely holds all parts of the rail together. To have no bolts, keys, pins, or holes, in it, to work loose or weaken the rail. To allow of unequal expansion of all its parts, thereby preventing one of the greatest causes of broken rails. To allow of being made a continuous lap joint rail, as shown in the drawing. The impossibility of a broken rail throwing a train from the track; or the breaking of a rail by unequal expansion. The form of the rail is such that, even though it should be broken in a number of places, it would remain securely together. The greater the weight placed on it, the tighter will its joints fit together, as the angular corner, *x*, along the center of the cap, will have a tendency to press in between the corners, *b*, of the base, thus pressing the upper edges of said pieces outward making the joints, *c*, *d*, *c*, and *y*, *z*, perfectly firm and tight. To be easily rolled and placed together, and to require no hand or other extra work on it, but to be finished when it comes from the rollers. Also the repairing or replacing of a rail at much less expense and time than any in use, and the top can be turned around when worn on one side.

While possessing all the good qualities of the steel and iron rail, it is cheaper and stronger than either, and there being no wear of the bases, they will last indefinitely. For further information address Geo. W. King, Georgetown, D. C.



KING'S IMPROVED RAILWAY RAIL.

A Good Example.

The Boston and Albany Railroad Company have provided a library of a thousand volumes of reference and miscellaneous books, and have fitted up a hitherto vacant apartment in the second story of the Boston passenger station for their reception. The library is divided into two departments, styled the Consulting and Circulating. The first named comprises railway enactments, English and American, encyclopedias, reports, scientific works, etc., to the number of four hundred, which are never to be removed from the building, except by permission of the library committee. The circulating department embraces standard works of interest, instruction, fiction, bound volumes of the most valuable periodicals of past years, etc., five or six hundred in number. Any person in the service of the company on the line between this city and Albany is privileged to take books from this department, two at a time, and to hold them two weeks—the train baggage masters and station agents along the route transmitting them to and from the library on Tuesday and Thursday of each week. Wednesday being the library day for reception and delivery.

How to Stretch Drawing Paper.

The *Building News* gives the following directions, which the writer says have been used successfully by him for fifteen years:

Have your boards perfectly clean and dry, free from dirt, grease, or gum. Have your paper clean on both sides, as the wet sizing will fix pencil marks or dirt in the grain of the paper.

Use gum arabic, dissolved in water, for mucilage. The mucilage should always be kept in readiness for use, and of consistency which will permit a ready application with a bristle brush. If too thin, it will lack strength and be slow in drying, and if too thick, the properties will be the reverse.

The remaining preparations are a clean sponge, bowl of clean water, napkin or towel, and a paper folder or similar instrument

The tools and materials in readiness and within reach, we will proceed to strain the sheet.

On a flat board, with all parts accessible, lay the paper with the back up. Wet the entire back of the paper, including the edges. This must be done by passing the sponge over the surface rapidly, and but once, leaving it well moistened, but without puddles or floating water. Wait a few moments until the first wash has been absorbed and distributed through the grain of the paper, and then apply a second wash in the same manner. As soon as the second wash has been applied, wipe the water and a part of the moisture from the outside edges and apply the mucilage. The paper should now be limpid, but not soppy. Turn the paper and place in position on the board.

This operation is easily performed by taking hold of the paper at the two opposite corners with the thumbs and forefingers, catching the paper inside of the gummed edges, the thumbs being on the surface side. In raising the paper from the board, let it bag moderately, which will prevent the corners from dropping, and the same precaution will keep the paper in shape during the operation of turning, and afterwards. The sheet turned, fix the same in position, first one corner, following up with one side and the whole sheet.

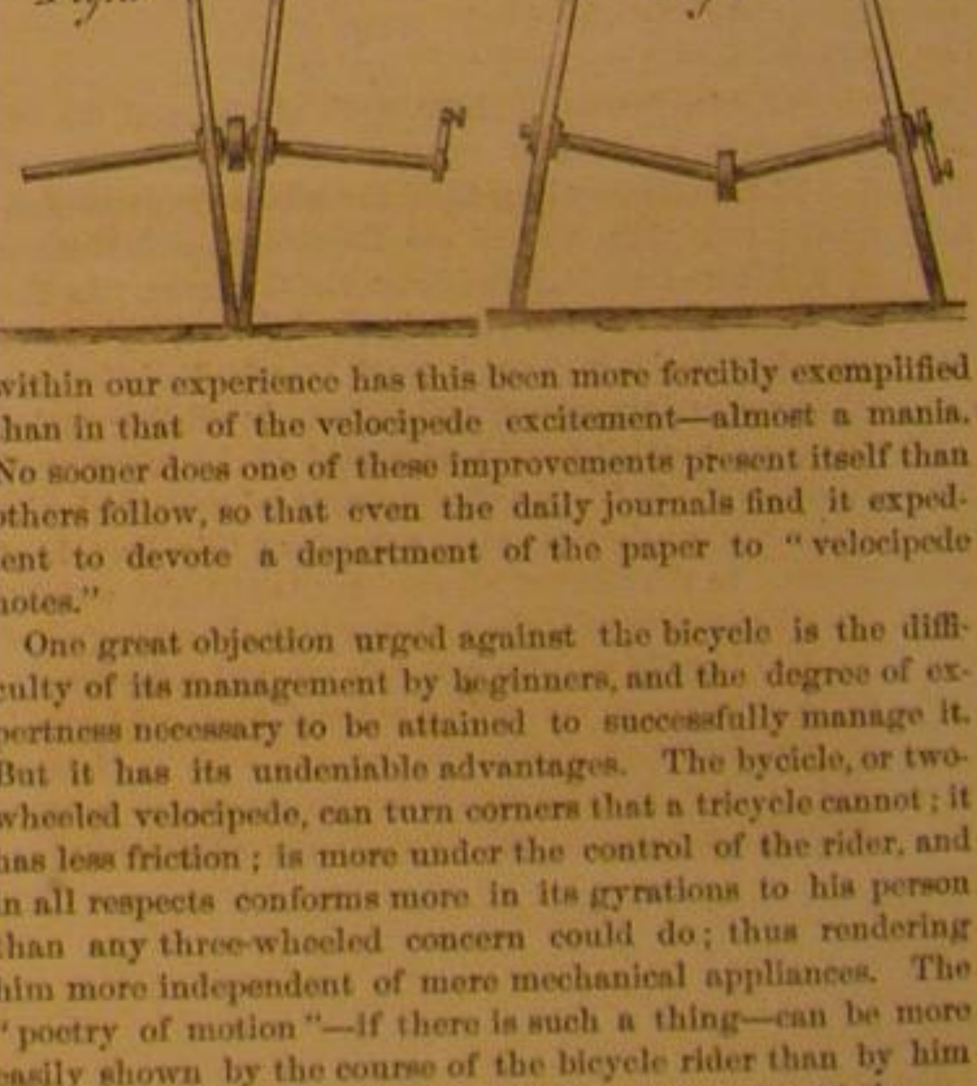
The paper should now lie flat on the board, with the surface and edges evenly extended. Press the gummed edges to the board rapidly with the paper-folder, taking care to work the surplus gum outside the sheet and not under. Wet evenly the face of the paper with the exception of marginal edges about one inch wide. This last operation enables the gum to dry first. When dry, the sheet will be found clean and evenly strained, with smooth edges, and the sizing less disturbed than by any other method.

A little practice will enable one to get the exact tension desired, and one person can more readily perform the entire operation than two, even for such sizes as—Double Elephant.

THE TOPLIFF AND ELY ADJUSTABLE VELOCIPEDE.

When the attention of inventors is directed to any one branch of mechanics, or to any one object, it is a matter of surprise how many improvements may be made on devices which seem at first sight near perfection. In no instance

Fig. 3 Fig. 2



within our experience has this been more forcibly exemplified than in that of the velocipede excitement—almost a mania. No sooner does one of these improvements present itself than others follow, so that even the daily journals find it expedient to devote a department of the paper to "velocipede notes."

One great objection urged against the bicycle is the difficulty of its management by beginners, and the degree of expertness necessary to be attained to successfully manage it. But it has its undeniable advantages. The byciclo, or two-wheeled velocipede, can turn corners that a tricycle cannot; it has less friction; is more under the control of the rider, and in all respects conforms more in its gyrations to his person than any three-wheeled concern could do; thus rendering him more independent of mere mechanical appliances. The "poetry of motion"—if there is such a thing—can be more easily shown by the course of the bicycle rider than by him who strides the three-wheeler, and thus the vanity of the expert is aroused, and he feels, like the skater, that the "eyes of the world are upon him."

It is, however, hard on beginners and the obese, those whose bodily activity has been for years directed to the brain. Imagine the "hefty" editor of the Scientific American on a two-wheeler, with all his load of science and patents in his head; *he* would make a healthy show on a bicycle!

Here, however, in the accompanying engraving, is just the thing—a three-wheeled or two-wheeled contrivance at the will of the rider. It is splendid. See the carelessness of the rider in the perspective engraving, then see the means by which he obtains his carelessness, shown in the accompanying diagrams.

The axle carrying the rear wheels is of a depressed V-form (exaggerated in the diagrams to more forcibly present the idea). When the novitiate mounts the machine it is as represented in the Fig. 2, the wheels at the outer extremity of the crooked axle. Then it is an ordinary three-wheeled velocipede. In this state the rider may run for an indefinite distance; but when he has learned, he may, by a single movement of the lever seen in the perspective drawing, reverse the position of the axle by a half-revolution, and run the wheels together, as seen in Fig. 3. In this case the two wheels, where they impinge on the ground, are simply one. As these wheels are constructed to run on any portion of this crooked axle, no difficulty is experienced in holding them at any intermediate point desired, while they are prevented from coming together by a fixed collar, or flange, on the axle at the point where the two angles meet.

In all other respects this velocipede is similar to others now in use. It is manufactured by Topliff & Ely, Elyria, Ohio. Patented February 23, 1869, through the Scientific American Patent Agency. Correspondence should be addressed as above.

Correspondence.

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

The Economy of the Short Stroke of Engines in Non-rotary Propulsion.

MESSRS. EDITORS:—Referring to my former paper on propelling vessels, on page 44, current volume, I now propose to point out a source of waste or non-utilized steam, which, owing to the radical imperfections of the present rotary system, is seldom if ever considered as such, namely, the steam consumed by an unnecessary length of stroke of engine; for if a pressure of 1,000 pounds of steam passing through a distance of $\frac{1}{2}$ foot, in a given time, will produce the same amount of propulsion that 1,000 pounds passing through 12 feet in the same given time will; the former (a short stroke) must be far more economical than the latter (a long stroke).

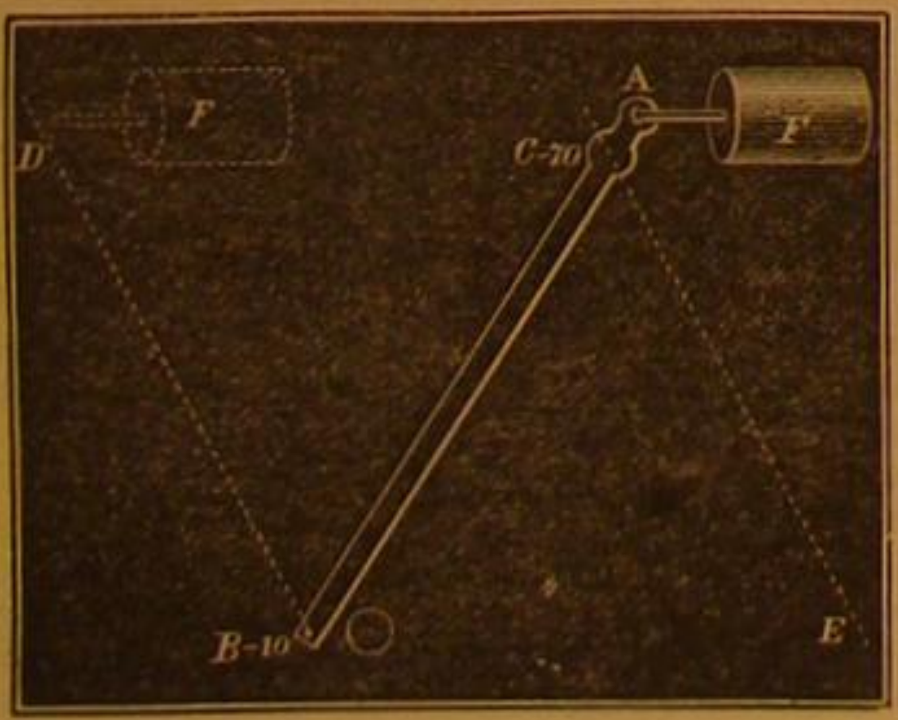
The writer's hypothesis is, that the speed of vessels, as relates to distance traveled, is determined by the amount of pounds' pressure and the duration of time of such pressure, and not by the distance through which this pressure passes.

For instance, supposing a vessel's resistance at any given velocity is equal to 1,000 units, the pressure of 1,000 units of power continuously applied during any duration of time, will produce motion at the same rate of velocity whether that power passes through the same or a less distance than that traveled by the vessel.

No one will deny that 1,000 pounds pressure is the equivalent of 1,000 pounds of resistance, but many may be of opinion that the pressure, or power, must pass through the equal distance of the resistance overcome, or that if the power passes through a less distance, the diminution in distance must be made up by an equivalent increase of power.

To sustain my hypothesis of the economy of a short stroke and long duration of time—it is necessary to show that neither of the above opinions can be correct.

Now as relates to the power passing an equal distance with resistance moved; while in some cases this is strictly correct, as in sailing vessels and boats drawn by horses, yet where steam is used and a lever brought in play, as in paddle wheel and screw steamers, the distance traveled by the power varies from $\frac{1}{4}$ to $\frac{1}{6}$ that traveled by the body in motion, from which one point at least is certain, namely, that the distance traveled by the vessel does not depend, *per se*, upon that traveled by the power;—and that diminution of distance does not require an increase of power, I think the following mathematical problem of the dynamic lever and its solution will sufficiently prove:



A B represent a dynamical lever attached at A to a short stroke engine, F, working on an axis at C, the crank, A, C, being one-eighth the length of the long arm, B C, *the lever and engine both being supposed to be attached to a body in motion.* The axis, C, being the line of motion is therefore the point of impact of the power and the resistance of body to be moved.

This resistance at axis, C, is represented as 70 pounds, while the resistance at the true fulcrum, a circle, B, is represented as 10 pounds, and it is required to move the resistance of 70 to D, without moving the resistance of 10 in the opposite direction of E.

Now it is obvious that 75 pounds pressure (over and above friction) applied at A, will overcome the resistance of 70, which will move in the direction of D, without overcoming the resistance of 10 at the circle, B; for the crank being one-eighth, it would require 8 times or 80 pounds, passed through one-eighth the distance to counterbalance the 10. Therefore 75 pounds passed through one-eighth the distance could not possibly displace the 10.

Suppose the stroke of engine to be 1 foot the distance traveled by point, B, of long arm of lever would be 8 feet if the resistance of 10 were moved to E, but as these 10 pounds are not displaced, it is obviously impossible for the engine to make its stroke without moving the resistance of 70 to point, D, from which it is easy to see that the resistance at C of 70 has been moved 8 feet to D, while the engine has made its stroke of 1 foot, *the power consumed* being 75 pounds passed through 1 foot, *the effect produced* being 70 pounds moved a distance of 8 feet.

This being correct (and I respectfully challenge any mathematician or engineer to disprove it), it follows that in propelling apparatus (non-rotary) the distance traversed by the body moved depends upon the pressure applied, and duration of such pressure, rather than upon the length of stroke of engine.

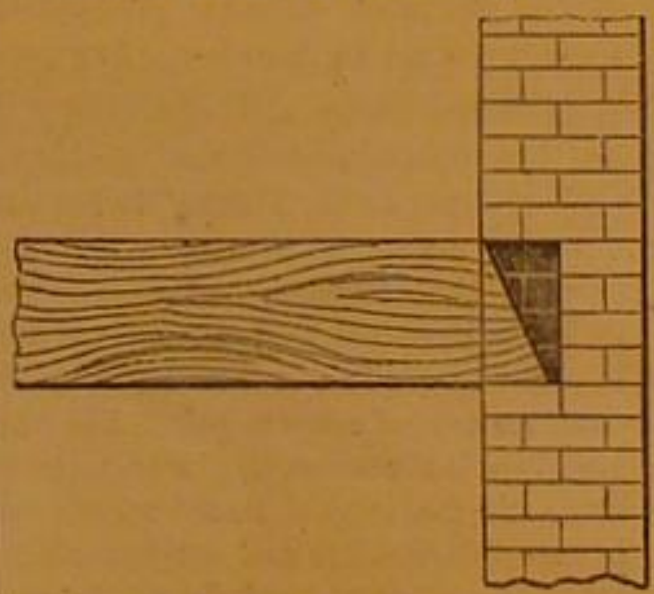
In further corroboration of the foregoing permit me to call attention to the fact that in the propelling apparatus of all living creatures the Divine Wisdom has ordained that the power to propel them shall always be applied at the axis or line of motion, hence the wonderful economy of power in nature.

In connection with this subject of steam propulsion, permit me to suggest to the leading engineers in the country, that, as it is daily becoming more apparent, with each new improvement in the more economical generation or utilization of steam, that the days of sailing vessels, and of towing canal boats by horses, are rapidly coming to an end, could some method be invented, saving fifty per cent over any at present in use, the economy of steam over sail or horses, would at once become so great as to insure its speedy adoption, in which case all the engineers and manufacturing establishments would be taxed to their utmost to supply the demand for engines, boilers, and machinery, for many years to come; hence, if they studied their best interests they would give an attentive ear and careful thought to any new invention, by which so desired an end might be possibly accomplished. If our leading engineers would once realize the fact, that the vital principles of all propulsion on land, on water, or of a bird through the air, is that of the dynamic lever; that though paddle wheel and screw are both dynamic levers, the axis in the paddle wheel is not the fulcrum, but the point of impact of the power and line of motion of the boat's resistance; and if the difference between the static and dynamic levers was fully understood, a new era of steam navigation would soon dawn upon the world, and many vast improvements in speed and economy of power be inaugurated for the benefit of mankind at large. F. R. P.

New York city.

Fastening Beams in Walls.

MESSRS. EDITORS:—Having noticed in your paper that the usual custom of building the ends of floor timbers into brick and stone walls, is apt, in case of fire, to throw over the walls, and that resting the timbers on corbels interferes with the cornice line below, allow me to suggest a cheap mode of obviating these defects. By cutting the ends of the timbers on a bevel, and laying in the wall as in the inclosed sketch, the cornice line will not be broken, and in case of fire the timbers will fall with little chance of injury to the wall. If in your opinion this plan is novel or useful, please publish for the benefit of all concerned. C. O.



Paterson, N. J.

How to Make Good Yeast.

MESSRS. EDITORS.—On page 59 of No. 4, for January 23d of this year, in the latter part of Prof. Horsford's lecture on bread, he gives a recipe for yeast which I consider a very poor one, for three reasons. 1st. It requires fresh baker's yeast to start its fermentation. 2d. It will only keep a week in winter, and from two to four days in summer. 3d. If bread made with it is not closely watched, and baked at the critical moment, it will be infallibly sour. The first objection is a serious one out West, on a farm, to wit: How are you to get fresh baker's yeast, when the nearest baker lives may be fifteen miles off? The second and third are equally serious to a woman who has her hands full of work at all times, for she must be making yeast every few days in warm weather; and when she bakes, be hovering over the stove to watch the loaves and turn them. I now offer you a recipe I brought from England, and which I have used with never-failing success for fifteen years. It is self-fermenting, improves by keeping, and, with its use, it is impossible to make sour bread, unless the flour is sour or the yeast is left uncorked. It will keep for weeks, winter or summer.

On Monday morning put two ounces of best bale hops into a gallon and a pint of cold water, boil half an hour, strain hot, and dissolve two ounces of finest table salt and half a pound of A sugar in the liquor; when cooled to new milk warmth, put one pound of sifted flour into a large basin, make a well in the center of it with the hand, and add the liquor by degrees, stirring round and round with a spoon, until the whole of the flour is evenly mixed with the liquor; set the pan with the liquor on a stool by the stove—in winter time day and night. In hot weather this is not requisite. On Wednesday morning boil and mash finely three pounds of good potatoes, and mix them with the liquor in like manner as the flour. On Thursday morning there should be a heavy dark scum on the surface. The yeast must now be stirred thoroughly, and strained through a sieve or colander into a gallon jug, corked firmly, tied down, and placed in a cool cellar. Shake well before using.

N. B. The liquor should be stirred three or four times a day during the process. A gallon serves my family for sixteen bakings. I use no drugs, as soda, etc., etc., in my bread, nor milk, as that causes bread to dry rapidly. It is best to add a teaspoonful of salt when you bake, and that should be dissolved in a little warm water and mixed with the yeast in setting the sponge over night. When the bread is once kneaded and put in the pans to rise, it may be left for hours with safety from souring, it will only be too porous.

Galena, Ill. KIRBY KITTOE, M. D.

Suction of Sinking Bodies.

MESSRS. EDITORS:—As the SCIENTIFIC AMERICAN has long since become the institution to which a considerable portion of the Yankee nation look for reliable information relative to scientific questions, I am induced, therefore, to request of you, or some other of your learned correspondents, to inform such of your readers as go down to the sea in ships, whether or not the common assertion and belief is true, that, in case a vessel founders and sinks at sea, it will produce a downward current or suck, so-called, that will carry with it all floating objects, such as boats, rafts, and persons swimming in the immediate vicinity of the sinking ship.

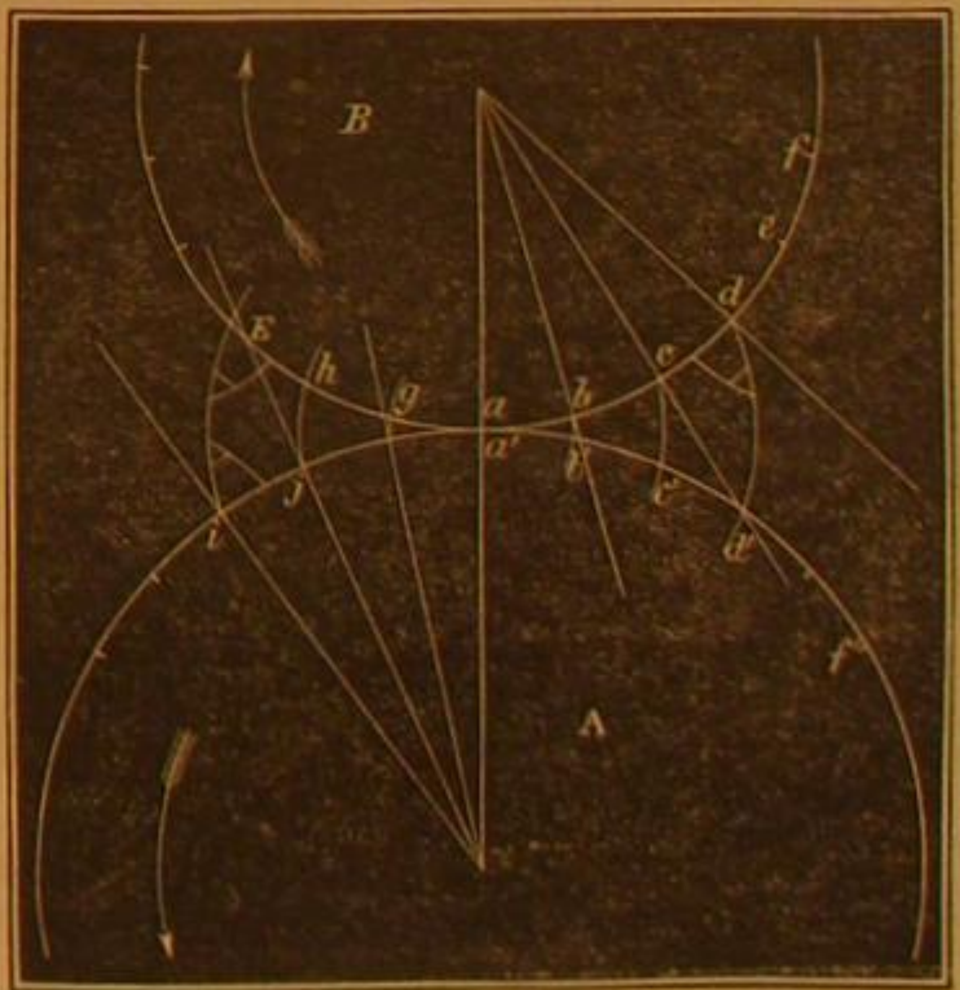
W. P. M.

[We presume there can be no doubt that sinking bodies of considerable bulk do produce a powerful downward current; yet many instances are recorded where a large boat, as a ship's long boat, or a raft, has withstood the tendency to go under, the boat, or raft, being on the vessel's upper deck at the time of sinking. Small bodies are usually drawn downward, but afterward float. The period of submergence would, however, in most cases destroy human life.—EDS.

Gearing—Form of Teeth.

MESSRS. EDITORS:—Why are the teeth of wheels made on a curve, is a question which, if propounded to a majority of mechanics, who have almost daily experience on the subject, would not elicit a satisfactory explanation. A few remarks, therefore, on the subject many not be inappropriate.

Let the two circles, A and B, represent the peripheries or pitch circles of two wheel, A the driver and B the driven, and the divisions, *a b c*, etc., respectively equal to *a′ b′ c′*, etc. Now if power be applied to A, and the friction of the faces of the wheels is greater than the resistance, it is evident that B will revolve, and the points, *a a′ b b′*, etc., will coincide. But when the resistance is greater than the friction, recourse must be had to projections or teeth to prevent slips. Let the right line at the point, *a′*, represent the side of a tooth, as both peripheries are to move at the same velocity, advance the wheels in the direction of the arrows until the points *b* and *b′* fall on the line of centers. It will now be observed, while the point *a* has advanced to *g*, the side of the tooth has progressed beyond, indicating a tendency to move the wheel, B, at a greater velocity. To prevent this the side of the tooth is required to be curved back to the point, *g*. Again imagine the wheels to be revolved until the points, *c* and *c′*, coincide at the line of centers. The point, *a*, will now have advanced to *h*, while the side of the tooth represented by E, has traversed a greater distance in order to maintain the relative velocities; it must be curved back to *h*. Upon advancing the wheels another division, the departure from the curve becomes more apparent.



Proceeding to form the tooth, bisect the division, *i j*, draw the curve found in an opposite direction from the point of bisection; from the center of A, with the proper radius draw an arc cutting the curves, and the point of the tooth is completed. A cavity is now required in the wheel, B, to enable the wheels to revolve. The sides of the cavity are formed by the curve already found extending into the wheel, B, as at *g*. Bisect the division, *g*, *h*, draw the curve in an opposite direction, and the root of the tooth is produced. To construct the tooth of the wheel, B, it is only necessary to revolve the wheels in the opposite direction and repeat the preceding operation. The curve forming the point of tooth of one wheel will be a curve for the root of the other. The curves thus found are the epicycloidal, the proper mathematical curve for the teeth of gearing. In practice the epicycloidal curve is not invariably given to the teeth of wheels, because it is peculiar to the diameters of the wheels for which it is constructed, and admits of a limited range in case the teeth are wanted to be used for other diameters than that for which they were made. To make patterns or cutters for every pair of wheels that are required would entail great expense on manufacturers, hence they generally have recourse to methods of their own,or use those laid down in text-books, for the purpose of constructing teeth; some of which, for fine pitches, are almost equal to the epicycloid and admit of more extended application with different diameters. Our method, which I have found to work well in practice, is to lay off the points of the teeth with the pitch, and for the roots, set one point of the compasses in the center of one tooth, and with the other point describe the root of the adjacent tooth; but where the disparity in the diameters is very great, this rule will have to be departed from, especially in large pitches, in which case the tooth of the pinion should be determined first, in order to obtain adequate strength at the root, and the teeth of the large wheel adapted to the peculiar form of the pinions. Epicycloid teeth, when properly constructed, require no clearance, or at most but a trifle, except at the bottom where good clearance should always be given, as much of the noise heard in gearing running is caused by the teeth "bottoming," often occasioned by the shafts springing or the journals and boxes wearing.

In departing from the epicycloid more clearance should be given between the teeth. The forward side of the driving tooth should come in contact with the rear side of the driven tooth first, and not, as I have observed in some instances, in ill-constructed teeth when the reverse was the case, the teeth in first meeting wedging and tending to press the wheels asunder, thereby consuming useful power in doing useless work. More clearance is required when the teeth are cast than when cut. In the former there is always some irregularity, even where there has been the utmost care exercised with the pattern, owing to the unequal contraction of the metal or the rapping of the pattern and mending up of the molds.

There are various methods of arranging the teeth of gear wheels, but in every departure from the plain spur there is a measurable amount of detriment. The step gear when a tooth is divided into a series, and each alternate one placed out of line with the other, is a favorite plan with some where heavy work is to be done. But I have failed to be convinced of its superiority over the continuous tooth. Unless set with the greatest accuracy some teeth will sustain more than their proper amount of strain while others will sustain less. These assertions can be verified by any one examining such gear and observing the inequality of the wear. The double oblique tooth is resorted to where strength of tooth is required and and the face limited. In this style the teeth unite in an apex at the center of the face and diverge obliquely with the axis. While this method gives a strong tooth it is a consumer of power as well as a transmitter. Of all the abominations of gearing the single oblique tooth is probably the greatest. In this style of gearing the teeth present inclined planes to each other, and there is a constant tendency in the teeth off or forcing the wheels asunder in a line with the axis, which tendency is resisted by the wheels being secured to the shafts, and a great amount of power is being absorbed by these antagonistic tendencies. I have seen a pair of such wheels, designed by an eminent engineer, absorb half the power of a pair of four-horse trunk engines.

Let me here condemn the practice prevailing to some extent of endeavoring to make many teeth bear at the same time. The number of teeth bearing depends altogether on the diameters and pitch, and any attempt to make more teeth bear than these will properly admit of, must necessarily cause a departure from the proper curve of the tooth or a disproportioned length. If strength is the object better give a little more face.

Cast teeth when true are much better than cut teeth, the outside scale wearing longer than the softer metal within. Especially are these remarks applicable to bevel gear, in which it is impossible to cut the teeth properly with the means usually employed in cutting engines, owing to the curve of the tooth being a varying one from end to end. After a perusal of the foregoing, the following facts must be impressed on the mind. 1st.* The pitch is the arc between the centers of two contiguous teeth, hence the ordinary rule, (Dia. × 3·1416) ÷ pitch = No. of teeth, or (Dia. × 3·1416) ÷ No. of teeth = pitch, is the proper one. 2nd. The plain spur is the best form of a gear wheel.

J. C.

Washington, D. C.

Window Glass.

Messrs. Editors:—I read in your last number a description of "How Window Glass is Made," which, though I have read many similar before, seems to me now so awkward in process—not in description—that I cannot help entering my protest against the idea, though it seems to be a fact, that there has been no essential improvements in glass making since the time the "Arabs camped, and burnt seaweed," etc. —you all know the story of its discovery. To take a lump of viscid tenacious material on the end of an iron tube, and blow it, and twirl it into such a shape that it is possible to make it flat, after a deal of further trouble, and this to be the only means of effecting this result now known, seems to me to be a disgrace to American inventive genius.

Why cannot a pot of melted viscid substance like glass be drawn out into sheets, as well as a continuous sheet of paper from the tank full of pulp, or a continuous lead pipe from a crucible full of melted lead. Guessing, *a priori*, I should say much easier, and better, and smoother, for the substance to be worked is of just the right nature to yield with ease and without danger to the manipulations of machinery, and be worked into all shapes, without breakage or chemical corrosion. "But," will say the glass workers, "it is the excessive temperature at which it must be worked that is the difficulty." My friends, if it took a machine as heavy as a Fondrinier paper machine, and all made of platinum, it seems to me it would pay if a sheet of glass could be run out like a sheet of paper, and I believe it can, and will be done some time. I have seen a glass thread spun at the rate of many thousand yards a minute, and it seems to me a sheet is only, theoretically, a multitude of threads.

When we open up the immense soda and potash fields of the Western desert, and when the pine forests and other timbers are exhausted, the question, of what shall we build houses, and construct a great many other things, now made of wood, will lie between glass, iron, and paper.

Cheap soda, potash, and fuel, and a glass (paper) machine to make it on, will decide the question in favor of this indestructible material, so far as it is applicable.

Who is there that has capital and spunk enough to try the experiment? A small apparatus to run out a sheet ten inches wide, made of platinum, and set in the furnace, running out a stream of window glass, through proper orifices and annealing ovens, I believe to be a possibility, and a not far distant accomplishment.

C. Boynton.

A Good Puddling Furnace.

Messrs. Editors:—I notice in a late number of the Scientific American, an extract from an English paper showing the extraordinary economy of E. B. Wilson's patent puddling furnace now in use in England and elsewhere. It seems, however, that the consumption of sixteen hundred weight of coal to the tun of puddled bars, is about the best that can be averaged, with his furnace, running night and day. This shows a great saving over what has been used as a general thing in England, or wherever coal is cheap; but it is not so economical as a double puddling furnace built in the Cold Brook Iron Works, this place, by Mr. John Wilson, an English furnace builder, now here: This furnace made 42 tuns 10 hundred weight of six inch bars (Scotch pig iron) with 27 tuns of coal, I think half Cumberland and half Pictou, equal to 12 hundred weight and three-quarters to the tun of 2,240 pounds. I doubt if a more economical furnace has ever been built.

E. G. S.

St. John, New Brunswick.

Poor Work on Agricultural Machines.

Messrs. Editors.—"Fulton" under the head of "Good Agricultural Machinery" in your issue of Jan. 23, page 54, current volume, says he noticed an article headed "Poor Mechanical Work on Agricultural Machinery" referring to issue of Dec. 16, volume XIX, page 393, which he claims "does a great injustice to a large class of manufacturers," etc. I noticed the same article and was greatly pleased that your ever-welcome paper should speak a word on that subject in the way of relief to the farmer.

As I was born and raised on a farm I have had considerable experience with agricultural machinery and can testify, as well as all other farmers, that nine-tenths of the machinery sold us are made only to sell and not to fit,"Fulton" to the contrary notwithstanding.

I never have seen a reaper that could be set up and run without the aid of a file or cold chisel, and sometimes new holes have to be made in order to get in some of the bolts; as was the case with some half an acre of reapers painted in high colors and shipped to this place last season, in pieces, to be set up "from the pile," not one of which could be set up without the assistance of a whole kit of blacksmith and carpenter tools.

While it is necessary that the greatest skill should be exercised in constructing this class of machinery, which is subjected to constant jerks and strains of different parts, by its movements over uneven ground, and being in all sorts of positions, the mechanical workmanship is fully developed only in other classes of machinery that set firmly on their feet or ride on easy springs. The prices that farmers have to pay for their machinery would warrant a better class of work.

Western Farmer.

Waukon, Allamakee Co., Iowa.

The Scientific American.—In these days, when new and worthless publications are being thrown on the market by the score, it is with a pleasing satisfaction that we come face to face with our old, tried, and trusty friends. We have not yet reached that millennial period in newspaperdom when a successful journal is born in a day. The process is like the processes of nature: "first, the blade, then the ear, and then the full corn in the ear." Among the newspaper successes in this country, none is more noteworthy than the Scientific American. For an American journal it is old in years, but young in strength and vigor, leaving all its imitators and would-be rivals, and there is a host of them, in the distance. It is safe to say that there is a degree of freshness, strength, and originality in the Scientific American that are found no where else among journals professing to occupy a similar sphere. A complete file of this paper from the original date of publication, would be a library in itself.—*American Builder.*

Artificial Ebony.—This substance, now used to a considerable extent in Europe, is said to be prepared by taking sixty parts of seaweed charcoal, obtained by treating the seaweed for two hours in dilute sulphuric acid, then drying and grinding it, and adding to it ten parts of liquid glue, five parts gutta-percha and two and a half parts of India-rubber, the last two dissolved in naphtha; then adding ten parts of coal tar, five parts pulverized sulphur, two parts pulverized alum, and five parts of powdered rosin, and heating the mixture to about 300 degrees Fahrenheit. We thus obtain, after the mass has become cold, a material which, in color, hardness and capability of taking a polish, is equal in every respect to ebony, and much cheaper.

For the Scientific American.

"WASTE" AND "ECONOMY" OF FUEL.

NO. 4.

How much remains to be done in connection with economizing the fuel consumed by our engines in the production of "work," will be comprehended, if we fully realize the fact, that not more than ten per cent of the real power of the coal burnt under our most perfect modern steam boilers, is turned to useful practical account.

In the year 1702, Savary constructed a steam engine by means of which, a weight of 1,000 tuns could be raised one foot high by the combustion of one bushel of coal.

In 1720, Otto Guericke Newcomen made an atmospheric engine which lifted 3,500 tuns by the consumption of the same amount of fuel.

Watt's original engine raised 6,000 tuns, the modernized Watt's engine raises 15,000 tuns by the same weight of coal.

The average duty of the ordinary improved Cornish engines of our day is equivalent to 56,000 tuns raised one foot high by the combustion of the same quantity of coal as above. Large as this last amount may seem to a superficial observer, it is yet infinitely below the probable realizations of the future, as the following computation conclusively demonstrates.

If we consider the calorific value of the combustion of one pound of average coal, as equal to 6,000 or 7,000 centigrade units of heat, and if each of these units, as has been proved by recent elaborate researches, is equivalent to 420 kilogrammetres or nearly 2,700 foot pounds, we find, that one pound of coal produces a force equal to 16,200,000 or 18,900,000 of foot-pounds.

The most economical engines in the world, do not on an average, reach a higher figure than 1,398,094 foot-pounds per pound of coal consumed, this being only 0·074 to 0·086 of the whole theoretical amount, or only from $7\frac{4}{10}$ to $8\frac{6}{10}$ per cent of the real power concentrated by nature in one pound of coal.

We must be careful not to confound the amount of foot pounds which are equivalent to the combustion of one pound of coal with the quantity of heat needed to vaporize a certain amount of water, this being a quite different thing.

If it takes 635·5 centigrade units of heat to evaporate one lb. of water and if one lb. of coal evolves on an average 6,500 centigrade units, then theoretically 10·22 lbs. of water should have to be evaporated from a lb. of such coal. We find in practice, that 8 lbs. of water from 1 lb. of coal may be taken as a fair average, so that in this case 2·20 lbs. of water or 22 per cent only have really been lost. By greater care and attention, this amount of waste may be further reduced, so as to assimilate still more closely the practical with the theoretical results.

What really becomes of the 90 per cent, more or less, of foot-pounds, lost, during the combustion of one lb. of coal, as mentioned above? This is a question which we expect to be asked and which we will here attempt to briefly elucidate.

The equivalent of the combustion of one lb. of coal being as above stated 18,900,000 foot lbs; we may suppose 10 per cent of this quantity to be converted into useful work by the engine and another 10 per cent to be entirely wasted (by remediable causes), during the production of steam. This gives a total consumption of 20 per cent or of 3,780,000 foot-pounds, leaving an apparent loss of 15,120,000 foot-pounds which have vanished during the vaporization of 10 lbs. of water. In such a case we might affirm that 15,120,000 foot-pounds have really been absorbed or rendered latent in the work of converting one lb. of water into steam, for which purpose every centigrade unit of heat evolved by the coal must have had to furnish no less than 2,520 foot-pounds of hidden work. A much larger quantity of fuel than 10 per cent, is however, in most cases, wasted by remediable causes.

We have shown in previous articles, in the Scientific American, how bad stoking causes a waste of fuel, which may reach 25 per cent; how, the necessary blowing off in cases of salt or impure water produces a loss of 33 per cent, and how priming and scale may add another 30 per cent to the above.

This however is but a fraction of what often takes place, as waste by radiation of heat and consequent condensation of steam in the boilers, steam-pipes, and cylinders are another source of very considerable loss. This radiation may, to a considerable extent, be obviated by the use of external coverings of felt or canvas, by superheating the steam, by steam jackets, or better yet, by the combined effect of these various remedies.

Leaks are another frequent cause of loss of fuel, the amount of which can only be determined by the calculation of the units of heat in every lost pound of steam or water, remembering that the waste by leakage of one lb. of steam exceeds by $5\frac{1}{2}$ times at least, that which would originate from the leakage of one lb. of hot water from the boiler. As is known to every tyro, repacking of the slides, pistons, blow-off nozzles etc., are the preventives of loss by leakage.

An imperfect vacuum leads to a waste of fuel, as the required power will in such a case, have to be obtained from a lower step of expansion and with a corresponding increase in the consumption of fuel.

The neglect to "ease" and "stop" in time, the urging of the fires, the unnecessary friction of any of the rubbing surfaces of the engine, the excess or the deficiency of draft in the furnaces, the use of bad coals, and many other causes too numerous to be here enumerated, all concur to increase to an almost indefinite extent, the waste of fuel.

The sum total of remediable waste in our ordinary carelessly managed engines, frequently reaches formidable figures, and this before the very eyes of the proprietors of the same who seem totally blind to the fact, that wasting fuel is injurious to their pockets.

It is not of the highest importance, as is sometimes believed, that an engine should run beautifully smooth and easy; it is however, most essential, that every bushel of coals burned under its boilers should be made to furnish their maximum of usefulness, a result, which can be attained only by constant care and vigilance, two words which in themselves comprise the whole duty of the engineer, and ought to be his motto.

ALUMINUM.

BY PROF. C. A. JOY.

Forty years ago a few grains of this metal were prepared by Professor Woehler, at the University of Goettingen. He sealed the little pellets in a glass tube, and it was not thought that the metal could ever have any useful applications. The discovery rested dormant for thirty years, when attention was called to it by the eminent French chemist, Deville.

The circumstances were as follows: The Emperor Napoleon, anxious to display some interest in scientific matters, appropriated fifty thousand francs to defray the expenses of researches into the properties and uses of aluminum, and Henry St. Claire Deville was authorized to make the experiments. We happened to be in Paris when this took place, and were one day invited by Professor Deville to witness the preparation of the metal in the presence of the Minister of War, Professor Dumas, and of other celebrities. Deville, who is the most genial, popular, and successful of the French chemists, received his guests with great cordiality, and explained. in the clearest possible manner, every step of the operation. He extracted a pure, silver-white metal from a lump of clay, The way he did this was very simple. Chlorine gas was passed over heated clay mixed with charcoal, and the chloride of aluminum thus produced was driven over melted sodium. The chlorine first extracted the metal from the clay, and was in turn decomposed by the sodium. In chemistry, might makes right, and every compound can be attacked and forced to capitulate, if the proper weapons are brought to bear upon it. The aluminum was first seduced from its strong citadel of clay by the chlorine, and was then attacked and captured by the sodium.

The experiments, in a small way, having proved successful, extensive works were established in the neighborhood of Paris, where aluminum was manufactured on a large scale. At the Paris exhibition of 1867, Mr. Paul Morin exhibited numerous objects manufactured from pure aluminum and from its alloys.

The specific gravity of the metal is 2·67. It is tin white, fusible at a red heat, brilliant, malleable, ductile, sonorous, an excellent conductor of electricity, insoluble in dilute sulphuric acid, and in concentrated nitric acid; easily soluble in hydrochloric acid and the alkalies. It does not decompose water, as was at first supposed, and does not oxidize materially in the air.

Professor Henry Wurtz, of New York, has recently discovered that if it be rubbed with mercury it oxidizes so rapidly as to produce great heat. It was at first found impossible to solder the metal, but this difficulty has been at length overcome. When fused with iron it forms a crystalline mass not malleable. Mixed with copper in the proportions of ten parts of aluminum, and ninety parts of copper, it forms a beautiful alloy, possessed of the color and many of the properties of gold. This alloy is called aluminum bronze, and is now frequently employed for the manufacture of watch cases, watch chains, and imitation jewelry. Nearly all the aluminum now manufactured is converted into the above alloy and the interest in it, which at one time began to flag, is once more revived, and several new establishments have arisen for its manufacture.

Four hundred pounds a month are now manufactured in France, and sold at twelve dollars a pound. It is also largely produced in England.

Aluminum is one of the most abundant metals on the earth. It is found in brick and porcelain clay, in feldspar, in cryolite, in granite, in slate rocks, in the ruby and sapphire. When iron rusts, it turns to a red powder, which can be washed away. When aluminum rusts, or is fused at a great heat among the crystalline rocks, it gives to us the precious stones called the ruby and sapphire.

As soon as the metal is required in large quantities, some method will be devised for producing it at a cheap rate; and when that time arrives we shall not have to fit out expeditions to go and search for the ore in remote regions, but we can dig for it under our feet, nearly everywhere, and make a mine of every stone quarry.

The beautiful tone of the metal has suggested its use in the manufacture of bells, and a successful application of it for this purpose has been made.

Aluminum has been employed by chemists as a reducing agent in the preparation of some of the rare metals, and we may have to record a more extensive use of it for this purpose.

There have recently been introduced into use in Paris two new alloys of aluminum. The first is called aluminum silver, or third silver (tiers argent), and is composed of one-third silver and two-thirds aluminum. It is chiefly employed for forks, spoons, and tea service, and is harder than silver and more easily engraved. The second is called minargent, and is made of one hundred parts copper, seventy parts nickel, five parts antimony, and two parts aluminum. It is a very beautiful, permanent, and brilliant alloy, capable of replacing silver for many purposes.

It must be acknowledged that the applications of aluminum in the arts are not so numerous as was at first predicted, and its manufacture, as compared with other metals, can, at the present time hardly be called a metallurgical one. The metal is so light that a little of it will go a great way. A cubic foot of it weighs one hundred and sixty-eight pounds, whereas a cubic foot of gold weighs twelve hundred pounds, and silver weighs six hundred and fifty-six pounds, iron four hundred and fifty pounds, and even granite weighs one hundred and eighty-six pounds to the cubic foot.

If the price of it were the same as that of silver, it would still be much cheaper, as only one-fifth as much would be required to cover the same space.

So abundant is this metal, that it is safe to predict that the day is not far distant when our houses may be built of it instead of bricks, and we shall use it for many purposes now unknown. –*New World*.

EXLPOSIVE COMPOUNDS FOR ENGINEERING PURPOSES.

Mr. Perry F. Nursey a few weeks ago read a paper on the above subject before the Society of Engineers, of London, from which we extract the following:

"Although many attempts have been made to supersede gunpowder, but few have practically succeeded, and this arises not so much from any inadequacy on the part of the substitutes, as regards power, but on account of the extreme liability of most of them to premature explosion from varying causes. Gunpowder itself is open to this objection, and hence the propositions to reduce the risk by mixing it with protecting ingredients. But this is not enough, we must go a step further. What is required is a material over which we can have perfect command, one which shall do more than burn when in contact with air, but which shall equal, if not exceed, gunpowder in its power when ignited in an air-tight chamber, as in a bore hole, or the barrel of a gun. The necessity for this is evidenced almost daily in one or other of our mining districts, where a large percentage of the explosions occur in the blasting operations. How frequently is gunpowder ignited by stray sparks, even when standing about, but much more frequently do accidents arise when tamping is going on. Here the contact of the metal rod with the rock leads to many a fearful accident. So much is this so, that the Royal Cornwall Polytechnic Society have taken the matter up, and have suggested safe methods of performing this dangerous operation. But however careful a miner may be, there never can be perfect immunity while he has to deal with a material which carries within itself all the elements of danger and destruction. To meet the case a perfectly inexplosive material is required, one which will not explode so long as the atmosphere has access to it, but in which all the active energy of gunpowder is developed immediately it is fired out of contact with the air.

"Gunpowder itself is at present more largely used than any other explosive material, and it is a remarkable fact that, notwithstanding the centuries which have elapsed since its first discovery, no radical or permanent change has been effected in its composition. Slight variations, it is true, have been made from time to time in the proportion of its constituents, but, in the main, gunpowder remains much as it was 600 years ago. But the danger ever present in handling this material has always been so patent, that many years since means were devised for rendering it harmless while in store, and to restore to it its power at the time of use. Colonel Ryley was the first to propound this theory, and he submitted his plans for enveloping the grains of gunpowder in bone dust, to the Government some twenty-five years since. In later times—in fact, very recently—Mr. Gale's proposition to render gunpowder non-explosive and explosive at will has been much before the public. His plan was to mix ground glass with the powder for storage and transport, and to sift it from it again when it was required for use. This addition to a large amount of a foreign substance with the powder no doubt answers the purpose most effectually; but unfortunately there are practical difficulties in the way of its adoption. The objections are, increased bulk and weight for transport, the necessity of numerous sets of mixing and shifting apparatus, and the utter impropriety of having to prepare an explosive material just when it is required for use. Beside, in blasting operations, the accidents usually occur in charging the mine; therefore a system of this kind would be of no value whatever.

"Before quitting the subject of gunpowder, it may be interesting to notice the force this material is capable of exerting when used for blasting purposes. The following particulars show the amount of earth or rock thrown down or removed by 1 pound of powder, under various circumstances, the results being taken from actual practice. At the Round Cliff, Dover, 85,232 pounds of chalk were thrown down by 1 pound of powder. In the Leith cutting, Tunbridge, 31,860 pounds of hard white sand were moved by the same weight of powder. At Plymouth 22,000 pounds of limestone were moved per pound; in small charges only 8,900 pounds were moved. In Antrim, 45,084 pounds of white limestone, and 32,430 pounds of whinstone or basalt were moved by 1 pound of powder. At East Dunmore, 14,280 pounds of hard conglomerate were moved; and on the Londonderry and Coleraine Railway, 22,400 pounds were thrown down by 1 pound of powder. Taking the mean of these results, we have 32,832 pounds of material to 1 pound of powder.

"Numerous compounds have been brought forward from time to time, for which it was claimed they perfectly superseded gunpowder. But, until very recently, no material has been found which would answer all the practical purposes, and fulfill perfectly all the conditions and requirements of that most important material. Saltpeter is the agent to which the characteristics of gunpowder, as an explosive material of permanent character, are mainly due. It is to the substitution of other nitrates for this constituent that most attention has been given, and the nitrates of sodium, lead, and barium have been successively tried. But although the products, which have been known by the names of soda gunpowder and barytic powder, etc., have obtained a certain amount of temporary success, they have ultimately been abandoned. In fact, all mixtures of this class, when compared with gunpowder proper, have been found to exhibit important and radical defects. Chlorate of potash has been a favorite substance with inventors, notwithstanding its violently explosive nature. The object has, of course, been to tone down its violence by proper admixture with other ingredients, and the resulting products have been to some extent successful. One of the earliest mixtures of this class was German or white gunpowder, which was tried, but proved unsuccessful. Many preparations of a similar character have also been brought before the public. Of this class is Ehrhardt's powder, the invention of which is also claimed by Mr. Horsley. M. Ehrhardt's compositions are as follows:

BLASTING POWDER.

Chlorate of potash	$\frac{1}{2}$ part
Nitrate of potash	$\frac{1}{2}$ "
Tannin of cachou	1 "
Charcoal	9 "

POWDER FOR ARTILLERY.

Chlorate of potash	1 part
Nitrate of potash	1 "
Tannin	1 "

POWDER FOR SHELLS.

Chlorate of potash	1 part
Tannin	1 "

"Mr. Horsley's powder is a compound of chlorate of potash and gall nuts in proportion by weight of three to one. The ingredients are ground separately to a state of fine powder, and then passed, also separately, through a very fine wire sieve. The two ingredients so prepared and thoroughly dried are blended when required to form the explosive compound. The blending of the ingredients is safely and easily accomplished by passing them in a mixed state through a series of horsehair sieves, arranged one below the other and set in motion. Upon the upper sieve the two ingredients are first mixed by being run together from two receptacles placed above the sieve, one containing a given weight of chlorate of potassa, and the other one-third of such weight of gall nuts. As the chlorate of potash is much heavier than the gall nuts, the volumes or measures of the two receptacles are about equal. Motion being imparted to the sieves, and as the two finely ground ingredients pass downwards through the sieves, they become blended, and form the explosive compound. Powders in which chlorate of potash is an ingredient are undoubtedly somewhat dangerous. The fact, however, of cannon-priming tubes, which are composed of chlorate of potash and ter-sulphide of antimony, having been prepared, stored, and used for more than thirty years past without accident, ought to relieve apprehension on that score. When treated, as it should be, with care, and not improperly blended with combustibles, chlorate of potash is practically safe. With regard to the explosive power of Horsley's powder, it may here be interesting to adduce a few facts in the shape of results of trials which came under the author's notice, and which were made to institute a comparison of its strength as against gunpowder. An eprouvette, weighing with its carriage 10 pounds, 2 ounces, was placed on a fir plank in a perfectly level position. The charge in each instance consisted of 50 grains of the various powders, and was kept in place by a small wad of thin paper. The recoil of the eprouvette, when charged with fine grain sporting powder, was $\frac{9}{16}$ inch; with very fine grain sporting powder, $\frac{11}{16}$ inch. Fine grain sporting powder in a state of meal, and compressed by a weight of 400 pounds on the square inch, gave a recoil of $4\frac{2}{16}$ inches. Horsley's powder in a similar state of meal, and with a similar pressure of 400 pounds per square inch, showed a recoil of no less than $11\frac{9}{16}$ inches. These results afford some idea of the relative power of Horsley's powder and the best gunpowder. The author has examined some blocks of elm which had been submitted to experiment to show the comparative disruptive force of Horsley's powder and of common gunpowder. In each case equal charges were used, and the eprouvette was discharged one inch from the wood and at right angles to its face. The disruptive force of Horsley's powder on the wood was as if a solid body had been driven into it, separating the fibers and tearing a hole completely into it. The force of the small grain best sporting powder merely left a mark upon the surface of the blocks.

A Wooden Railway.

A description of the Wooden Railway recently constructed for the Clifton Iron Company between Clifton and the Adirondac mines in New York is given as follows by Mr. C. G. Myers, late President of the Company. The rails are of hard maple scantling, 4x6 inches, set on round ties, on which are framed slots 6x4. The rails, set on edge and keyed in the slots by two wooden wedges driven against each other, project two inches above the ties. The rails admit of bending sufficiently to make the curves. The ties are laid on the earth and ballasted in the usual manner to two inches of the bottom of the rail. It takes 21,120 feet, board measure, of scantling for a mile, and 1,760 ties at three feet apart. Our road is a very rough one. We have a great deal of trestle work, some of it over thirty feet high, which is vastly more expensive than a level route. The engines used weigh from ten to fourteen tuns. The rails will probably last about five or six years. An engine will move about thirty tuns of freight at about six or eight miles an hour, with heavy grades and sharp curves. The Company expects to move over the road next year from 50,000 to 100,000 tuns of freight. Trains have passed over the road, light, at the rate of twenty miles an hour, but this would not do for freight.

Bench Punch for Perforating Sheet Metals.

A handy punch for ordinary and shop purposes, for light work, and which may be used on the work bench, is a desideratum in any machine shop. In the machine shown in the accompanying engraving, the old device of the "toggle joint" is used, the most powerful form of the lever when moving short distances.

The machine is very simple in construction, and almost impossible to get out of order. A brief description will show its build and use perfectly. The frame, or bed plate, is a single casting, screwed to the bench. To the handle, A, is pivoted a sliding arbor moving through holes in the snugs, B, and carrying a punch at its end, held in the arbor by a set screw. The matrix, or die, is similarly held in an adjustable seat bolted to the snug, C. A lever, D, is pivoted to a snug, E, at the rear of the bed plate, and also to the handle, A, just behind the sliding arbor.

The operation is so easily understood that nothing more than a reference to it is required. The sheet or piece of metal to be punched, is placed between the punch and die, the handle depressed forcing the punch forward and through the metal, when the handle is raised, and the punch moves back, the holder, F, releasing it from the metal.

It is apparent that punches and dies of any form may be used on this machine, as one of either may be instantly removed and others substituted. The machines may be made of different sizes, but one weighing only 21 lbs. will punch wrought iron or brass one-eighth of an inch thick. It may be used for cutting saw teeth or severing wire by employing the proper dies and punches.

Patented July 31, 1866. Orders should be addressed to Goodnow & Wightman, manufacturers and sole agents, 23 Cornhill, Boston, Mass. See advertisement on another page.

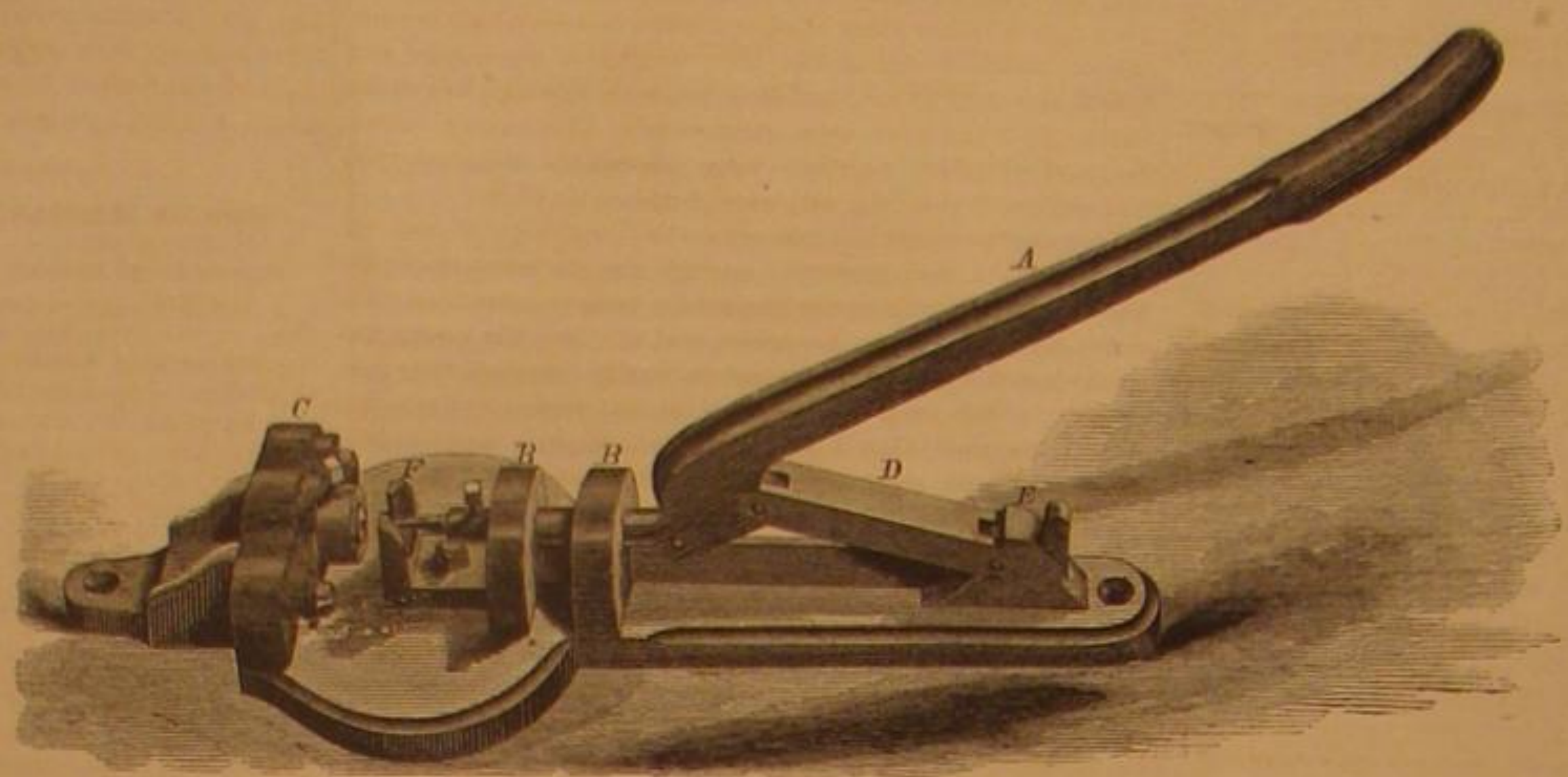
Manufacture of Clay Tobacco Pipes.

The clay of which these are made is obtained in Devonshire, in large lumps, which are purified by dissolving in water in large pits, where the solution is well stirred up, by which the stones and coarse matter are deposited; the clayey solution is then poured off into another, where it subsides and deposits the clay. The water, when clear, is drawn off, and the clay at the bottom is left sufficiently dry for use. Thus prepared, the clay is spread on a board, and beaten with an iron bar to temper and mix it; then it is divided into pieces of the proper sizes to form a tobacco pipe; each of these pieces is rolled under the hand into a long roll, with a bulb at one end to form the bowl; and in this state they are laid up in parcels for a day or two, until they become sufficiently dry for pressing, which is the next process, and is conducted in the following manner: The roll of clay is put between two iron molds, each of which is impressed with the figure of one-half of the pipe; before these are brought together a piece of wire of the size of the bore is inserted midway between them; they are then forced together in a press by means of a screw upon a bench. A lever is next depressed, by which a tool enters the bulb at the end, and compresses it into the form of a bowl; and the wire in the pipe is afterward thrust backwards and forwards to carry the tube perfectly through into the bowl. The press is now opened by turning back the screw, and the mold taken out. A knife is next thrust into a cleft of the mold left for the purpose, to cut the end of the bowl smooth and flat; the wire is carefully withdrawn, and the pipe taken out of the mold. The pipes when so far completed, are laid by two or three days, properly arranged, to let the air have access to all their parts, till they become stiff, when they are dressed with scrapers to take off the impressions of the joints of the molds; they are afterwards smoothed and polished with a piece of hard wood.

The next process is that of baking or burning; and this is performed in a furnace of peculiar construction. It is built within a cylinder of brickwork, having a dome at top, and a chimney rising from it to a considerable hight, to promote the draft. Within this is a lining of fire-brick, having a fireplace at the bottom of it. The pot which contains the pipes is formed of broken pieces of pipes cemented together by fresh clay, and hardened by burning; it has a number of vertical flues surrounding it, conducting the flame from the fire-grate up to the dome, and through a hole in the dome into the chimney. Within the pot several projecting rings are made; and upon these the bowls of the pipes are supported, the ends resting upon circular pieces of pottery, which stand on small loose pillars rising up in the center. By this arrangement a small pot or crucible can be made to contain fifty gross of pipes without the risk of damaging any of them. The pipes are put into the pot at one side, when the crucible is open; but when filled, this orifice is made up with broken pipes and fresh clay. At first the fire is but gentle, but it is increased by degrees to the proper temperature, and so continued for seven or eight hours, when it is damped and suffered to cool gradually; and when cold, the pipes are taken out ready for sale.

Dentistry in Japan.

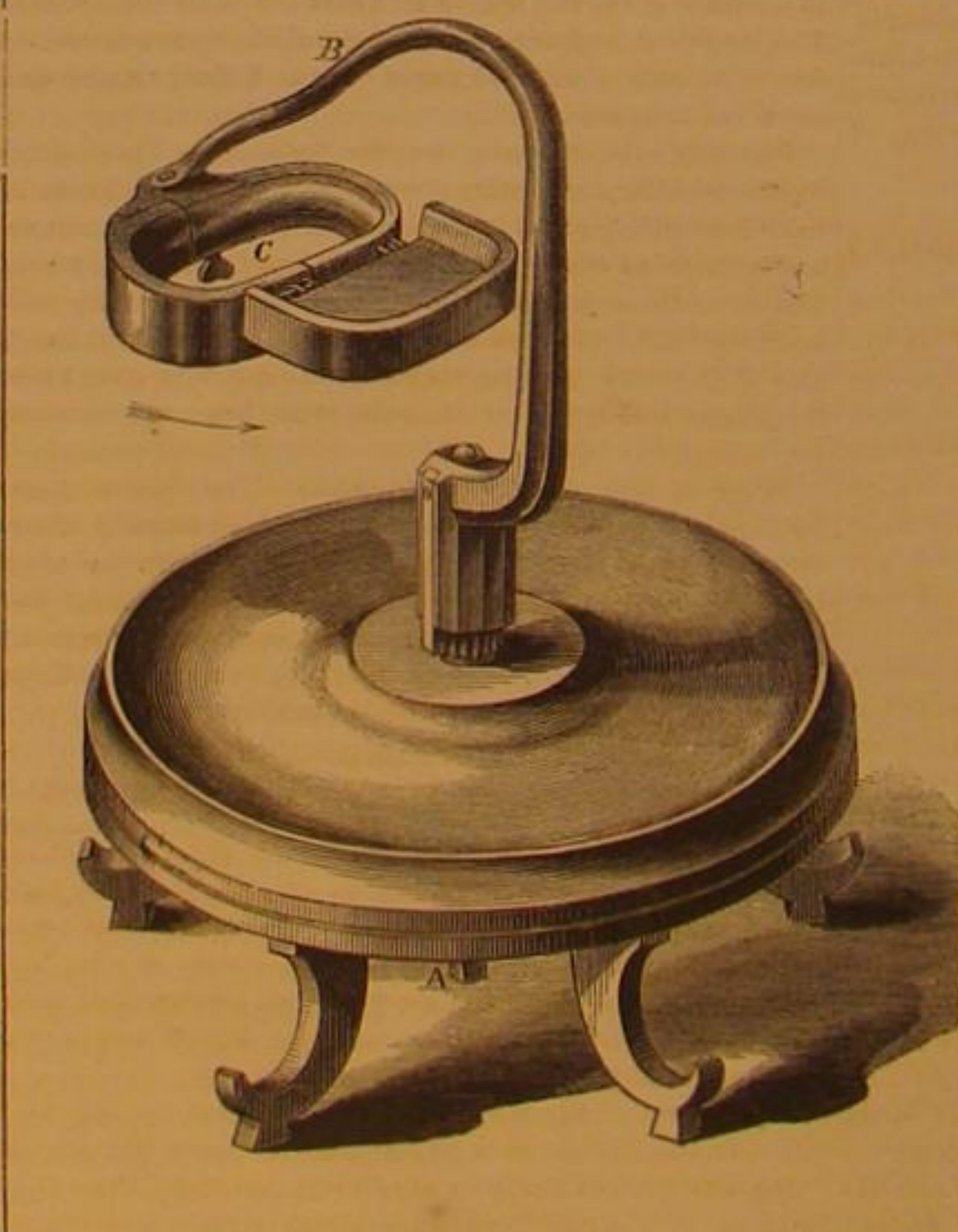
This trade, for such it may be more fitly considered in Japan, is carried on by a very low class of people, usually peripatetic in their habits, and who carry with them a box covered with brass ornaments, by which their occupation is recognized. Now, the extraction of a tooth by one of these gentry is regarded by the Japanese as a capital operation, and not without reason, if the information given me is reliable, that death (from tetanus, I presume) is not unfrequently the result. The tooth is extracted by the operator's fingers, but not until it has been well loosened by means of a stick and a mallet vigorously wielded. The operation is seldom performed, but I saw some teeth in possession of one of these charlatans that had large portions of the alveolar process attached. In the face of these facts it can scarcely be credited that artificial teeth, sustained by atmospheric pressure, have been in use from time immemorial. These teeth are carved out of sea-horse ivory, the molars being plentifully studded with little brass bosses, and the whole strongly mounted upon a base cut from the hard shell of a species of gourd, and carved to conform to the irregularities of the gums and palate. I have several sets of these teeth in my possession; they are not expensive, the very best, a complete upper set, costing about five boos, or about one dollar and sixty cents. Colossal fortunes are not accumulated from dentistry in Japan, as may be inferred from the foregoing.—*Dr. A. M. Vedder.*



MASON'S LEVER BENCH PUNCH.

GEISLER'S PATENT BABY WALKER.

The implement represented in the engraving is intended to assist infants in learning to walk, and to amuse them in waking hours when the mother or nurse may be otherwise employed. It is a circular ornamental platform with a raised rim around its outer edge, and a standard, A, in the center, adjustable as to hight, on which revolves a curved arm, B, to the extremity of which is attached a yoke, C, for embracing the child's body. This yoke is in two parts, one sliding within the other, and locked by a pin or screw when closed, so that it may not be opened by accident. On the front of the yoke is a tray for holding playthings or food.



The joint or pivot of the yoke, where it is attached to the end of the curved arm, permits only a slight lateral swing, so that the child can neither turn off the edge of the platform nor cramp under the curved supporting arm.

At the base of the arm, just above the surface of the platform, the standard is cut into or ratched, into the teeth of which fits a spring pawl on the upright. This allows the child to travel forward, but prevents a reverse motion. The pawl is seated in the upright, and the ratchet is concealed so that the child's clothes cannot by any accident be caught. It is partly shown in the engraving. Annoyed and wearied mothers and cross fathers will appreciate the use and value of this device.

It was patented through the Scientific American Patent Agency, Sept. 22, 1868, by Frederick A. Geisler, who may be addressed at Bristol, R. I.

PANAMA HATS.—WHAT THEY ARE MADE FROM, AND HOW.

The screw pines are natives of tropical regions; are abundant in the islands of the Indian Archipelago, and in most of the tropical islands of the Old World, but rare in America; the section Cyclantheæ, on the contrary, being exclusively confined to that continent.

This order is divided into two sections, the first of which called Pandanæ, and the second Cyclantheæ. Each of the sections contain several genera, some of which contain several species. The *Carludovica* is a small genus of the second section of the order. Of this genus the species called by botanists *Carludovica Palmata*, in the most valuable and interesting; it is the plant from whose leaves the celebrated Panama hats are made. Dr. Seeman, a celebrated South American traveler, states that the leaves of this plant are from six to fourteen feet high, and their lamina about four feet across. In the Isthmus the plant is called *Portorico*, and also Jipijapa, but the last name is the most common, and is diffused all along the coast as far as Peru and Chili; while in Ecuador a whole district derives its name from it.

The *Jipijapa* is common in Panama and Darien, especially in half shady places; but its geographical range is by no means confined to them. It is found all along the western shores of New Grenada and Ecuador; and it has been found even at Salango, where, however, it seems to reach its most southern limit, thus extending over twelve degrees of latitude from the tenth N. to the second S. The Jipijapa, or Panama hats, are principally manufactured in Veraguas and Western Panama; not all, however, known in commerce by that name are plaited in the Isthmus; by far the greater proportion is made at Manta, Monte Christi, and other parts of Ecuador. The hats are worn almost in the whole American continent and the West Indies, and would probably be equally used in Europe, did not their high price, varying from two to one hundred and fifty dollars, prevent their importation. They are distinguished from all others by consisting only of a single piece, and by their lightness and flexibility. They may be rolled up and put into the pocket without injury. In the rainy season they are apt to get black, but by washing them with soap and water, besmearing them with lime juice or any other acid, and exposing them to the sun, their whiteness is easily restored.

The process of making these hats is as follows: The "straw," previous to plaiting, has to go through several processes. The leaves are gathered before they unfold, all their ribs and coarser veins removed, and the rest, without being separated from the base of the leaf, is reduced to shreds. After having been put in the sun for a day, and tied into a knot, the straw is immersed in boiling water until it becomes white. It is then hung up in a shady place, and subsequently bleached for two or three days. The straw is now ready for use, and in this state sent to different places, especially to Peru, where the Indians manufacture from it those beautiful cigar cases, which have been sometimes sold in Europe for thirty dollars apiece. The plaiting of the hats is very troublesome. It commences at the crown, and finishes at the brim. They are made on a block, which is placed upon the knees, and requires to be constantly pressed with the breast. According to their quality, more or less time is occupied in their completion; the coarser ones may be finished in two or three days, the finest take as many months. The best times for plaiting are the morning hours and the rainy season, when the air is moist; in the middle of the day and in dry, clear weather, the straw is apt to break, which, when the hat is finished, is betrayed by knots, and much diminishes the value.

Test for Illuminating Petroleum.

The Corry (Pa.) Kerosene Oil Works recommend the following as a simple manner of determining the fire test of kerosene oil: "Take a cup or tumbler, fill it nearly full of water (previously tested by the thermometer to be 110° or 111° Fah.), then take a tablespoon full of the oil, of which it is desirable to test the igniting point, immerse it in the water, and stir for a moment or two to permit the oil to reach the equal temperature of the water, pass a lighted match very closely over the surface of the oil once, which always floats on the water. If it does not ignite, it can be safely used, but if it does ignite, discard it, however low the price may be; this is a fair and sure test as far as safety is concerned. The other so desirable point—does the oil burn brilliantly and without charring the wick?—the experience of every family will soon detect. Something depends upon the wick, and something upon the lamp; but properly manufactured oil is the main thing needed."

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(Illustrated articles are marked with an asterisk.)

THE PATENT OFFICE.

We have received several well-written communications respecting the propriety of discontinuing the present system of examination of applications for patents. The writers, as a general thing, are opposed to any change in this respect, and express themselves willing to pay for the service—if it can be properly and efficiently done. Ah! there's the rub. Now, it appears to us—though it is not a new idea—that the best possible thing to be done would be to establish the Patent Office upon an independent basis, which would enable the Commissioner to control the appointments, and manage its affairs without the interference of Senators and Representatives, who have succeeded in turning all our public departments into places for stowing away political favorites. The Patent Office is now suffering from this evil, and the Commissioner is necessarily much hampered in carrying out reforms in the service.

We notice with much gratification that a bill has been introduced into Congress to allow an increase in the examining force. This looks like business, and we trust that the bill may speedily become a law, and that under the new administration, the business of the Patent Office may be energized into new life. From present appearances, we think that inventors will soon have a more prompt and efficient examination of their cases.

IS A FLYING MACHINE A MECHANICAL POSSIBILITY?

Our readers are well aware that the above question has been answered, theoretically, in the affirmative many times; but it has never been practically answered except in the negative. We mean, of course, an artificial flying machine capable of performing flight independent of ordinary winds and currents, so that under most common circumstances it can be trusted to perform its work as ships do now, and have done for centuries. Man has made himself master of the treacherous sea, can he not also penetrate the aerial depths and control his motions in that element?

Much as has been said, written, and done in the elucidation of this subject, it is astonishing how little has been to the purpose. The inventions which have from time to time been made and tried only to demonstrate their utter absurdity, have been for the most part constructed in apparent ignorance of the true principles involved; and those who have criticised these inventions and ridiculed them have shown, in a majority of instances, almost as much ignorance as those whose work they have condemned.

Notwithstanding the failures which have uniformly attended the attempts to construct a useful flying machine, and the emphatic negative given by a large number of scientific writers to the question which heads our article, the belief in the ultimate accomplishment of flight by means of human devices has never lacked adherents among the learned and the unlearned. The organization of the Aeronautical Society, which gave its first exhibition at London last June, is an evidence that the belief is gaining rather than losing ground. Let us, then, examine the merits of this question.

The report of the above society contains some curious matter in the description of the engines exhibited. Steam engines have usually been considered as quite inapplicable to any possible flying machine, on account of the high relation their weight bears to their power. But what are we to say of an engine weighing only sixteen lbs., and being able to work to one-horse power? The council of the society voted their £100 prize to Mr. Stringfellow for an engine of this description; and whether or not it ever becomes the motive power for flight, it would seem, from its ingenuity, to be well worth the reward. "The cylinder," the report tells us, "is 2 inches in diameter, stroke 3 inches, and works with a boiler pressure of 100 lbs. to the square inch; the engine working 300 revolutions per minute. The time of getting up the steam was noted; in three minutes after lighting the fire the pressure was 30 lbs.; in five minutes, 50 lbs.; and in seven minutes there was the full working pressure of 100 lbs. When started, the engine had a fair amount of duty to perform in driving two four-bladed screw propellers, 3 feet in diameter, at 300 revolutions a minute."

The data for calculating the power are taken as follows: Area of piston, 3 inches; pressure in cylinder, 80 lbs. per square inch; length of stroke, 3 inches; velocity of piston, 150 feet per minute; $3 \times 80 \times 150 = 36{,}000$ foot-pounds. This makes rather more than one-horse power (which is reckoned at 33,000 foot-pounds). The weight of the engine and boiler was only 13 lbs., and it is probably the lightest steam engine that has ever been constructed. The engine, boiler, car, and propeller together were afterwards weighed, but without water and fuel, and were found to be 16 lbs."

This engine seems to demonstrate the possibility of making engines light and powerful enough for purposes of flight. The American wild goose frequently weighs more than this entire machine, boiler, propeller, and all; and the power exerted by this bird in flight, must be vastly less than that performed by the engine, according to the report referred to. Borelli assumed that a goose exerts in flight a force of 400-horse power, an estimate so wild and extravagant that it is simply ridiculous.

Dr. Fox, of Scarborough, has translated an instructive paper written by M. de Lucy, of Paris, "On the Flight of Birds, of Bats, and of Insects," in reference to the subject of aerial locomotion; in which it is stated, as the result of numerous investigations, that in flying animals the extent of winged surface is always in inverse ratio to the weight of the creature. He compares gnats, dragon-flies large and small, ladybirds, daddy-longlegs, bees, marsh-flies, drones, cockchafers, stag-beetles, and rhinoceros-beetles together, and arrives at the following highly interesting and unexpected results. The gnat, which weighs 460 times less than the stag-beetle, has 14 times more of (proportional) surface. The ladybird weighs 150 times less than the stag-beetle, and possesses 5 times more of surface, etc.; and it is the same with birds. The sparrow weighs about 10 times less than the pigeon, and has twice as much surface. The pigeon weighs about 8 times less than the stork, and has twice as much surface. The sparrow weighs 339 times less than the Australian crane, and possesses 7 times more surface. If we now compare the insects and the birds, the gradation will become even more striking. The gnat, for example, weighs 97,000 times less than the pigeon, and has 40 times more surface; it weighs three million times less than the Australian crane, and possesses 140 times more surface.

Coulomb calculated that in order to support a man it would be necessary to have a surface 12,789 feet and 2 inches in length, by 191 feet and 10 inches in breadth, but it has been since ascertained that a man can descend quite easily from a great elevation, with a supporting surface of 29 square yards, 8 square feet, and 14 square inches. This superfices reduced to a square gives the length of a side 5·3 linear yards, nearly. The length of supporting beams from the center needs therefore to be only about 2·75 yards, provided their own weight is not taken into account.

Precisely here comes in the first difficulty. These arms or beams necessary to sustain a web of silk or other texture, must have strength, rigidity, and lightness. When man can make a structure as strong, as rigid, as elastic, as light in proportion to bulk as a goose quill, the problem of flight will be nearly solved. Compensation for want of power in the muscles of the chest may be made by calling into play those of the thighs and legs as well as the arms, by means of suitable appliances.

What is now required, is a material combining greatest strength with least weight. We know of no such material now available for the purpose. We therefore conclude that until such materials are discovered man will not fly. To use the words of one of the sages of a shop in which many of our youthful days were spent, flying is, at present, "theoretically practicable, but practically impracticable."

APPLICATIONS OF THE GIFFARD INJECTOR.

This anomaly in mechanics is capable of a number of applications, and has been applied to uses not probably contemplated, originally, by the inventor. The main object was to enable a steam boiler to feed its own water by a jet of live steam. In some cases this proves to be an excellent method, but is not capable of general application. Where it can be applied it is economical and effective.

The Morton "Ejector Condenser," invented by Mr. Alexander Morton, of the firm of Neilson Brothers, Glasgow, Scotland, has worked finely in supplying boilers by their exhaust steam. It is a modification of, or rather an improvement on, the Giffard injector. A short time ago the application of the Giffard principle was extended to the raising of water by means of a water jet supplied from a head of considerable hight and was fully tested in France with excellent results. In Sheffield, England, the water is supplied from a head of 240 feet the jet being only one-eighth of an inch in diameter, the throat into which it discharges being three quarters of an inch in diameter. The suction and delivery pipes are two inches diameter, the water being drawn through the suction pipe from a depth of fourteen feet. The efficiency of this apparatus is claimed to be very great; that it delivers 72 per cent of the power expended, a duty considerably greater than that of pumps usually employed.

The ejector is in use, also, for discharging ashes and scoriæ from the boiler room of ships. A pipe of sufficient capacity, three or four inches diameter, extends from the outside of the ship, above the water line, down to the fire-room floor, ending there in a funnel-shaped mouthpiece, just above which is a pipe leading from the boiler to introduce a steam jet. The discharge pipe is furnished with proper valves not necessary to explain as every engineer understands the use of "flap," or check valves. Even at ten pounds pressure to the square inch the force is sufficient to lift the debris of the boiler furnaces. The quantity of the steam that passes up the pipe is very small compared with the volume induced by its velocity. Of course, this apparatus can be readily adapted to the discharge of ashes from stationary boilers, and also for excavating sand and gravel under water for the purpose of sinking cast-iron foundations. It is evident that, with modifications, the principle of the Giffard injector may be applied to many uses to which it is not now generally applied.

WHY IS MECHANICAL LABOR OBJECTIONABLE?

We copy the following from the Philadelphia *Ledger*:

A few days ago, a gentleman advertised for a clerk. By the close of the first day on which the advertisement appeared there were four hundred and eighteen applicants for the one clerkship. This afforded a very forcible illustration of the extent to which the occupation of clerking and bookkeeping is overstocked. But a few months since the head of a business establishment, who wished some help in the way of writing, but in which some literary ability was required, advertised for an assistant at a moderate salary, and having incidentally mentioned that the position might suit a lawyer or physician not in good practice, got more than a hundred applications, of which fifty-three were from young lawyers and doctors.

Here was another illustration of an over-supply of the professional or "genteel occupations." Another advertiser who wanted a person to take charge of the editorial work of a weekly paper, got fifty-seven applications, not more than half a dozen of the applicants being recognized newspaper writers, but nearly all of them being clerks, bookkeepers, and professional men. Still another advertised for two apprentices in a wheelwright and smith shop, in one of the semi-rural wards of the city, requesting applicants to give their address and age. He got three applications, but in every case the applicant was too old, two of them being over eighteen, and one nearly twenty. Still another advertised for an office boy, about fourteen years old, and had so many applicants that his place was crowded for more than five hours, and the applicants were of all ages, from mere children not more than twelve years old to full grown men of twenty-one.

These are not very cheerful or encouraging signs. The present generation of young men seem to have a strong aversion to every kind of trade, business, calling, or occupation that requires manual labor, and an equally strong tendency toward some so-called "genteel" employment or profession. The result is seen in such lamentable facts as those above stated—a surplus of bookkeepers and clerks of every kind who can get no employment, and are wasting their lives in the vain pursuit of what is not to be had, and a terrible over-stock of lawyers without practice and doctors without patients. The passion on the part of boys and young men to be clerks, office attendants, messengers, any thing, so that it is not work of the kind that will make them mechanics or tradesmen, is a deplorable sight to those who have full opportunities to see the distressing effects of it in the struggle for such employments by those unfortunates who have put it out of their power to do anything else, by neglecting to learn some permanent trade or business in which trained skill can always be turned to account.

The applications for clerkships and similar positions in large establishments, are numerous beyond anything that would be thought of by those who have no chance to witness it. Parents and relatives, as well as the boys and young men themselves, seem to be afflicted with the same infatuation. To all such we say, that the worst advice you can give to your boy is to encourage him to be a clerk or a bookkeeper. At the best it is not a well-paid occupation. Very frequently it is among the poorest. This is the case when a clerk is fortunate enough to be employed, but if he should happen to be out of a place, then comes a weary scarcity, the fearful struggle with thousands of others looking for places; the never-ending disappointments, the hope deferred that makes the heart sick, the humiliations that take all the manhood out of poor souls, the privations of those who depend upon his earnings, and who have no resource when he is earning nothing. No father, no mother, no relative should wish to see their boys or kindred wasting their young lives in striving after the genteel positions that bring such trials and privations upon them in after life.

It would almost seem that comment on the above facts and accompanying remarks is superfluous, but in daily received correspondence we frequently find inquiries for advice from those who think their talents are not properly appreciated and their efforts not adequately compensated. The state of affairs shown by the instances quoted by our cotemporary, we think, are not only easily explained, but are susceptible of improvement. One cause of it is innate laziness and the other foolish pride. There may be others, but these are the principal ones; the laziness that prevents a man from *learning* his chosen business, and the pride that prevents him from *choosing* one suited to his capacity and education. Yet the lazy often desire the most laborious places, and the proud those where they are the servants of servants.

He who would turn up his nose in scorn at serving an apprenticeship at a trade where his hours of labor would be but ten at most, possibly only eight, out of the twenty-four, and who, at the expiration of three, four, or five years would be a competent workman worth a handsome compensation, possibly capable of acting as foreman, superintendent, or employer, chooses to agonize and struggle for a place in some mercantile business where he is the drudge of his fellow employés, and almost a thrall to his employers for years, only to find himself a clerk for the best part if not the remainder of his life. As a journeyman in almost any mechanical business his pay would be absolutely greater than as a clerk, his hours of labor would, in most cases, be less, his responsibilities less, and the wear and tear on his body and mind less. But—the mechanic labors with his hands, and soils them, and wears overalls, and colored shirts, and rolls up his sleeves, and carries the honorable insignia of toil about with him, while the clerk may sometimes keep clean hands, and dress neatly, and show a white shirt front, and carry only a pencil behind his ear; consequently the choice of the show with its accompanying drudgery, rather than the substance with its independence.

Within two weeks we have had calls from young men who have studied for the "professions;" two had studied law, one medicine. Each wanted advice, and, if possible, aid; but although neither could succeed in his chosen profession, neither was willing to attempt manual or mechanical labor. What each wanted was either an insurance agency, a clerkship, traveling agency, or place as copyist—anything rather than soil the hands. We can point to men who write "M. D." after their names who cannot compose a parseable English sentence. We know of members of the "bar" who do not understand the constitution of their country or the principles underlying it. These might have made good blacksmiths, or machinists, or carpenters, or ship-builders (though we much doubt it), but they might have been usefully employed in shoveling gravel.

But after having chosen a mechanical profession, it is not seldom the case that the apprentice looks upon his term of apprenticeship as so many years of lost or wasted time. He does not care to learn. He seems to suppose that the practical knowledge of his business is, somehow, to grow into his apprehension without effort on his part. To worry through the years of apprenticeship, with the least labor or effort to themselves and the least benefit to their employers, is really the principal study of some apprentices. *They* are not the only ones who look upon the years of apprenticeship in the same light. A letter received from a young man says he wants to become a machinist, but his father objects to his *giving* (?) three years to a trade.

Possibly the time will come when mechanical labor and mechanical skill will be valued at their true worth, as compared with other employment and other aptness; but so long as our young men prefer to preserve soft and clean hands as something more valuable than personal independence and a means of usefulness, we look for no abatement in the number of applications for "genteel" places.

ART OF COLORING MARBLE.

Did the ancients practice the art of coloring marble, or is it a recent American discovery? The New York *Times*, of February 15, 1869, in an editorial headed "Marble Coloring," says: "The art of coloring marble, through the entire mass, is supposed to have been known to the ancients, inasmuch as among the ruins traces of colored marbles and stones are found."

The *Metropolitan Record*, of February 20, 1869, in an article headed, "A New and Important Discovery in the Fine Arts, and its Special Application to Church Architecture," thinks there are plausible reasons why some writers have ranked the art of coloring marble among the lost arts, because "among the ruins of ancient temples and monuments, colored marbles and stones have been found, of whose original sources no trace can be obtained. If they came from quarries, the quarries are unknown in our day."

In Venice and other cities of Lombardy are columns and altars of a translucent white marble, *marmo statuario*, which resembles the Parian, but is not quite so opaque. The quarries of this kind of marble are as yet unknown. Might it not be said with equally plausible reasons that the Italians knew the art of making this marble, but they lost it?

That analogues and quarries of ancient colored marbles have not been found, is hardly a sufficient reason for classing the art of coloring marble among "the lost arts," for it may safely be asserted, that in all the countries which constituted the ancient world, Egypt, Asia Minor, Greece, Turkey, Italy, Northern Africa, and the Mediterranean Isles, have been in a state of stagnation since the fall of Rome and Constantinople; and that whenever accurate geologic and mineralogic surveys are made, the quarries may be re-discovered.

A synopsis of what the ancients knew and did as to marble, will conclusively show that the art of coloring marble through the entire mass was neither known to, nor practiced by them.

The word *marmaros* was applied by the earliest Greek writers to any rock, stone, block, or fragment, with the idea of shining, sparkling, bright. B. C. 800 Homer ("Iliad," xii., 380) and Euripides (B. C. 450, in his "Phœniss," 673) used the term in that sense. It was evidently derived from *marmarein*, to shine, sparkle, gleam, glitter. B. C. 270, Theocritus first applied *marmaros* to works of art in marble.

The word *marmaron*, marble, also rock crystal, or feldspar, on account of their shining appearance, was of later date. The Latin word *marmor* is formed from it, and is neuter like its original, in spite of its termination *or*. The German, *marmor;* Italian, *marmo;* French, *marbre;* English, *marble*, are but so many Graeco-Latin derivatives. Mineralogists have limited the word to rocks and stones, whose sole or chief ingredient is carbonate of lime, susceptible of polish.

There were at Rome, as early as 493 B. C., two ediles, architectural engineers, whose duty was to superintend the erection, adorning, and repairing of public buildings, streets, markets, etc. B. C. 366, two more were added, styled *curile ediles*. Julius Cæsar joined to them two *ediles cereales*, B. C. 44. The ediles had precedence in the Senate; their office was one of the most honored in the State. Would not one of these distinguished Roman savants and engineers have somewhere alluded to the art of coloring marble if such an art had been known and practiced?

Polygnotus, who was surnamed "The Prometheus of painting," and whose works were so highly esteemed, no doubt knew all the colors and coloring of his epoch, B. C. 469. Yet, in connection with him or his paintings, we find nothing of the art of coloring marble. Neither do we find any mention of such an art in connection with Polycletus, the famous sculptor and architect who built the theater at Epidaurus, which Pausanias pronounces, in symmetry and elegance, superior to every other theater, and not excepting those at Rome.

Vitruvius, the ablest Latin writer on ancient architecture, does not allude to the art of coloring marble through the entire mass in his ten books. Yet he lived under Augustus, who zealously patronized the arts, and was wont to say, "That he found the city built of brick, and left it constructed of marble."

Pausanias (A. D. 120) visited Greece, Macedonia, Asia, Egypt, and even Africa, as far as the temple Jupiter Ammon, then retired to Rome, where he wrote his ten books on the edifices, monuments, and works of art he had examined, and contrasted them with those of Rome. In the work of this author, who is the highest authority on ancient archeology, there is no allusion to any art of coloring marble through the entire mass; yet this erudite writer not only describes the edifices and works of art, but furnishes historical records, anecdotes, and legends connected with them.

Not even Belzoni (A. D. 1818), describing the vivid colors of his "Room of Beauties," "Researches and Operations in Egypt," p. 227, pretended to assert that the ancients knew the art of coloring marble and granite through the entire mass, though he may have thought they could beautifully color and stain it on the surface.

Hence, as neither the ediles from B. C. 493 to A. D. 476, a period of one thousand years, neither the ancient painters, sculptors, and architects, nor the ancient writers on archeology mentions the art of coloring marble through the entire mass, we may fairly conclude that the ancients knew nothing of this art, and that it is simply and purely an American discovery.

No doubt, Winkelman, author of the "History of Art among the Ancients," and Quatremère de Quincy could not help indorsing such a conclusion.

As a synopsis of the finest marbles known to the ancients might throw more light on this subject, and be a guide to American explorers and pioneers, we shall give it in a future issue.

VELOCIPEDE NOTES.

There are some who think, or pretend to think velocipedes are a frivolous invention, only calculated to subserve purposes of amusement, and soon to be superseded by some other ephemeral claimant for popularity. To such it perhaps seems a waste of time and space to record the progress of this most prominent mechanical invention of the time. We, on the contrary, have avowed and still avow our belief that the velocipede, as now improved, is destined to mark an era in the history of vehicles, an era that will last long after present cavillers and devotees have passed off the stage. We therefore continue our notes on the progress of this invention, and are confident from the many letters of approval we receive, they prove very acceptable to a large number of our readers.

A young mechanic in Dubuque, Iowa, has invented and constructed a vehicle which he terms the "velocycle," and which he claims will supersede the velocipede. A local paper describes it:

"The reader must disabuse his mind of all the forms common to the velocipede, and imagine a wheel 5 feet 10 inches in diameter. Nay, the imagination must go further and comprehend this wheel to be, as it were, two wheels of this diameter, and of a proportion not unlike a driving sulky's—that the two are made a unit by a light rim twelve inches wide, running around and within two inches of the outer circumference of the two supposed wheels. This comprehension will enable the reader to understand that this wheel is in reality a rim 5 feet 10 inches in diameter and about 14 inches wide, with two flanges, of two inches depth, projecting over the edges. Having entertained this form, we proceed further. Inside of this rim or wheel, a light but strong frame is hung, by a novel device, which keeps it independent, so far as not to obstruct its (the wheel's) motion. From the bottom of the frame, which is square, and running to the top of it, at an angle of nearly ninety degrees, is a band that may be properly called an endless ladder. The band, it will be understood, passes over a pulley below and a pulley above. On the edges of this endless ladder, in close proximity and parallel to each other, like strings of great beads, are a series of friction pulleys. These pulleys are so arranged as to unhinge on similar peculiarly contrived pulleys on the inner circumference of the main wheel or rim, near to the intersections of the flanges. The revolution of this band or endless ladder, through the medium of these pulleys, causes the main wheel or rim to revolve."

While the velocipede is still having its run in Paris, the other cities and towns of France are putting spokes in its wheels in the way of municipal restrictions. At Lyons no one can appear in the public streets or highways on a velocipede, and at Bordeaux, if a velocipedist goes out after sunset, he must carry a lantern, lighted.

A velocipede race took place at Worcester, Mass., a day or two ago. There were eighteen competitors, eight of whom were thrown. The remaining ten finished a course, of a little less than half a mile, in various periods of time; the fastest rider making the course in seventy-two seconds.

It is said that the first velocipede made its appearance in Minneapolis, Minnesota, on Tuesday, Feb. 16, and created a great excitement.

There are at the present time some twelve or fifteen schools in Boston where the use of the velocipede is taught, and they are increasing in number every day. At these halls from four to twelve machines are kept, and the arrangements whereby one pays for learning differ at the several places.

Some charge so much for a series of ten lessons, while others charge a small admittance fee and a certain price per hour for using the machine, as is the case in playing billiards. In either case they all made money, and a machine pays for itself in a very short time.

The hall velocipedes are for the most part slim built affairs, not suitable for roads, where a strong machine will be required to withstand the jar of uneven roads. It is estimated that upwards of one thousand young Bostonians are taking lessons in riding, with a view of going on the road when the spring opens.

Mr. Nat Perkins, of Riverside Park, will offer prizes for a series of velocipede races to come off on his race track early in the spring.

Walter Brown has opened the velocipede rink, number 10, in Boston, on Court street, near the Revere House.

A few evenings since, Mr. Hiram Henlin, of 720 Broadway, New York, and Mr. Samuel Keeler, the well-known and popular treasurer of the New York Theater, while at the velocipede school of Mr. C. Witty, engaged on a tilt at riding, which ended in rather a novel wager, Mr. Henlin agreeing to ride a velocipede against Mr. Keeler, from New York to Chicago, in less time than Mr. Keeler could, for the sum of $1,500 a side. Articles of agreement were drawn up, and a forfeit of $250 each placed in the hands of Mr. Charles H. Bladen, the final deposit was made at the house of Mr. Henlin, 720 Broadway, on the evening of Thursday, February 16, 1869—umpires and starting day then named. We suppose this will be the forerunner of several matches of the same kind, as the velocipede mania is on the increase. The affair is creating considerable excitement in sporting circles, and a large amount of money is already staked upon the result.

A new style of bicycle—the first specimen of which was completed about a fortnight since, and several of which have since been manufactured, and subjected to a variety of tests as to strength and susceptibility of easy propulsion and control—is, we are informed, the recipient of many encomiums from those who have learned to ride it. It is called the Improved American Velocipede, invented by A. T. Demarest, of this city. It differs from the styles best known to the public, in important respects. The iron arms, between which the front wheel is held, are inclined back at an angle of forty-five degrees from the perpendicular, which inclination brings the seat in such a relative position to the fore wheel that a man of medium hight can with his feet reach the treadles of one of these velocipedes, the front wheel of which is forty-five inches in diameter, with as much ease as he can those of the ordinary velocipede, the fore wheel of which is of a diameter seven or eight inches smaller. This peculiarity gives likewise great facility in describing sharp curves and circles of small diameter, the body being inclined in the direction in which the rider wishes to propel himself, and in the direction in which the driving wheel is inclined. Those who have become expert in the use of this new machine, claim that the movement of the body in propelling and guiding it is more nearly analogous to that in skating than is that employed in controlling the ordinary bicycle. Indeed, they claim that it can be guided by the mere inclination of the body without perceptibly varying the pressure upon the handles to the one side or the other. It is also claimed that by the peculiar rakish arrangement referred to, three obvious advantages are secured—that the driving wheel never touches the pantaloons to soil them; that however formidable an obstruction may be encountered, whether it be a curb-stone or anything else of equal hight, the arms holding the driving wheel will never be bent back in such a way that the wheels will lap each other (as those of the other styles of velocipede sometimes will), for the reason that those arms point directly toward such obstruction, the sole effect of striking it being to lift the front wheel and the rider; and that the hind wheel—whether a straight line be followed or a circle described—remains in an upright or nearly upright position.

The *Milwaukee Sentinel*, of the 18th February, says that "Mr. Cubberley, the inventor of the new velocipede, gave an exhibition of its speed and mode of operation at the Chamber of Commerce yesterday. The 'new-comer' made a favorable impression, and will doubtless supersede the treacherous 'bicycles.'" This machine is described as a tricycle, the rider sitting over and between the main wheels, as upon a sulky. These are about the size of the hind wheels of an ordinary carriage. The third, or guide wheel, is of small size, and serves merely to support the forward part of the machine.

Its most striking peculiarity is the ingenious contrivance whereby the weight of the rider is made to contribute to the propelling power, thus materially relieving the strain upon the muscles of the arms and legs. The apparatus for guiding, in addition to its main purpose, is so connected that the arms may assist in imparting motion to the wheels when not engaged in giving direction. The movements of the body in riding are very similar to the gentle rise and fall of a person riding on horseback, the rapidity of the motions increasing with the velocity.

The following remarks upon learning the velocipede are based upon practical experience and will be found of use to those who have not yet "broken their colt:"

"To learn the velocipede, where possible, it is advisable to use a velocipede not too elevated, so that the soles of the feet touch the earth. To start with the velocipede it suffices to run with the machine, so as to master well in the mind the action of the fore wheel, for all depends on this wheel. Half an hour of this is all that is requisite. Then one *only* of the feet is placed on the pedal, keeping the other leg on the ground, and one guides oneself in pushing this pedal a few moments. When one has by this acquired the notion of governing the velocipede, one lifts the leg that was on the ground and places it on the other pedal. Then cause the legs to regularly and alternately turn the pedals; speed of course is increased by quickening the action. After an hour or two one will certainly thus have acquired the means of attaining a medium speed. To get off, the feet are at once and simultaneously lifted off the two pedals, which diminishes the speed, upon which both feet are put at once to the ground.

"There is no danger, with a little caution, in using this machine in this way, even for a novice. The pedal is so constructed that the foot of the rider can at once leave it, and he has only to put the foot to the ground at the side upon which the machine inclines to gain a resisting point: one must not let the handles go; these serve to maintain and restore the balance of the machine when the rider has got off it.

Should the velocipede be too high to practice it in the mode above indicated, the learner should get some one to hold the machine, the hands on the extremity of the bar upon which the rider sits, so as in no way to impede the action of the fore wheel. It is well to choose a sloping ground to learn on.

So far, accidents have been neither numerous or serious, and the predictions that these machines would prove dangerous have not been verified. A Cincinnati paper gives the following account of a velocipede accident, resulting, however, from no defect in the machine:

A lad by the name of George Grier, having a desire to learn to ride the velocipede, engaged one of the machines at the velocipede school on Seventh street, and commenced his lesson in the fourth story of the building. He proved to be a very apt pupil, and having made the circuit of the large room several times with the assistance of his teacher, was anxious to try it alone. Mr. Miller acquiesced, and gave the novice a good start. The lad ran the machine eight or ten yards very skillfully, but after that distance had been gone over, the velocipede became unmanageable, and made for a large hatchway in the middle of the room. The machine going at full speed, ran against the wooden guard around the opening, crashed through the boarding, and precipitated the rider to the cellar of the building, four stories and a half beneath. His fall was somewhat broken by the velocipede, which it seems struck the ground first, with him clinging to it; but notwithstanding this favorable circumstance, he received injuries which it is feared may prove fatal.

The junior editor of the Mauch Chunk *Gazette* has been experimenting on the velocipede, and gives an amusing account of his experience. The difference between these new-fangled horses and the orthodox quadrupeds seems to be about this: In the case of the former, the animal has to be broken before it can be ridden, while with the latter it is the rider who must undergo the breaking process.

ABOUT EARTHQUAKES.

On the 13th of August last, and the three successive days, fearful earthquakes occurred on the coast of Peru and in the interior of Ecuador, extending from Ibarra, a town of Ecuador, fifty miles to the north of Quito, to Arica, Arequipo, and Iquique, along the coast for a distance of 1,200 miles, and over a wide, but as yet unascertained region of the interior. The particulars of the catastrophe are familiar to our readers. An English exchange, in discussing this disaster in connection with earthquakes in general, gives some interesting details, from which we condense the following:

"Of all the great and overwhelming evils to which men are exposed, there is no one so sudden, so terrible, and so destructive as that produced by earthquakes in those regions in which the great internal fires of the earth, or the vapors produced by chemical or other action, are still in full force. It is the opinion of the great Humboldt that if we could obtain daily intelligence of the condition of the whole surface of the earth, we should probably arrive at the conviction that the surface is almost always shaking at some point, and that it is incessantly affected by causes working at one point or other in the interior of the earth. Earthquakes probably owe their origin to the high temperature of deep-seated molten strata in the interior, and are quite independent of the nature of the rocks or of the earth near the surface. Earthquake shocks have been felt even in the loose alluvial soil of Holland; and the great earthquake which destroyed the city of Lisbon on the 1st of November, 1755, was felt as far north as the shores of the Baltic and the mountains of Scotland. But it is one great happiness which the natives of the British Islands and Northern Europe possess that they have long been free from earthquakes of destructive violence. The great internal fires or forces, of whatever nature they may be, by which destructive earthquakes are produced, seem to have exhausted their strength, at least for some hundred years now past, in Northern Europe. Yet our distance from these great centers of commotion is not so great as we generally suppose. The earthquake of Lisbon in 1755 was probably one of the greatest convulsions in modern times, and attended with the most terrible loss of life. That at Messina, in Sicily, in the year 1783, was scarcely less terrible or fatal, and nearly the whole of the south of Spain, of Italy, and of Greece have at various times been shaken and convulsed with earthquakes. Happily, however, they do not appear in modern times to have exercised any destructive influence north of the chain of the Alps, although tremblings of the earth were felt almost every hour, for months together, in the month of April, 1808, on the eastern declivity of Mont Cenis, a portion of the chain of the Alps at Fenestrelles, and Pignesol. Beyond that point these great internal forces, though often felt, have never produced any dangerous convulsion in modern times, and the natives of France, Germany, and the British Islands may regard it as one of the many great advantages for which they have reason to be thankful that they are now, and have been for many generations, free from destructive ravages of forces by which so many other portions of the earth are periodically laid waste. The people of the United States have, to a great extent, the same reason for gratitude; for, although there were very destructive earthquakes in the valley of the Mississippi in the years 1810-11, there never yet has been an earthquake by which any considerable city of the United States has been destroyed.

"From the West Indies southward, over the greater part of South America, the causes by which the earthquakes are produced appear still to be in action. In the earthquake of Rio Banba, in the same district of country which has just been laid waste, the whole city of Rio Banba, with 30,000 or 40,000 inhabitants, was destroyed in a few minutes by a sudden explosion like the blowing up of a mine. Humboldt states that this terrible event was unaccompanied by any noise, but that a great subterranean detonation was heard twenty minutes after the catastrophe at Quito and Ibarra, one of the towns or cities destroyed in the recent earthquake in Peru. It was not, however, even heard at Tacunga, another of the places destroyed, although that place is (or rather was) nearer to the great convulsion of 1797. In the celebrated earthquake of Lima and Callao (Oct. 28, 1746), a noise resembling a subterranean thunderclap was heard a quarter of an hour later at Truxillo, but unaccompanied by movement. In like manner after the great earthquake of New Granada (Nov. 16, 1827), subterranean detonations were heard with great regularity at intervals of thirty seconds throughout the whole Cauca Valley, while at a distance of 632 miles to the north-east the crater of the volcano of St. Vincent, one of the small islands of the West Indies, was pouring forth a prodigious stream of lava. During the violent earthquake in New Granada, in February, 1835, subterranean thunder was heard as far north as the islands of Jamaica and Hayti, as well as the lake of Nicaragua. Wonderful as these distances are, they are not greater than the vibration produced by the great earthquake of Lisbon, which was felt over a space four times as large as the whole of Europe. In that great convulsion the sea rose at Cadiz, in consequence of the commotion of the earth, above sixty feet; and in the West India Islands, where it usually does not rise more than three feet, to an elevation of at least twenty feet. 'There is no manifestation of force yet known to us (including the murderous inventions of our own race) by which a greater number of human beings have been killed in the short space of a few seconds or minutes than in the case of earthquakes. Sixty thousand were destroyed in Sicily in 1693; 30,000 to 40,000 at Rio Banba, in South America, in 1797; and perhaps five times as many in Asia Minor and Syria, under Tiberius and the elder Justinian, in the years 19 and 526.' We fear that this new calamity in Ecuador and Peru will prove, when all the results are known, nearly equal to some of the above."

New American Pigment.

The London *Mining Journal* in noticing some extraordinary puffs of a pigment, known here as "Bartlett's Lead," says: "The process described, and the resulting product, are alike improbable, if not impossible. The mine from which the raw material is derived was described as being first in New Jersey and then in North Carolina; yet the removal of the mine would be much more simple than the production of the pigment stated by the process described. An ore, which contains various metals—lead, silver, zinc, copper, gold, iron, and manganese—is treated so as to remove the silver, lead, and gold, and when the residuum has been subjected to a white-red heat, the powder becomes impalpable and delicately soft, and of a pinkish chocolate color—this seems to be a common impure iron paint. This powder is made into white lead by burning it with small hard coal in a closed furnace, from which the mineral is drawn off by large rotary fans in minute and delicate flakes, which prove upon analysis to be composed of lead and zinc, with a small percentage of cadmium. In this process, the transmutation of metals is an accomplished fact; and, assuming that it can be carried out in practice, it must be admitted that all existing chemical knowledge is absolutely worthless."

Editorial Summary.

A CURIOSITY.—At the dining rooms of Messrs. Crook, Fox, & Nash, Park Row, this city, we saw last week a curiosity in the form of a smelt inside the shell of an oyster. The oyster shell (lower valve) measured four and a half by three inches and the smelt was five inches long, lying curved to conform to the mouth of the shell and in a good state of preservation. As the food of the oyster consists of nothing larger than the animalculæ of the salt water, it must therefore be inferred that the smelt was on an exploring expedition while the oyster had his shell open for an airing, and when that representative of the family *clupeidæ* intruded, the oyster imprisoned him for ransom.

THE PATENT SANDSTONE.—The recent fall of the church built of this material at Morrisania has set people to thinking what is likely to happen to the Freedman's Bureau buildings at Washington, built of the same worthless stuff at a cost of $200,000. The material is the very last we should adopt for any structure required to be permanent, but perhaps permanency was not contemplated for the Freedman's Bureau.

IT is said that contracts have been made with a French Company for opening a canal across the Isthmus in Nicaragua and with an American Company for an Isthmus railroad. Work on the latter is to begin in the spring, and the first thirty miles of the canal are to be finished in eighteen months. The contract price is ten millions of dollars.

INTERESTING EXPERIMENTS BY PROF. TYNDALL.—Dr. Tyndall has made some very surprising experiments by passing vapors of different chemical substances into an exhausted glass tube, and then sending through them a beam of electric light. The vapor is at first invisible, but after the light has shone through it for a few seconds, it forms clouds of a blue, green, red, or mauve color, which break up into the most fantastic and beautiful forms, endowed with a rotary motion, which adds greatly to their effect on the eye. In some instances, the cloud takes the shape of funnels overlapping each other, and, curiously enough, the inner ones can be seen through the outer ones. The most surprising of all is the vapor of hydriodic acid. The cloud is seen cone-shaped, supporting vases of exquisite form, and over the edges of these vases fall faint clouds, resembling spectral sheets of liquid. Afterwards, a change takes place—roses, tulips, and sunflowers appear; then come a series of beautifully shaped bottles, one within the other, and on one occasion there was seen the shape of a fish with eyes, gills, and feelers. What, it may be asked, is the use of all this fantistic beauty? The answer is, that Dr. Tyndall finds therein illustration of chemical decomposition, examples of molecular physics, and explanations of the formation of cloud and the blue color of the sky, whereof we shall hear more by-and-by, and by which science will be enriched.

TEST FOR THE STRENGTH OF ALCOHOL.—Alcohol dissolves chloroform, so that when a mixture of alcohol and water is shaken up with chloroform, the alcohol and chloroform unite, leaving the water separate. On this fact Basile Rakowitsch, of the Imperial Russian Navy, has founded his invention. The instrument he uses is a graduated glass tube into which a measured quantity of chloroform is poured, and to this is added a given quantity of the liquid to be tested; these are well mixed together and then left to subside; the chloroform takes up the alcohol and leaves the water, which being lighter than the chloroform will float on the top; and the quantity of water that has been mixed with the spirit will be at once seen.

N. F. BURNHAM, of York, Pa., in a recent letter, says: "I shall shortly send you an advertisement for my wheel; I have already received over one hundred letters from your description of it in your paper of the 9th Feb." This is a valuable endorsement of the SCIENTIFIC AMERICAN as an advertising medium.

THIS WINTER although a very mild one has been a very hard one on proprietors of Skating Rinks in New York and Brooklyn, who have only saved themselves from ruinous losses by adopting the velocipede.

MR. FRANK BUCKLAND states that the skin of the salmon will make leather as tough as wash-leather and about the thickness of dog-skin leather. The scale marks give a very neat pattern to the leather.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

QUICKSILVER.—It is asserted that the increased production of the California quicksilver mines has stimulated the workings of the old Almaden mines in Spain, and the Austrian mines of Idria, and that the price of this metal has fallen in consequence in London, where it is fifteen per cent lower than it was four or five years ago. California now sends quicksilver to various places in the following order of their importance—the first mentioned taking the smallest quantity; British Columbia, Australia, South America, Great Britain, New York, Mexico, and, during the past year, China, which was the best customer.

The Central Pacific Railroad Company finds it exceedingly difficult to keep their employés from deserting on account of the White Pine gold excitement. They ship car loads of workmen who get their ride for nothing, and strike for the gold region when they get as near as the road can carry them.

An item stating that the first cotton mill erected in New England was at Putnam, Conn., recently found its way into our manufacturing items by mistake. The first cotton mill erected in the United States was at Pawtucket, R. I., built by Samuel Slater in 1790.

The amount of petroleum remaining unsold in the United States on the first of January last is stated at 529,288 barrels; afloat and in Europe, 429,008 barrels; total 960,296, showing a decrease of 312,925 barrels as compared with the first of January, 1868.

St. Thomas' Church, in New York city, is to have a full chime of bells, the largest of which will weigh 5,500 pounds and be the heaviest harmonic bell ever cast in the country.

A valuable sulphur deposit has been found in Louisiana, near Lake Charles, 500 feet beneath the surface.

One thousand stationary engines are employed in the manufacturing establishments of Philadelphia.

The revolution in Cuba has raised the price of sugar and greatly depressed the hoop-pole business in Maine.

The first piano shipped to Japan was sent recently by a New Haven manufacturer.

One of the Oriental Powder Company's mills, in Gorham, Maine, blew up on Saturday. A Prussian named Shaiel had his leg broken. No one else was hurt.

A transparent agate inclosing a drop of water has been found in Willamette river, Oregon.

The product of the Nevada mines for 1868 is stated as being sixteen millions of dollars.

Seeds of the cork tree have been brought from Portugal to Florida with a view to test its cultivation there.

A seventy-five pound nugget one-third gold, is said to have been recently found in an Oregon mine.

Earth is stated to have been found frozen in a Colorado mine at a depth of 125 feet.

An Illinois beet sugar company uses fifty tuns of beets a day, and will soon increase its consumption to sixty tuns.

A world's fair, to be held in San Francisco in 1870, is talked of.

Gold diggings have been discovered in Scotland.

A canal across the State of Georgia is talked of.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; beside, as sometimes happens, we may prefer to address correspondents by mail.

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 should be by volume and page.*

T. P., of Mo.—If you wish to prevent the splitting of your hollow cutters or reamers in hardening, drill a small hole from the side to meet the large hole at its apex; otherwise there is no chance for the steam to escape and cracking is sure to result.

W. H. B., of Pa.—You can clean a clogged file or rotary cutter effectually by smearing it with oil lightly, exposing it to a forge flame a moment, and then carding it with the card that every machinist or filer uses. You may heat it so hot you cannot bear your hand upon it, but the temper will not be drawn.

S. R., of Me.—Ordinary rosin powdered and melted on the plate by a slight heat will give a temporary resistance to acids. In fact any resinous substance will form a base for a resistant to acids.

T. L., of Pa., wants to use an incombustible spongy coherent substance like platinum sponge but cheap. He says however that it need not possess all the properties of platinum sponge; all that is required is incombustibility, sponginess, and coherency.

H. N. C., of Pa.—A stream of cold air directed forcibly against a heated bar of iron keeps it hot, by the combustion of the iron itself. The oxygen of the air is brought so closely in contact with the heated metal, and is supplied in such quantity that it unites with the iron producing all the phenomena of combustion, among which is the evolution of heat.

A. W. P. of Pa.—There is no difficulty in making a speaking tube convey audible sounds one hundred yards. Biot, a celebrated French philosopher was able to hear low whispers through a tube of iron 3,120 feet in length. The straighter it is the better. We don't think putting it beneath the ground essential. Put it where it will be most convenient.

J. W. H., of Pa.—Self-sealing cans might be made that would perhaps allow the air to escape when the cans are heated, and close themselves hermetically upon the contraction of the air in cooling, but we are not aware that any such are used. The expulsion of the air is the only object to be attained in heating the fruit, where the modern process of canning is used, and if that is not thoroughly done the heating is detrimental rather than beneficial.

J. M., of Ill.—A good varnish for maps or water color paintings, is made of genuine Canada balsam and rectified oil of turpentine, equal parts. Mix; set the bottle containing the mixture in warm water, and agitate until the solution is perfect; then set in a warm place a week to settle, when pour off the clear varnish for use.

J. M. H., of Seminole Nation.—There is special legislation for the Indian reservations which can be found on consulting Brightley's Digest. Should the infringement of a patent be committed therein by a resident of some other State or Territory, a suit would be good, could the party be served, or the infringing machine be found within the jurisdiction of the court in which the suit is commenced. The Territories have District Courts which are severally invested with same jurisdiction as the U. S. Circuit and District Courts of the U. S.

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.

Scientific Books and Periodicals sent to order to any part of the country. Purchases of all kinds promptly attended to. Address A. W. Macdonald, Jr., Room B, 37 Park Row, New York.

Manufacturers and dealers of the best crimping machines for boots please send circular and price to C. Kramer, Enterprise, Miss. Box 44.

For sale—Foundery and machine shop. For description address O. F. Griffith, Ag't, Mt. Pleasant, Iowa.

Nut Machines.—For sale, State, county, shop, or machine rights of nut machines. Address H. C. Hart, Unionville, Conn.

$5,000 will purchase one half interest in a valuable patent that will pay $30,000 the coming summer. No capital required except the purchase money. Address E. L. Smith, Buffalo, N. Y.

Wanted—address of patentee of machine for converting potatoes into pulp and dry cakes. A. Ott, 22 First ave., New York.

J. T. Raftery, of Eldara, Ill., wishes to correspond with parties for the manufacture of water elevators.

Photographic apparatus, 1-4 size, for sale cheap. Apply at 56 and 58 Murray st.

Hydraulic, steam, and vacuum gages, all sizes, at the lowest prices. Addres R. H. Norris, Paterson, N. J.

Peck's patent drop press. For circulars, address the sole manufacturers, Milo Peck & Co., New Haven, Ct.

Brick clay lands for sale. Apply 19 Cliff st., New York, Room 7.

Compound Lathe Chucks—Fairman's patent—The best in the market. Send for circular. Address Hutchinson & Laurence, 8 Dey st.

Makers of hand or power brick presses, send circulars to H. Arndt, Fort Plain, N. Y.

Inventors' and Manufacturers' Gazette—an illustrated journal of new inventions and manufactures. Cheapest paper in the world. $1 per year. Sample copies sent. Address Saltiel & Co., Postoffice box 448, or 37 Park Row, New York City.

Fine and complicated watches of every description repaired, etc., in all their branches, by H. F. Piaget, 139 Fulton st., N.Y. A practical workman and author of The Watch. All work warranted.

Builders of 8 to 15-horse engines send address, with cut of engine and terms. Object, to select the best to sell for oil purposes. Wanted, 2d-hand iron planer, lathe, drill, pipe-cutting machine, and tools for small machine shop. Also, set of rollers. A. Logan & Co., Engine Dealers, Tidioute, Pa.

Pickering's Velocipede, 144 Greene st., New York.

For descriptive circular of the best grate bar in use, address Hutchinson & Laurence, No. 8 Dey st., New York. See Advertisement.

For sale low—Three second-hand presses for punching nuts and washers, all sizes, and other work. Punches and dies for same. Address Geo. H. Hawes, Fall River, Mass.

Two-set knitting mill for sale—See advertisement back page.

Glynn's anti-incrustator for steam boilers—the only reliable preventive. Causes no foaming, and does not attack the metals of the boiler. Liberal terms to Agents. Address M. A. Glynn & Co., 735 Broadway, New York.

W. J. T.—We think the patent asbestos roofing manufactured by H. W. Johns, of this city, is the best substitute for tin or slate. It is cheap and easily applied.

Inventors and patentees wishing to get small, light articles manufactured for them in German silver or brass, address Schofield Brothers, Plainville, Mass.

Tempered steel spiral springs. John Chatillon, 91 and 93 Cliff st., New York.

Two saw mills for sale. C. Bridgman, St. Cloud, Minn.

Rockwood, 839 Broadway, N. Y., photographs architectural or mechanical drawings and plans to a scale. Also, photographs of machinery.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Punching and shearing machines. Doty Manufacturing Co., Janesville, Wis.

Specialties in the Machinists' line. Parties desiring work of a special character address S. W. Gardiner, 6 Alling st., Newark, N. J.

Responsible and practical engineers pronounce the Tupper Grate Bar the best in use. Send for a pamphlet. L. B. Tupper, 120 West st., N.Y.

Iron.—W. D. McGowan, iron broker, 73 Water st., Pittsburgh, Pa.

N. C. Stiles' pat. punching and drop presses, Middletown, Ct.

Machinists, boiler makers, tinners, and workers of sheet metals read advertisement of Parker Brothers' Power Presses.

Winans' boiler powder, N. Y., removes and prevents incrustations without injury or foaming; 12 years in use. Beware of imitations.

The paper that meets the eye of all the leading manufacturers throughout the United States—The Boston Bulletin. $4 a year.

Recent American and Foreign Patents.

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

LIME KILNS.—George Atkins, Sharon, Pa.—This invention has for its object to furnish an improved lime kiln, simple in construction, easily and conveniently operated, and which will burn the lime thoroughly with a comparatively small amount of fuel.

ANIMAL TRAP.—W. Bronson Jarvis, Washington, N. C.—This invention has for its object to furnish a simple, convenient, reliable, and self-setting animal trap, which shall be so constructed and arranged as to be not at all liable to get out of order.

ROCK DRILLING MACHINES.—S. Gable, Millerstown, Pa.—The object of this invention is to provide a simple and effective machine for drilling rocks.

MEASURING INSTRUMENT.—Thomas Bisbing, Buckstown, Pa.—This invention relates to a new and improved device for measuring cloth and giving lineal measurements generally; and the invention consists in operating a revolving dial plate by a sliding pawl and ratchet wheel.

MACHINE FOR MAKING PAPER PULP.—Frederick Burghardt, Curtisville, Mass.—This invention relates to a new and important improvement in producing paper pulp from wood, and consists in pulverizing the wood by bringing it in contact with a revolving cylinder provided with a grating filing or scraping surface, and in vibrating the scraper longitudinally for changing the cutting or scraping surface of the cylinder on the wood, and also in a revolving cleaning cylinder.

FEATHER RENOVATOR.—Enoch Colvin, Paulet, Vt.—This invention relates to an improved apparatus for renovating feathers, and consists in subjecting them to the action of steam and heated air.

CARRIAGE TIRES.—William Williams, New York city.—This invention relates to a new and useful improvement in carriage tires, whereby they are made much more useful than they have heretofore been, and it consists in providing the tire with a flange for keeping the tire in place on the wheel, and also for protecting and strengthening the wheel.

SAFETY HAT.—James J. Giltenan, Cincinnati, Ohio.—The object of this invention is to so construct a hat that the wearer may be protected from danger from the sun's rays, and from excessive heating of the head; and it consists in making the hat with a double crown, and in inserting a sponge or other absorbant between the crowns for retaining moisture.

LOCK.—A. F. Pfeifer, Newark, N. J.—This invention has for its object to furnish a cheap, simple, and effective lock, designed especially for piano locks, sewing machine cases, and similar uses; and it consists in the combination of one or more hook or catch bolts, with the straight or sliding bolt of the lock.

BINDING ATTACHMENT TO HARVESTERS.—Wm. W. Snell, Brushford, Minn.—This invention relates to a new binding attachment, which is more particularly intended to be applied to the Marsh Harvester, but which may as well be used on any of the other harvesters now in use. It is arranged to operate entirely automatic, and will adjust itself to suitable size of bundles as they may be desired.

AUTOMATIC BOBBIN BUILDER FOR SPINNING JACK.—Oliver Brothers, Naugatuck, Conn.—This invention relates to a new machine for automatically winding the yarn around the bobbins of wool-spinning machines; its object being to do away with the necessity of imparting oscillating motion by hand to the follower or thread guide.

PROCESS OF MAKING SHEET-METAL PANS.—C. Hodgetts, Brooklyn, N. Y.—The object of this invention is to avoid the weakening of the bottoms of sheet-metal pans; and the invention consists in forming a circular depression in the sheet metal plate from which the pan is to be struck, and in then bending up the sides of the pan, the depression remaining in the bottom at the junction of the same with the sides.

ROD COUPLING.—G. Thompson, Shamburg, Pa.—The object of this invention is to produce a device for connecting two rods, which are used as pump rods in oil wells, salt works, or for any other suitable purpose. It consists in the use of two clamps in which the ends of the rods are respectively held, the clamps being provided with male and female screw, threads, or equivalent means, to enable their being connected; each clamp is constructed by cutting a wedge-shaped long recess into the lower end of a somewhat conical metallic block, and in forming lugs on the sides of such recess.

PROCESS OF MANUFACTURING PYROLIGNEOUS OR ACETIC ACID.—C. C. Parsons, New York city.—This invention relates to a new process of making acetic acid, and more particularly to a new manner of agitating and purifying the same, also to the application of electricity to the process.

VELOCIPEDE.—John A. Topliff and George H. Ely, Elyria, Ohio.—The object of this invention is to so construct a velocipede that it may be instantaneously transformed into a two or three-wheeled vehicle, as the rider may desire, and while in motion. It consists in providing a rear axle, which is bent, so as to be somewhat V-shaped, and in loosely hanging a wheel on each one of its inclined ends. When the axle is turned by suitable leverage provided for that purpose, so that its middle part is higher than its ends, the wheels will be both in the middle, and the tires will come together, so that the two rear wheels will constitute but one single wheel, making the velocipede a two-wheeled one, or, at least, one that possesses all the advantages of a two-wheeled velocipede.

CAR COUPLING.—W. J. Blackman, Columbus, Miss.—This invention relates to improvements in car couplings, by which it is designed to provide an arrangement by which the several cars of a train may be uncoupled by the engineer, while at his post on the engine, by means of hand levers and suitable connections, or by the brakemen on the several cars by a foot-pressing apparatus; and also certain improvements in the coupling apparatus.

CHURN.—W. D. McFadden, Senatobia, Miss.—This invention relates to an improved method of operating a vertically reciprocating churn dasher from a rotary driving mechanism.

FURNACES AND TOOLS TO BE USED FOR METALLURGIC PURPOSES.—Wm. Yates, Westminster, England.—This invention relates to improvements in the furnaces and rods to be used in metallurgic operations, and more particularly to puddling, converting, and reheating furnaces, in which iron and steel are operated upon, and consists in constructing such furnaces, or protecting their inner surfaces by a lining, so that they will be better able to resist the great heat to which such furnaces are exposed in metallurgic operations.

CAR BRAKE.—J. W. W. Smith, Canton, Mo.—This invention relates to improvements in car brakes, whereby it is designed, by the employment of a cylinder having a tapered hole through it longitudinally and fitted to an axle having a corresponding taper, to provide a simple and effective brake, the said cylinder being provided with means for sliding on the said tapered shaft so as to cause it to adhere by the frictional contact therewith, and rotate with it, thereby winding up cords or chains attached to the brakes, or to free it from the said frictional contact.

CAR COUPLING.—T. Caldwell and L. C. Wilcox, Buffalo, N. Y.—This invention relates to a new and improved car coupling of that class which are commonly termed "self-coupling," and it consist in a peculiar construction and arrangement of parts.

GATE.—E. B. Scattergood, St. John's, Mich.—This invention relates to a new improved method of constructing and hanging farm gates, whereby they are rendered much more useful and convenient than gates of ordinary construction

SELF RAKE FOR REAPING MACHINES.—Edwin H. Smith, Westminster, Md.—The object of this invention is so to provide a simple and effective self rake attachment for reaping machines, which, deriving its motion from the main drive wheel of the reaper, will obviate the necessity of employing an extra hand to rake off the grain as it falls on to the reaper platform.

VELOCIPEDE.—Isaac Samuels, Marysville, Kansas.—This invention relates to a new velocipede, which is set in motion by turning cranks by hand, and which is steered by the lower extremities of the occupant. The invention consists in the general construction and arrangement of parts, whereby the desired result—namely, causing the instrument to move rapidly with the application of but very little exertion, is obtained in a simple and efficient manner.

CULTIVATOR.—William Day, Morristown, N. J.—This invention relates to a new instrument for tilling the ground between rows of corn, potatoes, strawberries, onions, or any other similar plants, and consists in so arranging the draft above the wheels that a great leverage is obtained whereby the teeth or shovels of the instrument can be forced into the ground to any desired depth. The cultivators heretofore in use could not be made to do more than barely scratch the ground, a thorough overturning of the soil not being possible by their use, while this instrument will turn the soil to any desired depth in the most thorough manner.

SOFA BED.—B. L. Southack, New York city.—The object of this invention is to construct a sofa bed, in which the back of the sofa is used to form part of the bed bottom, in order to convert the sofa into a bedstead; the whole article has not to be moved off the wall near which it stands. This is a great inconvenience in the sofa beds now in use, and to overcome it is the chief object of this invention.

NEW PUBLICATIONS.

ELEMENTS OF GEOMETRICAL OPTICS. By N. F. Dupuis, M.A., Astronomical Observer to Queen's College, Kingston, Canada.

This is an abstract work, suited to the wants of students, engineers, surveyors, and astronomers, who wish to understand fully the principles upon which optical instruments are constructed. It contains concise formulae and useful problems for solution.

The NATIONAL NORMAL is the name of a new educational monthly, published at 176 Elm street, Cincinnati, Ohio, by R. H. Holbrook, who is also its editor. Mr. Holbrook has a wide reputation as an able writer upon educational matters, and the first three numbers we have received seem well adapted to the wants of the professional teacher. We commend this publication also to parents and others interested in educational improvement, as containing information and instruction that may be usefully applied to home education and family discipline, and as being calculated to elevate the standard of popular instruction.

The ATLANTIC MONTHLY for March has excellent articles by T. W. Higginson, Mrs. Stowe, Dr. Bowditch, James Freeman Clarke, James Parton, C. P. Cranch, and other well-known writers.

BROOKLYN MONTHLY.

A new candidate for popular support, and in all respects an excellent number. H. W. Love & Co., publishers.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING FEBRUARY 23, 1869.

Reported Officially for the Scientific American.

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Patents and Patent Claims.—*The number of patents issued weekly having become so great, with a probability of a continual increase, has decided us to publish, in future, other and more interesting matter in place of the Claims. The Claims have occupied from three to four pages a week, and are believed to be of interest to only a comparative few of our readers. The publication of the names of patentees, and title of their inventions, will be continued; and, also, as heretofore, a brief description of the most important inventions. We have made such arrangements that we are not only prepared to furnish copies of Claims, but full Specifications at the annexed prices:*

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87,088.—COMPOUND FOR REMOVING INK, STAINS, etc.—Victor G. Bloede, Brooklyn, N. Y.

87,089.—MACHINE FOR PLANTING COTTON SEED.—A. D. Brown, Sr., Columbus, Ga.

87,090.—SUGAR PRESS.—W. C. Bruson, Chicago, Ill.

87,091.—Mold for Casting Metals.—Edwin N. Cleaves, Boston, Mass.

87,092.—Saw Teeth.—Peter Cook, Tonawanda, N. Y.

87,093.—Cellular Buckwheat Huller.—Andrew Crawford, Wilkesbarre, Pa.

87,094.—Black Ink.—D. A. Dougherty, Kittanning, Pa., assignor to himself, E. A. Brodhead, and J. M. Taylor.

87,095.—Door Spring.—Wm. Duncan, Lebanon, N. H.

87,096.—Reversible Knob Latch.—Barthel Erbe, East Birmingham, Pa.

87,097.—Clamp for Elevating Well Tubes.—Daniel Fisher, Oil City, Pa.

87,098.—Railway Freight Car.—William A. Goodwin, Newton, Mass.

87,099.—Fireplace.—Elwood Hampton, New York city.

87,100.—Wood-sawing Machine.—G. M. D. Harreld and B. E. Harreld, Washington, Iowa.

87,101.—Cultivator.—James Harris, Janesville, Wis.

87,102.—Low-water Indicator.—George M. Hopkins, Albion, N. Y.

87,103.—Machine for Brushing Hats.—Joseph W. Hopkins, (assignor to himself and C. B. Hardick), Brooklyn, E.D., N. Y.

87,104.—Fluid Meter.—H. B. Leach, Boston, Mass.

87,105.—Mast Hoop.—W. T. Maddocks, Northport, Me.

87,106.—Hay Raker and Loader.—J. C. Moore and C. B. Garlinghouse, Madison, and G. B. Garlinghouse, North Madison, Ind.

87,107.—Bathing Dress.—Ozias Morse, Concord, Mass.

87,108.—Rotary Pump.—Jas. Naughton, Buffalo, N. Y.

87,109.—Anchor.—Guilford Norton, Boston, Mass., assignor to Philomela T. Vining, New York city.

87,110.—Shield for Harness.—M. W. Pond, Elyria, Ohio.

87,111.—Reclining Chair.—E. C. Ranks, Boston, Mass.

87,112.—Grate.—E. S. Renwick, New York city.

87,113.—Reel and Swift.—W. G. Ricker and O. B. Webber, Rochester, N. Y.

87,114.—Tea and Coffeepot Stand.—J. W. Routh (assignor to himself, J. A. Aikman, and W. H. Tisdale), Decatur, Ill.

87,115.—Adjustable Seeder.—Charles Rundquist, Mankato, Minn.

87,116.—Collar.—C. W. Saladee, Circleville, Ohio.

87,117.—Machine for Winding Braid.—Wm. Shedlock and Alfred Shedlock, New York city.

87,118.—Fluid Meter.—John Sheffield, Buffalo, N. Y.

87,119.—Tanners' Leach.—Simon Snyder, Cincinnati, Ohio.

87,120.—Street Car.—John Stephenson, New York city.

87,121.—Street Railroad Car.—John Stephenson, New York city.

87,122.—Brake for Horse-railroad Cars.—John Stephenson, New York city.

87,123.—Manufacture of Illuminating Gas.—Levi Stevens, Washington, D. C.

87,124.—Railway Frog.—A. B. Thompson, Owego, N. Y.

87,125.—Metallic Cartridge Case.—William Tibbals, Hartford, Conn.

87,126.—Safety Guard for Railway Cars.—Thos. Walter, Philadelphia, Pa.

87,127.—Cooking Stove.—W H. Whitehead, Chicago, Ill.

87,128.—Globe Shade for Lamps.—Henry Whitney, East Cambridge, Mass.

87,129.—Straightener for Boots and Shoes.—G. W. Wilford, Dayton, Ohio.

87,130.—Apparatus for Producing Heat and Light from Gases.—Robert d'Hurcourt (Edouard Armand), Paris, France.

87,131.—Lime Kiln.—Geo. Atkins, Sharon, Pa.

87,132.—Amalgamated Plate for Collecting Gold and Silver.—Melville Attwood and John Roach, San Francisco, Cal.

87,133.—Wrench.—B. F. Bee, Harwich, Mass.

87,134.—Apparatus for Measuring Cloth, etc.—Thos. Bisbing (assignor to himself and M. V. Sorber), Buckstown, Pa.

87,135.—Car Coupling.—W. J. Blackman, Columbus, Miss.

87,136.—Car Starter.—Joseph Boswell and J. W. Brindle (assignors to themselves and Jacob P. Brindle), Wilmington, Ohio.

87,137.—Overshoe.—A. O. Bourn, Cranston, R. I.

87,138.—Spinning Jack.—Oliver Brothers (assignor to himself and Joseph White), Naugatuck, Conn.

87,139.—Machine for Preparing Wood for the Manufacture of Paper Pulp.—Frederick Burghardt, Curtisville, Mass.

87,140.—Material for Filling Fire-proof Safes.—J. M. Burt, Philadelphia, Pa.

87,141.—Wedge for Ax Helves.—Beauman Butler, St. Johnsbury Center, Vt.

87,142.—Car Coupling.—Thomas Caldwell and Lewis C. Wilcox, Buffalo, N. Y.

87,143.—Hoisting Apparatus.—D. H. Chamberlain, West Roxbury, Mass.

87,144.—Rectifier and Condenser for Alcoholic and other Spirits.—J. F. Collins, New York city.

87,145.—Feather Renovator.—Enoch Colvin, Paulet, Vt.

87,146.—Screw Collar for Connecting Covers to Glass Vessels.—John Cook, New York city.

87,147.—Churn.—De Witt C. Cooley, Wilkesbarre, Pa.

87,148.—Pump Piston.—Solomon Crowell, Syracuse, N. Y.

87,149.—Plow.—Seymour Curtis, Fitchburg, Wis.

87,150.—Machine for Grinding the Knives of Mowing Machines.—B. F. Davis, Auburn, N. Y.

87,151.—Cultivator.—William Day, Morristown, N. J.

87,152.—Casing for Reverberatory and other Furnaces.—W. F. Durfee, Bridgeport, Conn.

87,153.—Manufacture of Steel.—A. K. Eaton, Piermont, assignor to himself, Albon Man, Brooklyn, N. Y., and Jas. Macdonough, New York city.

87,154.—Mosketo Canopy for Beds.—Warren B. Ellis, Boston, Mass.

87,155.—Climozonator.—Wm. Elmer, NewYork city. Antedated Feb. 11, 1869.

87,156.—Manufacture of Gas for Fuel Illumination, etc.—Wm. Elmer, New York city. Antedated Feb. 13, 1869.

87,157.—Refined Heavy Oil from Petroleum.—Hiram B. Everest (assignor to Vacuum Oil Company In Vacuo), Rochester, N. Y.

87,158.—Car Coupling.—R. F. Fairlie, London, England.

87,159.—Animal Trap.—Lafayette Faris, Princeton, Ohio.

87,160.—Corset.—Susan B. Fisler, Newark, N. J.

87,161—Paper File.—John O. Foster, Pecatonica, Ill.

87,162.—Rock Drilling Machine.—Samuel Gable, Millerstown, Pa.

87,163.—Mode of Rendering Wooden Bungs Impervious to Liquids and Gases.—Philip Geier, Cincinnati, Ohio.

87,164.—Safety Hat.—Jas. J. Giltenan, Cincinnati, Ohio.

87,165.—Cooking Stove.—Chauncey O. Greene, Troy, N. Y. Antedated Feb. 2, 1869.

87,166.—Water Meter.—Oliver B. Griggs, Mansfield, and Edwin A. Barrows, Windham, Conn., assignors to O. B. Griggs.

87,167.—Machine for Cutting Leather Straps, etc.—Justin Haberbush, Joseph Bentz, and F. S. Vogel, Lancaster, Pa.

87,168.—Excavating Machine.—Peter W. Hamel, San Francisco, Cal.

87,169.—Bitters.—W. P. Haubert and John Haubert, Canton, Ohio.

87,170.—Sheet Metal Pan.—Chas. Hodgetts, Brooklyn, E.D., N. Y.

87,171.—Sectional Pier.—Ozial A. Howe, Jersey City, N. J.

87,172.—Well Curbing.—W. T. Huntington, Washington, D. C.

87,173.—Animal Trap.—W. B. Jarvis, Washington, N. C.

87,174.—Cast-Iron Chord Connection for Bridges.—Chas. Kellogg, Philadelphia, Pa.

87,175.—Hearse.—J. F. Kinback, Carbondale, Pa.

87,176.—Toll Collector for Grist Mills.—Fredrich Klinkerman, Aurora, Ind.

87,177.—Mode of Carbonating and Dispensing Artificial Mineral Waters.—Daniel Kolb and Thomas Kolb, Washington, D. C.

87,178.—Ventilator.—Oswald Krakoviez, Chicago, Ill.

87,179.—Coffeepot.—J. L. Labiaux, Newark, N. J.

87,180—Railway Car Wheel.—William H. Mason, Boston, Mass.

87,181.—Low Water Detector for Steam-Generators.—G. B. Massey, New York city.

87,182.—Fluting Machine.—Eli J. Manville, Waterbury, Conn.

87,183.—Liquid Meter.—Gideon B. Massey, New York city.

87,184.—Spring Bed Bottom.—Francis B. Matson, Rockford, Ill.

87,185.—Churn.—W. D. McFadden, Senatobia, Miss.

87,186.—Ash-Shovel and Sifter.—William C. McGill, Cincinnati, Ohio.

87,187.—Composition Insulator for Telegraph and other Electric Conductors.—J. M. Merrick, Jr., Boston, Mass.

87,188.—Pivot Fishing-Line.—Francis X. Monnier, Detroit, Mich.

87,189.—Lantern.—Robert Mood and H. M. Britton, Cincinnati, Ohio.

87,190.—Breech-loading Firearm.—Wm. Morganstern, New York city.

87,191.—Saw Gummer.—Wm. Newcomb, Johnsonville, N. Y.

87,192.—Apparatus for Charging Air with Hydrocarbon Vapors.—H. M. Paine, Newark, N. J.

87,193.—Purifying Pyroligneous or Acetic Acid.—C. C. Parsons, New York city. Antedated Feb. 12, 1869.

87,194.—Fire Alarm.—Isaac T. Pease, Thompsonville, Conn.

87,195.—Vegetable Slicer.—George B. Peers, Farmington, Mo.

87,196.—Piano Lock.—A. F. Pfeifer, Newark, N. J.

87,197.—Potato Digger.—Ephraim Phillips, North Beaver township, Pa.

87,198.—Tool for Cutting Screw Threads.—Elijah S. Pierce (assignor to the National Screw Company), Hartford, Conn.

87,199.—Apparatus for Treating Petroleum so as to Produce Oil and Gas Therefrom.—A. C. Rand and Wm. M. Sloane, New York city.

87,200.—Machine for Pressing Seams and Cutting Welts of Boots and Shoes.—Edwin Reed, Kingston, Mass.

87,201.—Molasses Pitcher.—Chas. Reistle, Brooklyn, N. Y.

87,202.—Compound for Bating Hides and Skins.—L. F. Robertson, Morrisania, N. Y.

87,203.—Apparatus for Treating Hides, Skins, and Leather.—L. F. Robertson, Morrisania, N. Y.

87,204.—Velocipede.—Chas. H. Robinson, Bath, Me.

87,205.—Velocipede.—Isaac Samuels, Marysville, Kansas.

87,206.—Gate.—E. B. Scattergood, St. John's, Mich.

87,207.—Apparatus for Distilling and Separating Oils, Fats, and the Like.—Charles A. Seely, New York city.

87,208.—Method of Conveying and Using Heat in Chemical and other Similar Processes.—C. A. Seely, New York city.

87,209.—Adjustable Curtain Weight.—W. F. Shaw, Boston, Mass.

87,210.—Apparatus for Generating Gas from Petroleum.—Wm. M. Sloane, Buffalo, N. Y., assignor to himself and Alonzo C. Rand, New York city.

87,211.—Harvester Rake.—E. H. Smith, Westminster, Md.

87,212.—Machine for Grinding Edge Tools.—J. D. Smith, Greig, N. Y. Antedated Feb. 15, 1869.

87,213.—Wagon Brake.—John Smith, McKay, Ohio. Antedated February, 20, 1869.

87,214.—Car Brake.—J. W. W. Smith, Canton, Mo.

87,215.—Grain Binder.—Wm. W. Snell, Brushford, Minn.

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87,217.—Apparatus for Converting a Reciprocating into a Rotary Motion.—C. L. Spencer, Providence, R. I.

87,218.—Apparatus for Converting Motion.—Charles L. Spencer, Providence, R. I.

87,219.—Obtaining Turpentine from Trees.—R. J. Steele, Jr., Rockingham, N. C.

87,220.—Revolving Coulter.—C. E. Steller, Chicago, Ill. Antedated Feb. 11, 1869.

87,221.—Damper.—L. C. Taber, Eaton, N. Y.

87,222.—Steam Engine Lubricator.—George W. Teasdale, Lexington, Cal.

87,223.—Rod Coupling.—G. Thompson (assignor to himself and M. C. Geider), Shamburg, Pa.

87,224.—Metal-Plate Bending Machine.—Robert Tippett, Harrisburgh, Pa.

87,225.—Velocipede.—J. A. Topliff and Geo. H. Ely, Elyria, Ohio.

87,226.—Apparatus for Seasoning and Impregnating Wood with Preservative Substances.—M. Voorhees, Princeton, and G. W. N. Custis, Camden, N. J.

87,227.—Manufacture of Floor Cloths and Similar Fabrics, and Slabs for Pavements.—F. Walton, Linoleum Works, Staines, England. Patented in England, Dec. 19, 1863.

87,228.—Advertising Device.—W. S. Webb, Providence, R. I.

87,229.—Carriage Tire.—Wm. Williams, New York city.

87,230.—Lining Plate for Stoves.—A. Wisner, Philadelphia, Pa.

87,231.—Furnace and Tool for Treating Iron and Steel.—W. Yates, Westminster, England.

87,232.—Straw Cutter.—J. J. Andrew, Saltilloville, Ind.

87,233.—Sawing Machine.—J. K. Babcock, Shortsville, assignor to John Doyle, Bristol, N. Y.

87,234.—Curtain Fixture.—J. B. Bailey, New York city.

87,235.—Leaching Vat.—T. H. Baker, Springfield, Ohio.

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87,239.—Grain Screen.—S. Blair, New Wilmington, Pa.

87,240.—Composition Martingale Ring.—C. B. Bristol, New Haven, Conn.

87,241.—Reed Organ.—R. Burdett, Chicago, Ill. Antedated August 24, 1868.

87,242.—Telegraph Punching Apparatus.—E. A. Calahan, Brooklyn, N. Y., assignor to himself and Marshall Lefferts, New York city.

87,243.—Blind Hinge.—J. L. Cathcart, Georgetown, D. C.

87,244.—Harvester.—Walton Chapman (assignor to himself and John Barnett, Jr.), Salisbury, Conn.

87,245.—Velocipede.—A. Christian and John Reinhart, New York city, assignors to A. Christian.

87,246.—Loop for Halters.—S. F. Cross, Canton, Ohio.

87,247.—Depurator.—Wm. Curran, St. Louis, Mo.

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87,252.—Thill Coupling.—A. Furman, Lloydsville, Pa.

87,253.—Envelope.—J. C. Gaston, Cincinnati, Ohio.

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87,255.—Glass Furnace Kiln, etc.—J. Green, Norristown, Pa.

87,256.—Burglar Alarm.—G. R. Harding, Manchester, Va.

87,257.—Sweat Shield for Horse Collars.—C. B. Hogg (assignor to American Horse Collar Company), Boston, Mass.

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87,259.—Mechanism for Driving Velocipedes.—M. Howe and D. F. Hartford, Boston, Mass.

87,260.—Tire Upsetter.—Wm. M. Hughes, San Francisco, Cal.

87,261.—Machine for Making Tags.—C. S. Hutchinson, Burlington, N. J.

87,262.—Button.—L. A. Jefferson, Bridgeport, Conn.

87,263.—Harvester.—J. H. Jones, Rockford, Ill.

87,264.—Harvester.—J. Herva Jones, Rockford, Ill.

87,265.—Milk Cooler.—Wm. M. King, Morrison, Ill.

87,266.—Kitchen Safe.—John M. Klingenmeier (assignor to himself and Henry Latz), Buffalo, N. Y.

87,267.—Horse Rake.—Samuel D. Knight, J. W. Smith, and George W. Bercaw, Bryan, Ohio.

87,268.—Covering for Whips.—M. D. Knowles, Westfield, Mass.

87,269.—Horse Crupper.—P. A. La France, Elmira, N. Y., assignor to himself and Oscar B. Gray, New York city.

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87,278.—Steel Beam.—Richard Montgomery, New York city

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87,283.—Construction of Double-walled Coolers.—John Oldfield, Thompsonville, Conn.

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87,286.—Lawn Mower.—E. G. Passmore, Philadelphia, Pa.

87,287.—Velocipede.—Stuart Perry, Newport, N. Y.

87,288.—Sorghum Juice Evaporator.—Henry Ramey, Louisville, Ky.

87,289.—Machine for Filing Saws.—George W. Rathbun, North Providence, R. I.

87,290.—Velocipede.—John Reinhart, New York city, assignor to A. Christian.

87,291.—Dry Dock.—Jonathan Richardson, Germantown, Va.

87,292.—Lifting Jack.—John Riddlesberger, Waynesborough, Pa.

87,293.—Crossing Plate for Street Railways.—Jacob E. Ridgway, Philadelphia, Pa.

87,294.—Steam Generator.—G. Adolph Riedel, Philadelphia, Pa. Antedated February 12, 1869.

87,295.—Preparing Fiber from Bamboo, etc.—Louis S. Robbins, New York city, and John A. Southmayd, Elizabeth, N. J.

87,296.—Corn Cultivator.—R. B. Robbins, Adrian, Mich.

87,297.—Metallic Cartridge.—Benjamin S. Roberts, of the United States Army.

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87,303.—Mode of Polishing Artificial Teeth.—Sidney B. Sill, Three Rivers, Mich.

87,304.—Copying Press.—W. M. Smith, Washington, D. C.

87,305.—Draft Equalizer.—Seth H. Smith, North Adams, Mich.

87,306.—Boiling Kettle.—Stephen Spoor, Phelps, N. Y.

87,307.—Pneumatic Spring.—Louis Sterne, London, England.

87,308.—Chair for Street Railway Rails.—James F. Stileman, Philadelphia, Pa.

87,309.—Bit Stock.—Francis M. Thompson and John W. Thompson, Greenfield, Mass.

87,310.—Water-proof Boot and Shoe.—Lewis C. Tower, Rochester, N. Y.

87,311.—Thill Coupling.—Edward J. Watson (assignor to himself and George A. Ruby), Bridgeport, Conn.

87,312.—Clothes Dryer.—Seth Way, Laporte, Ind.

87,313.—Plant Protector.—Wm. B. Wickes, Sharon, Mass.

87,314.—Case for Holding Cigars.—S. R. Wilmot, Bridgeport, Conn.

87,315.—Horse Rake.—Hosea Wood, East Henrietta, N. Y.

87,316.—Gun Lock.—Alfred Young, Philadelphia, Pa.

REISSUES.

62,313.—Office Calendar.—Dated February 26, 1867; antedated December 11, 1866; reissue 3,306.—Clark W. Bryan, Samuel Bowles B. F. Bowles, and J. F. Tapley, Springfield, Mass., assignees of Clark W. Bryan.

62,001.—Button Fastening.—Dated February 12, 1867; reissue 3,307.—George J. Capewell, West Cheshire, Conn.

71,986.—Tack Hammer.—Dated December 10, 1867; reissue 3,308.—Thomas A. Conklin, New Britain, Conn.

42,675.—Hollow Wooden Ware.—Dated May 10, 1864; reissue 3,309.—David Lyman, Middlefield, Conn., and Sidney Fairbank and Washington Whitney, Winchendon, Mass., assignees of Henry Mellish, Walpole, N. H.

18,579.—Seeding Machine.—Dated November 10, 1857; reissue 3,310.—Frederick H. Manny, Rockford, Ill. assignee of Albert Franklin.

63,066.—Bed Bottom.—Dated March 19, 1867; reissue 3,311. John S. Paine, Boston, Mass., assignee, by mesne assignments, of David Manuel.

37,006.—Slide for Breast Straps for Harness.—Dated November 25, 1862; reissue 3,312.—Dexter Pettengill and Andrew Buckham, Delhi, N. Y., assignees, by mesne assignments, of Dexter Pettengill.

33,799.—Hot-air Engine.—Dated November 26, 1861; reissue 3,313.—Shaw's Union Air Engine Company, Brookline, Mass., assignees of Philander Shaw.

81,838.—Composition for Roofing and for other Purposes.—Dated September 1, 1868; antedated April 3, 1868; reissue 3,314.—Benjamin Stephens, Wheeling, W. Va.

DESIGNS.

3,383.—Bracelet.—A. Codding, Jr., North Attleborough, Mass.

3,384.—Spoon or Fork Handle.—John Cook, Brooklyn, N. Y.

3,385.—Trade Mark.—John Farrell, Baltimore, Md.

3,386.—Hat Box.—Gustav L. Jaeger, New York city.

3,387.—Face-plate of a Lock.—Emery Parker (assignor to Russell and Erwin Manufacturing Company), New Britain, Conn.

3,388.—Picture Frame.—Christian Pfeffer, Buffalo, N. Y.

3,389.—Printers' Type.—Edwin Charles Ruthven (assignor to Mackellar, Smiths & Jordan), Philadelphia, Pa.

3,390.—Grinding Mill.—Joseph Sedgebeer, Painesville, Ohio.

3,391.—Spoon.—Frederick Whitehouse, Brooklyn, N. Y., assignor to the Whiting Manufacturing Company, New York city.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

3,691.—Treating Diseases.—M. H. Utley, Montreal, Canada. December 4, 1868.

163.—Burning Brick and other like Articles.—H. W. Adams, Philadelphia, Pa. January 18, 1869.

187.—Metallic Action Frames for Pianofortes.—Theodore Steinway, New York city. January 20, 1869.

214.—Machine for Quarrying and Sawing Stone, etc.—C. O. Luce and C. W. Green, Brandon, and C. M. Willard, Castleton, Vt. January 23, 1869.

215.—Graduating the Admission of Steam to Cylinders of Steam Engines by means of the Reversing and Regulator Gearing.—W. A. Robinson, Hamilton, Canada. January 23, 1869.

223.—Compositions Resembling Ivory.—W. M. Welling, New York city January 25, 1869.

228.—Machinery for Making Articles of Sheet Metal.—W. D. Grimshaw, Newark, N. J., F. P. Erskine, Chicago, Ill., and J. P. Peabody, New York city. January 25, 1869.

230.—Fermenting Substances and Germinating Grain and Seeds.—R. d'Heureuse, San Francisco, Cal. January 25, 1869.

243.—Ventilating Apparatus.—Henry Howard, St. John's, Canada January 29, 1869.

244.—Machinery for Cutting Veneers.—John N. Lyman, J. A. Squires and M. A. Lyman, New York city. Jan. 26, 1869.

255.—Fire Extinguisher.—Wm. Lincoln, Boston, Mass. January 27, 1869

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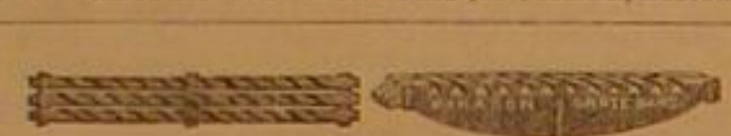

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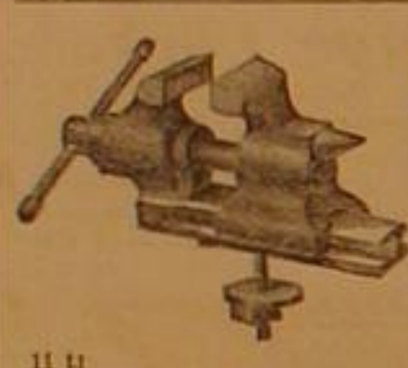

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U. S. Patent Office, Washington, D. C., Feb. 17, 1869.

William Boyd and William F. Boyd, of Mansfield, Mass., having petitioned for the extension of a patent granted them on the 26th day of June, 1855, for an improvement in Bridle Winkers, it is ordered that said petition be heard at this office on the 31st day of May, next.

Any person may oppose this extension. Objections, depositions, and other papers, should be filed in this office twenty days before the day of hearing.

ELISHA FOOTE, Commissioner of Patents.

U. S. Patent Office, Washington, D. C., Feb. 19, 1869.

Arcalous Wyckoff and E. R. Morrison, of Elmira, N. Y., having petitioned for the extension of a patent granted to them September 25, 1855, and reissued on the 14th day of October, 1856, for an improvement in Boring Machines, it is ordered that said petition be heard at this office on the 2d day of August next.

Any person may oppose this extension. Objections, depositions, and other papers, should be filed in this office twenty days before the day of hearing.

ELISHA FOOTE, Commissioner of Patents.

U. S. Patent Office, Washington, D. C., Feb. 19, 1869.

Robert Cushman, of Pawtucket, R. I., having petitioned for the extension of a patent granted him on the 22d day of May, 1855, for an improvement in Stop Motion for Knitting Machines, it is ordered that said petition be heard at this office on the 3d day of May next.

Any person may oppose this extension. Objections, depositions, and other papers, should be filed in this office twenty days before the day of hearing.

ELISHA FOOTE, Commissioner of Patents.

U. S. Patent Office, Washington, D. C., Feb. 19, 1869.

John Tyler, of West Lebanon, N. H., having petitioned for the extension of a patent granted him on the 22d day of May, 1855, for an improvement in Curbs for Water Wheels, it is ordered that said petition be heard at this office on the 3d day of May next.

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U. S. Patent Office, Washington, D. C., Feb. 20, 1869.

John S. Barden, of Providence, R. I., having petitioned for the extension of a patent granted to O. Snow and G. B. Farnum, assignees of the said John S. Barden, on the 22d day of May, 1855, for an improvement in Water Meter, it is ordered that said petition be heard at this office on the 3d day of May next.

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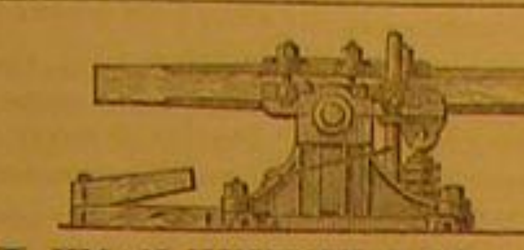

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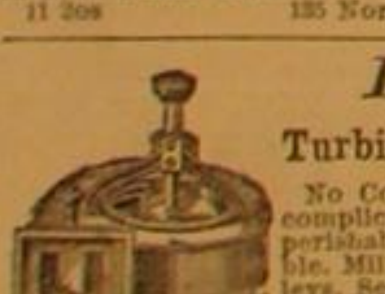

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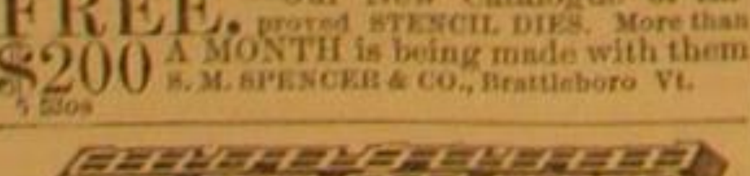

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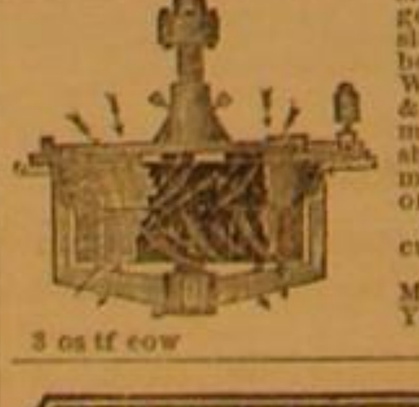

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GUSTAVUS A. JASPER, Superintendent.

KEYSTONE ZINC WORKS,
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JOSEPH HARRISON, JR.,—DEAR SIR: In reply to yours of the 7th inst., would say, it gives me great pleasure to bear testimony in favor of your Boilers. We have had them in use for two years. I put them up myself, and had never seen anything of the kind until they came here, and, with the aid of your draft, I had no trouble in erecting them.

They use less coal, never get out of repair—in fact, I have no hesitancy in saying they surpass anything in the shape of boilers. Yours,
8 4os E. O. BARTLETT, Superintendent.

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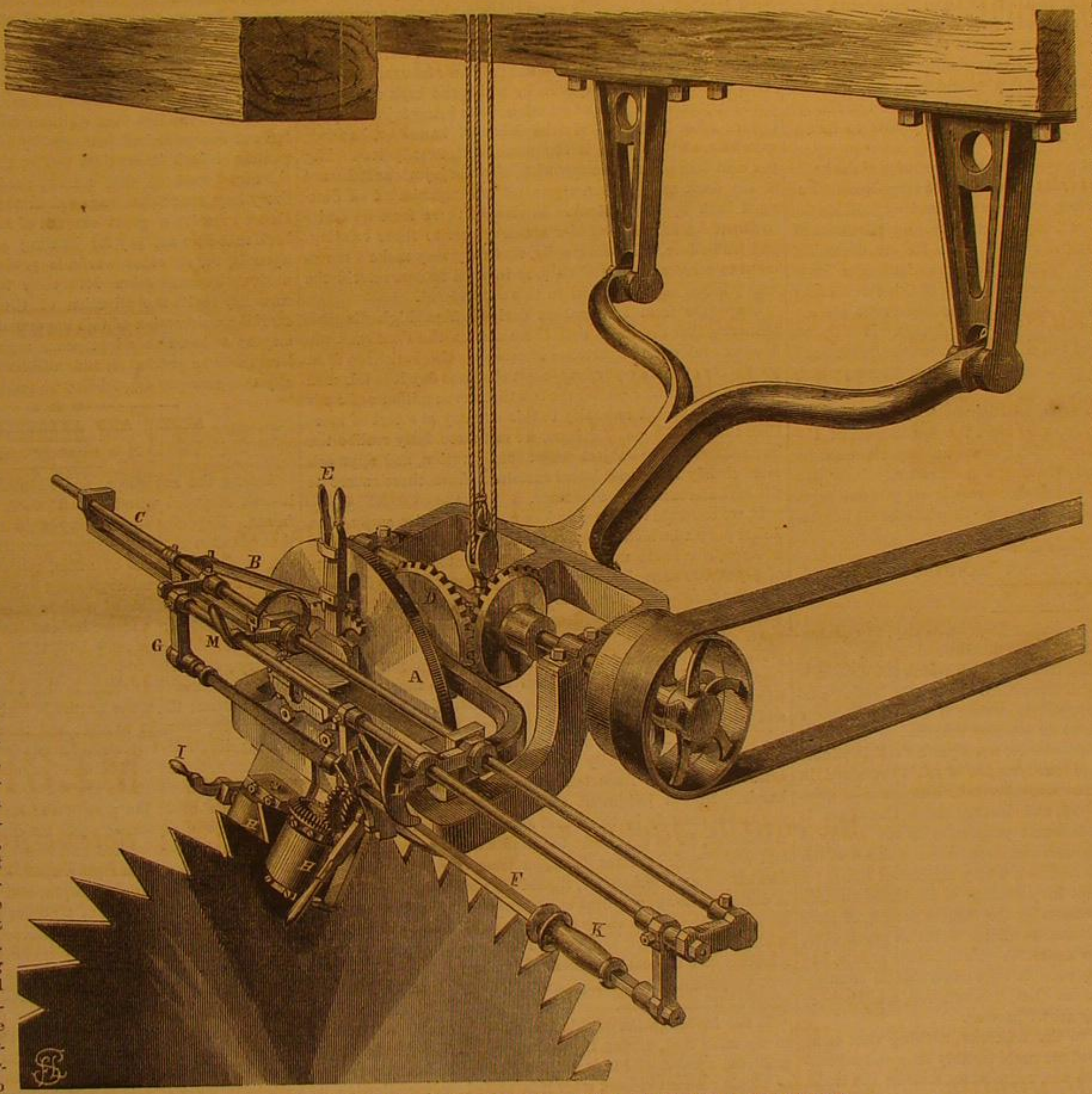
Vol. XX.---No. 12. [NEW SERIES.] | NEW YORK, MARCH 20, 1869. | $3 per Annum, [IN ADVANCE.]

Automatic Saw Filing Machine.

The art of filing—the expertness, mechanical skill, and judgment necessary to use a file properly—is acquired only after long practice. This practice is required for ordinary filing in the machine shops, but for properly filing the teeth of circular saws, on which the value and amount of work performed largely depend, additional skill and practice are necessary. The object of the machine herewith represented is to secure a uniform result without the necessity of depending wholly on the judgment and practical skill of the workman. Yet some exercise of judgment is required, for the angle at which the file is presented to the teeth and the degree of pressure used are both under the control of the operator.

The device is swung from suspended brackets by means of a forked brace, as shown, and motion is given to the rotary and reciprocatory parts by a belt, through the medium of fast and loose pulleys and bevel gears, or they may be driven by hand by placing a crank in place of the pulleys. Thus, on holidays or at other times when the mill is not running, the saws may be put in order. A fall, or other suitable means, is used to raise or lower the device to adapt its position to the diameter of the saw to be filed. The face plate, A, carries, in a slot, an adjustable crank pin by which the stroke of the file may be regulated. By means of a connecting bar, B, the bar, C, is made to slide forward and back through bearings in a transverse frame—that is, pivoted on the shaft of the bevel wheel, D—and a stud on the same line on the forward part of the frame proper. By means of the spring lever, E, and a notched quadrant, the inclination of this bar may be made to take any vertical angle (within certain limits) desired. To the bar, C, is connected by arms held by set screws, the file frame that accompanies the bar, C, in its reciprocating movement.



THOMPSON'S SAW-FILING AND GUMMING MACHINE.

The file is held in two snugs so that it forms a part of the file bar, F, that may be turned to present the face or edge of the file to the teeth at the proper angle. The tang of the file is secured in the snug, or thimble, which is a part of the bar, F, and the point in one that revolves freely in the arm, G.

To an inclined plate, affixed to the front of the suspended frame and slotted to allow the periphery of the saw to pass, are attached two friction rollers, H, of wood, or covered with leather, one being made to slide, and being held against the face of the saw by a spring, or, as shown in the engraving, by an adjusting screw, I. The other is rotated by means of two bevel gears, a ratchet and pawl, J. By this arrangement the saw can be turned, one tooth at a time, to present a tooth to the file, successively, as the previous tooth is finished.

When not in use, as when placing the saw in the machine, the file bar may be raised by swinging on its arms, and held in position by the sliding thimble, K, engaging with the segment, L. By removing the filing frame and replacing the crank disk, A, by an emery wheel, the saw may be rapidly gummed. By a spring handle, M, attached to the arm of the file bar and pivoted on the frame the direction and pressure of the file may be governed by the operator. The saw with its arbor is placed in a movable frame, not shown, with adjustable or temporary boxes, so that no necessity exists for removing the saw from its mandrel.

Patent pending through the Scientific American Patent Agency. All communications should be addressed to Albert Thompson, Ridgeway, Elk Co., Pa.

Essence of Disease.

The following is from the pen of Doctor Hall, in the February number of *Hall's Journal of Health*:

The science of medication, as far as it has become a science, is beautifully simple, and carries with it, to the thoughtful and logical mind, a high degree of interest, which the reader may presently see.

All disease may be said to be founded in an unequal distribution of the blood, while its equilibrium is essential to high health and manly vigor.

While it is true that too much blood at a particular part of the body, causes a diseased condition of that part, such as head-ache, if in the head, the same amount of blood may give two very different diseases, or two very different symptoms or manifestations, according to the set of vessels which contain that excess of blood, whether artery or vein.

Many know the difference between a dull, heavy, depressive head-ache which invites repose, and the sharp, piercing pain which makes sleep an impossibility: between the burning feet in some forms of dyspepsia, which makes standing on the snow a perfect luxury, and the cold, clammy sweat of cholera consumption.

The blood is distributed to the body through the veins and arteries, and where there is an artery there must be a vein. The blood flows through the veins like a slow, steady river; but through the arteries like the dash of the leaping waters.

When there is too much blood in the veins, it is called "congestion," because it packs, it gorges, it dams up; when there is too much in the arteries it is called "inflammation," because it fires up the parts, makes them hot, red, flame-like.

When the veins of a part are too full, there is a dull pain, and the color is inclined to a black red; when the arteries are too full, there is a fierce, quick, darting pain, and a fiery appearance.

Disease being a breaking up of the equilibrium of the blood, whatever has a tendency to restore that equilibrium, to withdraw the blood from the over-stocked part, promotes health to that extent.

Although the very last part to die, death, in a sense, begins at the heart, by its not being able to relieve itself at a given beat, of all the blood that is in it; the next beat, and there is a greater surplus, and, with that, less power to distribute the vital fluid to the extremities of fingers, feet, and skin; then they begin to grow clammy and cold, and death-like. But if, almost in the article of death, any great physical or mental shock can be imparted, by which the heart shall bound with a superhuman throb, and clear itself of its entire contents, life is saved.

The devoted and indefatigable missionary Durfee was dying of low fever, the cold extremities, the fixed eye, the labored breathing, all showed that the powers of life were rapidly wasting away, although a loud voice would arouse him to consciousness. This suggested to the physician that if the heart could be relieved of its load of blood, if the equilibrium of the circulation could be for a moment restored, he might be saved. He was placed on the floor, and buckets of water were poured upon the body from the hight of a man. He seemed to wake up as from a heavy sleep or dream; the circulation was re-established, natural warmth restored, the voice became as clear and the mind as active as in health; he fondled his youngest child, and for a while all seemed hopeful, but nature had lost her recuperative power, had not strength to sustain herself, and he gradually pined away. A poor old woman had been bed-ridden for years with rheumatism, when, being left alone one day, she waked up to find the house on fire, with one bound she leaped from her couch, ran as fast as any body, and thereafter could walk as well as others of her age.

It is related of a celebrated physician, that journeying one day, he heard that a lady was dying with a low fever and greatly desired to see him, as they had not met since childhood, when they were very dear friends. On the instant of entering the chamber, he clapped his hands joyously, and exclaimed, "The Eagle's Nest"—and she lived. They had spent many happy hours of school time around the eagle's nest, and all the associations coming back upon her in an instant, caused a shock which other means were powerless to produce.

Within a short time, a young man named Joseph Wheeler, of New Orleans, who had been deaf and dumb for four years, in consequence of some sickness, sauntered up to a cannon's mouth, without any one noticing it; the match was applied, when it was too late to snatch him away. He fell down as if dead, but presently came to himself, speaking as fluently as he ever did, and answering all questions put to him, to the great wonderment of the bystanders.

All are familiar with the pallor of the face induced by sudden alarm or other great excitement; it is because that under the influence of great mental or physical shocks, the blood retreats to the heart in extra quantities, draining the other portions of the body, leaving such of them as were diseased by reason of their having too much blood there, in their natural or more healthful condition.

While the first effect of a shock is to send the blood of the body in upon the heart, the second effect is for the heart, by the excess of stimulus, to make a desperate effort to relieve itself; this is "re-action," but in making that clearance, although it received more blood from the diseased part than naturally belonged to it, it sends back only its proper proportion to that part, hence the restoration of the equilibrium and return to health.

In the first case the excess of blood or obstruction was in the head, hence the stupor; in the old woman, it was in the joints; in the young man it was in the ear; while in the case of the "Eagle's Nest," it was in the internal organs, the liver most.

But there are less heroic methods of restoring the equilibrium; more quiet ways of equalizing the circulation. Persons have appeared to be dying, when the mustard or blister applied to the wrists and ankles has drawn the blood to the parts, evidenced by their being reddened, thus relieving the heart and saving life. A man sits down to dinner with a severe headache, eats heartily, and feels it no longer. It is because an excess of blood is required in the stomach when it is filled with food; the brain, by furnishing its quota, is relieved of the surplus blood which caused the pain, and the equilibrium is restored. But a hearty meal will not always remove head-ache, for reasons not necessary now to be explained.

Insane persons cannot sleep enough, the arteries of the brain are too full of blood, it is sent to them in too large quantities; hence, in some cases, sleep has been obtained by feeding the lunatic six or eight times a day; thereby keeping the stomach full of food, and drawing the blood there for its digestion, thus relieving the brain. The medical proprietor of a lunatic asylum in England has pursued a plan of this sort for fifty years with very successful results. Most observant readers have felt the somnific effects of a hearty dinner. It is by restoring the equilibrium of the circulation that the "reaction" of the cold shower bath removes some forms of disease, which failed to be reached in other ways.

The practical lesson of this article is, they will live the healthiest and the longest, who have the equilibrium of the circulation least interfered with; hence an important means of avoiding sickness and attaining a good old age, is to live quietly, uniformly and regularly; there is no preventive of disease equal to this, and it is well worth while for all to practice it.

PRACTICAL SUGGESTIONS ON TANNING LEATHER.

BY C. GILPIN.

If, as has been established upon high authority, the character and quality of the leather are determined by the nature and quality of the tanning material with which the gelatin is combined or, to adopt a more practical idea, if the leather partakes positively of the properties contained in the substances employed, as when mineral or gummy material is combined with the tannin, the result will be, not a perfect and insoluble union, as is the case when pure tannin alone is contained in the liquor, but an irregular and uncertain compound of gelatin with the base employed, and leather made therefrom is more or less serviceable in exact proportion to the purity of the elements brought together and circumstances under which they are united; hence it becomes a very important object for the manufacturer, to direct his attention at all times towards securing that material containing the largest portion of pure tannin, freed from all extraneous matter, so far as practicable, to enable him not only to make the most durable article, but produce it in the shortest possible time; two objects connected with the leather interest that, it is believed, can be more fully developed than they are at present.

During a recent visit to the tanneries, nothing that came under my notice impressed me more forcibly than the necessity of adopting some rules and regulations among the trade, to correct the abuses and negligence that exist in every section, in this department of the business, by which great losses are sustained, not only by the tanner, but the consumer of his products, in the damage sustained by the bark, mostly it is believed from want of proper attention while in the forest and before it is hauled to the yard. Hence it is assumed that this is the direct and proper position to start from, if we ever expect to reform abuses, and avoid imposition, which, it would appear, judging from the condition of the bark that I examined in more than two hundred yards, have been increasing in a ratio proportionate to the demand and increase in price. I observed it was a common practice among the trade, to pay nearly full price for all qualities of bark, which ranged from six to eighteen dollars per cord, depending upon locality; and when a reduction was made it was not in proportion to the difference between damaged and sound bark; also discovered that considerable competition existed to obtain a supply of bark, the quality and value of which was doubtful, notwithstanding some of these competitors had, they informed me, a fair supply of good bark on hand, to whom I suggested perhaps they might find it more profitable to curtail their operations to meet the supply of good bark on hand, than to pay full price for material that had been deprived of fully one-half of its tanning properties. This growing evil is not confined to oak bark, but exists to an equal extent among the hemlock tanners, although it has been asserted that hemlock bark did not become injured by exposure; this assumption it is confidently affirmed cannot be maintained and for the following reasons:

First.—Because it is a self-evident proposition that all perishable articles when exposed to the influence of the elements which are known to destroy their virtues, must as an inevitable consequence part with a portion of their virtues just in proportion to the extent they are brought in contact with them. Hence we find that bark exposed for a length of time to rain and snow, the latter frequently melting and passing through the piles left standing in the woods, must yield up no inconsiderable portion of its tanning properties. Those who have not turned their attention to the real difference between a liquor made from first quality and that made from damaged bark cannot realize the comparative value in actual tanning material between the two. From a test made some years since, it was discovered that bark which had been exposed for two days to continued warm rains during the month of July, had yielded up one-fifth of its tannic acid, and consequently required that much more bark, to produce the required strength of liquor; or, in other words, one cord and one-fifth to accomplish what one cord of good, sound bark will do. A test was also made with hemlock bark, which proved that a cord of that bark which had been standing in the woods exposed to the weather for two months had parted with nearly one-fourth of its tanning principle, which had been leached out, entirely extinguished through negligence, by not being properly protected from those elements that are known to destroy the tanning properties of all barks used for tanning purposes. Nor is this the only loss incurred through want of some thorough system by which the bark can be immediately secured, beyond question, from being injured by exposure after it is peeled; the labor of handling, hauling, grinding, and pitching is the same, with twenty-five to fifty per cent less material to tan with, also the injurious influence of the dark moldy color, a general accompaniment of damaged bark upon the stock. In view of these facts we desire to direct the attention of the manufacturer to these existing, and we believe, increasing evils, that they may make a movement to correct them, and thereby in some measure avoid the heavy losses now sustained in this department.

It appears from information derived from high English authority that the trade both there and on the Continent understand fully the importance of securing the bark crop from possibility of damage, by housing it the same day it is taken off the tree. When we consider the fact that seven millions of cords of bark are peeled annually in this country at a cost of more than thirty millions of dollars, we can more fully realize the importance of the subject under consideration, and approach more closely the actual losses sustained from these causes to the manufacturer and consumer.

If we estimate the average loss upon the entire crop at one dollar per cord, which we believe is below, rather than above, the average, from enumerated causes it amounts to the startling sum of $7,000,000 annually, to say nothing of the expenses for handling, hauling, etc.; distribute this loss among 4,000 tanneries and we have an average loss for each of nearly $1,800 per year.

Now, these are stubborn facts, that stare us glaringly in the face, yet have rarely, if ever, been brought to the serious notice of the fraternity through the medium of our journals,—and why? Simply because we have few practical members, who will give us the advantages of their experience through that source; consequently the subject has not received that attention that its importance would seem to claim at our hands. In our judgment the price of all bark should be regulated entirely by the actual amount of tanning principle it contains, for in that alone the profits to the tanner consists; and when bark becomes damaged from any cause, its value, like all other merchandise, should be measured accordingly. A difficulty however seems to present itself, in reference to determining the actual value of all damaged bark, and which I will, to some extent, endeavor to remove by suggesting the adoption of a custom in general use among all manufacturers, *i. e.*, keeping on hand samples of all qualities of bark recognized as merchantable.

In the investigation of this branch of our subject, it occurs to my mind that, during the peeling season, there should be a sufficient number of hands detailed for the exclusive purpose of looking after the bark after it is peeled; never allowing it to remain exposed longer than one day to the weather if fair, and always have it turned ross side out, and so laid that it will be sure to shed all the rain let it come from whatever quarter it may; during the bark peeling season storms rarely come from a due northern or westerly course, hence you can always let the flesh side face either of those directions without exposing it to damage from that cause. It is well known that most men who peel bark for sale, pay but little attention to having it well secured, and in many instances I have known them to turn it flesh side out, so that it would curl up nicely and yield more to the vender and less to the tanner when measured. In all regions where competition exists the man who peels bark for sale being fully aware he can sell his bark readily at a large price and for cash, he is not apt to be very particular, either in regard to quality, or the manner in which his bark is packed in the wagon or other conveyance in which it may be brought to market, knowing as a general thing the demand is fully equal to the supply and consequently meets with ready cash sale; and my experience has satisfied me that it is a matter of economy for the tanner to have the control of the peeling, hauling, and management of the bark in the woods, as thereby he can have it secured in the best possible manner against damage, even if it should cost him an extra quarter or fifty cents per cord, which would be a small amount in consideration of the advantages gained. And as a further security against imposition, it occurs to my mind that the judgment of the tanner would be much assisted by making selections from bark in all conditions, from the very best down to the most inferior quality; make the best liquor possible from each, then have them analyzed to determine the exact proportion of tannin contained in each quality, and, as a still further assistance in arriving at correct estimates, let the samples be marked so as to indicate the quality and strength of liquor made from each specimen; by adopting this method it is confidently believed the manufacturer would have a more positive and certain guide by which he could always determine much more accurately and satisfactorily to all parties concerned, or pecuniarily interested, the real value of the article offered for sale. This plan would be preferable to any test that might be made through the medium of the Barkometer, for it is known beyond controversy, that results indicated by that instrument are not reliable, because it gives the density of the liquid, and not the quantity of tannin contained in it; and all liquors vary in density just in proportion to their purity, all things being equal, and while we might approximate towards the relative strength by applying the Barkometer, it is known that the surest and really only reliable test is the one suggested; actual analysis, or the more sluggish but equally certain indicator, the advancement of the stock when placed in conjunction with the liquor; that is to say, when all conditions are comparatively equal, hides thoroughly prepared, application and temperature of liquors favorable, method of leaching such as will guarantee the best quality of liquor, all of which operations have their influence beneficially or otherwise upon the character and progress of the stock. In concluding my remarks upon this branch of our subject, I desire to call the attention of the trade to the fact that while in Europe and England they tan out one pound of best quality of sole leather with four pounds of bark, it requires twelve to thirteen pounds to do the same work in this country; this alone should satisfy every inquiring mind engaged in the production of leather, that we receive a great amount of material in the shape of bark that does not pay for hauling and the other labor put upon it, or, in other words, is perfectly worthless and obnoxious in connection with their tanning operations, and earnestly invite the attention of the whole fraternity to the careful consideration of this important subject, whereby they may be induced to adopt some regulations by which these losses will be prevented, and millions of dollars saved annually that now perish, yielding no profit to anybody.

ARCTIC AND ANTARCTIC OCEANS.

From Chambers' Journal.

Among the navigators and scientific men of former times, it was disputed whether salt water was capable of being frozen. Experience—in many cases a stern teacher—has set that question at rest, proving that within the polar circles the sea is, for hundreds of miles, covered with masses of ice, which form a sullen, unyielding barrier to the poles. Maury describes the agencies at work in these terrible solitudes in a famous passage: "There icebergs are framed and glaciers launched; there the tides have their cradle, the whales their nursery; there the winds complete their circuits, and the currents of the sea their round in the wonderful system of oceanic circulation; there the aurora is lighted up, and the trembling needle brought to rest; and there too, in the mazes of that mystic circle, terrestrial forces of occult power and of vast influence upon the well-being of man are continually at play. Within the arctic circle are the pole of the winds and the poles of the cold; the pole of the earth and of the magnet. It is a circle of mysteries; and the desire to enter it—to explore its untrodden wastes and secret chambers, and to study its physical aspects—has grown into a longing."

Marine ice is whitish, opaque, and rough on the surface, and consists of thin flakes of a porous spongy texture. From the quantity of strong brine enclosed in its substance, it is very heavy and dense, and projects only one-fifth above water. When sea-water begins to freeze, it partially deposits its salt, which, thus set free, retards the process of congelation below. Old floes are almost fresh, but a thaw renders them brackish. The polar seas do not congeal until the temperature falls to 28½ degrees of Fahrenheit, which takes place in September in the north, and March in the south; though even in summer, a slight increase of cold is sufficient to form young ice several inches thick. The sun sets early in November, and the severity of the arctic winter begins in December, continuing to the end of January, during which time the thermometer ranges to about 40 degrees below zero. A week or two of milder weather comes on; but the middle of February brings with it the sun, immediately followed by the most intense cold of the whole winter. After that, the sun's influence begins to be felt, and in July the ice breaks up. During the three summer months, the sun never sets, but noon and midnight are equally illumined by brilliant sunshine. A few stars appear in September. The darkest part of the winter is from the middle of December to the middle of January, when the aurora transforms the sky into a vault of fire, and paraselenæ appear, surrounding the moon with blazing crosses, circles, and mock-moons, scarcely surpassed by the wonderful deceptions of the solar rays. The intense cold of February is accompanied by considerable twilight; and in the latitude of Banks' Land, there is even at the end of January tolerable light from 9.30 A.M. to 2.30 P.M., so much so, that at noon Arcturus is the sole star unquench by the increasing daylight. The only navigable time is from July to September within the northern, and January, February, and part of March within the southern circle. During the rest of the year, the arctic regions are impenetrably sealed by vast fields of ice, both "floe" and "pack," covering every foot of water, from the shallowest inlet to the wide expanse of Baffin's Bay or Melville Sound.

The interior of Greenland is occupied by vast glaciers which encroach on the coast, filling the deep dark fiords with frozen snow. As summer advances, those portions of the glacier that project into the sea are undermined by the waves, and fall with tremendous noise, rocking in the foaming water till they gain equilibrium, when, perfect icebergs, they float here and there, impelled by winds and currents. Many are borne by the polar current southward. They meet the warm waters of the Gulf-stream in latitude 50 degrees, where they melt, and deposit the loads of earth and stones borrowed from the Greenland soil. According to Maury, this has probably, in course of time, formed the Grand Bank of Newfoundland. They are in incredible numbers. As many as five hundred have been counted in sight together, ranging from fifty to three hundred feet in hight, and of all sizes up to a mile in extent. Their appearance is very beautiful and no less extraordinary. Gothic churches, Egyptian temples, aerial palaces with pillars and arched windows festooned with crystal draperies, are only some of the inconceivable varieties of form displayed, while they gleam under the summer sun like mountains of burnished silver, with pinnacles and cliffs of clear sapphire or the palest green, from which rush cataracts of limpid water mingled with fragments of ice. These various hues arise from several causes. Bergs are originally composed of fresh water ice of different ages, but that formed from salt water frequently overlays it in parts. A great deal of snow lies on their summits, and forms large ponds of fresh water, when dissolved by the heat of the sun. Finally, the solar rays touch the bergs with colors, changing with the position of the spectator. Only one-eighth of their total thickness is seen above water. Frequently bergs capsize in consequence of the sea undermining their base. An ominous rolling motion gives notice of this event; it continues for some time, and at last the berg heels over and disappears with a terrific plunge, sending up columns of spray. It reappears bottom upwards, balances itself, and floats quietly on with a changed face.

All the antarctic land yet discovered consists of gigantic cliffs without a single opening, three thousand feet high in some places, descending in others to one hundred feet. The whole is faced with ice of enormous thickness, and covered with snow, so that at a glance the eye can scarcely imagine it to be land at all, but for spots showing the dark stone where the cliff is too perpendicular to admit of even ice maintaining its hold. Nothing is so tenacious as the cold of the antarctic regions. In February, the warmest summer month of 1841, the thermometer never rose above 14 degrees at noon near the continent. It is rarely above 30 degrees in the sun at mid-day during summer, and falls in winter more than 50 degrees below zero. The sun stays a week longer north of the equator than it does south, making the winter and night of the antarctic regions longer. South Georgia, in a latitude corresponding with that of Yorkshire in the northern hemisphere, is always covered with frozen snow, and produces scarcely anything but mosses and lichens. The immense preponderance of water south of latitude 50 degrees, allows the fierce westerly winds to blow round and round the world, a perpetual cyclone, keeping the sea in constant agitation.

The two polar circles differ greatly in physical conditions. The antarctic has a marine climate, that is to say, it is equable. Though wet and stormy, it is not subject to extremes of temperature, and it is believed that the south pole must be warmer than the north in winter. Arctic sunshine raises the thermometer to 66 degrees or 70 degrees, and hung in the shade immediately after, the mercury falls to the freezing point. The arctic climate is continental—dry, calm, and variable. The thermometer has a range of about 120 degrees; and while the round of the seasons brings but little change in the frightful antarctic wastes, nothing can surpass the beauty of the arctic summer—"an endless blaze of light, the air and sea and earth teeming with life," plains glowing with richly tinted flowers, and strange, glittering forms sailing past "in stately and solemn procession." Its currents are strong, and bear large numbers of bergs to meet the warm Gulf-water, and, as it is natural to suppose, bergs are found to be most numerous where the drift is strongest. The antarctic seas are in direct opposition to this. Not only are its currents sluggish and feeble, but the most powerful of them, Humboldt's Current, carries few bergs along the Chilian coast, while the main ice-drift is towards the Falklands on one side, and the Cape of Good Hope on the other, where there is scarcely any motion of the water. This is a fact which no navigators are able to explain, except perhaps on the supposition that there may be strong submarine currents at a great depth below the surface. Bergs have been observed in Baffin's Bay drifting rapidly to the north, where there was a powerful surface-current running against them, showing that in consequence of their weight and immense draft of water (in some instances more than a thousand feet), they must be influenced by some "resistless undertow" yet stronger.

ILLUMINATING GAS—WHAT IT IS, AND HOW IT IS MADE.

The illuminating gas made in large gas works, and used almost universally for lighting the buildings and streets of large cities throughout the civilized world, is composed of products of the distillation of bituminous coal in close retorts.

The retorts used are made of refractory clay in the form of hollow half cylinders, the semi-cylindrical or arched portion being the top, and the flat floor the bottom as they are placed in the furnace. The ends of these retorts are open before they are set, but when placed in position the inner ends communicate with upright iron pipes or cylinders, which are secured at the top and communicate with what is called the hydraulic main, which we will describe further on. The outer ends of the retorts are closed when in action by iron doors, luted with fire-clay to prevent the escape of gas. The retorts are usually placed in groups of five, under which the fire-grate is placed.

The "hydraulic main" is a large iron pipe or cylinder many times larger than the recurved pipes, which connect it with the retorts. These tubes penetrate the hydraulic main, which is partially filled with water, and terminate beneath the surface, so that the gas which passes from the retorts when at work bubbles up through the water, and is prevented by it from escaping when any of the retorts are opened for repair or recharging with coal. This main receives all the distilled products from all the retorts, frequently numbering hundreds in large works, and of course has to be of a size sufficient to convey all away freely.

Before going further in our description of the apparatus employed, we will enumerate the products obtained from the distillation of coal as it is performed in gas retorts. They vary considerably in proportions according to the quality of the coal used. They are olefiant gas, light carbureted hydrogen, carbonic acid, carbonic oxide, hydrogen, oily vapors, sulphurous acid, sulphureted hydrogen, ammonia, steam, nitrogen, tar, and coke which remains in the retort and contains all the matters which are not distilled over. Beside these substances there are many others which occur in small quantities, and which, although they need not be mentioned here, are not altogether unimportant.

The volatile products which pass over, are totally unfit for use in their mixed and crude condition; the object of all the intermediate apparatus between the retorts and the gas holder is to eliminate those products which render the gas unfit for use, if we except the pump used to remove the back pressure against the ends of the tubes connecting the retorts with the hydraulic main.

About 120 lbs. of coal are used as a charge for each retort. It takes about six hours to work off one of these charges. When the volatile products are removed by the action of heat, the residue (coke) is raked out and and quenched with water.

A considerable proportion of the tar is deposited in the hydraulic main, from which it is removed as it accumulates. It contains the ammonia and the oily vapors, but the gas being still quite hot contains a large amount of impurities, much of which will deposit upon subsequent cooling. The gas is therefore passed from the hydraulic main to the condensers, a series of upright pipes surrounded with cold water, and through which the gas is successively forced. During the process of condensation the gas deposits more of its impurities, which trickle down through the pipes and are collected in a receiver provided for that purpose. From the condensers the gas passes to and through the scrubbers. The latter are large cylindrical structures filled with stones, through which running water is allowed to flow, the gas at the same time passing through to their tops. Being thus brought in contact with a great surface of water, the gas is washed and more of its impurities are absorbed and carried down by the running water to a reservoir below.

Between the scrubbers and the purifiers is situated the "ex-exhauster" or gas pump above alluded to. There are several varieties of these in use, and we shall not attempt a description of any of them. Their sole object is to remove pressure from the hydraulic main, by exhausting the gas from the portions of apparatus already described.

The gas having passed through the exhauster is carried along to the purifiers. The chief impurities which remain at this stage of the process are the sulphur compounds and carbonic acid. Portions of these compounds have been absorbed by water in the scrubbers, but enough still remain to render the gas offensive and deleterious to health, and to greatly impair its illuminating power. Among the substances employed to effect their removal, none have been so largely used as lime, which fact indicates the value of that substance for the purpose as compared to others. It is employed in two ways. The lime is either used dry, in which case it is placed upon trays with open-work bottoms, upon which layers of straw, moss, or other similar materials are laid, and the lime spread upon them; or it is in the form of cream of lime, and the gas is made to bubble through it until the impurities combine with the lime and are thus eliminated. Both methods have their special advantages; but the dry lime process has obtained latterly in large cities in this country on account of the greater ease with which the spent lime can be disposed of, and greater freedom from offensive odor. A method of purification by the use of brown hematite (bog iron ore), to absorb the sulphur compounds, has been employed with success in Europe, and although it is said not to remove the impurities so thoroughly as the lime, the disagreeable smell emitted from the latter when the purifiers are discharged is avoided.

An opinion prevails among many, that the vicinity of gas works must be unhealthy on account of the odors emitted. Experience, however, has shown that these odors do not engender disease, but really act as a preventive of epidemic and sporadic complaints. The sulphureted hydrogen and sulphide of ammonium escaping from the lime when it is taken out of the purifiers, are undoubtedly unwholesome, when the air is sufficiently saturated with them; but although their smell is extremely disgusting to most people, it is rare, we believe, that they contaminate the air in the vicinity of gas works so much that their effects upon public health need be feared.

After the process of purification is performed, the gas passes to the gas holder, an immense iron vessel inverted in a cistern containing water, through which the gas bubbles up under the receiver. Its buoyancy enables it to raise the receiver as the gas accumulates. As the receiver descends by its own gravity when the gas is drawn off through the general service, a constant pressure may be maintained. We say *may be* maintained, for we have pointed out in previous articles how a diminution of pressure may be made to wrong the consumers and enrich the producers. The consumer may be greatly wronged also by the improper purification of gas, paying for sulphurous acid or carbonic acid gases the same price per cubic foot as for good gas, while their presence interferes with illuminating power, and contaminates the air in dwellings.

The meter system now in use only measures bulk. It does that well enough, but it does not tell us anything about the quality or the pressure under which the gas is delivered, and is thus defective in two radical points. We will not, however, say anything more upon the subject of meters, having in previous articles exhausted the topic.

A case is now pending between the Metropolitan Gas Company, of New York, and the Board of Health, originating in the refusal of the Company to obey an order of the Board directing the former to either discontinue the manufacture of gas at the present location of their works, at the foot of West Forty-second street, or to adopt a method of purification (the iron process above described) that does not involve the escape of deleterious gases. The case is exciting much attention, and experts and chemists are called upon to give testimony in the case. The testimony seems strangely conflicting, so much so as to excite the suspicion that personal interest has given a bias to the opinions of some of the witnesses. Be this as it may, we give it as our opinion that nothing yet discovered, or likely to be discovered, is equal to lime for gas purification; and we also believe that the free escape into the open air of the gases to which objection is made, is preferable to permitting any larger portion of them to pass through the service and be delivered into the close rooms of our residences and offices, a necessary consequence of a more imperfect system of purification.

The smell of a gas works is disagreeable, and real estate is always less valuable in their immediate vicinity than in more favored localities; now, is it the increased health of the people, or the increased value of real estate, that would result from the removal of the above works, that is the ruling motive in this raid against the Metropolitan Gas Light Company?

How to Build Houses.

Build your houses in the country, in preference to any place near the seacoast. In the country, choose a slope rather than a plain to build upon, and where the sun can have full access to it, if possible, all the day. Be sure (if need be, by effectual drainage) that the soil is thoroughly permeable to water. Let no moisture from the soil, from any source, be permitted to distill its pernicious influences upon the future dwelling or its inmates. Let the rooms be large, of substantial breadth rather than hight, and so pierced by windows that the air may have a bounteous and free entrance and exit. Let fireplaces be built in every room and chamber,—fireplaces made for real use, not kept for show, and not closed with iron plates which are to be pierced for air-tight stoves. Eschew all furnace heat except for warming the entries and corridors.

Outside the house let there be ample space for air and sunlight. One or two trees may be permitted to grow near the house, but not to overshadow it, for nothing but evil comes from too much shade, either of trees or climbing vines. Both of these may very materially prevent the warm rays of the sun from reaching and bathing the exterior, or from penetrating the interior of the house, which they should be allowed to do freely, even in the depths of summer. Nothing so deadens the atmosphere as the too constant closure of the windows, blinds, and curtains, whereby light and heat, as well as fresh air, are excluded. Every morning let the windows be opened widely, so as to drive off the remains of foul air that has necessarily accumulated from the sleepers during the previous night. Every night let a part of the windows be left open, and, if possible, at the top and bottom, so that during sleep there may be still a plenty of fresh, unbreathed air for the children and adults to use. Of course, the amount of space thus opened will vary with the season; but often, even during our Northern winters, especially in a furnace-heated house, a small aperture, at least, may thus be left. Two or three extra blankets only will be needed for any coldness thus caused.

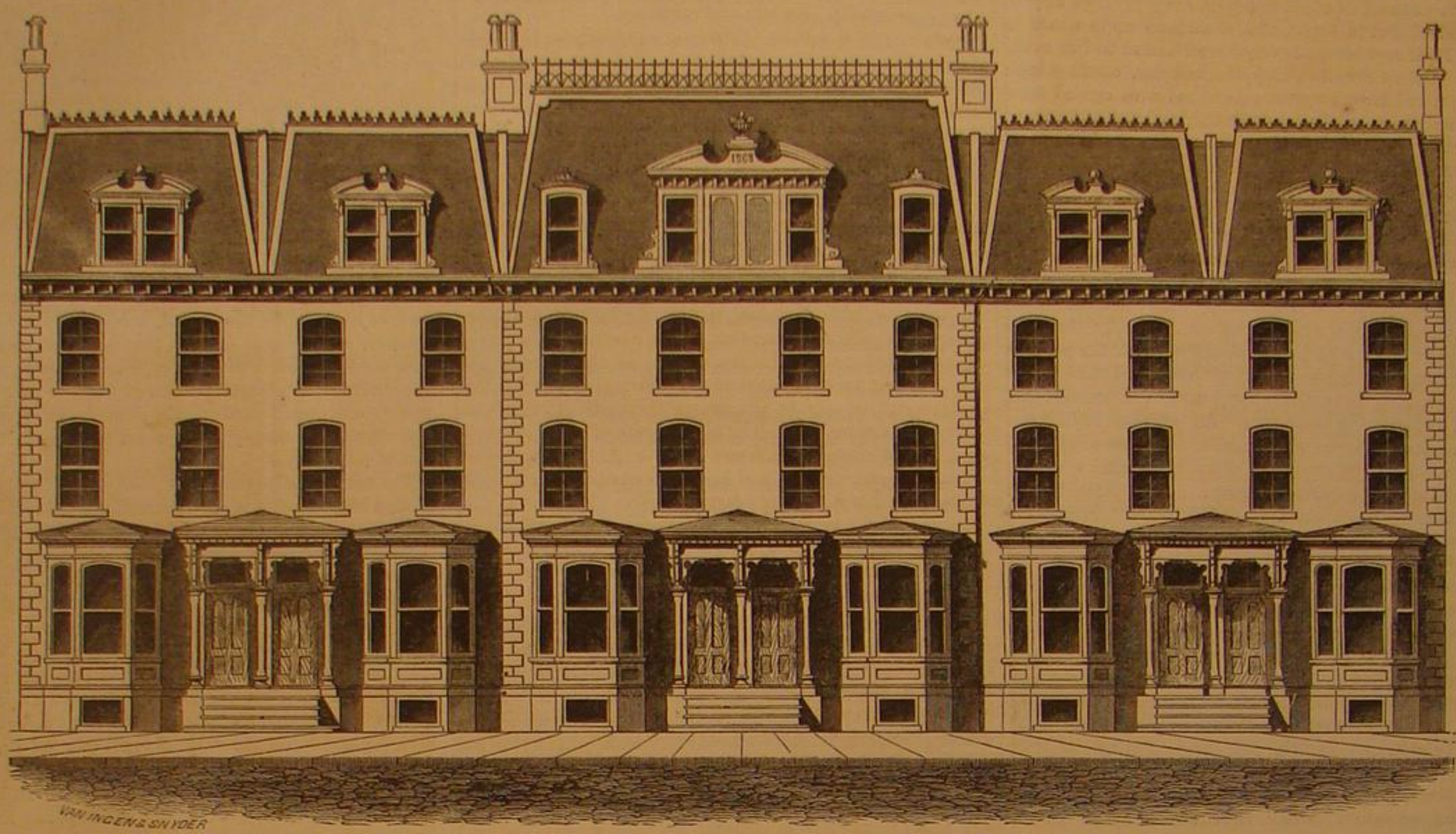
As to the value of fresh air, alike for the healthy and the invalid, there seems to exist great doubt in this community. Even the healthy have no real faith in its efficacy as a means of giving health. Invalids, almost without exception, we have to educate to that faith. They have so many doubts about the weather. It is too cold, too hot, too windy, or too blustering. It is cloudy, or an east wind prevails. These and a hundred other trivial deviations from perfect weather are noted, and the unfortunate invalid quietly stays within doors, day after day, to avoid them. Nothing is more pernicious, no behavior more unwise. Both invalids and healthy persons ought to eschew all such views as arrant folly. "Whenever *in doubt*," we say to our patients, "about going out, *always go out*. If a violent storm is raging, to which no one would willingly expose himself, then keep to the house, but the moment it ceases, seize the occasion for exercise out of doors." "It would be better," said the late John Ware, "for everybody, sick and well, to face every storm, than to be fearful, as we now usually are, of even a trace of foul weather.—*Dr. H. I. Bowditch in the Atlantic Monthly.*

PERSEVERING INVENTORS.—Evan Skelly, one of our old clients, writing from Iberville Parish, Louisiana, says: "I shall send you another model in a few days. I have to work on it at night time, after my day's work is done. Now, is not that much better than spending time in a grog shop? I have now 32 orders for sulphurous acid machines, for the next crop. Patented September 15, 1868, thanks to the Scientific American Patent Agency—long may it prosper."

DESIGN FOR A BLOCK OF SIX DWELLINGS.

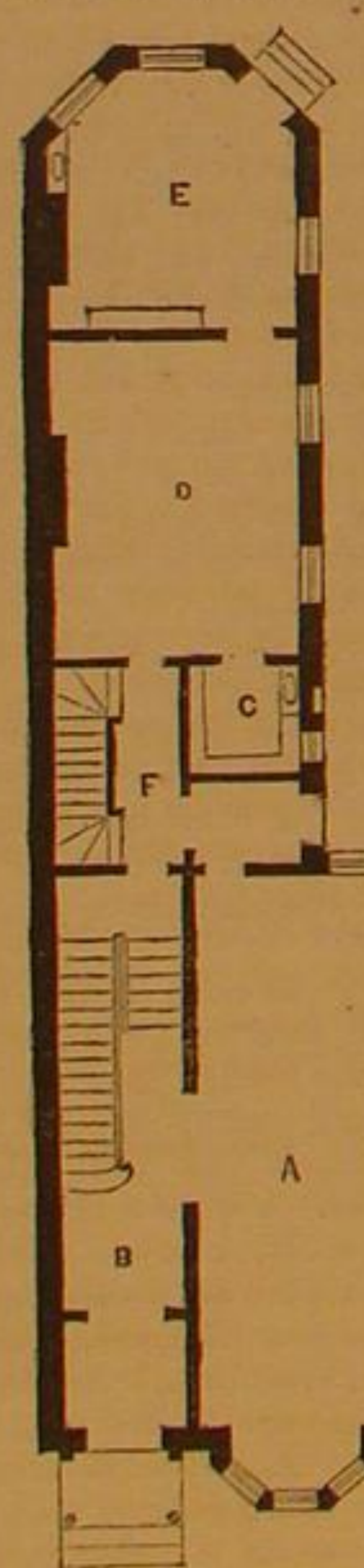
We copy from *Sloan's Architectural Review and Builders' Journal*, a design in the Franco-American style, and a description of a block of six dwellings, which we consider much superior to the ordinary method of building blocks of buildings, in which each dwelling is built without reference to the general design of the entire block. We give elevation of the whole and ground plan of each.

The design is particularly applicable to small cities, and to larger towns which, like Philadelphia, do not adopt the vicious system of tenement houses in vogue in New York, and is commendable as being at once tasteful and inexpensive.



BLOCK OF SIX DWELLINGS---FRANCO-AMERICAN STYLE.

From the elevation it will be seen, that the intention is to construct six houses in connection; each house, eighteen feet front and three stories high, being surmounted by a French roof, making a fourth story. The sky line is thereby agreeably and effectively diversified by the different hights and breaks of the roof.



The long façade, or face line of the front, is but slightly varied, no projection being more than twelve inches beyond the receding sections, thus dividing the block into compartments, affording opportunities for slight but tasteful decorations, and obtaining what are the greatest desiderata in architecture, breadth of light and depth of shadow.

Each house has a bay window in the front, together with a porch to the front door, projecting about the same distance The form and features of these bay windows may be different in each, by being made square, circular, or octagonal; and, by these means, an effect of pleasing variety will be obtained, considerably to improve the external appearance of the block. The windows, also, are intended to have their heads slightly curved on the outside, but finished square within. The intention is to exhibit the conception of such a block as can be erected at a very moderate cost, and one that would be within the reach, while still meeting the wants, of the major class of the business men of ordinary means.

Beginning with the principal floor: A is the parlor, 12×28 feet, with a front bay window. B, the main hall, containing the stairway to the upper portion of the house, with a vestibule on the front. C, the butler's pantry, D, the dining-room, 12×16 feet. E, the kitchen, 12×14 feet. F, the private staircase to the upper stories.

The other floors may be arranged to suit individual requirements and taste.

The front of this block would present a very pleasing and agreeable effect, if it were constructed of pressed brick, relieved with white marble trimmings, and quoins on the four corners.

Zinc as a Material in Building.

It appears, from a report published in France, on the use of zinc for purposes of construction, that most of the defects experienced in the employment of this material arise from ignorance as to the proper mode in which it should be thus used—the one object to be kept in view being to permit perfect freedom to the sheets; to confine them nowhere, and to separate lengths of guttering, and any other portions of a roof requiring to be made in long pieces, as much as possible. Eaves' gutters should be made in short lengths, bent in the direction of the way in which the sheet has been rolled and soldered, the solder being put between the sheets, and one sheet lapping over the other, nor must they be screwed to the rafters, as this is a practice which occasions a constant failure in the joints of iron eaves' gutters.

Wherever a down pipe comes there should be a stopped end in the gutter, and the gutter should not be continued longer than possible in one place; where it is laid behind a parapet a separate piece of flashing will disconnect it wholly from the sheeting on the roof. For guttering, the gage used should be increased in proportion to length; there should be a proper substance in all cases. Oak boarding will spoil the zinc, and the fir should be dry—the boards with an aperture of about half an inch between each. If they are damp, as much oxidation will take place on the under side of the zinc as on the top of it. It appears from actual experiment that the oxidation proceeds for about four years, gradually diminishing after the first three months, when it hardens into a protecting coat of a dark gray color, preserving the metal beneath from further deterioration. It appears to be evident that a sheet of zinc exposed to the atmosphere for a series of years losses little or nothing of its weight or thickness, and that its surface remains hard and polished like enamel.

Ink from Elder.

According to a German journal, an excellent permanent black ink may be made from the common elder. The bruised berries are placed in an earthen vessel and kept in a warm place for three days, and then pressed out and filtered. The filtered juice is of such an intense color that it takes 200 parts of water to reduce it to the shade of dark red wine. Add to 12½ parts of this filtered juice, one ounce of sulphate of iron and the same quantity of pyroligneous acid, and an ink is prepared which, when first used, has the color of violet, but when dry is indigo blue black. This ink is superior in some respects to that prepared with galls. It does not become thick so soon; it flows easier from the pen without gumming; and in writing the letters do not run into one another.

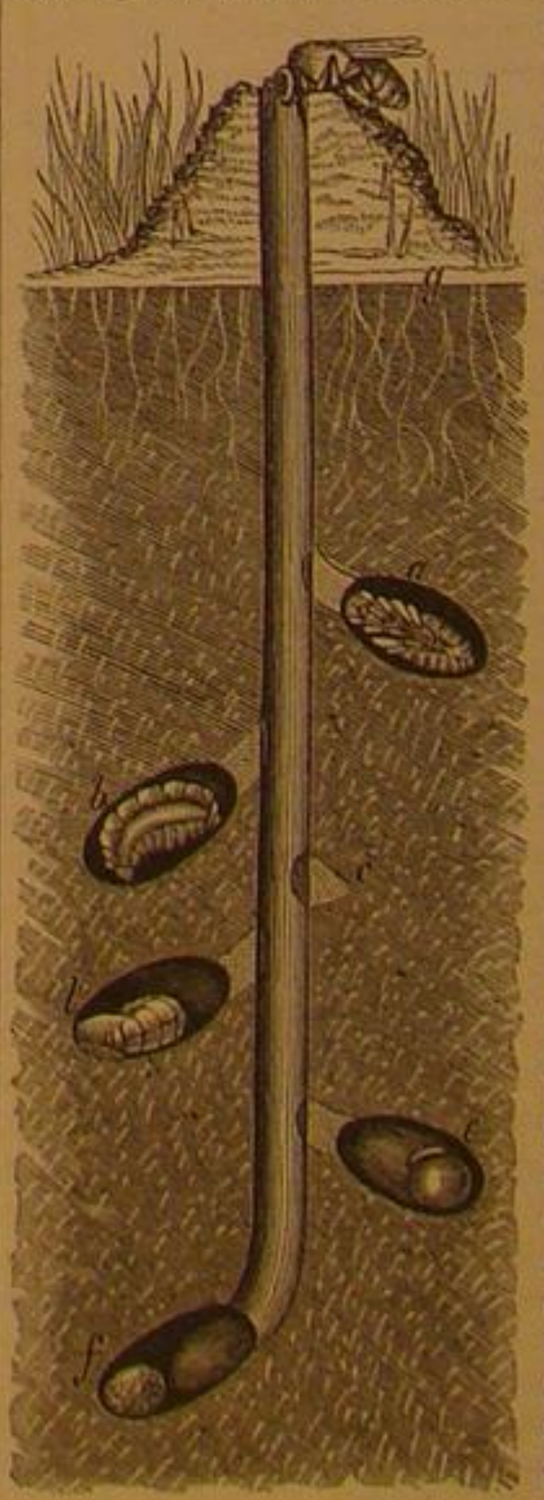
Important to Woolen Manufacturers.

It is announced that the Supreme Court has given a decision in the case of E. D. Jourdan *vs.* the Agawam Woolen Company, confirming the validity of the Goulding patent. This decision involves several millions of dollars, and affects the whole woolen manufacturing interests of the country. There were several curious points in the case, which constitute it one of the most remarkable suits ever instituted under the patent laws of the United States. In the year 1826, letters patent were granted to John Goulding for an "improvement in the mode of manufacturing wool and other fibrous materials." This patent was reissued in 1836, and expired in 1840. In 1862, twenty-two years after the patent had expired, Goulding succeeded in having an act of Congress passed for his relief, which renewed and extended his patent seven years from that date, with the proviso, however, that such renewal and extention shall not have the effect or be construed to constrain persons who may be using the machinery invented by said Goulding, at the time of the renewal and extension hereby authorized, or subject them to any claim for having used the same. This extraordinary legislation on a patent which had expired nearly a quarter of a century before was eclipsed by the action of the United States Patent Office in reissuing the patent, giving to Goulding an exclusive property in said woolen machinery. It was under this reissue that Eben D. Jourdan, the assignee of Goulding, sued the Agawam Company for an infringement of the patent, and his success involves nearly every woolen manufactory in the country, as Goulding's improvement was in common use when Congress authorized its conditional renewal and extension.

Burrowing Bees.

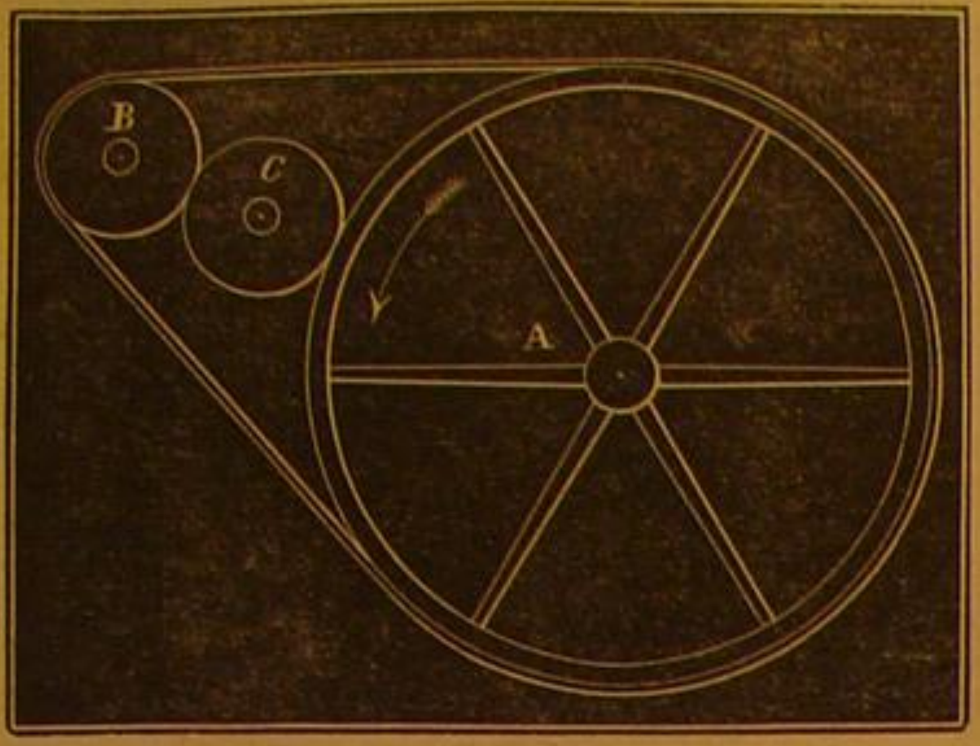
Packard's *Guide to the Study of Insects* gives an account of certain species of bees that burrow in the earth, and a drawing of the home of a family of them, which we herewith reproduce. This species is called by the entomologists *Andrena vicina*, one of the most common of burrowing bees. Mr. Emerton has closely observed the habits of this species, which builds its nest in grassy fields.

The burrow is sunk perpendicularly, with short passages leading to the cells, which are slightly inclined downward and outward from the main gallery. The walls of the gallery are rough, but the cells are lined with a mucus-like secretion, which, on hardening, looks like the glazing of earthenware. In the annexed figure, Mr. Emerton gives us a profile view of natural size of the nest, showing the main burrow and the cells leading from it; the oldest cell, containing the pupa, *a*, is situated nearest the surface, while those containing larvæ, *b*, lie between the pupa and the cell, *e*, containing the pollen mass and egg resting upon it. The most recent cell, *f*, is the deepest down, and contains a freshly deposited pollen mass. At *c* is the beginning of a cell; *g* is the level of the ground The bees were seen at work on the 4th of May, at Salem, Mass., digging their holes, one of which was already six inches deep; and by the 15th, hundreds of holes were observed. On the 28th of May, in unearthing six holes, eight cells were found to contain pollen, and two of them a small larva. On the 29th of June, six full-grown larvæ were exhumed, and one about half-grown. About the first of August the larva transforms to a pupa, and during the last week of this month the mature bees appear.



INTERMEDIATE BEARING PULLEY FOR SHORT BELTS.

It not unfrequently occurs that pulleys, the driver and driven, must be placed very near together, necessitating a short belt, which, whether for efficiency or durability, is not economical, as the belt must be kept very tight. Especially is this arrangement objectionable when the driver is very much larger than the driven. We give an illustration of a device

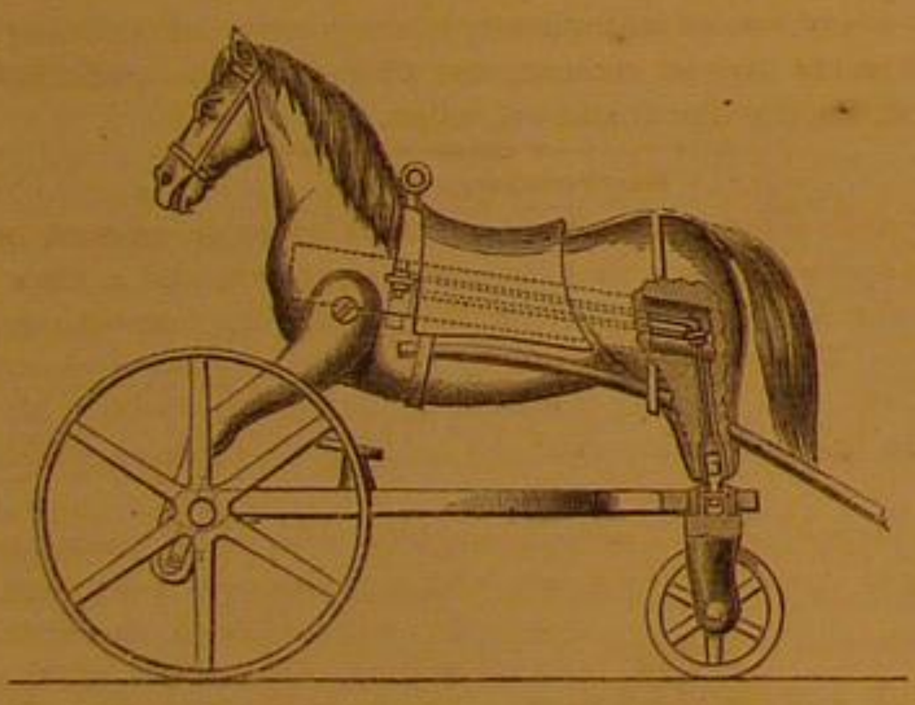


for obviating this annoyance, which we see in *Engineering* applied to a portable centrifugal pump. The driver, A, revolves in the direction of the arrow, carrying a belt to the driven, B, and between the two is interposed a friction wheel, C, bearing equally on the faces of both pulleys. The face of this intermediate is hollowed so that it bears on the outer edges of the pulleys. Its effect is to relieve the great strain on the shaft of B.

PROGRESS OF THE VELOCIPEDE.

Parties interested in the manufacture of velocipedes have recently been called upon by Calvin Witty, of this city, to arrange with him for the right to build velocipedes, such as embrace the devices for propelling the vehicle, as shown in Lallement's patent, illustrated on page 102 of the Scientific American. A new claimant has entered the field in the person of Stephen W. Smith, of this city, who claims that the so-called French velocipede is an American invention, perfected in this city, and introduced into France by patent, and personally by himself.

It appears by reference to the Patent Office Report of 1862, that P. W. MacKenzie, a citizen of the United States, patented a "cantering propeller," which illustrates a hobby horse mounted upon wheels, as shown in the accompanying engraving. The patent has recently been reissued for the purpose of widening the claims, so as to cover the whole ground occupied by the patent bicycle of Lallement. The reissued claims are as follows:



1 claim, in combination with a saddle seat for the rider, the employment and use of a cranked axle, arms, and foot-rest, so arranged that power applied by the feet of the rider shall give motion to the vehicle, substantially as described and specified.

2. The combination of the following elements, namely, a saddle-seat for the rider, a cranked axle for propelling the vehicle by power applied by the feet of the rider, and a steering mechanism, so constructed that the direction of travel of the vehicle may be governed by the rider, substantially as described and specified.

3. The universal joint, in combination with the fulcrum of the vehicle and the steering wheel, constructed and operating substantially as and for the purposes specified.

4. The hinged legs in combination with the body of the horse, and with the cranks, substantially as and for the purposes specified.

5. The foot-rests upon the arms, substantially as and for the purposes specified.

6. The double-armed levers and diagonal cords in combination with the handle and steering wheel, substantially as described and specified.

It will be seen that the first and second claims are intended to embrace, and do embrace so far as words can accomplish it, the essential elements of the velocipede now in use. It remains to be determined by the courts how far the rival claimants clash with each other. The fight begins to assume an interesting aspect, and it may be that other old patents will be reissued to enter upon the contest.

There is no dearth of velocipede incidents and inventions. In fact, from indications we are inclined to think that inventive genius will not leave a stone unturned till this little vehicle has reached perfection as nearly as any human device can be supposed to approach it.

An invention has been made by a Western gentleman which may be attached to any two-wheeled velocipede, enabling the rider to propel either with the hands or feet, or both. This invention will make a five-foot driving wheel practicable, without raising the saddle too far from the ground.

Rev. Arthur Edwards, Assistant Editor of the *Northwestern Christian Advocate*, said to be a most expert velocipedestrian, has had rubber tires put upon the wheels of his "Pickering," and finds it practicable by their use to ride over ice and snow without slipping. He believes that their use would be advantageous in summer as well as in winter, as the rubber would relieve the jar from roughness of roads.

An exchange asserts that among those that distinguished themselves as velocipedists in England thirty years ago was Michael Faraday, the chemist, who frequently drove his machine through the suburbs of London.

The police had a battalion drill the other day at the Twenty-second regiment armory in New York. There were a number of velocipedes around, and one of the "boys in blue" and brass, believing himself an expert on the thing, got on one of them and started on a run. For about ten paces it went very well, and the policeman gaining confidence, gave the crank a more violent push, and up went the velocipede and down went the policeman, and while he was standing on his head, his feet cutting the air furiously, the velocipede, as if in mockery, turned a somersault over him and ran away.

Our sister city Brooklyn, is showing an enterprise in velocipede matters decidedly characteristic. It is announced that the managers of the Prospect Park Driving Association, of Brooklyn, have made arrangements to signalize their first annual spring meeting with a grand velocipede tournament, by which they intend to inaugurate a series of bicycle contests on their handsome course during the ensuing summer. A feature of the Parisian racing meeting now is the velocipede races, and they have proved far more attractive and exciting than even the turf meetings. The Prospect Park Association Course is a level one, and just suited for velocipede riding, and it is to be specially prepared for the races in question, the velocipede contests taking the lead of the horse races on the course of the coming spring meetings.

It is intended to make this tournament an exhibition of velocipede riding unprecedented in this country, and as the list of entries will be open to all comers, there will of course be considerable competition. The highest rate of speed reached on a Parisian course has been a mile in 2:14, but this was done only on one occasion, and has not been equaled since. A mile in three minutes is very fast time.

The races will be governed by a special code of rules, which will include handicapping for weight of machines and riders, diameter of driving wheels, and extent of treadles. The amount which will be presented in prizes will reach $1,500. There will be first, second, and third prizes for the greatest speed; prizes for best time made, and prizes for slow riding. The tourney will afford not only an excellent opportunity for a display of skill in American velocipede riding, but also a fair chance to show off the merits of the different styles of velocipedes. There is no doubt of the fact that the races will create an excitement, and we should not be surprised to see 20,000 people there.

All those intending to enter the lists should at once set to work to get themselves in training by practicing road riding. It will be found to be no child's play to run a mile race on a velocipede against a well-trained proficient, and therefore plenty of practice should be had by all of our leading experts who desire to enter the lists. The tournament will take place the last of April. We shall give due announcement of the details of the programme as soon as the managers have prepared it.

Mr. Cuyler, the Engineer in charge of Prospect Park in Brooklyn, announces, officially, that the velocipede riders have been and are permitted to make use of the walks of the Park, and are also allowed to use the tarred area or plaza and walks at Fort Green. The question of the general use of the Park by velocipede riders has not, as yet, been officially acted upon.

From the above it will be seen that velocipedists can avail themselves of all the privileges in Prospect Park granted to equestrians, for they can use all the bridle paths and plazas in the Park.

The Brooklyn *Union* of March 4th says that "Palm Johnson, the noted Brooklyn skater, returned from Paris last week, and he informs us that not only have we better velocipedes here than they have in Paris, and greater facilities for practice under cover, but that the most expert riders now in Paris are Americans. He says that the Parisians would be astonished to see the beautiful machines our Broadway makers turn out."

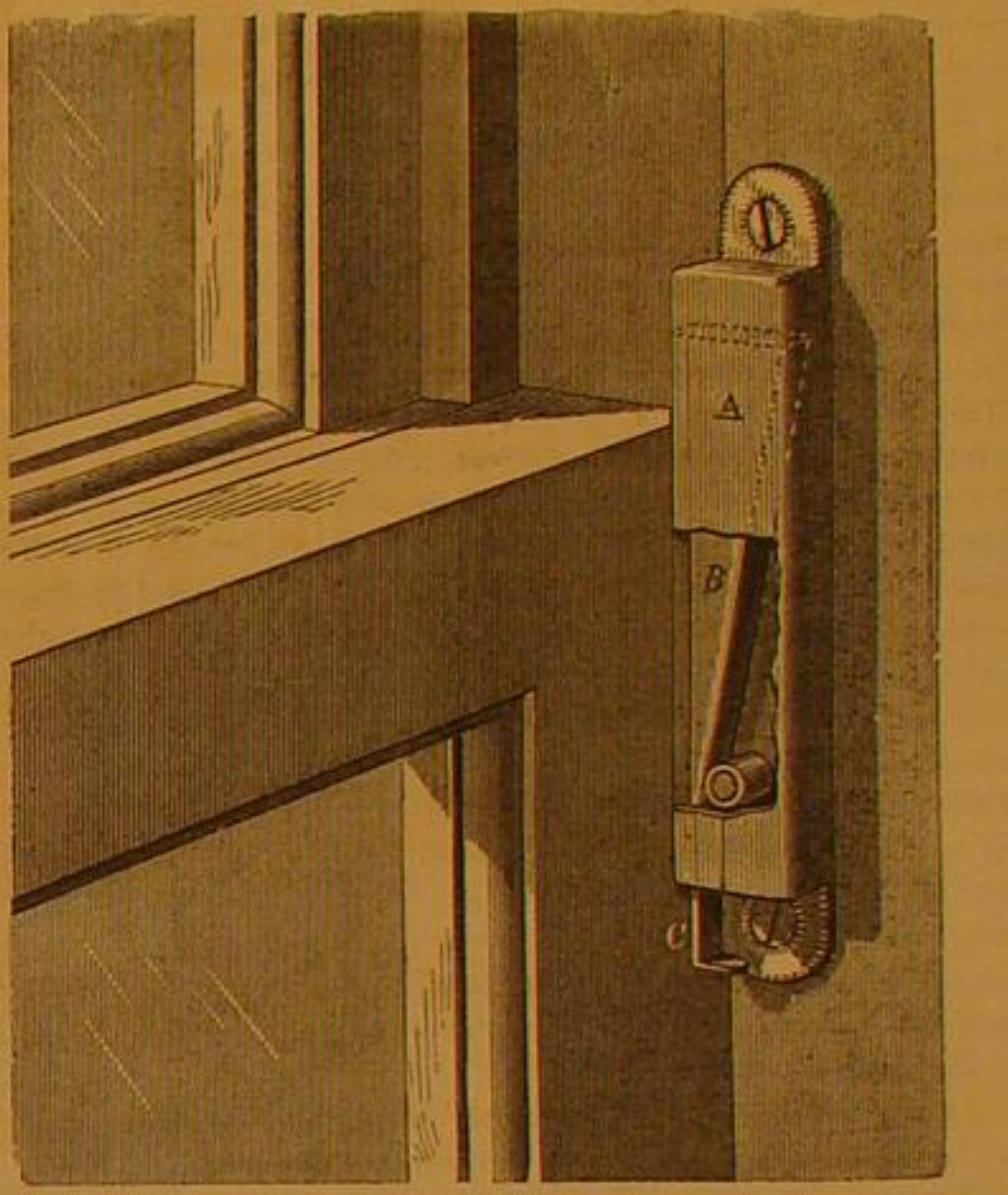
The bicycle has been introduced into gymnasiums, for ladies' exercise who use the dress commonly used by them in calisthenic exercise. The fair ones who have learned to manage "the beast" are in transports, and a rush is the consequence of the new attraction. Gentlemen are excluded while the ladies practice the art, but a few Benedicts who have been permitted to look behind the scenes while their better halves were performing on their fiery untamed steeds, say that they make a very pretty and graceful appearance. We can see no valid objection why ladies should not adopt a special dress for this sport, and enjoy it in the open air, instead of close and confined rooms. What say our *modistes*.

A correspondent from Poughkeepsie writes us that he has invented a machine in which both of the hind wheels are drivers instead of the forward one. They are three feet eight inches in diameter, and fast on independent axles meeting in the center, connected by a beautiful and novel arrangement of gearing, so that either wheel can stand as a pivotal point and the other be driven around it by the operator on the machine fast enough to make one's head swim. He says "I can turn it in less space than any other velocipede ever made. The leading or steering wheel is thirty-two inches in diameter, hung upon a swivel (as the front wheel of the bicycle) with the tiller, which has a cross handle running back to the operator, and is jointed to the top of the swivel, extending forward and downward with a block or rubber on the end, so that by lifting up on the tiller the rubber is brought in contact with the wheel and acts as a brake. I have for foot pedals two boards about thirty inches in length by five in width, suspended or jointed at the forward ends, and connected at the rear ends by rods running up to the vibrating levers which are pivoted on the axles; and are capable of being lengthened or shortened at pleasure, to get more or less power according to circumstances. To these levers are attached pawls which engage ratchet teeth on a wheel or cylinder which drives the axles. The levers are vibrating so that when one pedal goes down the pawl catches and moves the cylinder forward, at the same time the other lever is moved backward to continue the operation. These levers are so connected that they throw each other back. I have other foot levers fastened to the pedals, and standing vertically or nearly so, so that the operator, by sitting down and placing his feet against them, can drive the machine as well as by standing up."

HUTTON'S PATENT AUTOMATIC SASH LOCK.

On page 152, Vol. XVII, of the Scientific American, we published an article on the desirability of an improved window sash fastener, particularly for railway car windows. The one we herewith illustrate seems to meet this requirement perfectly, and is also applicable to other similar cases. It appears to possess in a high degree the qualities of simplicity, cheapness, durability, and effectiveness, beside being easily applied and not unsightly. No mortising or cutting of the window frame or sash is required, the paint or polish of the sash is not defaced or marred, and the device may be applied by any one who can use a screwdriver.

It consists of a case, A, of sheet metal, japaned, silvered, or gilded, held to the casing by two screws, as seen. Inside the case is a wedge-shaped key, B, also of sheet metal, clasping a



filling of rubber that projects slightly beyond the edges of the metal and bears against the sash. The side of the case, A, toward the sash, is open. The metallic back of the wedge key bears against a friction roller in the lower part of the case, and a portion of it extends below the case and is bent or formed into a thumb-piece, C. This thumb-piece is for raising and disengaging the face of the wedge or key from the sash when the latter is to be lowered. When it is to be raised nothing is necessary but to lift the sash with a force proportioned to its own weight only, as there is no friction in this direction from the wedge. For car windows it seems nothing could be contrived to answer the purpose better, and as it requires no particular effort to raise or lower the window and prevents the incessant rattling so annoying to the weak, ill, or nervous, we hope to see it generally adopted by steam and street railway companies.

If placed on the sash instead of the window frame it becomes a secure lock, preventing the opening of the window from the outside; it may be equally well applied to the upper sash; it costs only $18 per gross, and is susceptible of elegant external form and finish.

Patented through the Scientific American Patent Agency, January 1, 1867, by Robert Hutton, Brooklyn, N. Y. Orders should be addressed to the patentee, care "Waterbury Brass Company," First street, near Grand, Williamsburgh, N. Y.

The Invention of Lithography.

The impatience of a German washerwoman led to the invention of lithography. The history of that elegant art begins with a homely domestic scene, which occurred at Munich about the year 1793, and in which three characters figured,—Madame Senefelder, the poor widow of an excellent actor, then recently deceased; her son, Alois Senefelder, aged twenty-two, a young man of an inventive turn; and the impatient washerwoman just mentioned. The washerwoman had called at the home of this widow for the weekly "wash;" but the "list" was not ready, and the widow asked her son to take it. He looked about the room for a piece of paper upon which to write it, without being able to find the least fragment, and he noticed also that his ink was dry. Washerwomen are not apt to be overawed by such customers, and this one certainly did not conceal her impatience while the fruitless search was proceeding. The young man had in the apartment a smooth, soft, cream-colored stone, such as lithographers now use. He had also a mass of paste made of lampblack, wax, soap, and water. In the hurry of the moment, he dashed upon the soft, smooth stone the short list of garments, using for the purpose this awkward lump of oily paste. The washerwoman went off with her small bundle of clothes, peace was restored to the family, and the writing on the stone remained.—*James Parton in the Atlantic Monthly.*

Correspondence.

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

Boiler Testing and Boiler Examining.

MESSRS. EDITORS:—I have often thought, when reading in the columns of the SCIENTIFIC AMERICAN and in other papers, accounts of explosions of boilers, that the treatment to which they are subjected in testing them for the pressure they are to sustain is one cause of the explosions. It seems improper to subject a boiler, either new or old, to a hydrostatic pressure of 125, 150, or 200 pounds to the square inch, when in use it is not intended to carry more than 50, 60, or 80 lbs. steam pressure. Does not this excessive strain tend to permanently weaken those parts which under a more sensible treatment would with safety withstand the working pressure? Is there any necessity of testing the boiler so far above its intended capacity? If the object is to detect faults, the after treatment, when the fault is detected, is rarely calculated to remedy it. If a leak shows itself in a seam, the calking iron and hammer is used; if under the head of a rivet, a similar process—hammering down the rivet head around its edge. If a sheet bulges because of the imperfect welding of its laminæ, a stay is put in or a patch put on. It does not appear to me that either of these methods amount to anything; I do not approve of makeshifts and temporizings. I believe in going to the root of the matter; remove the faulty rivet, and put in one that fills the hole; put in a new plate, or fit the one already there to its fellow; do not put patches on a faulty plate or sheet.

These remarks apply with greater force to old or second-hand boilers than to new, for no boiler in use deteriorates equally in every part, and it is not always easy to determine the exact point of weakness by the hydraulic test, as the very weakest point may be protected and defended by a deposit of scale, sufficient to resist the pressure when cold, yet liable to break up and expose the imperfection when heated. The hydraulic test as used by the legalized inspectors of steam boilers is, in most instances, a farce, ridiculous but for its possible consequences. The inspectors are frequently pretenders or self-deluded imposters, wise in their own conceit; and their certificate of inspection and safety lulls the fears and encourages the confidence of the owner, who might otherwise be reasonably anxious and exercise proper care.

It appears to me, as an old engineer, that personal examination of the boiler internally, if possible, but, at least, externally, and carefully, is far better for ascertaing the condition of a boiler than the hydraulic test. If this duty was religiously performed, at least once a month, by those who run stationary boilers, and the blowing off occassionally attended to, I feel certain that the number of explosions would be materially reduced. J. H. L.

New York city.

Congelation of Water.

MESSRS. EDITORS:—Having carefully perused in the columns of the SCIENTIFIC AMERICAN the descriptions of the various machines for congealing water, recently patented in this country and in Europe, all of which are troublesome and expensive to manage, and impracticable for general use among a large portion of the agricultural communities throughout the United States, I would suggest the following method of obtaining ice in warm climates, superseding the use of machines or chemical mixtures, involving but a trifling expense after the first outlay, and possessing the additional advantage of the process being conducted by any person above seven or eight years of age. Travelers from the East have informed us of the method the Hindoos employ during the winter months, when the temperature has descended to 40°, or less, above zero; which is, to select a piece of level ground on their respective farms, of about four acres in extent, and, having made shallow excavations throughout the field of two feet square by four inches deep, with intervalling walls, four inches in thickness, and having placed therein pieces of straw matting, covering the bottom and sides about an inch in thickness, at night they place in the cavities tin pans filled with water of corresponding dimensions with the cavities, namely, nearly two feet square by three inches deep, the water in which will, in the morning, have become solid ice, if the temperature has fallen during the night as low as 40° Fah. above zero. The meteorological explanation is, that the straw matting, inclosing a wall of air an inch in thickness, prevents the heat underneath it, that is constantly radiating from the interior of the earth, from escaping into space otherwise than by the uncovered partitions or walls surrounding the cavities, which act as funnels conducting the radiating heat into space, before it has time to sensibly affect the water in the tin pans, which latter assumes the solid form, from the lack of the supply of caloric, necessary to maintain its fluidity, that is constantly radiating throughout unimpeded space and matter. Experience has probably determined that the area of cavity, etc., here given, is the most suitable for the successful operation of the phenomenon. Any farmer throughout the warmer latitudes may, by thus understanding the nature and reason of the process (the sole varying condition being the attainment of a temperature not above 40° Fah.), secure an abundant supply of this necessary luxury whenever desired, at a comparatively small expenditure of time, expense, or trouble.

New York city. H. M. R.

Increase of Resistance as Velocity Increases.

MESSRS. EDITORS:—In the article signed "Mathematician," in your issue of January 30, 1869, at page 70, on the question, "Does Resistance to Ships Increase as the Square or Cube of the Velocity?" there is a confusion of ideas arising from omitting to include time as an element of the power required to overcome the resistance. It will require only four times as much steam to be developed and utilized in driving a steamer from New York to New Haven in one hour, as will be required if the voyage is performed in two hours; but the engine and boiler which perform the voyage in one hour must have the capacity to develop and utilize 8 times the steam per hour, since it is to overcome 4 times the resistance in half the time. In other words, the resistance is as the square of the velocity, but the power of the engine must be as the cube of the velocity.

Following this article a quotation is made from "Silliman's Principles of Physics," as follows: "The resistance increases as the square of the velocity; for, if the velocity is doubled, the loss of motion must be quadrupled, because there is twice as much fluid to be moved in the same time, and it has also to be moved twice as fast." There is in this paragraph a confusion of ideas somewhat similar to that before referred to. The single fact that "the fluid has to be moved twice as fast" is alone sufficient to quadruple the resistance. The further fact that "there is twice as much fluid to be moved in the same time" does not add to the resistance in the proper sense of that term, but it makes it necessary that the power of the engine, which has already been quadrupled for the former reason, should be doubled for this reason. Thus, as before, the resistance is as the square of the velocity, but the power of the engine that overcomes it is as the cube of the velocity. B.

Required Power for Increased Speed of Steamers.

MESSRS. EDITORS:—Your correspondent of March 6th, page 151, cannot discover my position on this subject, as published in an article of Feb. 20th, page 119, wherein I stated that the required power, or steam, was for a given *distance*, as the square of the velocity, and for a given *time*, as the cube.

I gave a practical example of a steamer's ordinary time of passage from New York to Liverpool, being ten days; and to perform it in five days, by double velocity, would require a supply of four times the coal and steam over the former ten days' passage, or as the square of the velocity; but that during the five days' time in which the distance was made, the consumption of steam would be at the rate of eight times the former ten days' passage supply, or as the cube of the velocity. I am charged with a supposed error in omitting the important item of the time occupied, being only one-half "which he would not have done, had he been a more accurate mathematician."

If we try figures, that "won't lie," and place the quantity of steam used on the ten days' passage at 1 per diem, we have $1 \times 10 = 10$; and during the five days under double velocity at 8 per diem, we have $8 \times 5 = 40$; or four times that of the ten days' passage, being as the square for the *distance*, and eight times, or as the cube of the velocity for the *time*, as previously asserted. T. W. BAKEWELL.

Pittsburgh, Pa.

Noiseless Air Guns.

MESSRS. EDITORS:—My attention was drawn, a short time ago, to a paragraph in one of our dailies, on air guns, assuming their noiselessness and consequent adaptation to the assassin's purpose. The following is the description:—"It consists of lock, stock, barrel, and ramrod. The stock is made hollow, and provided with proper cocks for filling it with compressed air by means of a force pump. Each lock is nothing but a valve which lets into the barrel a portion of the air compressed in the stock, when the trigger is pulled. The gun is loaded with wadding and ball, in the ordinary way, and the air, suddenly introduced from the stock, propels it with a velocity proportional to the square root of the degree of the of the compression of the air. By this weapon a person may be killed at a distance of sixty or eighty yards. Later improvements give it a propelling force almost equal to the old-fashioned musket. Its chief advantage to criminals is its noiseless discharge."

It is surprising that such statements should find currency when they are so self-contradictory. In your valuable paper, page 57, No. 4, Vol. XVII., this subject is treated, and the notion of the noiselessness of air guns effectually disposed of.

Now, that projectiles may be thrown with deadly effect, almost noiselessly, is beyond dispute. It was one of the most ancient methods of warfare, and even now, and in this country, the fatal effects of the Indian's arrow receive almost daily illustration; and a bullet, or other form of projectile may be also impelled with great force by the bow or some other modification of the spring.

The air gun is nothing new; every schoolboy has used the quill air gun, loaded with its potatoe disk; but it has its explosion—it is not noiseless. Now, in the air gun, the air is compressed, and it is a well-known fact, that compressed air or gas cannot be suddenly liberated against the atmosphere without producing a detonation. But while exploding gunpowder exerts a force against the air of about twenty thousand pounds per square inch, air cannot be compressed by mechanical means more than about forty times, or to exert a force of six hundred pounds per square inch; consequently, the effect of the projectile impelled by the compressed air and the detonation produced are less than those of gunpowder.

New York city F. W. B.

Patent Office Fees.

MESSRS. EDITORS:—I hope you will excuse me for referring to the following interesting question, "Is Our Patent System Defective?" found on page 105 SCIENTIFIC AMERICAN. I am impressed that this is a question of profound interest to all classes of mechanics. At the present time there is a great deal said and published in regard to extravagance, and advocating reform and retrenchment in all branches of the Government, but nothing is said about reducing exorbitant fees, high salaries, etc.

I hope the SCIENTIFIC AMERICAN will become a strong advocate for reducing the patent fees, which I think are entirely too high. This is an important question.

Mount Olive, Va. L. PITMAN.

[Certainly they are, and we should be glad to have the fees reduced; but the danger is, that when Congress commences to tinker the patent laws, we shall be saddled with a more complex and costly system. Reforms in legislation usually proceed very slow.—EDS.

To Find the Contents of a Cylinder in Gallons.

MESSRS. EDITORS:—As a good many of your readers may sometimes be called upon to find the capacity of a cylinder in gallons, permit me to offer you a rule, which I think is new and short, and as near correct as in most cases may be wished for. It is: Multiply the diameter by diameter and hight of cylinder, and divide the product by the number 294, which I have found to be nearly correct—taking 231 cubic inches to the gallon. Anything better will be thankfully received by a good many of your readers.

M. J. St. ——.

Richmond, Va.

Crank Pin.

MESSRS. EDITORS.—Friend Watson, asks, on page 151, of your issue of March 6, why an inside connected locomotive engine must have a crank-pin so much larger than an outside connected one.

Suppose he puts his question in the following form, when it will almost answer itself; viz.,

Why does the axle of a locomotive need to be larger than the crank-pin? CALLIPERS.

Worcester, Mass.

Railway Restaurants.

It is an astonishing thing that, with scarcely an exception, there is not a railway restaurant properly conducted in the United States. There are, indeed, no end of cake and pie shops; places where viscous and glairy pies, likewise doughy cakes, are to be had unlimitedly, but of honest bread and beef, clear unadulterated coffee, and tea that grew in China, there is very little; and the traveler with a simple stomach may starve for aught the restaurant can do for him. Doubtless there are people in the world who live and thrive on pie, dough boiled in fat, and similar edibles; but there are still others who, when hungry, satisfy their appetites with bread and beef, and some provision should be made for such ridiculous tastes.

Along the line of the New York Central road are huge restaurants, one especially at Utica, where the eye ranges up and down immense tables covered with platoons of cakes decorated in the highest style of art; small cones of dough with holes in the top like volcanoes, others rolled up in scrolls and still others spotted, ringed, and streaked with red sugar. Pies are strongly represented also, but for that juicy sirloin from which one can get a generous slice, for well made, well baked bread, for the round of corned beef, one looks in vain, and those who cannot feed upon such trifles may go hungry. It is perhaps useless to complain, but for all that we shall lift up our voice against such places in the hope that there may be a coming man who will keep a restaurant at railway stations with clean, well cooked, simple, food, at *high* prices, so that he can make some money out of it. In that event the institution will be universal, for hosts of imitators will arise and establish themselves in every corner of the land.

Cannot the Falls of Niagara be made to Run the Machinery of Buffalo.

A correspondent from Ann Arbor, has been thinking, like many others, about the utilization of the enormous, and now wasted power of Niagara Falls. He sends us the following description of a plan for transmitting that power to the machinery of Buffalo, which, though it may be objected to by some, contains some good suggestions. He says:

"First, I would make a proper channel for conducting the water from the river above the Falls to the bank or precipice below, where a sufficient number of turbine wheels may be put in to get the power wanted. With the power brought under control by these wheels, I would, by a series of force pumps, compress air into a proper receiver, from which a large main pipe may be laid to Buffalo, having branches connecting with the engines scattered in the various parts of the city in the same manner as gas and water are now conducted to buildings.

"I can see no reason why air could not be compressed so as to give a pressure of four or five hundred pounds to the square inch (perhaps more) in Buffalo. Hence, much smaller engines might be used, which in many cases would be no small consideration. It would, of course, be desirable to obtain as high a pressure as practical as a proportionally smaller pipe might be used, and it would be difficult to lay a very large pipe so great a distance. It seems to me that this is an enterprise which might be managed by a stock company, and made to pay large dividends. The running expenses would be very slight. I am not prepared to say what capital would be required to put it in operation. It would not, I think, be very great as compared with the profits likely to accrue from it."

IT is stated that the injurious action of mercury upon those employed in the looking-glass manufacture, can be prevented by using one-half per cent of sodium in the mercury, while at the same time the saving of the quicksilver will compensate for the cost of the sodium.

ON THE POISONOUS EFFECTS OF BISULPHIDE OF CARBON, AND ITS USE FOR THE EXTERMINATION OF ANIMALS LIVING UNDERGROUND.

Bisulphide of carbon, when diffused in a large volume of atmospheric air, may be introduced into the respiratory organs of living beings, without producing immediate effects; such a mixture, however, will prove fatal when inspired for a sufficient length of time.

If the atmospheric air, instead of being loaded with some millionth parts of bisulphide of carbon, contains one-twentieth of this gas in volume, it will act very promptly, death ocuring invariably, if its effects are not interrupted in time. M. S. Cloëz sometime ago communicated a series of experiments to the French Academy of Sciences on the effects of the gaseous mixtures in question, which he had undertaken with various species of mammalia, birds, and reptiles, with the view of applying them for practical purposes.

I. In a first experiment, a large rat was brought under a tabulated bell jar of seventeen liters capacity, after a plug of cotton saturated with bisulphide of carbon had been placed under it. The animal kept quiet in the first instance and seemed to get sleepy, but after half a minute it began to move violently, and attempted to withdraw itself from the poisonous atmosphere; its movements, however, soon became slower, convulsive affections followed, the animal fell on one side, its breathing gradually became slow and labored, and death followed some minutes after the commencement of the experiment.

II. The second experiment was made with a full-grown rabbit. A sponge impregnated with bisulphide of carbon was held under its nose for a few moments. The animal first kept quiet, but then tried to resist, when it was set at liberty; it soon lost control of its muscles, appearing as if it were intoxicated. It was then forced anew to respire the sulphide of carbon vapors, until a complete insensibility of all its limbs had taken place, when the same phenomena were witnessed as in the first experiment. The sponge, however, was withdrawn when death seemed to have occurred. The rabbit remained in a state of unconsciousness for half an hour, but gradually life returned again; after the lapse of an hour it lifted its head, and, though the posterior extremities still remained paralyzed, it attempted to resume an erect attitude, and after another hour the animal resumed all its functions as if nothing had happened.

III. This experiment was also undertaken with a rabbit and forms a repetition of the second one, with the only difference that the poisonous vapors were allowed to act until life was destroyed, which occurred nine minutes after the commencement of the experiment. In dissecting the body, it was found that congestion had taken place at the lower termination of the lungs, and it was also noticed that the right ventricles of the heart continued to contract, though they had been removed from the cavity of the breast, together with the respiratory organs, for over five hours.

Upon birds, the bisulphide of carbon appears to act more promptly than upon mammalia. Upon reptiles, however, as might be foreseen, it acts much slower. The respective experiments were undertaken with sparrows and frogs.

Experiments on the applicability of bisulphide of carbon, for the extermination of rats and other vermin living underground, were undertaken with rats in the museum for natural history in Paris, where these animals had lodged themselves near the menageries for the wild beasts, and in the neighborhood of the laboratory for comparative physiology.

Bisulphide of carbon is now manufactured on a large scale, and may be bought at a comparatively low rate. The mode of its application for the extermination of rats is also very simple. M. Cloëz employs for this purpose a lead pipe of a length of from three to five feet, and of suitable diameter, open on both ends, and provided at one end with a small funnel of sheet tin and near the other with some holes, through which the liquid may flow into the rats' nests, in case the lower aperture should get choked up with earth.

Before the experimenter proceeded to try his method on a large scale, he made a trial in the small alley which leads to the laboratory for comparative physiology. Here, on an area of fifty square yards, some inhabited rat holes existed, which were connected together by subterranean canals. In one of these holes the lead pipe was pushed as far as possible, while the others were closed with bricks. Fifty grammes of the liquid were poured through the pipe, when the latter was withdrawn and the hole stopped with earth. This method was repeated at the rest of the holes. Two days after the ground was dug up, and not less that fourteen dead rats were found, which had suffocated in their nests. Numerous trials undertaken thereafter in various quarters of the city met with no less satisfactory results.

Limekiln at Ingleton in Yorkshire, England.

A new limekiln, constructed on the principle of a German patent, which seems to be a very effective plan, has been erected at the above place. The kiln is oval, and measures in circumference 450 feet, being surrounded by a road for the use of carts. At the hight of four feet from this road there is a platform all round the kiln, six and a-half feet wide. From the platform there are fourteen arched openings into the chambers, for the purpose of taking in the stone and bringing out the lime. Each chamber, which is nine feet in hight at the center of the arch and eighteen feet wide on the floor, is capable of holding 100 tuns of limestone, and, as the stone is calculated to lose by burning two-fifths of its weight in carbonic acid and moisture, a chamber yields at one draw about sixty tuns of lime. As it requires many days to convert the stone into lime, and three days to cool a chamber before it can be discharged, sixty tuns of lime is the amount produced per day. From the platform to the feeding chamber it is in perpendicular hight eleven feet, but as the wall slopes it measures fourteen feet. The feeding chamber extends over the whole of the fourteen lime chambers, and is 150 feet in length and 65 feet in breadth. This chamber, which measures from the floor to the ridge fourteen feet, is covered over with a wooden roof, which cost £200. In this chamber, into which there are forty-one brick openings six and a-half feet high by five feet wide, there are 424 feeding holes, through which, by the use of a small funnel and scoop, the fires are supplied with fuel. In the center of this chamber are fourteen valves 2 feet 1 inch in diameter, connected with the chambers which surround a central chamber in the kiln, called the smoke or carbonic acid chamber, through which the carbonic acid gas and moisture pass through a long flue, and escape from a brick chimney erected on the top of Meal Bank. As all the smoke is consumed, and the men who feed the fires are under cover, and have only to use a wheelbarrow, a funnel, and a scoop in performing their labor, they can do it with much more cleanliness, comfort, and ease than on the old plan. About 500,000 building and fire bricks, which cost about £1,000, have been used in the erection of the kiln.

Why Don't Boys Learn Trades?

The *Morning Post*, published at Philadelphia, answers this inquiry, which recently appeared in the SCIENTIFIC AMERICAN, as follows:

It is popular to say that young men should learn trades. Those people are especially fond of saying so to whom manual labor or any extra exertion in the matter of gaining a living is distasteful. But such self-satisfied advisers apart, young men do, in fact, get the wisest counsel when advised to so employ their youth as to always have at their command in after times some sure means of independence. But how is this desirable end to be obtained? The entire apprentice system seems destined, under the present tyranny of the Trades' Unions, to be driven out of existence. It is a rule with many of these societies to refuse to allow their members to work in any shop, office, or factory, with non-members or with apprentices. When the society is powerful and virtually controls the journeymen of its particular craft (as it does in many instances in this city and elsewhere), the door is conclusively shut in the faces of would-be workers in that direction. The employer is quite at the mercy of the society. If he takes apprentices, his journeymen, bound by the articles of their association, leave him. He cannot replace them, for the good hands are all in the same boat. With the best of feelings, therefore, for the boys who want one day to be journeymen themselves, what can he do for them? Nothing.

This may be all very well for the mechanics and artisans of the present; but for the future? While now labor is controlled and good prices obtained, no skilled workmen are growing up. We may be well off, but what is the next generation to do? We must take care of ourselves, say the Unions. You must, indeed, gentlemen, but it is none the less a fact that such is a short-sighted and illiberal policy that says "there are workingmen enough in the world, every individual added to the force diminishes our profit, and, therefore, we combine to keep the body where it is." A reasonable protection to mechanics and others, who have worked to achieve a special excellence in their business, is to be approved, but such exclusiveness, when it comes to the point of shutting young men and boys out of opportunities of learning the best trades, cannot be too strongly condemned. Such a policy will be, in the end, destructive to industry.

Telegraphs---Europe and United States.

The whole number of messages sent in Europe, in 1866, was 18,688,000, and the sum received, $10,329,000 in American gold, or $14,461,000 in currency, at 140. This makes the average cost of these messages 77½ cents each. The Western Union Company, which does about 75 per cent of the business in this country, for the year ending June 30, 1867, transmitted 10,068,000 messages, and received for the same $5,739,000, equal to 57 cents a message, and in that number is not included the vast amount of railway business, nor the regular dispatches to the press, in which the number of words delivered were 295,000,000, equal to 14,725,000 messages of 20 words each. In Europe the press dispatches are not a tenth part of those in this country. The number of offices to population is vastly greater here than in Europe. In Prussia there is an office to every 33,000; in France, one to 32,000; in Great Britain, one to 14,000; in Belgium, one to every 12,000; in Switzerland, one to every 10,000; and in the United States, one to every 7,500, and in the Pacific states one to every 2,500. So in the use made of the telegraph America stands pre-eminent. In France the number of messages sent is one to every 13 persons; in Prussia, one to every 9; in Great Britain, one to every 5; in Belgium and Switzerland one to every 4; and in the United States, one to every 2½.

How to Make Dense Negatives from Engravings.

Sufficient density, when reproducing engravings, may be obtained without having recourse to any of those operations which some are pleased to designate as "dodges," but which, so far from coming under such a category, are most legitimate and useful. Develop with iron somewhat old and peroxidized, intensifying with silver and pyrogallic acid; then fix and examine the clearness of the lines. If they are not composed of clean glass, bring about that result by means of a wash of a very weak solution of iodine, followed by one of cyanide of potassium. When the black lines are thus rendered quite clean, and free from any deposited silver, further density is obtained by a reapplication of the silver and pyrogallic acid. Negatives possessing great density may be obtained by first chlorizing the deposit by immersing it for two or three minutes in a solution of three drachms of bicarbonate of potash, and one drachm of hydrochloric acid in twelve ounces of water. After rinsing, pour over the surface a weak solution of sulphantimoniate of sodium (or Schlippie salts) by which the color will be changed to an intense and deep scarlet.

The Cobden Club Medal.

The Cobden Club, of London, last summer announced in their organ, the London *Star*, that they would give a gold medal for the best essay "on the best way of developing improved political and commercial relations between Great Britain and the United States of America." The essays were to be presented to the secretary of the club on the 1st of January, 1869, and the prize to be awarded by a committee of three of the highest authorities in England, both in economical science and in literary criticism.

The cable informs us that the award was made February 26th, to Dr. Joshua Leavitt, of New York city. Dr. Leavitt has been for many years one of the most earnest and successful advocates of sound economical principles in the New York press.

The Prize Essay will be published at once in London, by the Cobden Club, and will be at once republished in the United States. It will be a timely discussion of a subject which is attracting more and more attention, both at home and abroad, as the great questions of the navigation laws, of international coinage, and of tariffs, are becoming better understood in their influences upon international relations.—*Evening Post.*

Quicksilver and Iron.

The difficulty of imparting to iron a complete and uniform coating of mercury by dipping it in a solution of mercury is well known. The process may, however, be very easily accomplished by cleaning the iron first with hydrochloric acid, and then immersing it in a diluted solution of blue vitriol mixed with a little hydrochloric acid, by means of which it becomes covered with a slightly adherent layer of copper, from which it must freed by brushing, or rubbing with sandpaper, and washing. It is then to be brought into a very diluted solution of mercurial sublimate, mixed with a few drops of hydrochloric acid. The article will now be covered with a layer of mercury, which cannot be removed even by hard rubbing. This layer of quicksilver protects the iron from rust, especially if it be washed with spirits of sal ammoniac after the amalgamation. Articles for the laboratory, and for other purposes, coated with quicksilver in this way, and allowed to lie exposed with similar articles not so protected, retain their luster perfectly, while the others become covered with rust. This same process is especially applicable to the coating of the steel or iron instruments for which oil is generally employed, and will probably be found to resist the injurious effect of moisture much more perfectly than the oil.

Safe Illuminating Oils.

Professors Horsford and Doremus have lately made tests of an excellent illuminating oil manufactured from crude petrolium, the results of which prove that the flashing point of the oil is about 125° Fah., and the burning point about 145° Fah. They say that there is a great want for some more definite mode of determining the safety and value of petroleum oils; and one which could be practiced by the consumers of the oil, as well as by appointed inspectors. The invention of such an instrument has evidently not received the attention of inventors which it deserves, and the subject affords an opportunity for some party to bring credit and profit to themselves by supplying the want.

This oil is manufactured by Mr. Charles Pratt, a very reliable dealer, whose advertisement appears in another column.

Beware of Benzole.

From the facility with which it removes grease spots from fabrics, this substance is regarded almost as a household necessity. But few persons, however, are aware of its explosive character, or the dangers attending the careless handling of it. Being one of the most volatile and inflammable products, it vaporizes with great rapidity, so that the contents of a four ounce phial, if overturned, would render the air of a moderate sized room highly explosive. The greatest care should be taken in handling this substance in proximity to fire, and it is important to remember that the vapor escaping from an uncorked bottle will cause a flame to leap over a space of several feet.

Gas on Shipboard.

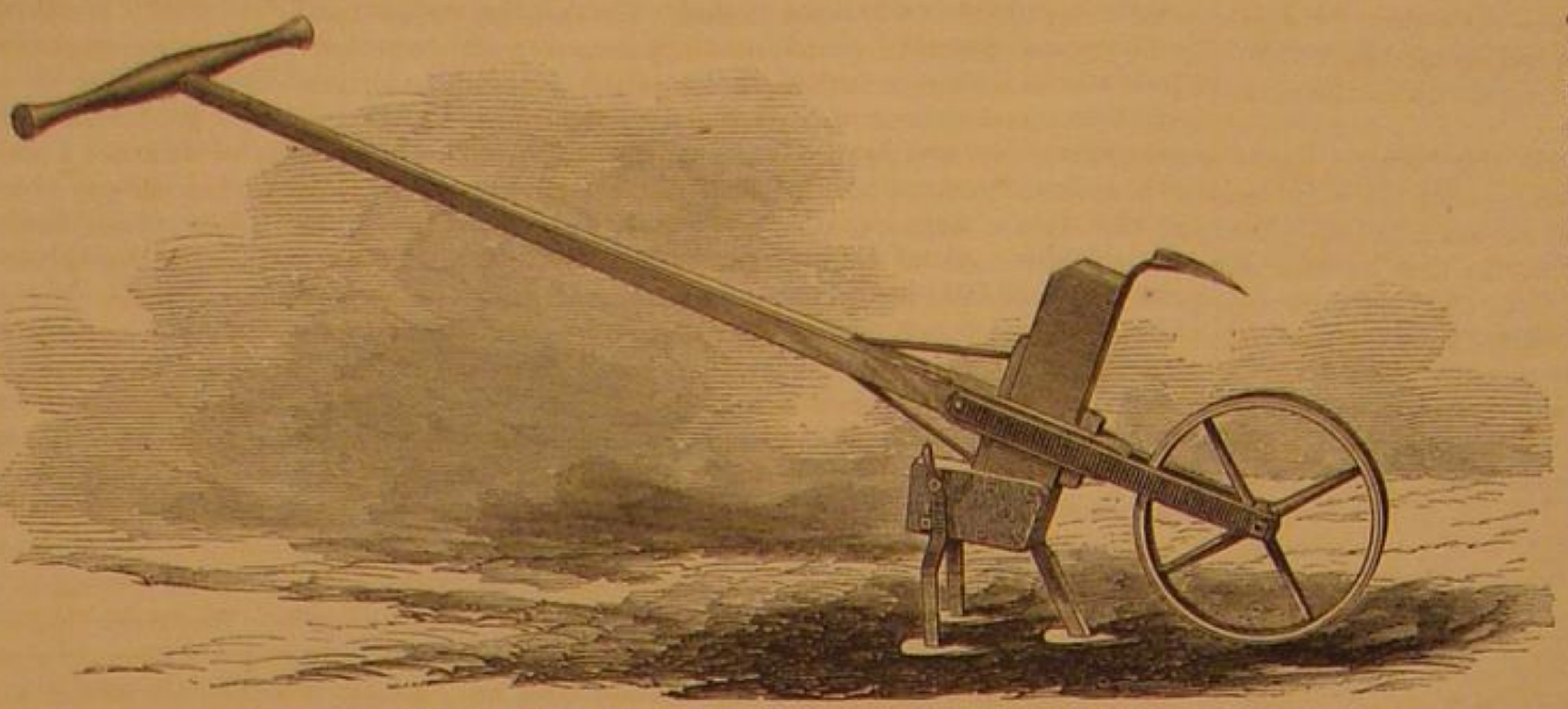
Attention has recently been directed in England to the practicability of lighting men-of-war with gas manufactured on board. Two vessels in the royal navy are illuminated with gas, but a correspondent of an English paper states that forty years ago the *Duke of York*, a steamer carrying mails and passengers between London and the Mediterranean, was lighted with gas, stored in iron bottles, one of which screwed on to the "main," and when the gas contained in it was consumed, a fresh bottle was substituted.

A STRONG liquid glue for repairing broken vessels, cementing glass, etc., is made, according to M. Knaff, by taking three parts of glue in small pieces, and placing them in eight parts of water for some hours, when half a part of hydrochloric acid and three quarters o a part of sulphate of zinc are added, and the whole kept at a moderately high temperature for ten or twelve hours. The glue thus treated retains its liquid condition, and will not become gelatinous again.

A CORRESPONDENT of the *Boston Journal of Chemistry*, says that water-spouts and sink-spouts frozen up may be speedily thawed out in the following manner: Procure a piece of lead pipe of suitable length and size; place one end against the ice to be thawed, then, through a funnel in the upper end, pour boiling water. Keep the pipe constantly against the ice, and you can penetrate one foot or more per minute.

Improvement in Hand Cultivators.

This device is calculated primarily for cultivating growing crops, especially those planted in rows, and is intended to supersede, in a measure, the use of the hand hoe, or at least to reduce the labor by that well-known implement, so far as cutting down weeds and loosening the soil are concerned. It also may be used for describing and forming furrows for the reception of seed, while it will cover them and compact the earth above them when they have been deposited. Its simplicity of construction and the fact that it is worked entirely by hand are greatly in its favor. These qualities, with their exhibition by actual experiment, have secured for the machine the first premium at several State and county fairs, and the commendation of all who have tested it. The lower portion (as shown in the position represented in the engraving) presents three shares, or blades, the front one rigidly fixed to an arm, and the two others suspended to pivoted arms, so arranged that one or both may be raised from contact with the ground to adapt the implement to the width of the rows between the growing plants. By reversing the position of the implement the shovel seen projecting over the wheel may be brought to the ground to make a furrow for the reception of seed. The contrivance is pushed by the operator, like a barrow, before him. The depth of the cultivator blades or shovel may be adjusted by a wedge that holds the block sustaining the blades, and may be, of course, guided as to depth and direction, by the hands of the operator.



TAYLOR'S PATENT HAND CULTIVATOR.

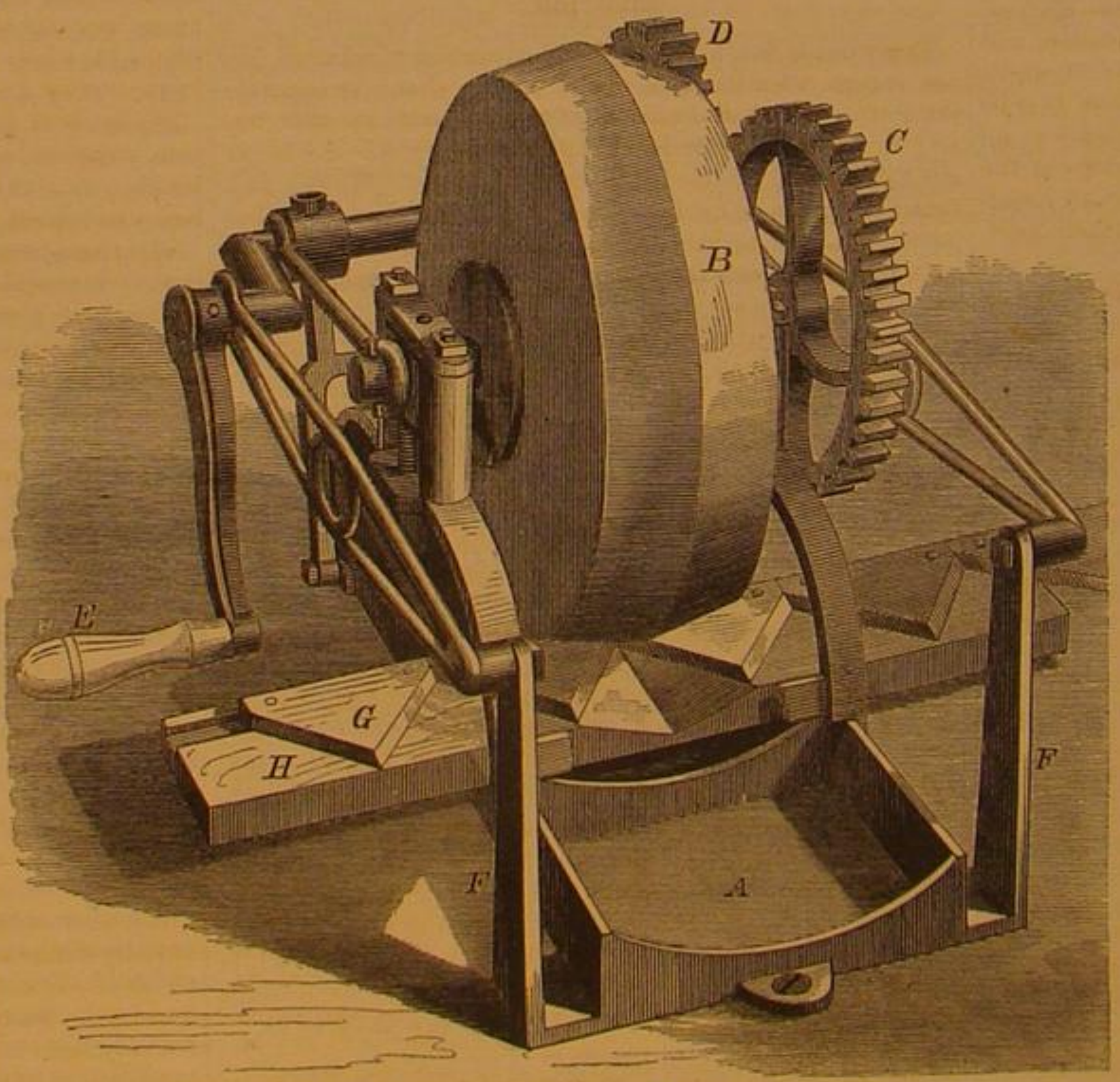
Patented through the Scientific American Patent Agency, August 11, 1868, by Barnett Taylor. Orders for machines or rights should be addressed to the patentee, at Forestville, Fillmore county, Minn., or D. E. Runnals, same place, J. L. Michener, Leroy, Mower county, Minn., or R. B. Brown, New Concord, Ohio.

Portable Grinding Machine for Harvester Knives.

Mowing and harvesting machines are now so extensively used that any device that renders them more useful and easier of application is advantageous to the farmer. Grinding the knives or cutters of these machines is a work requiring time and labor, neither of which can be well spared at just the point when the sharpening is most needed—the period of gathering the crops. To remove the cutter bar, leave the machine idle in the field, and go to the barn to grind the knives, requiring the services and time of a man and boy, is quite vexatious.

The accompanying engraving shows a portable machine that may be carried to the field and be a portion of the mower or harvester, ready at all times for use. A bed or frame, A, supports a sliding carriage on which is mounted a grindstone, B, having a gear wheel, C, on its shaft, engaging with a similar wheel, D, the shaft of which has a crank, E, for giving motion to the stone and its parts. From uprights, F, pivoted connections run to a crank on either end of the driving, or crank shaft, and from the same shaft go pivoted bars to the axle of the stone or grinding wheel. The bearings of this crank shaft are in a vibrating frame pivoted to the base or bed plate of the machine. It will therefore be seen that by turning the crank not only is the stone revolved, but it and all connected with it on the sliding frame, are moved backward and forward.

The knives, G, to be ground, are seated on a guide, H, fixed to the frame at the proper angle to insure the right bevel to the edge of the blade and held in position by the cutter bar sliding in a corresponding groove in the guide. The face of the stone is razed to a double bevel so that one side of the two blades is ground simultaneously The reciprocating movement of the stone insures the even grinding of the blades from root to point, and keeps the stone from wearing out of shape, an object that is more fully secured by the fact that the teeth in the two gears are odd and even, so that no one place on the stone is presented to the blades in two successive revolutions. The stone is hung in vertically-sliding boxes that may be raised or lowered by means of set screws to adjust the stone to the blades to be ground. The whole machine can be easily carried by one man, and it requires but one person to operate it.



THE EMPIRE HARVESTER CUTTER GRINDER.

Patented through the Scientific American Patent Agency, January 19, 1869, by Milton Fowks, assignor to himself and A. and J. A. Foote, to whom all orders should be addressed at Catskill, N. Y. State and county rights for sale.

Telegraphs versus Rogues.

The New York *World* illustrates the extent of telegraph operations in some comments on the fact that a knavish Chinaman in California having contracted the barbarian vice of swindling, has been cheating sundry merchants in San Francisco out of $18,000, and, getting on board the Pacific Mail steamship, fleeing to the Central Flowery Kingdom. In this way he hoped to put between himself and those whom he had robbed, first, some 10,000 miles of ocean, but "A telegram from San Francisco bears the tidings of his crime to New York. New York sends it by cable across the Atlantic to London, London through France and under the Mediterranean to Alexandria, Alexandria by the Red Sea and Persian Gulf to Bombay, Bombay to Ceylon, and Ceylon by the Peninsula and Oriental steamers to China. So that when Hong-Kee trips lightly down the ship's gangway at Hong-Kong or Shanghai, dreaming of much opium and many almond-eyed daughters of the Sun in the Land of Flowers, his placid soul will be disconcerted by the tap of a bamboo on his shoulder and a voice of doom will murmur an ungentle summons in his ear. Poor Hong-Kee! The bad morals of the Christians have corrupted him, and in the steam engine of the Christians has he put his hope. But the literal 'chain-lightning' of the Christians is after him, to outstrip their steam engine, and to teach him in sorrow and in shame how much better is a pot of honest rice and the teachings of Confucius therewith, than many thousands of illegal dollars and a warrant of arrest therewith."

Chemical Equivalents.

The following will convey to a young photographer or a curious reader an idea of chemical equivalents, or combining proportions. It has been found by accurate experiment, that when oxygen and hydrogen combine, they do so in the proportion of eight of the former to one of the latter; hence the chemical equivalent of hydrogen is 1, that of oxygen 8, sulphur 16, silver 108, etc. These numbers indicate the proportions in which the elementary bodies combine with each other. Stöckhardt's illustration is one of the simplest that can be adopted: For the same sum can be purchased six ounces of gold, or 12 ounces of platinum, or 100 ounces of silver, or 1,500 ounces of mercury; consequently six ounces of gold have the same mercantile value as 12 ounces of platinum, or 100 ounces of silver, etc. The same principle holds good in chemistry. Twenty-eight ounces of iron, forty ounces of potassium, or two hundred ounces of mercury, combine with eight ounces of oxygen; accordingly twenty-eight ounces of iron have the same chemical value as forty ounces of potassium or two hundred ounces of mercury. By one equivalent, from *aquus* (equal) and *valor* (value), of oxygen is to be understood eight parts of it by weight, and the same with the other elementary bodies.

Recent Improvements in Electro-metallurgy.

Mr. Kress, in a treatise on this art recently published in Stuttgardt, Germany, describes a new composition (an invention of Mr. Kress) for reverses or molds of objects to be reproduced by galvanic action, from which a faithful cast in gutta percha can not be obtained, as is the case with plates presenting landscapes, etched clouds, or other fine designs in relief or intaglio. While in other cases accurate reverses by means of gutta percha can only be obtained by the application of pressure, this is not the case with the composition of Mr. Kress, which, in assuming a liquid state at a comparatively low temperature, allows the reproduction of all kinds of objects in a uniform manner at a cheaper rate and with less loss of time than heretofore known. In operating with the composition spoken of it is necessary that the various objects should first be inclosed with a strip of potter's clay. This done, the mass is liquefied and poured over them, care being taken that the mass be not too hot, as in such a case its subsequent removal would probably be attended with difficulty. It is also indispensable that the original should previously be slightly greased. These precautions being taken, the molds may, when cool, be quite easily lifted from the forms. The finest etched tones in *aqua tinta* may thus be reproduced faithfully and in a short space of time.

The molds are finally rubbed over with fine graphite powder until they acquire a shining black appearance, when they are ready for the bath. The composition, however, is not quite as hard as gutta percha, therefore brushes of the softest kind must be employed, otherwise the surface will be roughened and the work will have to be done over again.

The composition itself consists of 12 parts of white wax, 4 parts of asphalt, 4 parts of stearin, and 4 parts of tallow These ingredients are melted together in the following order: 1. Asphalt, as possessing the highest melting point; 2. wax; 3. stearin, and, finally, tallow. When the whole forms a homogeneous liquid, enough soot is stirred into it, to impart to it a fine black color. In order to give to the mass more body and also to prevent its adhesion to the original, some plaster of Paris is mixed with it.

Molds of this composition may not only be taken from medals, dies, and engraved plates, but also from plaster casts. In this case the latter are previously immersed in tepid water until thoroughly soaked, which will have taken place when the generation of air bubbles has ceased. But another method may also be adopted. The plaster cast may be kept immersed in glue water, until, when withdrawn, a drop of glue water will not remain upon the surface. The original is in this case to be greased before cast, and if the glue water has been applied with a brush, which may likewise be done, the model ought to be allowed to dry. Substitutes for glue water are solutions of gum arabic and isinglass.

When the copper deposit has been removed from the mold the latter may be used anew, and in case it should ultimately become too brittle by use, it is only necessary to stir a small portion of tallow or yellow wax into the previously liquefied composition.

For small objects, as for coins and medals, a simple mixture of wax and stearin has proved to work perfectly well, but for objects of several inches diameter, such a composition would be useless because the contraction which it undergoes is so great as invariably to produce fissures upon its face. Mr. Kress, whose very valuable treatise we would like to see translated into English, furthermore states, that, although all the known and recommended compositions for electrotyping were subjected by him to trial, he had not met with any which answered all purposes so well as the one described.

Covering for Tents.

The best and lightest material for covering a tent is a thin india-rubber coated fabric, sold by all dealers in india-rubber. It is very light, and quite impervious to both rain and light. Black twilled calico, coated with boiled linseed oil, will form a rain tight cover. Cloth may be rendered waterproof in a variety of ways; for example, brushing it over on the wrong side with a solution of gelatin, followed when dry by an application of an infusion of nut galls. If one is not afraid of an unpleasant smell (of short duration), make a varnish of india-rubber dissolved in bisulphide of carbon, and apply it to the cloth.

Pipe clay rubbed on the hands will remove the unpleasant ordor caused by the use of chloride of lime and salts.

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Contents:

(Illustrated articles are marked with an asterisk.)

THE NEW ADMINISTRATION.

The inauguration of President Grant marks a turning point in the history and policy of the Government, and the people have abundant reason to feel confident that the new administration will speedily commence reforms which shall not end until the public service is purified of those corruptions and villainies which disgraced the last administration.

The appointment of Alex. T. Stewart, of this city, to the responsible office of Secretary of the Treasury means business. The most successful merchant of his time—his vast wealth places him beyond the possibility of temptation, and if he had no higher motive to guide his action, Mr. Stewart's social position and wealth are sufficient guarantees that he will endeavor to administer the affairs of the Treasury in an honest and economical manner. The revenue service, at the present moment, is filled with a set of sharks who are cheating the Government and robbing the people of their hard-earned substance.

We undertake to say, that, if Secretary Stewart takes as good care of the public treasury as he does of his own private affairs, he can save $50,000,000 every year, and to that extent lighten the burdens of the tax payers. Secretary Stewart cannot afford to do wrong—he has every incentive to do right and to give us a class of honest men in positions now held by swindlers and thieves. We venture the prediction that the business of the Treasury Department will be very much improved in its character and efficiency.

The appointment of Ex-Governor Cox, of Ohio, to the position of Secretary of the Interior, is eminently a good one. Under his administration, we shall expect to have no more Dempsey & O'Toole contracts in the Patent Office; and we cherish the belief that the new Secretary will give earnest consideration to the pressing affairs of that bureau.

The service of the Patent Office is now inadequate to the demands of inventors. Some of the employés are notoriously inefficient, and ought to be removed; and the Commissioner needs to have his hands strengthened by an energetic and able corps of examiners. There is work enough for all the new Secretaries to do, and President Grant has shown his practical good sense in selecting men who are untrammeled by strict party rules; in other words, while they are pronounced adherents to the political creed of the successful party, they come to their new duties pledged to no class of greedy spoilseekers, but are free to do honest, fearless work for the country, irrespective of partisan selfishness. The politicians, it is said, growl; but the people, who make parties, are heartily sick of the corrupt rings which, for four years, have made our public service a scandal to the nation. We go for solid reforms, and for an honest collection and application of the public revenues.

THE SUM OF ALL THE MOTIONS IN THE UNIVERSE.

Motion is a constant quantity; "The sum of all the motions in the universe is always the same." This sentence placed at the foot of a column in a recent issue of our paper, has attracted the attention of a correspondent, who, while admitting its truth, says he finds it "hard to solve all the perplexing problems that grow out of such an admission. For instance, suppose a terrible conflagration to take place at midnight. Thousands of persons awake from sleep and rush to the fire. Where so many are rushing, in what form would that motion have been manifested, if there had been no fire and the people had remained in bed?"

The doctrine of the perpetuity and indestructibility of motion involves the truth that all motions originate, or are increased by subtractions from other pre-existing motions, or cease, or become diminished, only by imparting motion.

The difficulty in accounting for the origin of a new motion, arises chiefly from not clearly comprehending the distinction between mass motion and molecular motion. In the motion of a mass, the relative position of its geometrical center is constantly changed. Molecular motion may exist in a body without any relative change in the position of its geometrical center. When mass motion suddenly appears, without being immediately caused by other mass motion, it results from the immediate conversion of molecular motion.

Of all the molecular motions heat is the one most concerned in the direct production of mass motion. The case suggested by our correspondent, of people suddenly aroused from sleep into action, is analogous to that of a locomotive standing in a depot with steam up, and then suddenly, by the simple act of the engineer, expending the power confined in the boiler in the propulsion of itself and its load. All the motion that it and the train it draws possess after starting, existed previously in the form of heat in the furnace and boiler, and molecular motions of the coal in the tender and oxygen in the atmosphere, which, when chemical combination (combustion) takes place between these elements, are converted into heat, which in its turn is converted into mass motion.

Men and animals are locomotives. Their food is the fuel which drives them; their wills are the engineers which control them. The fuel (food), which is put into their furnaces (stomachs), is however applied to two purposes. Part is expended in warming the machine and part is stored up in the various tissues of the body, to be consumed either for warmth or motion, as occasion may require. But because it is thus stored up, it must not be inferred that motion does not exist in it. It may or may not possess mass motion, according to the state of action or repose in which the animal chances to be; but in all cases where mass motion of a living body exists, as an act of the will, consumption of tissue also takes place, that is, a change of molecular motion into mass motion. After the crowd have rushed to the fire and rushed back again, their aggregate weight will have been considerably reduced, and they will find it necessary to "coal up" next morning at breakfast to make up for the loss.

Thus we see that in the case cited there is no difficulty in referring the mass motion, suddenly resulting from the interposition of will, to previously existing molecular motion. In all other cases, although in some the connection between a mass motion and pre-existent molecular motions may be difficult to trace, there can be no reasonable doubt of its existence; and in the light of modern science it is certain that the sum of all the motions in the universe is a constant quantity.

SOLUTION.

Every one is familiar with the phenomenon of solution, but few except scientific men really know what a remarkable thing it is. We toss a handful of common salt into some water; in a little while it has entirely disappeared. So far as our sight can determine it has ceased to exist. We can still detect its presence by taste, and by its effects upon other bodies, but until, by the aid of heat or some chemical reagent, we wrench it from the strong grasp of its transparent menstrum we cease to see it.

So alcohol absorbs into itself camphor, and other gums or oils, and retains them. Add a little water to these solutions and you will immediately see the dissolved substances reappear like spectres, to again vanish upon the addition of more alcohol.

The analytical chemist knows well how to make such appearances and disappearances answer his inquiries, both as to quality and quantity, of any substance contained in a given mass which he examines. In fact the department of substances in solutions in the presence of certain reagents forms the basis of one method of analysis.

One of the most conspicuous characteristics of a solution is transparency. This is a test as to whether a solid contained in a fluid is perfectly dissolved. Very concentrated solutions may intercept to a great degree the transmission of light molasses is an example; but if the solution be perfect, thin layers will prove to be transparent. Any opacity or cloudiness is an index that either solid or vesicular matter is present. Solid substances when dissolved are changed into fluids. What is the agent by which the intense cohesion existing between the atoms of the most solid bodies can be so overcome? To this question science has, we think, yet given no satisfactory answer.

The only means known to us other than solution by which solid bodies can be made fluid is heat. It is a well ascertained fact that heat and cohesion are opposing forces, but in the phenomenon of solution sensible heat does not appear except in such quantity as may be accounted for by the increased density of the entire mass of the solvent and the substance dissolved. In cases where solids placed in contact become liquefied we have decrease of temperature and absorption of heat; an example of this kind of action is the liquefaction of mixed ice and salt.

The books account for the phenomenon of solution by classing it among the manifestations of adhesive force. Cohesion is the attraction existing between molecules of the same kind at insensible distances; adhesion is the attraction existing between molecules of *different* kinds at insensible distances. A very slight consideration of the nature of these attractive forces, and their effects upon the condition of material bodies, will show that solution involves something more than disruption of the particles of a solid by the superior adhesive force of a liquid.

A solid body is *solid* by virtue of the great cohesive force by which its particles are held together. When cohesive attraction is nearly or quite in equilibrium with repulsive molecular force, bodies assume the liquid form. Liquids may therefore be considered as practically without cohesive attraction, that attraction being neutralized by repulsion. Suppose now the cohesive force in a solid body to be represented by 4, the superior adhesive attraction of some liquid for that solid to be 6, and the cohesive force in the liquid as neutralized by the repulsive force to be nothing. What ought to take place upon the immersion of the solid into the liquid as the result of cohesion and adhesion? The particles of the liquid adjacent to the solid ought to adhere to the solid so strongly that they could not be removed by an external force without rupturing the solid. If either body be acted upon by an external force, the rupture ought to take place in that body having the least cohesive power, *i. e.*, the liquid. A stick thrust into treacle is a good illustration of this action. When the stick is withdrawn it carries a portion of the treacle with it; the stick is not broken nor any of its particles removed.

But it may be said in this case the cohesive force acting between the particles of the wood is greater than the adhesive force of the treacle. Let us then suppose the adhesion of the treacle to the wood to be so powerful that the treacle can not be removed from the stick except by scraping down into the body of the wood itself. If solution depends solely upon the fact that adhesion in the liquid is greater that cohesion in the solid, the stick ought in this case to dissolve. But in order that a substance may dissolve, its particles must not only be seized upon by the particles of the solvent but conveyed away from their position in the solid to new positions in the liquid. We submit that adhesion accounts sufficiently for the seizure but it does not account for the convection. Standing in a boat by the side of a wharf, a man may clutch a timber attached to the wharf with great force; he may, however, tug in vain to remove it, so long as the want of cohesion in the water upon which his boat is floating affords a resistance less than that which holds the timber to its place.

There must be some other principle involved in this matter. Something perhaps analogous to electrical attraction and repulsion, at least some force acting independently of adhesion which overcomes the cohesion of the solid.

DROWSINESS AND REMEDIES FOR IT.

A correspondent writes us that the excellent article on "Wakefulness," recently published in the SCIENTIFIC AMERICAN, does not meet his case, which he states is a common one with laboring men. His affliction is drowsiness. He says within the narrow circle of his acquaintance there are not less than three-fourths who are afflicted in the same way. This affection is a standing obstacle in the way of self-improvement; and our correspondent complains that his own acquisitions have been greatly limited on account of it, and desires to know what may be done to remedy the evil.

We are well aware that drowsiness is a much more common complaint than wakefulness, and, in general, it is one, which, owing to the difficulty of inducing people to renounce long established habits, is hard to cure.

The phenomenon of sleep is yet enveloped in profound mystery. Volumes have been written upon it; numberless experiments have been performed; and after all we know nothing whatever of its true character. Experiment has taught us, however, that drugs produce it when taken into the stomach, or otherwise conveyed into the system; that certain habits produce a greater desire for it than is natural; and that the will has power to resist its demands to a limited extent.

The causes of sleep are then either natural, or unnatural, and the phenomenon is correspondingly morbid or healthy. The natural and healthy sleep, consequent upon exhaustion, can never be interfered with without greater or less damage to the general health in each instance. Unnatural drowsiness generally results from some error in the habits of living, or it is a constitutional defect. The latter is difficult to cure, but the majority of cases are not constitutional affections, and they are curable.

Many cases of supposed abnormal drowsiness, are not abnormal at all. People who work hard all day, or who have been exposed to cold winds, are apt to feel sleepy when they find themselves comfortably housed in the evening, especially if they have indulged in a *hearty supper*. All these causes naturally induce sleep, and when the tendency to sleep is powerful it ought not to be resisted. Many will find the disposition to sleep postponed for several hours, by the substitution of a very light meal for the hearty one which is often taken at the close of the day's work. Others will find that this does not avail them, and that notwithstanding their abstemiousness, the drowsy god still asserts his sway. These people will have to submit, and either doze in their easy chairs or go to bed; but they need not on that account be deprived of time for study. They will almost invariably find that they can rise two or three hours earlier than other people, without inconvenience, and they will further find that their three morning hours *before breakfast* are as good as four in the evening *after supper* would be if they could keep awake and study. They may, at first, find some difficulty in waking at the proper time; an alarm clock will overcome that. They should not, at first, apply themselves to reading or study in these reclaimed morning hours, but should engage in some active occupation until the habit of thoroughly waking is established, after which in the majority of cases no inconvenience will be experienced.

A feeling of drowsiness after eating is perfectly natural and healthy, but it is easy to see that over-eating might so intensify the feeling as to render it nearly impossible to resist it. Those troubled with this complaint, ought then to carefully avoid over-eating at any time, and particularly so before any period during which they desire to keep awake.

In this, as in all other complaints, an ounce of prevention is worth a pound of cure. It will, we think, be rare that drowsiness will occur if perfectly regular hours for sleeping are observed; unless it is induced by a plethoric condition, consequent upon high living, or a constitutional habit. Nevertheless, there are some simple remedies. One of the best is to wet the head suddenly and thoroughly with cold water. The shock will generally suffice to throw off the sleepy feeling. Strong tea or coffee will often aid in preventing drowsiness, but these are only temporay helps. A radical cure can only be attained by the correction of the habits, whatever they may be, that induce it. Temperance in *eating* as well as in drinking, regular hours, avoidance of too exhausting labor, must be observed. We do not advocate the use of drugs for this complaint. Each person so afflicted ought to make a thorough examination of his habits of living, and in most cases he will find the stomach to be the offending organ.

EDUCATION OF IDIOTS.

With all our advancement in science the question "What is mind?" still remains unanswered, and will probably remain unanswered till the end of time. Like the question "What is force?" it seems beyond the reach of human intelligence. We know something of its manifestations, and a little—very little—of the laws which govern them; that is all. One primary fact is sure; viz., the increase of its powers by exercise. We have also found by experience that certain methods of training are more successful than others, and that a certain order in the presentation of ideas is desirable. The reasons for differences in mental power wholly elude us. We observe that, in general, extraordinary mental deficiencies are accompanied by marked bodily defects; but whether the latter are the cause or the effect of the former, we are totally unable to decide.

Elaborate treatises have been written upon mental philosophy. Physiologists have struggled for ages with this question, and nothing but hypothesis has been the result of their labors.

The present age has, among its other achievements, demonstrated the fact that many of those formerly considered hopelessly imbecile, are capable of considerable mental development. It needs no argument to convince those familiar with the trials imposed upon parents by the idiocy of a child, that anything which can render these unfortunates capable of even measurably caring for themselves, is worthy of careful attention.

It has been reckoned that between thirty and forty per cent of genuine idiots are capable of being educated to some extent. Not unfrequently some particular faculty is developed in a high degree. The writer of this article once knew an idiot, who, although singularly deficient in most mental qualifications, had that of construction very highly developed. He could never lay out or plan work, but he could execute with great precision, and was of much assistance to his father, who was a carpenter. This lad (lad only in appearance, at the time we saw him he was 25 years old) would cut a hole in a plank with a compass-saw nearly as round as it could be described with the compasses. He delighted in work, and was always ready to go to bed as soon as he had eaten his supper.

We might mention many other instances, both from hearsay and observation, showing that the minds of idiots frequently possess some faculty or faculties as fully developed, or nearly so, as others more richly endowed by nature. One of the most remarkable cases, and one with which the public is already familiar, is that of Blind Tom, the negro boy pianist.

Quite a number of schools and asylums for idiots, are now in successful operation in Europe and America. One of the prominent facts brought to notice in the results of these institutions, is that the majority of imbecile children capable of any improvement at all, may be taught to do and delight in doing simple kinds of labor. As most idiots are meager in stature and of weak constitution, such exercise improves their bodily health, which, of course, reacts favorably upon their mental condition.

The qualifications of patience, insight into individual character, and adaptability to mental peculiarities, are even more requisite in teaching these weak minds, than those of ordinary children. Indeed, it has been asserted by many heads of institutions like those mentioned above, that their greatest difficulty has been to find good teachers. It is thought by some, that almost any person capable of teaching average intellects, ought to be competent to teach inferior ones, but such is not the case.

We look with great interest upon the humane efforts now making to ameliorate the condition of imbecility; and we have no doubt much that will be valuable to mental science may be obtained by the study of the means by which light is made to dawn on the clouded minds of imbeciles.

PROTECTION CONSIDERED AS A CONSERVATIVE ELEMENT IN NATIONAL AFFAIRS.

No better illustration of our proposition, made in a recent article, that it is unwise for a nation to depend upon foreign sources for any commodity which is a national want, when that want can be supplied by home production, could be furnished than the present rise in the price of sugar consequent upon the Cuban insurrection. A very much larger proportion of the sugar used in the United States has hitherto come from Cuba than from all other sources put together.

The rapid rise in this commodity, shows how thoroughly commercial men understand the effect upon the market, sure to occur upon a total or partial interference with the successful harvest of the sugar crop in the (so far as size is concerned) insignificant area upon which we have become so abjectly dependent for one of our most important articles of diet.

The inconvenience and rise in price which is certain to take place, should the apprehensions of a diminished crop be realized, will in this instance more than counterbalance the burden of twenty years' protective duty, to those not engaged in the production of sugar, to say nothing of the value of such protection to all engaged in that industry.

The deprivation of accustomed comforts—necessities, for comforts are necessities to people of the present age—engenders discontent among the masses, and thus becomes a disruptive force. Citizens demand of Government that it shall secure to them the privilege of living comfortably as well as safely, and they are discontented, and reasonably so, with a government that fails in this respect. Deprive the mass of American citizens of shoes and compel them to go barefoot, by want of proper foresight on the part of the Government, and such an important mistake would produce a murmuring that would shake its foundations.

A protection to home industry, which will make our nation as far as possible independent of others for any important product, is, then, a conservative power. Though it increases the price of particular manufactured commodities, it hightens the price of agricultural products also by its indirect effect upon all collateral branches of industry.

We do not in these views disregard the claims of commerce for protection, in our zeal for the manufacturing interests of the country, but we do believe that if the interests of any class of people have a prior right for consideration, they are those of the hard-toiling producing class. All we want of commerce is to bring us those things which we cannot produce, and those things which it is not easy to produce in our own land. We can easily produce iron, cotton goods, woolens, sugar, etc., in quantity ample to meet our requirements. It is such industries that we believe it the duty and the wise policy of the Government to protect.

CONNECTION ON ENGLISH RAILWAY TRAINS.

The great trouble now, and the great trouble for years past, that has bothered English railway managers, is the insolvable problem how to enable a passenger to communicate with the "guard," or conductor, and the guard to communicate with the "driver," or engineer. Probably more time in inventions and tests, at which Col. this and Capt. that, and Hon. Mr. Blank, M. P., and Sir Toodles, K. C. B., assisted, has been spent in the repeated attempts to solve this terrible problem—to cross this modern *pons asinorum*—than has been expended by all our improvers of steam engines, agricultural machines, and velocipedes; and these may be counted by the hundreds. Still the railway murders, and ravishments, and assaults, and insults go on, and the passengers are still locked in their cushioned and upholstered cells, subject to the exploitering pleasure of any well-dressed and purse-competent villain.

Some of the ingenious arrangements for establishing communication between the victims of Müllers and Booths and the guard (what a misnomer!) are sufficiently ridiculous to excite a laugh, was not the subject one too mortally serious. The passenger, in peril of his life, or throttled by garotters, has only, in one case, to smash a pane of glass and turn a handle, previously defended by that glass screen, when he will show a signal that *may* be seen by the driver or guard if either happen to be looking back over the train. As it is the constant custom for the driver (engineer) to be always looking back over the top of the cars, and the guard (conductor) in his van is continually doing the same thing, it is evident that the after telegraphic communication between the two could be established within less than an hour, and, better still, the railway officials would be able to ascertain in what compartment the audacious breaking of the protective glass was done, and possibly fix the act on the impertinent and presumptuous victim of English fashionable railway assault.

Semaphore signals worked by similar means, electric signals and alarms, ringing a bell or waving a flag, and flexible air tubes extending the length of a train, and operated by the compression of air, and other similarly ingenious (?) contrivances have been tested, but as hitherto without success. Not entirely so, however; for recently at a trial of the atmospheric "kudingus" a Col. somebody, stationed on the "foot-plate" of the locomotive *for the purpose*, really recognized the signal and informed the engineer. It was highly successful.

Seriously, this nonsense is pitiable—shameful. But, there may be some reason after all for it. One of our exchanges gives a probable solution of what might be otherwise incomprehensible to our minds. The Hartford *Post* says:

The manners of our English cousins don't seem to be as refined as they might be, indeed many of them would fare hard if tried on a charge of rudeness and boorishness. The English railway companies steadily resist all efforts for the adoption of the American mode of communication, by a cord, between the different portions of passenger trains and the locomotive, on the ground that the trains would be liable to constant stoppage by young gentlemen "on a lark" or by other mischievous people. It is said to be useless to tell the railway officials that in America trains are never stopped in this manner, and that there is no good reason for supposing the British traveling public worse than the Americans. They know their countrymen too well. It does really seem as though there is something exceptionally rude, to say the least, in the average Briton and there seems to be a natural proclivity to wanton mischief even among the educated classes. Two illustrations of this are recently reported: Two persons described as "gentlemen," lately amused themselves on the way from London to Dover, with tearing up the cushions and carpetings of the railway carriage; and another, likewise dignified with the title of "gentleman," was fined five shillings at Dewsbury for singing "If I had a donkey," in a church, while a funeral service was going on. Both of which instances are cheerful evidences of refinement and gentlemanliness. We know better than that even in this "dom blarsted country."

Another instance of rudeness not mentioned by the above writer lately occurred in Dresden. An elderly English gentleman persisted in pounding with his cane on the floor of the chapel, whenever the chaplain undertook to pray for the President of the United States. He was very devout and docile when Queen Victoria and other members of the royal family were mentioned, but became violent the moment an attempt was made to remember our Chief Magistrate. A Frenchman would have recognized the propriety of such a prayer, but an Englishman "could not see it."

SCENTING, DEODORIZING, AND VENTILATING.

The sense of smell is one of the most important of the warders on the walls of health's citadel. When alert it is unfailing and reliable in its warnings, but it may be drugged or stupefied by the insidious foe if too often allowed to hold a parley. To drop metaphor, the sense of smell is as useful as a guardian of health as it is as a contributor to pleasure. As a rule, any atmosphere that is offensive to the olfactory nerve is detrimental to health. The effluvia from decaying animal or vegetable substances is instinctively shunned by the human race, unless the demands of business or duty have proved strong enough to silence the monitor. There are those, however, who seem but little affected by villainous smells, and some who by accustoming themselves to such offences come to disregard them; yet it would be difficult to find one possessing the sense of smell in any degree who could stand unmoved the assaults of sulphureted hydrogen. Others there are who are injuriously affected by scents which yield a positive pleasure to most. Some sicken at the smell of musk; some faint at the aroma of cheese; others turn with disgust from the pungent onion, the succulent cabbage, or the fragrant lemon. To these, where the instinct is natural and not an affectation, there can be no doubt that these scents are really harmful.

The bodies of all animals have a scent peculiar to their kind. The healthful scent of the cow is associated in the mind of many a country-bred resident of the city with the labors and pleasures of the farm. The scent of the horse is not unpleasant, the cat and the dog have each their own peculiar aroma. To go further, it is more than conjecture that each individual of the human race gives out his own atmosphere else how can the dog, the horse, the cat distinguish, by smell alone, the person of his master or mistress? The dog will track his master through traveled roads by the sense of smell. In some individuals this personal atmosphere, more pungent than pleasant, surrounds them with an acrid flavor, despite frequent bathings and great care in cleanliness. This misfortune is more general than may be supposed, and after cleanliness there is no remedy but a neutralizing agent in the form of an odor, pungent and powerful, or soft and suggestive as the case may demand. And here we may say that strong odors of any one element, or any one kind rather, are to be shunned as possibly being more offensive to those with whom we come in contact than the annoyance they are designed to remedy. A judicious mingling of differing odors blending into one perfume is the most agreeable boquet for the handker chief, gloves, or hair.

The utility of scents is, however, noted more strongly in the sick room. Here perfumes that would be most agreeable and refreshing in health are positively unpleasant and injurious in sickness. He who is ill cares little for the scent of musk, cologne, or even of flowers. These are for the convalescent. What he desires is pure air; the life-giving oxygen. But at times it is impossible to purify the sick room of its offensive and unhealthy odors by the comparatively slow process of ventilation, without danger to the invalid. Then resort must be had to some powerful deodorizer that will act at once. Latterly, carbolic acid has been strongly recommended for "killing" the offense of human excretæ and the other offenses of the sick room; but to many persons the odor of this acid is very unpleasant. It gives an idea of cleanliness, to be sure, an idea born of our consciousness of the fact; but the sense of smell instinctively revolts at it. Burning sugar is objectionable for the same reason, and it loads the atmosphere of the the room with a bitter, acrid property, trying to weak lungs and the throat. On the contrary, the scent of boiling sirup, as in "sugaring off" in the manufacture, and the sweetness in the shop of the candy maker are pleasant and healthy.

Probably no means of deodorizing, quickly, and not offensively, the atmosphere of a sick room equals that of roasting coffee. The agreeable aroma thus thrown off is due, undoubtedly, to the essential oil in the berry and not to the element known as caffein. The best method of using it is to pound up or grind the unroasted berry and sprinkle a few grains on a hot shovel or pan. If the raw material is not obtainable, the roasted material will do, treated in the same manner.

But, after all, ventilation is the proper means of affording the invalid and his attendants the comfort of pure air; but where these scenting and deodorizing agents must be employed, no opportunity to change the loaded and vitiated atmosphere of the room for God's life-bearing and health-giving air should be neglected.

PERIODICAL SCIENTIFIC PUBLICATIONS.

The periodical literature of the period may be divided into four classes. The first may be said to include those papers—chiefly dailies—which make the publication of news, upon any and all subjects, their prime object.

A second class including a large number of weekly papers, and all the purely literary monthlies either make news subordinate, or omit all mention of facts as they occur, unless they can be made the text for some discussion, or otherwise subserve some general literary purpose; general literature being the scope of this class of publications. A third class includes those papers and magazines devoted to some specific object, to the advancement of whose interests, and the collation of news specially bearing upon it, their entire space is allotted. A fourth class comprises those devoted partially or exclusively to scientific literature, and to scientific news. It is of the latter class, we propose to speak in the present article, confining ourselves to those published in America.

The sole claim any publication can make that can entitle it to public favor is, that it *educates* its readers. If it does not accomplish this it is a failure, unworthy of public patronage. Whatever its scope may be, whether scientific, purely literary, or amusing, it should still educate, or it is worthless. More than this it should educate in the right way, or it is mental poison. The scientific press of the country claim more than any other department to instruct the masses, and the demand for popular scientific instruction is largely increasing in this country. Our own paper, which is the oldest of its kind published in the United States, has without doubt been largely instrumental in developing the present popular taste for scientific information, and its success is an evidence that it has supplied satisfactorily the public demand in this regard.

The *Journal of the Franklin Institute*, the oldest monthly scientific periodical in this country, and *Silliman's American Journal of Science*, the oldest quarterly scientific periodical, respectively fill places in American scientific literature which is occupied by no other. The SCIENTIFIC AMERICAN also fills another and distinct place, and notwithstanding the many attempts which have been made, and are making, to compete with it, its progress is steady, and its circulation larger than at any former period of its history.

The more recent publications devoted to scientific and industrial matters are the *American Builder*, Chicago; *Sloan's Architectural Review*, Philadelphia; *Journal of Chemistry* Boston; *Industrial American*, *Manufacturer and Builder*, *American Artisan*, *Inventors' and Manufacturers' Gazette*, New York; and Van Nostrand's *Eclectic Magazine*—a monthly which consists of articles copied from the current scientific literature of this country and Europe. The two numbers of this monthly already issued are well supplied, and the articles generally are selected with considerable care. We are happy to record a growing interest on the part of our people for a greater knowledge of scientific subjects.

A Mechanical Whale.

The ingenuity of man often manifests itself in curious shapes, a recent instance of which was brought to light in one of our city courts. It appears that a German, by the name of Gebhard, was employed by one of his countrymen to construct a whale, to be exhibited as a veritable monster at his "natatorium," or swimming tank, at the foot of Sixty-sixth street, on the East river. Gebhard set to work, and applied all his inventive and mechanical skill to produce a whale rivaling in appearance the famous creature which swallowed up Jonah.

A nice mechanical contrivance was introduced inside the whale, whereby it might be "vivified" and made to enact the part of the genuine thing. Gebhard then placed flaming advertisements in the newspapers, announcing himself as an eminent doctor and traveler who had just arrived from the Pacific ocean, where he had captured a monster whale, which would be exhibited on such a day at his "natatorium." This advertisement drew a large crowd of persons to the place designated on the day set down for the exhibition. But the amazement and delight of the people, who had paid to see the sight, were destined to be of short duration; for on the return of the whale to the "natatorium" one or two parties, who had secreted themselves for the purpose, saw four modern Jonahs emerge from his capacious belly, and a further inspection revealed the fact that the whole operations of his whaleship in the water had been managed by machinery. The nonplussed Gebhard had to beat a speedy retreat, or he would have received rough treatment at the hands of the incensed crowd, who vented their chagrin on the now inanimate whale, and almost tore it to pieces.

The party who employed Gebhard's skill, brought suit against him to recover sixty-seven dollars, the amount paid for constructing the animal, and, strange to say, the judge encouraged the swindle by giving judgment to the plaintiff.

Carbon Printing by a Single Transfer.

Some months ago M. Soulier submitted to the French Photographic Society numerous proofs (some of which were of very large dimensions) obtained by the carbon process. These proofs were on very thin but tough films, which remained perfectly flat during the development of the image, and could afterwards be applied to the cardboard with great exactness. There is no occasion to transfer the proof twice, as in Swan's process. M. Soulier operates as follows: He spreads on glass a very thin collodion; when this has been effected he covers it with a very thin layer of gelatin which is afterward rendered insoluble. On these two layers adhering together, he spreads, lastly, the sensitive mixture in which the image should afterward appear. After desiccation the film is easily detached from the glass and is sufficiently rigid to be handled. The exposure is made in the usual way as in Swan's process, and the washings are proceeded with afterward in the ordinary manner. When this is done nothing further remains but to paste the pellicule on the cardboard. M. Soulier showed by numerous specimens what could be achieved by this process, which is very economical and very quick. With the chromatized gelatin are mixed lampblack, carmine, sepia, purple, etc.

Editorial Summary.

AN INDIGNANT INVENTOR.—Andrew Whitely has issued a printed memorial to Congress wherein he pitches into Secretary Browning, Commissioner Foote, and Chief Examiner Hodges, because they refuse to execute the decree of a court which ordered certain patents to issue to said Whitely. In his memorial, he twits the Honorable Andrew Johnson of "being politically dead," "a rebel and a knave," and then goes on to compliment President Grant, and calls upon him to name a fit man for the Commissionership of Patents, and also "to name three men fit to take the place of the present unfit Board of Examiners-in-Chief. He also wants Congress to enact a law to send to the penitentiary officials of the Patent Office who refuse to execute the decision of the judge. This is a good suggestion. For some reason Mr. Whitely has had a good deal of trouble in getting his patents issued to suit his views, and, if we mistake not, this is not the first manifesto that he has put forth on the subject. It appears to us that if the Commissioner refuses to execute the decrees of the courts, the shortest and best way is to have him arrested and brought up for "contempt of court," and compel him to behave in a legal manner. We are not now speaking of the merits of the case, but desire simply to point out to Mr. Whitely a simple remedy, the choice of which may save him the trouble and expense of printing sensation pamphlets.

REFINING OF ALLOYED GOLD.—Certain kinds of gold, especially from Australia, are alloyed with antimony, by which they are rendered brittle and unfit for use in many practical applications. One method of removing this ingredient has been to melt the gold with oxide of copper, which converted the antimony into a volatile oxide, but left the gold alloyed with copper, which has to be removed by a subsequent operation. Another method consisted in melting the gold with corrosive sublimate, by means of which both antimony and mercury were driven off as volatile chlorides, involving, however, serious loss of mercury. A new and much improved plan has finally been adopted in Australia, applicable to the purification of gold from silver and the baser metals, and which consists in passing a stream of chlorine gas through the melted metal for an hour or two, and after allowing the gold to harden, the still liquid chlorides are poured off. A subsequent operation recovers the silver and every remaining proportion of gold.

LARGE PUMPS.—The *Colliery Guardian* notices some centrifugal pumps just completed at the Hammersmith Iron Works, England, which are the largest ever made. Each is intended to lift 250 tuns, or upwards of 50,000 gallons of water per minute, to the height of six feet. The revolving disk, or "fan," is 4 feet 6 inches in diameter, and its width at the periphery 8½ inches. The suction and delivery pipes are 3 feet 6 inches in diameter. The whole hight of each pump is 11 feet 6 inches, and its length 9 feet, while the extreme width in the direction of the main spindle, is 8 feet 6 inches. The spindles are of Bessemer steel, 6 inches in diameter through the disk. The weight of the disk is 18 cwt., of the spindle 16 cwt., and of each side casing 2 tuns 13 cwt., the whole weight of each pump being 7 tuns.

SHEEP multiply so prodigiously in Australia, that the boiling down of the animals merely for the extraction of the tallow, has grown into a business of huge proportions. Four hundred sheep are cut to pieces, and thrown into a big boiler, steam from another boiler is turned on, and soon the carcasses are reduced to a pulp; the tallow rises to the top, and is drawn off through large taps into barrels for export. The gravy and other juices, the remains of the meat, and the bones, which are so softened as to crumble easily in the hands, are given to pigs. Four thousand sheep are boiled down in a day.

THE New York Society of Practical Engineers recently spent a whole evening in discussing the feasibility of flying. The discussion was simply a rehash of all the absurd notions upon that subject, which have troubled the minds of enthusiasts for nearly a century. Not a single practical idea was suggested.

SHARP JUSTICE.—A man in England was recently fined for holding a rough political controversy in the cars, to the annoyance of three other passengers. The court considered the case a gross one, and inflicted a fine of £3 upon the offender. If we could get such a fine as this upon similar offenders here, it would pay a man well to go about picking up jobs.

A NEW illuminating material, recently patented in Germany, consists of a mixture of two parts of the poorest rape seed oil, and one part of good petroleum. It is burned in a lamp of peculiar construction, but somewhat similar to that of the ordinary moderator lamp, and gives a light not to be surpassed for purity and brilliancy.

A CEMENT said to possess many advantages, and to be especially adapted for sealing up vessels containing benzoles, etherial oils, etc., is prepared by rubbing up finely ground litharge with concentrated glycerin. The liquid cement is to be poured upon the cork or stopper, or it may be applied with a brush.

FOR a polish for mahogany cameras, take three ounces of white wax, half an ounce of castile soap, and one gill of turpentine. Shave the wax and soap very fine, and put the wax to the turpentine; let it stand twenty-four hours; then boil the soap in one gill of water, and add to it the wax and turpentine.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

In pegging boots by steam, twenty cases, or 240 pair of boots, are a usual day's work. One man in Hopkinton, Mass., has pegged eighty-three cases 1,992 boots, in two days. He once pegged forty-eight boots, twice round in fourteen minutes, and did one boot, in a trial of speed, in thirteen seconds.

The California papers state that the total amount of treasure exported during the year 1868 from San Francisco to New York and foreign countries was $35,444,395, a decrease of over $6,000,000 from 1867, and that the amount of merchandise exported was $22,000,243, showing an increase of about $500,000 over the previous year.

California exchanges state that the track of the Central Pacific Railroad was a week ago laid to a point 495½ miles east of Sacramento. The road is graded 100 miles west from the northern end of Salt Lake—and between these two points the gap is only 65 miles, 56 miles of which are graded. Forty to fifty days more will complete it.

In several of the mines in Cornwall, England, there are galleries which extend under the sea, where the sound of the waves is distinctly heard when the sea in a storm rolls boulders and pebbles over their roofs.

The little town of Lisbon, N. H., manufactures annually over 50,000 mackerel kits, 500,000 bobbins, 25,000 bushels of shoe pegs, and over 200 tuns of starch.

The large six driver engine recently put on the Boston, Hartford, and Erie Railroad will draw with ease one hundred loaded freight cars.

From 1804 to 1827, North Carolina furnished all the gold produced in the United States. The aggregate of all her gold yield up to 1866 is about $9,300,000.

The Pacific Railroad Company have commenced arrangements for a grand excursion from New York to California upon the completion of the road.

We have received some good specimens of okra paper made at the Chickasabogue Paper Mills, near Mobile, Alabama, recently noticed in our paper.

An English improvement in envelopes is to gum the under side, so that the tongue is not applied to anything but the paper in sealing.

It is contemplated to erect water works in Meriden, Conn., including six dams, which will cost nearly $200,000.

It is said that for every acre put in cotton last year in Tennessee two will be planted in 1869.

A very fine quality of glue has, it is said, been made from the eyes of fishes.

The twelve leading railway companies of Great Britain own 6,595 locomotives valued at over $80,000,000.

A line of four first-class steamships is proposed to run between Philadelphia and Bremen.

A starch manufactory in Massachusetts uses a thousand bushels of potatoes daily.

East Tennessee is experimenting in the culture of tea.

A plan for driving piles by gunpowder has been invented.

The Madison, N. H., lead mine is being worked with great success.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; beside, as sometimes happens, we may prefer to address correspondents by mail.

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 advertisemets at $1 00 a line, under the head of "Business and Personal."

☞ *All reference to back numbers should be by volume and page.*

O. I. C., of Ind.—The best and cheapest material for making concrete pavement with gravel is coal tar from the gas works.

J. K., of Boston.—A person has no right to construct a velocipede or any other machine for his own use, which would infringe on an existing patent.

J. W. R., of N. J.—A permanent magnet will gradually lose its power when the armature or keeper is removed from the poles. The circumstance you mention will not affect the action of this law.

C. Y., of N. Y.—You can easily make your name upon steel by the process called etching. Coat over the tools with a thin layer of wax or hard tallow, by first warming the steel and rubbing on the wax; warm until it flows, and then let it cool. When hard, mark your name through the wax with a graver and apply aquafortis (nitric acid); after a few moments, wash off the acid thoroughly with water, warm the metal enough to melt the wax and wipe it off with a soft rag. The letters will be found etched into the steel.

W. R. J., of Pa.—A perpetual motion as the term is understood in mechanics, is a machine that creates the force by which it is driven independently of any external cause. It must of course be able to start itself and remain in motion until its parts are worn out. Any machine that depends for its motive power upon any force derived from any external source as heat from coal, electricity from the corrosion of metals by chemical reagents, etc., is not a "perpetual motion." A body immersed in a fluid, subjected to pressure would require more power to move it than when the pressure is removed.

W. G., of N. Y.—A hollow tube in order to possess maximum strength must have its external and internal diameters in the proportion of 10 to 7. The external diameter of a bar being 5 inches, its internal diameter should be 7-10 of 5 equal to 3·5 inches. When this proportion is maintained the hollow bar has twice the strength of a solid one containing the same amount of material. The absolute strength of beams, geometrically similar in form, is as the squares of their corresponding dimensions. These data will enable you to solve the particular case you mention.

F. D., of La., wishes to know the composition and mode of manufacture of gold colored and violet colored inks. We have seen these and other colors lately displayed in store windows, and we are inclined to to the opinion that coal tar, or aniline colors are the coloring bases. We do not understand the manufacture. Perhaps some correspondent can give the information.

J. E., of Mass.—We were correct in our reply to B. M. R., of Va., that plumbago is a compound of carbon and iron. The purest ever yet discovered contains 98·55 per cent of carbon and about 1 per cent of iron, the remainder being made up of other impurities. Graphite or plumbago is formed or produced artificially in the slags of furnaces in the process of reducing iron ores. To your second question we reply that, when dissolved, common salt is muriate of soda, when dry it is chloride of sodium. This may seem paradoxical, but if we had room we could give you an explanation of its reactions under treatment which would be convincing.

J. R., of Ohio.—"Gas lime" is regarded as being a good and cheap fertilizer upon soils deficient in lime.

J. F., of Ind., asks how to temper blacksmith's anvils. We never imagined there was any peculiar difficulty in it. We have known of a "new laid," or new faced anvil, hardened simply by heating to the proper degree then immersed in a tank of cold water, face up, so that two or three inches of water were above the face, and a constant stream of cold water from a hose pipe kept playing over the face

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.

Wanted—an engine, 15 to 20-H. P. Also—2 cylinder boilers, about 30 in. diam., 25 to 30 ft. long. Address Adams & Bro., dealers in all kinds of Machinery, Salisbury, Md.

Mill privilege wanted, either in Pa. or Va., about 100-H. P., to buy or lease. A. W. Macdonald, Jr., Room B, 37 Park Row, New York.

Parties, wishing to invest in the best bean sheller and winower please address A. C. Sisson, Easton, Mass.

Manufacturers of the best velocipedes are using our patented rawhide axle washers. For circular and sample address Darrow Manufacturing Co., Bristol, Conn.

Builders of cotton-seed oil, cotton yarn, and Osnaburg weaving machinery address J. W. Bocage, Pine Bluff, Jefferson county, Ark.

Green lumber dried in two days. Also, tobacco, meal, and every substance,cheaply. Circulars free. H. G. Bulkley, 135 Fulton st.,New York.

"Steam."—You can get Broughton's lubricators and oil cups, which are the best, of John Ashcroft, 50 John st., New York.

Norris' improved steam gage. Steam-gage repairs promptly attended to. Small machinery built to order. Address R. H. Norris, engraver and model maker, Paterson, N. J.

The U. S. Clothes Ironer will iron clothes perfectly without heat. State rights for sale. Address J. Seaman, 257 State st., Chicago.

Manufacturers of elastic strings, cords, bands,etc., in the United State. Address D. Buckler, London Postoffice, Ontario.

Manufacturers of machines for making "Excelsior," address C. D. Gordon, Glen Beulah, Wis.

Patent right agents please address Box 230, New Britain, Conn., for description of valuable patent for sale on commission.

For portable grist mills and mill machinery, address J. T. Phillips, No. 13 Adams st., Brooklyn, N. Y.

For sale at a bargain—a complete barrel factory, nearly new. Address Hartmann, Laist & Co., Cincinnati, Ohio.

Peck's patent drop press. Milo Peck & Co., New Haven, Ct.

Diamonds or Carbon for mill-stone dressing, drilling, and all mechanical purposes. Also, Glaziers' Diamonds. See advertisement on another page.

Brick clay lands for sale. Apply 19 Cliff st., New York, Room 7.

Compound Lathe Chucks—Fairman's patent—The best in the market. Send for circular. Address Hutchinson & Laurence, 8 Dey st.

Inventors' and Manufacturers' Gazette—an illustrated journal of new inventions and manufactures. Cheapest paper in the world. $1 per year. Sample copies sent. Address Saltiel & Co., Postoffice box 448, or 37 Park Row, New York City.

Fine and complicated watches of every description repaired, etc., in all their branches, by H. F. Piaget, 119 Fulton st., N.Y. A practical workman and author of The Watch. All work warranted.

Pickering's Velocipede, 144 Greene st., New York.

For descriptive circular of the best grate bar in use, address Hutchinson & Laurence, No. 8 Dey st., New York. See Advertisement.

Two-set knitting mill for sale—See advertisement back page.

Glynn's anti-incrustator for steam boilers—the only reliable preventive. Causes no foaming, and does not attack the metals of the boiler. Liberal terms to Agents. Address M. A. Glynn & Co., 735 Broadway, New York.

W. J. T.—We think the patent asbestos roofing manufactured by H. W. Johns, of this city, is the best substitute for tin or slate. It is cheap and easily applied.

Inventors and patentees wishing to get small, light articles manufactured for them in German silver or brass, address Schofield Brothers, Plainville, Mass.

Tempered steel spiral springs. John Chatillon, 91 and 93 Cliff st., New York.

Two saw mills for sale. C. Bridgman, St. Cloud, Minn.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Punching and shearing machines. Doty Manufacturing Co., Janesville, Wis.

Specialties in the Machinists' line. Parties desiring work of a special character address S. W. Gardiner, 6 Alling st., Newark, N. J.

Responsible and practical engineers pronounce the Tupper Grate Bar the best in use. Send for a pamphlet. L. B. Tupper, 120 West st., N.Y.

Iron.—W. D. McGowan,iron broker,73 Water st., Pittsburgh,Pa.

N. C. Stiles' pat. punching and drop presses, Middletown, Ct.

Machinists, boiler makers, tinners, and workers of sheet metals read advertisement of Parker Brothers' Power Presses.

Winans' boiler powder, N. Y., removes and prevents incrustations without injury or foaming; 12 years in use. Beware of imitations.

The paper that meets the eye of all the leading manufacturers throughout the United States—The Boston Bulletin. $4 a year.

Recent American and Foreign Patents.

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

Electro-Magnetic Signal Telegraphs.—W. R. Smiley, New Lisbon, Ohio.—The nature of this invention relates to an apparatus for making telegraphic signals by means of electro-magnets, and embodies improvements upon the analogous instruments heretofore in use.

Scaffold.—Frederick App, Selin's Grove, Pa.—The object of this invention is to provide a scaffold for house painters and other persons employed n working on the walls of buildings.

Pruning Shears.—D. B. Seeley, Portland, Ill.—This invention relates to a new and improved implement for pruning plants, bushes, trees, etc.; and it consists of a stationary hook-shaped blade in connection with a sliding one.

Stench Trap and Overflow for Bowls, Closets, etc.—John McClosky, New York city.—This invention relates to a new and improved method for constructing the stench traps and overflows of wash bowls, sinks, water closets, etc.; whereby the same are more simple in their construction, and are more easily cleaned out and repaired, and more effectually prevent the rising of noxious and unpleasant gases.

Window Blind and Door Hinges.—L. R. Chapman, Grand Rapids, Mich. —This invention has for its object to furnish a neat, simple, convenient, and reliable self-adjusting hinge for doors, window blinds, etc., which shall be so constructed and arranged as to hold the blind or door securely locked when swung open, in such a way as not only to hold it securely, but also to prevent rattling.

Boat and Davit Tackle.—Capt. Edgar Wakeman, Brooklyn, Cal.—This invention has for its object to improve the construction of my improved boat and davit tackle, patented April 2, 1867, and numbered 63,585, so as to make it stronger, and more convenient, reliable, and effective.

Water Elevators.—W. G. Hamilton, Milton, Wis.—This invention has for its object to furnish an improved apparatus for raising water, which shall be simple and durable in construction, and convenient and effective in operation.

Wood-Bending Machine.—Robert Fitts, Jr., Fitchburg, Mass.—This invention has for its object to furnish an improved machine, designed especially for bending the frames of chair seats, but which shall be equally adapted for bending wood for other purposes, and which shall be so constructed and arranged as to apply the pressure to the timber to be bent gradually and progressively until it is brought into the desired form.

Hames Fastening.—William Fawcett, New York city.—This invention has for its object to furnish an improved hame fastening, designed more particularly for the hames of light harnesses, and which shall be so constructed as to hold the hames securely against side strain, and at the same time be easily and conveniently detached and attached.

Smiths' Bellows.—J. P. Hemmingsen, Marshalltown, Iowa.—This invention has for its object to improve the construction of the ordinary smiths' bellows, so that it may receive and retain a supply of air, to be given off gradually, to keep up a blast upon the fire to heat one piece of iron while the smith is working upon a piece previously heated, without the employment of a bellows blower being necessary.

Steam Engine.—Horace Bartine Martin, San Francisco, Cal.—This invention relates to a new oscillating steam engine, which consists of a two-ended cylinder, in which two pistons are arranged, they being connected on the outside by means of a yoke. Steam is alternately let into the cylinders so as to act upon one of the pistons, the cut-off being produced by the weight of the yoke, and the pistons connected therewith.

Shoe Knife.—G. W. Spencer, South Groveland, Mass.—This invention relates to improvements in shoe knives, such as are employed on machines for channeling the soles of boots and shoes; and consists in certain improvements in the knife holder, and the combination with the knife of a grooving instrument for forming a grove in the channel for the thread.

Plow Truck.—Joseph Clees, Darbyville, Ohio.—This invention relates to improvements in plow trucks, the object of which is to provide a simple and convenient arrangement for adjusting the same to vary the depth and width of the furrowing as may be required.

Fifth Wheel for Vehicles.—Henry Poth, Pittsburgh, Pa.—The object of this invention is to provide a more simple and durable fifth wheels for vehicles than was heretofore in use. It is designed more particularly for buggies or spring wagons, and is applicable to such vehicles when constructed either with a single or double reach.

Brick Machines.—Rembrandt Lockwood and Charles C.Schmitt,New York city.—This invention relates to improvements in brick machines, whereby it is designed by the employment of a sliding clay receiver, reciprocating molding apparatus, and delivering carrier arranged to receive the clay from the bottom of the mill, and carry it to the vertically reciprocating molding apparatus, where it is molded and delivered to the delivering carrying apparatus, which delivers the molded bricks from the mill, to provide an improved and simple apparatus for accomplishing the molding and pressing of bricks.

Apparatus for Loading Ice.—Peter F. Whitney, Saugerties, N. Y.—This invention relates to improvements in mechanism for receiving ice as it is shuted from the store houses, and delivering it into the holds of vessels. The object of which is to reduce the labor, and preserve the ice from breaking. It consists of a framing to be placed over the hatchway of a vessel, having a rotating drum, from which is suspended a carriage, which, when in the elevated position, forms the termination of a shute extending to the bulwarks or thereabouts of the vessel to receive the ice. The said carriage is lowered into the hold by the weight of the ice, under the restraining action of a friction brake, and is raised again by a weight.

Spark Extinguisher.—E. H. Garrigues, St. Louis, Mo.—This invention relates to a new and improved device for extinguishing sparks from chimneys and smoke stacks.

Match Safe.—Jesse E. Folk, Brooklyn, N. Y.—This invention relates to a new and useful improvement in boxes or safes for keeping lucifer matches whereby they are rendered much more convenient and useful than they have hitherto been, and it consists in forming on the top of the cover of such box or safe a receptacle for the stubs or waste ends of matches.

Process for Preparing Articles for Gilding and Plating.—G. J. Sturdy and Solomon W. Young, Providence, R. I.—This invention relates to a new and improved process for finishing, gilding, or plating various metallic articles, as hooks and eyes, buttons, eyelets, and all metallic articles of a similar nature.

Lubricator.—William McCully, Paterson, N. J.—This invention consists in providing a single cock, in combination with an oil reservoir and suitable oil passages,by which the oil, or other lubricating material, is distributed to each of the cylinders.

Newspaper File.—Michael Sullivan and John Reedy, New York city.—This invention relates to a new and improved "file" for the preservation of newspapers, unbound periodicals, sheet music, and all descriptions of papers, whether printed or written, which papers it is desired to preserve in order, or to keep on file before binding.

Horse Hay Rake.—G. M. L. McMillen, Dayton, Ohio.—This invention is a simple, cheap, convenient, and effective device for automatically locking down the teeth so as to hold them in contact with the ground while allowing them to be easily raised by the attendant when occasion may require.

Safety Lamp Burner.—John Pons, Baltimore, Md.—The object of this invention is to provide for public use a lamp so constructed and operating, that when, by being overturned, or from any other accident, the chimney shall drop off or cease to bear upon the cap, the flame of the lamp shall be automatically extinguished and all danger of explosion thereby avoided.

Tanners' Table.—Franklin C. Sexton, Shelbyville, Ind.—This invention relates to a new and useful improvement in apparatus used by tanners in dressing and coloring hides in the process of making leather.

Stacking.—Robert McLarn, Shirland, Pa.—The object of this invention is so to improve the process of thatching stacks of hay, grain, etc., that the labor can be more conveniently and expeditiously performed than heretofore, while the stack will be neat in appearance and will be well protected against the weather.

Safety Cattle Tie.—Charles P. Winslow, Westborough, Mass.—The obect of this invention is to provide means for releasing cattle, horses, or other animals which are tied in barns or stables, in case of fire, and thereby enabling them to escape.

Steam Engine.—Henry B. Verry, New York city.—This invention relates to a new and important improvement in steam engines, and consists in the arrangement of the valves and ports whereby the steam is exhausted from the same ports through which it entered the cylinder.

Carriage for Sawing Saddle Tree Stuff.—James H. Preston, Jefferson City, Mo.—The object of this invention is to facilitate the construction of saddle trees. Heretofore it was customary in the manufacture of saddle-trees to rive or split the billets of wood in order to give them the proper triangular cross section preparation, to working them down into "bars," "cantles," "heads," and "side trees," so-called, and other accessory parts of saddle trees that require to be beveled more or less. By means of this invention these enumerated parts may be sawed with the proper bevel or triangular cross section and a great saving thereby effected in time and material.

Lounge.—Francis Hayek, New York city.—The object of this invention is provide a lounge with an arm or foot support at its open end so that it may, if desired, be used like a sofa by two persons who can both support their arms. Such an attachment is also important, as it allows a convenient position on the foot end of the lounge, when on dark days it is desired to read on the lounge, whose foot end generally is nearer to a window than the head end. For reclining postures this attachment is also convenient as it forms a support for the feet.

Smoking Pipe and Cigar Holder.—August Tappe, Johnstown, N. Y.—The object of this invention is to provide a new attachment to the stems or mouthpieces of pipes and cigar holders, whereby the tobacco juice is prevented from entering the mouthpiece and from thereby injuring the health of the smoker. The invention consists in the application within the stem of a perforated conical tube, suspended from a perforated diaphragm, and of a perforated tube projecting upward above said diaphragm, so that by the said tubes the juice will all be arrested and only smoke allowed to pass into the mouth piece.

Puddling-furnace Frame.—P. E. Shear, Saugerties, N. Y.—The object of this invention is to construct the bit or tool-support of a puddling furnace door so that it cannot shrink and bend by coming in contact with the cold metallic surface underneath, and so that it can be moved in if its inner exposed edge has been destroyed by the excessive heat. Also, to so construct the frame of the door,that the fire brick, built against it,can be left stronger to be less liable to burn out.

Fan Attachment for Tables.—J. C. Mansker, Clinton, La.—This invention relates to improvements in fan attachments for dining and other tables, to be operated by any suitable weight or spring mechanism, or by treadles, as may be preferred.

Water Supply Regulator for Water Works.—Birdsill Holly, Lockport, New York.—The object of this invention is to provide an effective and reliable means for governing or regulating the supply of water in the street, of town water works. It is designed more particularly for those towns and cities where there is no material head to give the requisite pressure for carrying the water into the upper stories of the buildings, but is also applicable solely as a fire apparatus in any city, whether supplied with artificial water works or otherwise.

Hand Seed Planter.—John Jeffcoat, Onawa, Iowa.—This invention relates to a new hand seed planter, which is so condensed as to be of convenient size, and easily handled, and which is cheap and can be readily made by any ordinary mechanic. It can be used single or double; that is, one person can operate one or two of them at once, and the mechanism is easily adjustable to different kinds or quantities of seed to be planted.

Uncut Caps for Cans.—J. I. Livingston, Pittsburgh, Pa.—This invention relates to improvements in caps for sheet-metal cans, such as are designed to close a vessel hermetically, when packed for shipping and to be opened by cutting out a portion of the metal, the object of which is to promote an arrangement whereby the part to be cut out may be removed more readily, and whereby, also, the removable cap commonly applied to close the opening so cut out, may be attached more readily, or a plug or cork inserted in place thereof; also, to provide a cheaper construction.

Process for Baking Bread, etc.—J. Y. Betts, Coventry, England.—This invention relates to an improved process of baking, whereby the quality of thê bread and other farinaceous articles operated upon will be greatly improved, the chemical change set up by the heat of the oven being more thorough throughout the loaf, and from which there result an economy to the manufacturer,and lighter and more wholesome bread(with an improved appearance) than is ordinarily obtained. These advantages are attained by the introduction of steam into the ordinary or any approved oven charged with the dough to be baked, and heated in any well-known or approved way. The steam will be supplied from an adjacent steam boiler. The oven is kept charged with an atmosphere of steam for the greater portion of the time that the charge of bread, biscuits, or other articles,is submitted to the heat of the oven,but before the oven is drawn the supply of steam is cut off. The heat of the oven will superheat the steam admitted thereto; and the more effectually to insure this result, the steam supply pipe may be coiled or given a turn or two round the interior of the oven. The steam admitted to the oven will serve to keep open the pores of the bread, and allow the heat effectually to penetrate the mass.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING MARCH 2, 1869.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT OFFICE FEES:

On each caveat	$10
On filing each application for a Patent (seventeen years)	$15
On issuing each original Patent	$20
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

In addition to which there are some small revenue-stamp taxes. Residents of Canada and Nova Scotia pay $500 on application.

Patents and Patent Claims.—*The number of patents issued weekly having become so great, with a probability of a continual increase, has decided us to publish, in future, other and more interesting matter in place of the Claims. The Claims have occupied from three to four pages a week, and are believed to be of interest to only a comparative few of our readers. The publication of the names of patentees, and title of their inventions, will be continued; and, also, as heretofore, a brief description of the most important inventions. We have made such arrangements that we are not only prepared to furnish copies of Claims, but full Specifications at the annexed prices:*

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
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Patent Solicitors, No. 37 *Park Row, New York*

87,317.—Machine for Drying and Finishing Tubular Knitted Fabrics.—Nelson P. Akin, Philmont, N. Y.

87,318.—Method of Securing Covers to Glass Pitchers. Charles Ballinger (assignor to McKee and Brothers), Pittsburgh, Pa.

87,319.—Use of Nitrous Oxide as an Anæsthetic Agent. W. P. Barker, Grand Rapids, Mich. Antedated Feb. 20, 1869.

87,320.—Medicated Cigar.—Joseph Barrett, Chicago, Ill.

87,321.—Sprinkler for Watering Pots.—James Barrows, Hyde Park, Mass.

87,322.—Apple Parer.—A. G. Batchelder, Lowell, Mass.

87,323. — Butter Tub. — George S. Batcheller, Saratoga Springs, N. Y.

87,324.—Apparatus for Destroying Insects on Trees.—Constant Baudoin and Alphonse Fteley, New York city.

87,325.—Process of Tanning.—J. F. Bechmann, Abbot's Corners, N. Y.

87,326.—Concrete-brick Machine.—Bolivar Bisbee, Ames, Iowa.

87,327.—Furnace for Roasting Ores.—S. W. Bullock, Elizabeth, N. J., assignor to Hamilton E. Towle, New York city. Antedated Feb. 12, 1869.

87,328.—Bale-band Shears.—A. H. Daniels, Manchester,N.H

87,329.—Sliding-door Sheave. — Mark L. Deering, New York city.

87,330.—Machine for Whipping Cloth.—Eben Eaton, Norwalk, Conn.

87,331.—Sewing Machine for Sewing Shoes.—G. W. Eldridge, Cambridgeport, Mass.

87,332.—Machine for Packing Coiled Springs.—J. W. Evans, New York city.

87,333.—Boot Crimp.—Benjamin C. Finfrock, Stephenson's Depot, Va.

87,334.—Fur Box.—Maurice Fitzgibbons, New York city.

87,335.—Seat for Street Cars.—Charles H. Foster, San Francisco, Cal.

87,336.—Fence.—Eugene L. Fraker, Oshkosh, Wis.

87,337.—Mechanism for Operating the Shuttle Boxes in Looms.—Robert Burns Goodyear, Elkton, Md., assignor to Barton H. Jenks, Bridesburg, Pa.

87,338.—Sewing Machine for Working Buttonholes.—J. A. House and H. A. House, Bridgeport, Conn., assignors to the Wheeler & Wilson Manufacturing Co., New York city.

87,339.—Printers' Furniture. — Thomas J. House, Pittsburgh, Pa.

87,340.—Process of Working Silver Ores.—Henry Janin, Virginia City, Nevada.

87,341.—Loom.—Barton H. Jenks, Bridesburg, Pa.

87,342.—Carding Engine.—Barton H. Jenks, Bridesburg, Pa.

87,343.—Medical Compound.—Alexander Johnson, Brockport, N. Y.

87,344.—Toy Bow.—F. W. Judd, New Britain, Conn.

87,345.—Horse Rake.—Edmund E. Lauer and Henry W. Eisenhart, York, Pa.

87,346.—Prepared Coffee.—Benj. B. Lewis, Bristol, Conn.

87,347.—Horse Hoe.—Calvin Lobdell, Fort Hill, Ill.

87,348.—Refrigerating Car.—A. L. McCrea, Chicago, Ill.

87,349.—Hoisting Grapple.—Thomas McGrath, Albany, N.Y.

87,350.—Composition for Printing Designs on Boots and Shoes.—David McKellar, Lowell, Mass.

87,351.—Railway Switch.—John McLaughlin and Benj. F. Dean, Columbia, Pa.

87,352.—Metallic Cartridge. — Joe V. Meigs, Washington, D. C.

87,353.—Mechanical Movement.—George R. Metten, Cleveland, Ohio.

87,354.—Manner of Forming and Pressing Bricks.—Joseph Miller, Olean, N. Y.

87,355.—Velocipede.—Frederick Myers, New York city.

87,356.—Hilling Plow.—George Notman, Deerfield, Ohio.

87,357.—Ditching Machine.—Abram B. Overbaugh (assignor to Oliver Reeves), Newark, N. J.

87,358.—Carriage Jack.—Calvin H. Paine (assignor to himself and W. E. Barratt & Co.), Providence, R. I.

87,359.—Manufacture of Pasteboard. — H. L. Palmer, Stillwater, N. Y.

87,360.—Centrifugal Ore Separator.—S. T. Pearce, New York city.

87,361.—Machine for Separating Ores and Other Granular Substances.—S. T. Pearce, New York city. Antedated February 18, 1869.

87,362.—Plow Stock.—Lawson G. Peel, Preston, Ga.

87,363.—Horse Rake.—John Perry (assignor to himself and and Benjamin C. Baker), Vernon, Ind.

87,364.—Fence.—Thos. E. Phillips, Coatesville, Ind.

87,365.—Manufacture of Acetic Acid.—Anthony Pirz and Manuel Pirz, East New York, N. Y.

87,366.—Car Coupling.—Theodore R. Power, Arsenal Post Office, Pa.

87,367.—Lamp.—Daniel C. Ripley, Pittsburgh, Pa.

87,368.—Garden Hoe.—A. M. Ross, Ilion, N. Y.

87,369.—Construction of Shears.—Joseph Ryals, Terrysville, Conn.

87,370.—Truss.—William Schnebly, Hackensack, N. J.

87,371.—War and Signal Rocket.—Taliaferro P. Shaffner, Louisville, Ky.

87,372.—Blasting in Oil Wells, etc.—Taliaferro P. Shaffner, Louisville, Ky.

87,373—Cultivator.—D. Slaughter, West Hempfield township, Pa.

87,374.—Flyer for Spinning Machine.—Aaron W. Smith, Manchester, N. H.

87,375.—Propelling Apparatus.—C. T. Smith, Nyack, N.Y.

87,376.—Corn Planter, Grain Drill, and Harrow Combined.—H. Smith, Kirksville, Mo.

87,377.—Spinning Machine.—John Speight, Bradford, England.

87,378.—Cradle Chair.—Marietta Studley, South Yarmouth, Mass.

87,379.—Sweat Shield for Saddle Pads.—R. C. Sturges, Boston, Mass., assignor to "American Saddle Company."

87,380.—Bedstead Fastening.—George Sugg and William Metz, Chicago, Ill.

87,381.—File for Gaging the Teeth of Cross-Cut Saws.—W. G. Tuttle, Geneva, N. Y.

87,382.—Application of Grahamite in the Manufacture of Gunpowder and Lamp Black.—P. H. Vander Weyde, New York city. Antedated Feb. 13, 1869.

87,383.—Hay Spreader.—M. N. Ward (assignor to himself, B. S. Grant, and T. Hersey), Bangor, Me.

87,384.—Horseshoe.—Wm. R. Watson, Stockton, Cal.

87,385.—Metallic Screen for Paper Pulp.—A. S. Winchester (assignor to himself and Jas. S. Parsons), Boston, Mass.

87,386.—School Desk and Seat.—W. S. Wooton (assignor to himself and J. F. Piehl), Richmond, Ind.

87,387.—Valves of Steam Guns for Separating and Disintegrating Fibers.—H. Allen, New York city, assignor to the American Fiber Company.

87,388.—Hulling Machine.—A. Angell, Newburgh, N. Y.

87,389.—Scaffold.—F. App (assignor to himself J. S. Burkhart), Selin's Grove, Pa.

87,390.—Admission of Steam to Baking Ovens.—John Y. Betts, Coventry, England, assignor to F. W. Betts, New York city. Patented in England, April 20, 1865.

87,391.—Preparation of Solder.—C. D. Blinn, Port Huron, assignor to George Cary, Detroit, Mich.

87,392.—Hay Spreader.—Nathan Brand, Ilion, N. Y.

87,393.—Medical Compound.—John Carnrick (assignor to Reed, Carnrick, and Andrus), New York city.

87,394.—Attachment to Reed Organs.—R. W. Carpenter, Chicago, Ill.

87,395.—Mode of Operating Tremolos in Organs.—R. W. Carpenter, Chicago, Ill.

87,396.—Hinge.—L. R. Chapman, Grand Rapids, Mich., assignor to himself, George H. Traxsbury, and Elbert Ward. Antedated February, 26, 1869.

87,397.—Cattle Food.—J. Christie, Atlanta, Ill., and Henry G. Dayton, Maysville, Ky.

87,398.—Plow Truck.—J. Clees, Darbyville, Ohio.

87,399.—Car Jumper.—C. C. Dow (assignor to himself and L. Hylton), Philadelphia, Pa.

87,400.—Cultivator.—D. S. Early, Hummelston, Pa.

87,401.—Cultivator.—Benj. M. Ely, Perry, Mo., assignor to himself, L. T. Tulley, and W. A. and L. P. Munger.

87,402.—Hames Fastening.—W. Fawcett (assignor to Fawcett Brothers and R. Campbell), New York city.

87,403.—Spring Bed Bottom.—J. A. Fegan, Brooklyn, N. Y.

87,404.—Machine for Bending Wood.—R. Fitts, Jr. (assignor to W. Haywood Chair Company), Fitchburg, Mass.

87,405.—Match Safe.—J. E. Folk, Brooklyn, N. Y.

87,406.—Spark Arrester.—E. H. Garrigues, St. Louis, Mo.

87,407.—Manufacture of Pasteboard.—William E. Hale, Chicago, Ill. Antedated Oct. 6, 1868.

87,408.—Water Elevator.—W. G. Hamilton, Milton, Wis.

87,409.—Cloth Guide for Sewing Machine for Working Buttonholes.—A. Harroun, Jr., Onondaga, N. Y.

87,410.—Roulette Apparatus.—G. Hauschild, St. Louis, Mo.

87,411.—Lounge.—F. Hayek, New York city.

87,412.—Smiths' Bellows.—J. P. Hemmingsen, Marshalltown, Iowa.

87,413.—Water Supply Regulator for Water Works.—B. Holly, Lockport, N. Y.

87,414.—Hand-Seed Planter.—John Jeffcoat, Onawa, Iowa.

87,415.—Uncut Caps for Cans.—J. I. Livingston, Pittsburgh, Pa.

87,416.—Brick Machine.—R. Lockwood and C. C. Schmitt, New York city.

87,417.—Fan Attachment for Tables.—J. E. Mansker, Clinton, La.

87,418.—Sash Fastener.—M. R. Margerum, Trenton, N. J.

87,419.—Oscillating Engine.—H. B. Martin, San Francisco, Cal.

87,420.—Plow.—E. G. Matthews, Newton, Mass.

87,421.—Plow Clevis.—E. G. Matthews, Newton, Mass.

87,422.—Stench Trap and Overflow for Basins.—John McCloskey, New York city.

87,423.—Lubricator.—W. McCully, Paterson, N. J.

87,424.—Mode of Fastening Trusses.—R. McGee, Martinsville, Ind.

87,425.—Thatching for Stacks of Hay and Grain.—R. McLain, Shirland, Pa.

87,426.—Seeding Machine.—George Paddington, Springville, Iowa.

87,427.—Tremolo for Wind Instruments.—Robt. W. Pain (assignor to Brainard and Wing), New York city.

87,428.—Lamp Shade.—J. F Phelps, Havana, N. Y.

87,429.—Fifth-wheel for Carriages.—Henry Poth, Pittsburgh, assignor to himself and G. A. Klages, Birmingham, Pa.

87,430.—Carriage for Sawing Saddle Tree Stuff.—James H. Preston, Jefferson City, Mo.

87,431.—Centring Device.—N. L. Revere, Worcester, Mass.

87,432.—Process of Preparing Bamboo Fiber.—Louis S. Robbins, New York city, and John A. Southmayd, Elizabeth, N. J.

87,433.—Manufacture of Flock from Bamboo or Cane Fiber.—Louis S. Robbins, New York city, and John A. Southmayd, Elizabeth, N. J.

87,434.—Manufacture of Oakum.—Louis S. Robbins, New York city, and John A. Southmayd, Elizabeth, N. J.

87,435.—Hydraulic Lifting Jack. — Joseph Ryan, St. Louis Mo.

87,436.—Pruning Shears.—D. B. Seeley, Portland, Ill.

87,437.—Tanners' Table. — Franklin C. Sexton, Shelbyville, Ind.

87,438.—Door or Frame of Puddling Furnaces.—Peter E. Shear (assignor to himself and William Mulligan), Saugerties, N. Y.

87,439.—Fire Alarm Telegraph.—W. R. Smiley, New Lisbon, Ohio.

87,440.—Shoe Knife.—George W. Spencer, South Groveland, Mass.

87,441.—Smut Machine.—Wm. P. Springer, Oswego, N. Y.

87,442.—Process of Cleaning Metallic Articles for Plating and Gilding.—George J. Sturdy and Solomon W. Young, Providence, R. I.

87,443.—Paper File.—Michael Sullivan and John Reedy, New York city.

87,444.—Smoking Pipe and Cigar Holder.—August Tappe, Johnstown, N. Y.

87,445.—Railway Car Wheel.—Theodore R. Timby, Saratoga, N. Y.

87,446.—Case for Preserving Butter, Cheese, and other Articles.—Theodore R. Timby, Saratoga, N. Y.

87,447.—Barrel for Cooling Fluids.—Gustave Verplaetse, New York city.

87,448.—Steam Engine Valve Gearing.—Henry B. Verry, New York city, assignor to himself, G. Koonz, New York city, and D. G. Whitman, North Kingston, R. I.

87,449.—Boat-detaching Apparatus.— Edgar Wakeman, Brooklyn, Cal.

87,450.—Horse Power.—Seth Wheeler, Albany, N. Y.

87,451.—Shoe Fastening.—L. F. Whitman and O. P. Whitman, Macomb, Ill.

87,452.—Apparatus for Loading Ice.—Peter F. Whitney, Saugerties, N. Y.

87,453.—Mining Machine. — David Williamson, Elizabeth, Pa.

87,454.—Safety Cattle Tie.—Charles P. Winslow, Westborough, Mass.

87,455.—Burning Kiln For Bricks, Tiles, etc.—Henry Aiken, Pittsburgh, and Henry McAllister, Jr., and Henry G. Morris, Philadelphia, Pa.

87,456.—Rotary Blowing Fan for Furnaces, Gas Works, etc.—Henry Aland, London, England, assignor to Samuel and George Aland.

87,457.—Clothes Mangle.—Daniel Arndt, Toledo, Ohio.

87,458.—Spring Link for Plow Clevis.—John Ball, Canton, Ohio.

87,459.—Stove Pipe.—J. W. Bates, St. Paul, Minn.

87,460.—Lock Nut Attachment for Railroad Chairs.—G. W. R. Bayley, Algiers, La.

87,461.—Violin Bridge.—Samuel Boden, Louisville, Ky.

87,462.—Locomotive Alarm Bell.—Benjamin Briscoe, Detroit, Mich.

87,463.—Invalid Bed and Bedstead.—Smith S. Brown, Woonsocket, R. I.

87,464.—Punch, Shears, and Iron Shrinker Combined.—Dennis C. Burdick, Milton, Wis.

87,465.—Lifting Apparatus.—D. P. Butler, Boston, Mass.

87,466.—Manufacture of Illuminating Gas.—Car Carpenter, Buffalo, N. Y.

87,467.—Manufacture of India-rubber Trunks, Valises, Boxes, etc.—John H. Cheever, New York city.

87,468.—Steam Engine Mechanism.—Mirtillow R. Clapp, New York city, assignor to himself and Edward D. Jones, Brooklyn, N. Y.

87,469.—Shutter Fastener.—Edwin S. Collamer, Georgetown, D. C.

87,470.—Post Hole Auger.—S. W. Corbin, Bainbridge, N. Y.

87,471.—Three-horse Equalizer.—Joseph E. Coveney, Buchanan, Mich.

87,472.—Railroad Car Heater. — Archibald C. Crary, Utica, N. Y.

87,473.—Nailing or Pegging Machine.—J. B. Crosby, Boston, Mass.

87,474.—Machine for Making Spikes.—Ferdinand Davison, Liberty, Va.

87,475.—Enameling Iron and Steel.—Jules George Dreyfus, New York city.

87,476.—Apparatus for Burning Gases for Metallurgic and Other Purposes.—Cyprien Marie Tessié du Motay, Paris, France, assignor to Edward Stern, New York city.

87,477.—Preparing Zirconia for Use in Producing Light, and for other Purposes.—Cyprien Marie Tessié du Motay, Paris, France, assignor to Edward Stern, New York city.

87,478.—Process and Apparatus for Generating Combustible Gases.—Cyrien Marie Tessié du Motay, Paris, France, assignor to Edward Stern, New York city.

87,479.—Manufacture of Iron and Steel.—Cyprien Marie Tessié du Motay, Paris, France, assignor to Edward Stern, New York city.

87,480.—Lamp Burner.—R. N. Eagle, Washington, D. C.

87,481.—Leather-cutting Machine.—Hemon Eichler, New Lisbon, Wis.

87,482.—Apparatus for Rendering Lard, Tallow, etc.—Charles J. Everett, New York city.

87,483.—Stone Dressing Maching.—A. M. George (assignor to himself and B. F. George), Nashua, N. H.

87,484.—Plow Point.—Edward C. Gero and James N. Cooley, Kalamazoo, Mich.

87,485.— Manufacture of Lubricating Oils from Petroleum.—Samuel Gibbons, Freedom, Pa., assignor to Excelsior Oil Manufacturing Company of Pennsylvania.

87,486.—Street-Car Draw Bar.—John C. Gove, Cleveland, Ohio.

87,487.—Process of Purging and Draining Sugar.—W. H. Guild, Brooklyn, E. D., N. Y.

87,488.—Harvester.—J. C. Hall, Monroe, Wis. Antedated February 20, 1869.

87,489.—Bed Bottom.—J. J. Harris, Pewamo, Mich.

87,490.—Seed Sower.—Alexander Hathaway, Independence, Iowa.

87,491.—Ice Tongs.—Randolph Hayden (assignor to Ferree and Hayden), Middletown, Conn.

87,492.—Cultivator.—G. J. Hayes, Ionia, Mich.

87,493.—Machine for Bundling Cigars.—F. A. Henckell, New York city.

87,494.—Device for Soldering Tin Cans.—W. H. Henderson, Franklin, Ind. Antedated Feb. 20, 1869.

87,495.—Machine for Brushing and Napping Hats.—Jos. W. Hopkins (assignor to himself and Chas. B Hardick), Brooklyn, N. Y.

87,496.—Car Wheel.—R. B. Hugunin, Cleveland, Ohio.

87,497.—Device for Checking Horses.—Theodore Itzstein, New York city.

87,498.—Projectile.—R. H. Jones, San Francisco, Cal. Antedated Feb. 21, 1869.

87,499.—Fly-net for Horses.—S. B. Kline, Mechanicsburg, Pa. Antedated Feb. 27, 1869.

87,500.—Buckle for Grain-Bands, Bag-Ties, etc.—Le Grand Kniffen, Rochester, Pa.

87,501.—Thill Coupling.—E. Lane, Philadelphia, Pa.

87,502.—Wash Boiler.—Alex. Lee, Scranton, Pa.

87,503.—Flat-Iron Scraper, polisher, and Stand.—Wm. B. Mason, Boston, Mass.

87,504.—Horse Rake.—G. M. L. McMillen, Dayton, Ohio.

87,505.—Cotton Press.—J. J. Morrison, Atlanta, assignor to himself and V. A. Gaskell, Fulton, Ga.

87,506.—Glass Mold.—Thos. G. Otterson (assignor to S. B. Rowley), Philadelphia, Pa.

87,507.—Apparatus for Hardening Steel.—D. O. Paige, Detroit, Mich.

87,508.—Knitting Machine.—Robert Peberdy (assignor to Jas. Creighton), Philadelphia, Pa.

87,509.—Pianoforte.—D. T. Peck, New York city.

87,510.—Reversible Knob Latch.—Frank P. Pfleghar, New Haven, Conn.

87,511.—Lamp Extinguisher.—John Pons (assignor to himself, J. S. Russel, and Henry Vogler), Baltimore, Md.

87,512.—Machine for Rolling Metals.—George Reynolds, Collinsville, Conn.

87,513.—Water Meter.—Ira Robbins, Hughesville, Pa.

87,514.—Lock for Drawers, etc.—Ira Robbins, Hughesville, Pa.

87,515.—Screw Fastening for the Covers of Fruit Jars.—S. B. Rowley, Philadelphia, Pa.

87,516.—Liquid Meter.—Thomas A. Searle, Providence, R. I.

87,517.—Wooden Railway.—J. Y. Smith, Pittsburgh, Pa.

87,518.—Key for Locks.—F. W. Smith, Jr., Bridgeport, Ct.

87,519.—Furnace Stove and Register.—Earl Spaulding, Ionia, Mich.

87,520.—Rocking Chair.—Geo. H. Spaulding, Rockford, Ill.

87,521.—Milk Cooler.—E. P. Spencer, Scott, N. Y.

87,522.—Gas-Cock.—Matthias Stratton, Philadelphia, Pa.

87,523.—Blower Case.—Benjamin F. Sturtevant, Boston, Mass.

87,524.—Car Starter.—R. R. Taylor, Reading, Pa,, assignor to himself, J. H. Boone, J. M. Heller, and C. B. Bertolette.

87,525.—Railway Rail Chair.—Geo. Tefft, Salem, N. Y.

87,526.—Lamp Shade.—J. F. Travis (assignor to Archer and Pancoast Manufacturing Company), New York city.

87,527.—Shifting Rail for Carriage Tops.—J. J. Waldron, East Durham, N. Y., assignor to himself, T. G. Palmer, and Henry Brown.

87,528.—Stop-Motion Mechanism for Warping Machine.—Henry Weber, New York city.

87,529.—Railway Switch.—William Wharton, Jr., Philadelphia, Pa.

87,530.—Pick for Dressing Millstones.—Cornelius Whitehouse, Bridgetown, near Cannock, England.

87,531.—Wrench for Bit-Braces.—Darius Wilcox, (assignor to himself and E. A. Johnson), Ansonia, Conn.

REISSUES.

24,397.—Lamp.—Dated June 14, 1859; reissue 3,315.—R. S. Merrill, Irasburg, Vt.

85,121.—Water Supply Regulator.—Dated Dec. 22, 1868; reissue 3,316—G. P. Nutting, Chicago, Ill.

79,395.—Ventilator.—Dated June 30, 1868; reissue 3,317.—E. L. Roberts, New York city.

73,524.—Machine for Dressing Millstones.—Dated January 21, 1868; reissue 3,318.—H. B. Sears, Liverpool, England, assignee of Samuel Golay.

36,161.—Velocipede.—Dated August 12, 1862; reissue 3,319.—S. W. Smith, New York city, assignee of P. W. MacKenzie.

44,130.—Apparatus for Concentrating Metallic Ores.—Dated September 6, 1864; reissue 3,320.—Zenas Wheeler, San Francisco, Cal.

47,834.—Fruit Jar.—Dated May 23, 1865; antedated Dec. 6, 1864; reissue 3,321.—S. B. Rowley, Philadelphia, Pa., assignee, by mesne assignments, of Chas. G. Imlay.

DESIGNS.

3,392. and 3,393.—Stocking Fabric.—Conyers Button, Philadelphia, Pa. Two patents.

3,394.—Buckle Loop.—Edward N. Crane, Newark, N. J.

3,395.—Trade Mark.—D. F. Packer, Mystic River, Conn.

3,396.—Picture Frame.—W. H. Sadler, Baltimore, Md.

3,397. and 3,398.—Leg of a Stocking.—Charles Spencer, Philadelphia, Pa. Two patents.

3,399.—Blower Case.—B. F. Sturtevant, Boston, Mass.

3,400.—Boot.—Amelia Strang, Oakland, Cal.

3,401.—Flower Pot.—William Sutherland and Thos. I. Lewellen, Philadelphia, Pa.

3,402.—Spoon or Fork Handle.—William K. Vanderslece and Lucius Thompson, San Francisco, Cal.

3,403.—Floor Oil-Cloth Pattern.—John T. Webster, New York city.

NEW PUBLICATIONS.

A Dictionary of Dyeing and Calico Printing. Containing a brief Account of all the Substances and Processes in Use in the Arts of Dyeing and Printing Textile Fabrics; with Practical Receipts and Scientific Information. By Charles O'Neill, Analytical Chemist, Fellow of the Chemical Society of London, etc., etc. To which is added an Essay on Coal Tar Colors, and their Application to Dyeing and Calico Printing. By A. A. Fesquet, with an Appendix on Dyeing, as shown at the Exposition of 1867. Philadelphia: Henry Carey Baird, 406 Walnut street.

This is a reprint of a well-known and valuable treatise on dyeing and calico printing, with such additions as bring the work fully up to the present state of these arts. The extent and value of these additions will be appreciated by those familiar with the English editions of the work, and the wonderful advances that have been recently made in the art of dyeing. The style in which the work is printed, as well as the treatment of the subject matter, alike recommend it to the technical reader, to whom we can commend as a first-class work.

We have received the "Almanac" of the *British Journal of Photography* for 1869. It is replete with interesting information and many valuable formulas pertaining to the beautiful art.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

3,158.—Manufacture of Water and Drain Pipes.—J. E. Hughes and I. S. Church, San Francisco, Cal. October 13, 1868.

570.—Puddling and other Furnaces.—Samuel Danks, Cincinnati, Ohio February 6, 1869.

584.—Steam Engine Governors.—William Bellis, Richmond, Ind. Feb. 8, 1869.

586.—Puddling and other Furnaces.—Samuel Danks, Cincinnati, Ohio. February 8, 1869.

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The model should be neatly made of any suitable materials, strongly fastened, without glue, and neatly painted. The name of the inventor should be engraved or painted upon it. When the invention consists of an improvement upon some other machine, a full working model of the whole machine will not be necessary. But the model must be sufficiently perfect to show, with clearness, the nature and operation of the improvement.

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Lithographic Fac-simile Copying Press.

The invention of Alois Senefelder, at the close of the 18th century, of printing from chemically prepared slabs of argillaceous, slaty limestone, is one of those few which was perfect at the first, or susceptible of few improvements, either in the principle or the details. Lithographic printing *per se* and lithographic printing machinery have experienced no notable change during this century. The superiority of specimens now produced over those of Senefelder and his immediate successors is due mainly, if not wholly, to the expertness and skill of experienced workmen, the principle and the mode of operation being the same.

The art may be called a branch of engraving as in some cases the stone is engraved by hand, as is a steel or copper plate. It also partakes of the character of drawing or designing, for usually the figure is drawn on the stone with crayon, pen, or brush.

Sometimes, however, the design is transferred from chemically prepared paper. For engraving, the stone is finished to a fine face and its surface washed with a weak dilution of nitric acid. The artist then uses his burin until the design is completed. The engraving is merely a slight scratching sufficient to reach beyond the influence of the acid, which is only superficial. The ink is of an oily nature and is spread over the engraving by a hand dabber, leaving its substance only in the lines, which are untouched by the acid.

When the figure is drawn on the stone by crayon, the surface is slightly roughened by rubbing two stones together with a small amount of fine silicious sand and water between the faces. The crayons and drawing ink (the latter dissolved in water, are composed of tallow, wax, shellac, common soap, and Paris or Brunswick black, or similar substances, the proportions varying in different establishments. The artist makes his design with this crayon oil, and when finished the acid is washed over the stone, when it dissolves out the alkali of the ink, leaving the insoluble portion to harden upon the stone; it attacks also the calcareous material of the stone, thus lowering the clean portions slightly and correspondingly raising the inked portions. These take readily the ink from the roller as it is passed over the stone, while those clean portions of stone, not having the design upon them, are prevented from receiving any ink by the interposition of moisture.

MAURICE'S PATENT AUTOGRAPHIC PRESS.

In transferring from paper, the ink and paper must be specially adapted to the purpose. The ink is similar to that used for printing from the stone and after the transfer is made the treatment is similar.

In printing, the stone is secured on a movable table or bed, the roller, charged with ink, is passed over its face and an application of gum arabic and water is made, which fixes the ink. This must be allowed to thoroughly dry before the stone is ready for printing, when a damp sponge is passed over the stone, removing the gum from all portions. The stone is dampened and the ink applied, which adheres only to the prepared lines of the design. This deposition of the ink, although apparently simple, is a process requiring the exercise of good judgment and the experience acquired only by long practice. The paper is then laid on the stone and the tympan, of some flexible material, as rubber, brought down over it. The stone is then traversed by means of a crank pressure being applied to the tympan and stone by an edge of wood—appletree being preferred—that is brought down by a powerful leverage. This method sometimes requires the services of two persons.

By the press represented in the engraving, however, only one person is required, the pressure being obtained by a weight. A is the table, and B the frame. C is the stone, supported on bearers adjusted by screws, as seen. D is the roller to which are suspended weights, E, connected with guides, F, the weights bearing on the roller, D, by means of friction rollers in each guide. G is the tympan over which the roller runs, in this machine made of leather and rubber. The stone in this machine is stationary and the roller passes over it.

It is designed for office use in multiplying duplicates of letters, notes, circulars, etc., for merchants, bankers, companies, architects, lawyers, schools, copyists, artists, clergymen, and others. The inventor says the press can print one hundred copies per hour of writings or drawings.

Patented through the Scientific American Patent Agency, February 28, 1868. Orders should be addressed to C. C. Maurice & Co., No. 10 North William street, New York.

INTERMITTENT SPRINGS—ERROR IN THE WORKS ON PHYSICS.

Silliman's "Principles of Physics" contains, on page 226, section 286, the following description and explanation of intermittent springs:

"There exist in nature intermittent springs, the water flowing regularly for a time, and then suddenly ceasing. In these springs, the opening, as at A, in Fig. 1, communicates with a cavity, C, by means of a channel, A B D, which has the form of a syphon. This cavity is gradually filled, until, at last, the water attains the level, B B, when the syphon is filled and the water escapes. If the syphon discharges the water faster than it flows into C, after a time its level would be lowered to D; air would then rush in by the syphon, the flow of water would cease, and would not recommence until it had again attained the level, B B."

This theory of intermittent springs is substantially the same as that given by all textbooks on physics, and it is either an insufficient or an absurd one, as we shall proceed to demonstrate.

FIG. 1.

FIG. 2.

We shall find it necessary, however, to first discuss the operation of the syphon. A syphon is a bent tube, having one of its legs longer than the other. (See Fig. 2). When the syphon is filled to any point, I, below the fluid, J, in which the shorter leg is immersed, the fluid will commence to flow until the level of the fluid, in the containing vessel, reaches the bottom of the shorter leg, when the flow will suddenly cease. The cause of the rise of the fluid in the shorter leg is atmospheric pressure, the pressure being removed from the section, G H, by the depending weight in the longer leg. If, when the fluid in the containing vessel becomes exhausted, it be replaced with *sufficient rapidity* till its level rises above the bend in the syphon, the syphon will again commence to flow, and will exhaust the fluid in the vessel, if its discharge is greater than the supply *after the flow commences*. Operated in this way, with a greater supply than the capacity of the syphon before the flow commences, and a less supply afterward, until the discharge from the syphon should cease, it would be an intermittent fountain, without regard to the size of the bore of the tube, which we will next proceed to consider.

The principle of the rise of the fluid in the shorter leg being the same as that of the ordinary atmospheric pump, the column, as it proceeds over the lower part of the bend, H, must remain solid and unbroken, or the tube will not act as a syphon at all. It will not remain unbroken unless the tube be so small that capillary attraction preserves its integrity, or the supply be as great as or greater than the capacity of the tube for discharge, until the end of the column in the longer leg has passed below the level, J, in the cistern; two limiting circumstances, which, if they exist in intermittent springs, have not been noticed in the works on physics, so far as we have been able to discover.

We have then to suppose, in order to substantiate the syphon theory of intermittent springs, a remittent supply, trickling into the chamber, C, Fig. 1, greater before the beginning of the discharge, and less afterward, or to suppose the channel, A B D, a capillary tube. The latter hypothesis is opposed to facts—how about the former? An entirely intermittent supply does not necessitate the hypothesis of a syphon, as that would make an intermittent spring as well through a straight channel as a syphon. A constant supply less than the capacity of the syphon, will raise the level in C to the lower part of the bend, B, Fig. 2, when it will commence to flow over, and continue to do so, thus forming a perpetual spring. A constant supply, as great as the capacity of the syphon, will also give us a perpetual spring. We can then account for intermittent springs only by supposing an *intermittent supply*, with any form of channel, or a *remittent supply*, in connection with a syphon channel. In order that the syphon may work, we must also suppose the air to have free access to the chamber, C, which it may have through cracks and fissures, and not to have such access to the channel—a supposable case, although not a probable one. We believe the theory of an intermittent supply the only one that accounts for the facts. What is the cause of such intermission may form the subject of a future article.

The Chicago Equatorial Telescope.

Prof. Barnard, of Columbia College, has written an interesting letter to the *College Courant*, of Yale, descriptive of the great equatorial telescope of the Dearborn University of Chicago, of which the Professor says that, if it is not the largest in actual existence, he would not know where to look for a larger one mounted and in use. In comparison with the Harvard equatorial, the Chicago instrument has a light as three to two. The clear illuminating aperture has a diameter of eighteen and a half inches, while that of Harvard measured fifteen. The whole diameter of the Chicago objective, mounting included, is twenty inches. The defining power of this glass is unrivaled, as has been satisfactorily proved by the discovery, it enabled its constructor, Mr. Clark, to make of the companion of Sirius, a star which was confidently believed to exist, but which had eluded the refractors of Cambridge and Pultova (of exactly the same capacity), and the reflectors of Mr. Lessell and Lord Rosse.

The history of this magnificent telescope is singular. It was made to order for the University of Mississippi, and was to have been erected in an observatory already built and still standing at Oxford, in that State, the order for its construction having been obtained chiefly through the untiring efforts of Professor Barnard himself. The war came to change the destiny of the instrument, and Professor Barnard thinks that Chicago would not have been in possession of this magnificent object glass but for the order given by the Mississippi University. It is just matter of pride that American skill and science have produced this marvel among telescopes.

DYEING IN FRANCE AND CONTRIBUTIONS OF MODERN SCIENCE TO THE ART.

BY E. R. MUDGE, U. S. COMMISSIONER TO THE PARIS UNIVERSAL EXPOSITION OF 1867.

There would be but a limited field for the exercise of taste in the textile industry without the art of dyeing, which is to tissues what the summer's sun is to the landscape, the source of all which delights the eye in light and color. While admiring the splendors of impression and color displayed upon the fabrics of the present day, we should not forget how largely they are due to the intelligence and science of the French statesmen and savans of former generations.

The great Colbert, in establishing manufactures in France, made improvements in the art of dying the object of special care. He published, in 1672, a set of regulations "for the dyeing of wools and the manufacture of wools of all color," and showed that dyeing was an object deserving public attention from the additional value which it confers upon many of the articles of commerce. "If the manufactories of wool, silk, and thread are to be reckoned among those which contribute most to the support of commerce, dyeing," says Colbert, "which gives them that striking variety of color by which they resemble what is most beautiful in nature, may be considered as the soul of tissues, without which the body could scarcely exist. Wool and silk, the natural color of which rather indicates the rudeness of former ages than the genius and improvement of the present, would be in no great request if the art of dyeing did not furnish attractions which recommend them even to the most barbarous nations. All visible objects are distinguished and recommended by colors but for the purposes of commerce it is not only necessary that they should be beautiful, but that they should be good, and that their duration should equal that of the material which they adorn."

These ideas bore fruit in the magnificent tapestries of the Gobelins manufactory, and more usefully in the famous black cloths of Sedan, both of which are due to this great statesman. The art of dying was also during his time applied to printing cottons. The industry of calico printing was founded in Holland during the 17th century by a native of France. It was planted by a Frenchman in 1690 upon the banks of the Thames, and established about that time by a French refugee at Neufchatel, from whence it was brought back again to the country of its nativity by the celebrated Oberkampf. The regulation of the art of dyeing continued after the time of Colbert to be an object of governmental care in France; and Hellot, Macquer, and Berthollet, all eminent chemists, were successively appointed to superintend the practice of dyeing and to cultivate the branches of science which had a tendency to promote the progress of the art. Each of these chemists left practical treatises upon dyeing, of great value. The work of Berthollet, published in 1791, became the standard book of the age, since it contained not only a detailed account of the practical operations of the art, but theoretical views of the principles upon which it was founded. These works, and that of Chaptal, who while occupying the office of minister of the interior, had become interested in the art, contained nearly all that was valuable respecting the art of dyeing in any language at the close of the last century. The best informed Englishmen of that period, such as Mr. Anderson, author of the "History of Commerce," and Mr. Howe, author of an essay on bleaching, did not hesitate to admit the superiority in brilliancy of color of the articles of French manufacture of this period, and to attribute it to the fostering care of the government.

The Exposition of Paris has called forth a beautiful study on the dyeing and printing of fabrics from M. De Kaeppilin. This treatise, the more elaborate work of M. Schutzenberger, published in 1867, under the auspices of the Industrial Society of Mulhouse, and the admirable report of Dr. Hoffman, president of the Chemical Society of London, published in 1863, furnish ample information as to the progress of the art in this century. A signal step in the advancement of this art was the discovery by the celebrated Vauquelin, in the early part of the present century, of the metal chromium the compounds of which have since had so many industrial applications, especially in the printing of mousselines and calicoes, as in the chromate of lead first prepared for printing cottons by Lassarque in 1819, and the oxide of chromium combined with arsenious acid to form green, applied by Courez. In 1810, Loffet introduced the process of fixing colors by means of steam to the printing of cashmere shawls, thus dispensing with the immersion of the fabrics in a bath of tincture. During the years 1837, '38, '39, '40, and '45, the beautiful discovery of Loffet received its most remarkable application in the fabrication of mousselines of wool, and with warps of cotton, by means of colors fixed by steam. It was this application which gave the vast extension to the manufacture of printed woolen tissues, which constitute at present the most important part of the combed-wool industry of France, and the only branch which has been successfully pursued in this country. The application of steam colors to cotton fabrics was greatly advanced by the discovery of stannate of soda by Mr. Steiner, which enables the colorist to give to the steam print a solidity and luster in which it was wanting before.

Of the modern discoveries in chemistry there is none more brilliant than that of the cheap production of ultramarine, which was effected by Guimet in 1828, the right being secured to him by patent. This material, affording a blue color of surpassing intensity and purity, was formerly supplied by levigating the powder of the mineral *lapis lazuli*, obtained in small masses from Siberia. Its value in the arts was 125 francs an ounce, more than its weight in gold. The artificial ultramarine is produced by combining the same chemical substances, the soda, silica, sulphur, and alumina, which are found in the lapis lazuli, and is equal in brilliancy of color to the natural ultramarine. Its cost has been reduced from 6,000 francs to 6 francs the kilogram. The first impressions were made with this color, fixed by albumen upon mousselines delaine, in 1834, and in the richest fabrics of France this beautiful color replaces the duller tints formed by indigo and prussian blue, the latter dye having been fixed upon woolen tissues as a color of impression in 1836.

We must not pass over another series of inventions, although they have special relations to the printing of cotton fabrics. For the printing of cotton madder is by far the most important material on account of the permanency of its dyes. The extensive demand for this material, and the desirableness of obtaining brighter tints, have made it an object of the highest importance to free the coloring principle of the madder root from entraneous matters. The French chemical manufacturers have achieved remarkable results in this direction. In 1826, MM. Robiquet and Collin discovered in the madder root the principle *alizarine*, formerly a rose-colored dye, which the English afterward introduced as a commercial article under the name of *pincoffine*. In 1828, purpurine, also derived from madder, was indicated by the same chemist as a chemical species, distinct from alizarine. It furnishes a more vivid red than the alizarine, and is now prepared commercially. Since the period last mentioned, the coloring matter of madder has been concentrated in the form known as garancine and flowers of madder. These materials are prepared commercially in France in vast quantities, their use proving greatly advantageous, both in respect to economy and improvement of color. The dying powers of purpurine and alizarine are remarkable, that of purpurine being equal to forty or fifty times the same quantity of madder, and that of alizarine to that of thirty-eight times that of madder. These new substances have been found valuable in dyeing wool. Wool mordanted with alum and cream of tartar gives, with purpurine, a brilliant crimson red, and mordanted with tartar and a solution of tin gives, with purpurine, a scarlet almost as fine as that from cochineal.

(To be concluded next week.)

Skate Patents.

It will interest the lovers of that most graceful and noble exercise, skating, to know that in purchasing their skates they may take their choice from two hundred and ten kinds, all of them patented within twenty years. Mayne Reid's new magazine, *Onward* for March, contains some interesting statistics relative to this subject, from which we take some paragraphs:

From the year 1790 to 1849 no skates of any description were patented in the United States. The first skate patent was granted to Barkley & Bontgen, of Newark, N. J., on the 17th of April, 1849—the only one applied for in that year. During the years 1850, '51, '53, and '54, none were sought for, and only one in 1852. In 1855 two patents were taken out, two also in 1856, three in 1857, and one in 1858. After this, skating practice seems to have increased at an accelerated ratio, since in 1859 no less than nineteen new patents were taken out; in 1860, twenty-one; in 1861, twenty-four; in 1862, eleven; in 1863, twenty-three; in 1864, seventeen; in 1865, fifteen; in 1866, eighteen; in 1867, twenty-two, and in 1868, twenty-nine; in all, two hundred and ten! Even the war does not seem to have brought any blight on this healthful sport.

Among the recently patented skates, worth noticing, are the following: George Havell, of Newark, N. J., November 3 1868, succeeded in securing a patent for one as follows: New York club-runner, brass top throughout, one clamp back of heel, clamps on sides of feet. All three clamps worked by a long bar of steel under the sole, and turned at back of the heel by a key. The skate body is bent just in front of the heel so as to be a support to the back fastening. Joseph Lyon, of Newark, N. J., patented May 31, 1864, a stop for skates. Henry Gettey, of Brooklyn, N. Y., patented February 23, 1864, a skate with two runners, so arranged as to be close together or an inch apart. E. B. Phillips, of Cambridgeport, Mass., patented February 14, 1860, a skate made of one piece of brass, runner included. William Jordan, of Galena, Ill., patented April 7, 1868, a singular sort called a "stilt skate." M. C. Haight, of Geneva, N. Y., patented April 7, 1868, a very light, simple, and cheap skate, of one piece of metal, with straps over the foot. Barney & Berry, of Springfield, Mass., patented June 11, 1867, and May 12, 1868, the "New York Club," having a toe point for fancy operations—a very fine strong skate. S. A. Du Bois, of Chicago, Ill., patented June 30, 1868, a toe and heel skate. Scott & Smith, of Boston, Mass., patented December 11, 1866, one having three runners, the middle one round, others flat. The "Empire Skate" is an improvement upon the "New York Club," invented by Stone & Co., of Philadelphia, and very favorably received among skaters.

We may also notice under this head some skating adjuncts that have been thought worthy of being secured by patent: Frederick R. Willis, of Waltham, Mass., patented March 28, 1865, a skate-sharpener, consisting of two different grades of files, placed like a double T-rail. William P. Patton, of Harrisburg, Pa., patented March 10, 1868, "skate-buckling tongs," a combination of pincers, gimlet, cleaner, screwdriver for plain screws and for skate screws having heads with two cavities in them. The implement occupies small space, is made of brass, and weighs but an ounce or two. N. H. Spofford, of Boston, Mass., patented May 29, 1860, an ankle supporter, to be attached to any skate, consisting of one bar of metal to be screwed on to the heel part, and which bends (at about the hight of the ankle) forward and backward. The top to be bound to the calf of the limb with a strap. H. P. Gengembre patented a device for "skating floors," November 20, 1866, consisting of a metal floor, with pipes from an engine so arranged as to flood it to any depth. J. H. A. Harvey, of Cleveland, Ohio, patented an "improved skating rink," January 28, 1868. From his model we should think it a very nicely arranged affair.

It is only a few years since the most approved skate was built or fashioned in an entirely different manner, as regards the general position of the foot toward the ice.

A noted writer on "British Field Sports" recommends that the skate "be higher at the heel than at the toe," so as to save slipping; whereas, nowadays, it is just the reverse—being about one-quarter of an inch higher at the forward part of the skate than at the heel. Also, it was quite a curiosity then (say twenty years back) to see a skate "rock" at all; and now there is hardly a boy of ten years but has progressed enough both to use and like a "rocker."

If our readers could only take a glance at a few of the skate models, deposited in the Patent Office at Washington, they would see the great changes that have taken place in skate building. Some of the old models (only about fifteen years of age) of what was then *the* skate, might serve as "scarecrows" on almost any rink in Uncle Sam's dominions.

Effects of the Removal of Forests upon Climate.

An interesting letter was recently read before the Geographical Society of London, which shows the effects upon climate resulting from the clearing away of large tracts of forest. The facts given are of universal interest.

The paper was "On the Effects on Climate of Forest Destruction in Coorg, Southern India," by Dr. Bidie. This district is composed of hills and valleys, which were formerly covered with forests. The lower slopes, however, are now denuded, and the rainfall is found to decrease with the arboreal vegetation. As regards the elevated crests of the Ghauts, which intercept the rain-bearing winds of the Southwest monsoon, they would cause an abundant precipitation whether they were covered with trees or not, but the water supply and fertility of the lower slopes and plains to the East are seriously diminished by the clearing of forest on the hills, and the result is brought about in the following way: The natural forest acts as a check on the too rapid evaporation, and carrying off by streams, of the rainfall on the surface of the land. As the rain descends, it is gradually conveyed by the leaves of trees to the dense undergrowth of shrubs, and carpet of dead leaves, and below this it encounters a layer of vegetation mold, which absorbs the water like a sponge. By these, aided by the roots of trees, the moisture is transferred to the depths of the earth, and a reservoir of springs is thus found, which keeps up a perennial supply of water to the lower land. But rain falling on the bare surface of cleared lands runs off at once by the nearest water-courses, and none is retained to keep up the flow during the dry season. Beside which, evaporation is so much more abundant from a surface exposed to the rain than from land screened by a clothing of forest, and the flow of surface water tends to sweep away the clothing of soil and render a district utterly barren. There is no doubt that this is one of the main causes, in hilly countries, of drought and floods. In France, for instance, since the mountains of Auvergne and Forey have been so denuded of forests, the Loire has been constantly flooded, occasioning vast destruction of property. The same cause, in Algeria, has caused frequent droughts, and the French government have lately been considering the proposition of some scientific men to replant these districts with trees.

Extraction of Odoriferous Principles of Plants by the Use of Glycerin.

We are in receipt of inquiries in regard to the methods employed in the extraction of the odoriferous principles of flowers by the use of glycerin. The process is that of simple contact. This substance when pure is devoid of odor and not liable to turn rancid, and is therefore much superiorto oils or fats for the purpose, not excluding the best olive oil.

The plan of extracting certain delicate and fugacious odors which are destroyed by ordinary distillation, used to consist in placing flowers between oiled or greased cloths or plates of glass prepared with oil or grease, after which, the essential oils were washed out from the oily matters by means of alcohol, which thus charged with perfume, became an essence or extract.

The extraction of odoriferous oils with glycerin is performed by introducing the flowers, such as those of the jasmine, hyacinth, narcissus, lilac, syringa, violet, rose, etc., into a vessel filled with glycerin, in which they are allowed to remain for three weeks. At the expiration of this time, the liquid is strained off, and contains the odoriferous principles of the flowers. The glycerin has been converted into a delightfully perfumed extract which may be used as it is, for hair dressing, or it may be dissolved in all proportions in water or alcohol forming various highly perfumed and variously scented liquids or washes. Some of the less volatile essential oils may also be transferred to ether, and from it to alcohol.

Statistics of Cotton Manufacture.

The National Association of Cotton Manufacturers and Planters has just issued a report which contains some highly interesting information. It appears that the number of cotton mills in the Northern States is at present 664, running 6,359,020 spindles, and consuming annually 385,952,021 pounds of cotton; while there are in the Southern States 86 mills, running 225,063 spindles, and consuming annually 31,415,750 pounds of cotton. In the Northern mills each spindle is made to spin, on an average, sixty pounds of cotton a year, while in the Southern mills each one spins 138 pounds, showing that a coarser quality of goods is manufactured at the South. There are, altogether, nearly 100 fewer mills in operation now than there were in 1860. The total consumption of cotton for manufacturing purposes last year was 450,000,000 pounds, which, at the usual estimate of 400 pounds to a bale, equals 1,125,000 bales, or nearly one half the production of the United States. The consumption in 1868, in Europe and the United States, was 2,094,105,000 pounds, against 1,976,520,000 pounds in 1858, and 2,284,901,000 pounds in 1859. At the present relative prices of raw cotton and cotton cloth, there is no profit on the manufacture of the latter.

Adulterations of Food.

We have alluded to the results of some investigations, recently published in the New York *World*, regarding the adulterations of current articles of food in the United States. Some of our transatlantic exchanges have alluded to the subject in a manner calculated to imply that the Yankees are experts in this sort of thing. It would seem, however, that such deception is not by any means confined to this country. A committee composed of a large number of very able men, chemists, physicians, etc., being appointed by the British Parliament to investigate the subject, report that they cannot avoid the conclusion that adulteration widely prevails, though under circumstances of very various character. "As regards foreign products some arrive in this country in an adulterated condition, while others are adulterated by the English dealer. Other commodities again, the product of this country, are shown to be in an adulterated state when passing into the hands of the dealers, while others undergo adulteration by the dealers themselves. Not only is the public health thus exposed to danger, and pecuniary fraud committed on the whole community, but the public morality is tainted, and the high commercial character of this country seriously lowered, both at home and in the eyes of foreign countries. Though happily very many refuse, under every temptation, to falsify the quality of their wares, there are unfortunately large numbers who, though reluctantly practicing deception, yield to the pernicious contagion of example, or to the hard pressure of competition forced upon them by their less scrupulous neighbors."

Without enumerating all the adulterations detected by the committee, the following list will show that English ingenuity in the art of cheating is not to be ranked as very inferior to that of other nations:

"Some of the leading articles which have been proved to be more or less commonly adulterated, are: Arrowroot, adulterated with potato and other starches; bread, with potatoes, plaster of paris, alum, and sulphate of copper; bottled fruits and vegetables, with certain salts of copper; coffee, with chiccory, roasted wheat, beans, and mangle wurzel; chiccory, with roasted wheat, carrots, sawdust, and Venetian red; cocoa, with arrowroot, potato flour, sugar, chiccory, and some ferruginous red earth; cayenne, with ground rice, mustard husks, etc., colored with red lead; lard, with potato flour, mutton suet, carbonate of soda, and caustic lime; mustard, with wheat flour and tumeric; marmalade, with apples and turnips; porter and stout (though sent out in a pure state from the brewers), with water, sugar, treacle, salt, alum, cocculus indicus, grains of paradise, nux vomica, and sulphuric acid; pickles and preserves, with salts of copper; snuff, with various chromates, red lead, lime and powdered glass; tobacco, with water, sugar, rhubarb, and treacle; vinegar, with water, sugar, and sulphuric acid; jalap, with powdered wood; opium, with poppy capsules, wheat flour, powdered wood, and sand; scammony, with wheat, chalk, resin, and sand; confectionery, with plaster of Paris and other similar ingredients, colored with various pigments of a highly poisonous nature; and acid drops, purporting to be compounded of Jargonelle pear, Ribston pippin, lemon, etc., with essential oils, containing prussic acid or other dangerous ingredients."

Further investigations, an account of which we omit, seem to indicate that pure articles of diet are rather the exception to the rule among our self-complacent critics. It is impossible in this connection not to recall the lines of Burns.

Oh wad some power the giftie gie us
To see ourselves as ithers see us,
It wad frae mony a blunder free us,
And foolish notion.

The United States Coast Survey.—Interesting Experiments.

For some time past, the United States Coast Survey officers, have been engaged in making astronomical observations between Cambridge University and the cities of the West, using the telegraph to aid them in their labors. In order to arrive at the mean time between the Atlantic and the Pacific, the one represented by Boston and the other by San Francisco, the wires of the Western Union Telegraph have been nightly brought into use for nearly a month past. The wires were connected with a chronometer at Cambridge in such a manner that the main circuit is broken and instantly closed again at every beat or tick of the time-piece, and the result is that each second of time, as marked by the chronometer at Cambridge, goes forth from the university on the Atlantic coast, and, with almost the speed of light itself, hurries on over the magic wire, passing through intermediate cities, towns, and villages, across rivers, over mountains and along the open country, until it finally reaches the recording instrument on the Pacific coast, in all its original fullness of pulsation. Think of it once! The ticks of a clock in Boston are heard and recorded in San Francisco almost in the same instant that they reached the ear of the observer in the first named place!

So perfect were the connections and the workings of the wires that, had any one gone into the office of the Western Union Telegraph in this city, at any time during the time when the experiments were going on, he could have heard the ticking of the chronometer at Cambridge, as the signals were rapidly transmitted to the Pacific seaboard. For five minutes the tick! tick! tick! goes on, and then all is quiet. Presently San Francisco telegraphs Boston "All right; your second signals came good, and have been recorded for five minutes. Go ahead five minutes more." Again, tick! tick! tick! for five minutes, and then San Francisco says again: "All right, are you ready to take my signals?" And the answer from Boston is: "Yes, go ahead." "Tick! tick! tick!" says San Francisco for the allotted five minutes, and Boston says, in his turn: "All right!"

The signals are perfect, yet the question is not solved. The loss of time in the transmission of the signals between one point and another is to be computed, and the experimenters have the problem of how to measure that time, for solution. This is, however, only a small part of the labor. Another wire is switched on at Boston, a repeater is added, and the question is solved. In a trifle less than sixty seconds, one minute, the signals go to San Francisco and return to Boston, having traveled about six thousand miles.

The experiments are now closed, but they have been entirely successful. The route is from Boston through Albany, Buffalo, Cleveland, Detroit, Chicago, Omaha, Cheyenne, Salt Lake City, Virginia City, in Nevada, to San Francisco and return.

This triumph of art over what appeared to be insurmountable difficulties has been the greatest yet recorded, inasmuch as space, so to speak, has been totally annihilated. The true difference in the mean time between the two points has not yet been fully announced.

Effects on Man of Residence at Great Altitudes.

Prof. Robert von Schlagintweit, the celebrated traveler, at a recent meeting of the Boston Society for Medical Improvement, made some very interesting remarks upon the effects of high altitudes upon the human system. We extract from the Boston *Medical and Surgical Journal* a synopsis of his remarks which are of value, as they are based upon personal experience and observation in the highest regions of Asia, through which Prof. von Schlagintwait has traveled extensively.

"There is a hight above which human life is impossible; in in a balloon, Mr. Glaisher fainted when 32,000 feet above the level of the sea; probably no man could live at an elevation greater than 34–36,000 feet; this will, however, depend much on the state of the atmosphere, the idiosyncrasies of individuals, and the habit of living in high places. The Professor, himself, on first reaching an elevation of 17–18,000 feet, felt great inconvenience and distress, but at another visit was not much affected. People living at a moderate elevation, on going higher, suffer full as much as the unaccustomed traveler. In 'High Asia' the effects of elevation are shown by headache, hæmoptysis, dyspnœa, anorexia, muscular debility, and low spirits, all increased at night, and at times every one gasps for air, apparently in vain; moments occur when every one believes that he must inevitably be suffocated. In day time epistaxis may occur, but if the nose is not too much irritated it seldom occurs. He had never seen bleeding from the eyes, lips, or ears. All these symptoms disappear as soon as one begins to descend. In the Andes, it is said, beside these symptoms, are also intense headache, swoons, bleeding from the nose, lips, gums, and eyelids, especially the *tunica conjunctiva*. The hight at which these symptoms come on among the Andes is not nearly so great as in High Asia; in the latter country being not below 16,500 feet, while in the Andes the effect of hight has been repeatedly felt as low as 10,700 feet, lower than anywhere else. No satisfactory explanation of this fact has yet been given. Prof. S. thought it might be owing to the different geological construction, but the existence of volcanoes in the Andes would not wholly account for the difference. In balloons, these symptoms do not come on till a much greater hight is reached, bodily exertion rendering one much more likely to suffer; in a balloon, the passengers keep perfectly still, any exertion, at a great hight, causing intense depression and greatly hightening the pulse. Cold does not increase the intensity of the suffering, but wind decidedly. One could stay for days at hights of 16,500 feet and not suffer during the first portion, but at evening a breeze usually sprung up, rendering every one sick; in the morning the appetite came back and the bad symptoms were gone. The effect of great hights is influenced by the state of the atmosphere (which is always better in the morning than in the evening), the existence of wind, or clouds, or electricity. There is a great decrease in the atmospheric pressure, the barometer at the hight of 22,259 feet showing only 13·3 inches. In High Asia, at a hight of 18,600 or 18,800 feet, the atmospheric pressure is one-half of that at the level of the sea. These symptoms, which all are liable to in great hights, prevent human beings from living there, even if all conditions are at hand for their thriving well.

"In none of the pastures in Thibet is the hight greater than 16,320 feet, and they are only used in certain portions of the year. A French author, Paul de Carmoy, has described a described a village in the Peruvian Andes, named Pueblo de Ocoruro, at a hight of 18,454 feet, whose inhabitants spend all the year there, but from his own experience, Prof. von Schlagintweit thinks this impossible; Carmoy's statement rests either on an erroneous observation or on a wrong measurement; he has probably mistaken a transitory settlement, only inhabited for a few days, for a permanent abode.

"Dr. Parks said, some years ago he ascended Monte Rosa, and when near the summit, in the midst of a flurry of wind and snow, had an attack of dyspnœa, and other disagreeable feelings, which all passed away on reaching the summit.

"Prof. von Schlagintweit said these symptoms were not usually felt on the Alps, which were only on the confines of the elevation at which these symptoms were likely to occur. They might be felt in an exceptional case, in a storm, as in Dr. Parks' experience, or by people of highly nervous temperaments.

"Why should this influence show itself at so much lower an elevation among the Andes than in the Alps or elsewhere? Whole villages live in Asia at the hight of 10,500 feet above the level of the sea. The inhabitants are robust, with well-developed chests; their stature is somewhat less than that of Europeans or Americans, but their strength is enormous, that of the women as well as the men. The diet varies with the race, some living on vegetable, some on animal food alone. The Hindoos live principally on rice; they also make use of an intoxicating liquor made of millet.

"Animal traces are found at very great hights; the yak (*Bos grunniens*) at 19,400 feet, wild horse (*Kyang*), and several species of wild sheep and ibex at 18,600, but very few birds.

"As to the diseases: in Thibet we find goitre but seldom, while it is common in some Himalaya valleys; rheumatism is very common, as is also constipation; smallpox causes fearful ravages in Thibet; no apoplexy; no phthisis, but, on the contrary, consumptives find great relief in these high altitudes. Prof. von Schlagintweit anticipates happy results from the study of the hygiene of high regions."

The Twig-Girdler.

We have been puzzled for a long time to know what insect it is that girdles and occasionally amputates the twigs of various trees in the manner shown in the following engraving. The mystery has at length been solved by one of our correspondents, Mr. Geo. Burnside, of South Pass, Ill., detecting the culprit in the very act. Upon examining two specimens, kindly sent to us by that gentleman, the girding insect proves to be one of the rarest of our capricorn, or long-horn beetles (the *Oncideres cingulatus* of Say, color, *a*, grayish-brown). And now that we have thus been enabled to recognize the species, we find that, so far as regards the girding of hickory twigs by this beetle, the discovery was made and published more than thirty years ago by Prof. Haldeman. Possibly the amputation of pear twigs, and especially of persimmon twigs, which we have ourselves notices noticed to be so very common in South Illinois, in consequence of such girding, may be effected by a distinct species; but, as Mr. Burnside says, that he discovered the very same insect, which he had seen actually girdling hickory twigs "under very suspicious circumstances" upon a pear tree, the probability is that it is the same species that operates upon all these three trees.

The twig-girdler, according to Prof. Haldeman, "may be seen in Pennsylvania during the last two weeks in August and the first week in September, feeding upon the bark of the tender branches of the young hickories. Both sexes are rather rare, particularly the male, which is rather smaller than the female, but with longer antennae. The female makes perforations, *b*, in the branches of the tree upon which she lives, which are from half-inch to a quarter of an inch thick, in which she deposits her eggs (one of which is represented of the natural size at *e*). She then proceeds to gnaw a groove, of about a tenth of an inch wide and deep, around the branch and below the place where the eggs are deposited, so that the exterior portion dies, and the larva feeds upon the dead wood."—*American Entomologists*.

Seventeen and Thirteen Year Locusts.

There is probably no one American insect more intimately connected with the history of the United States, and of which more has been written, than the 17-year cicada. It is scarcely necessary to tell Americans that, as the name implies, this insect generally requires seventeen years to undergo its transformations; remaining, with the exception of about three months, the whole of this time under ground. There is not a parallel case, that we know of, within the whole range of natural history; but though so much has been written about this cicada, yet some of the most interesting facts relative to its history were unknown till the present year.

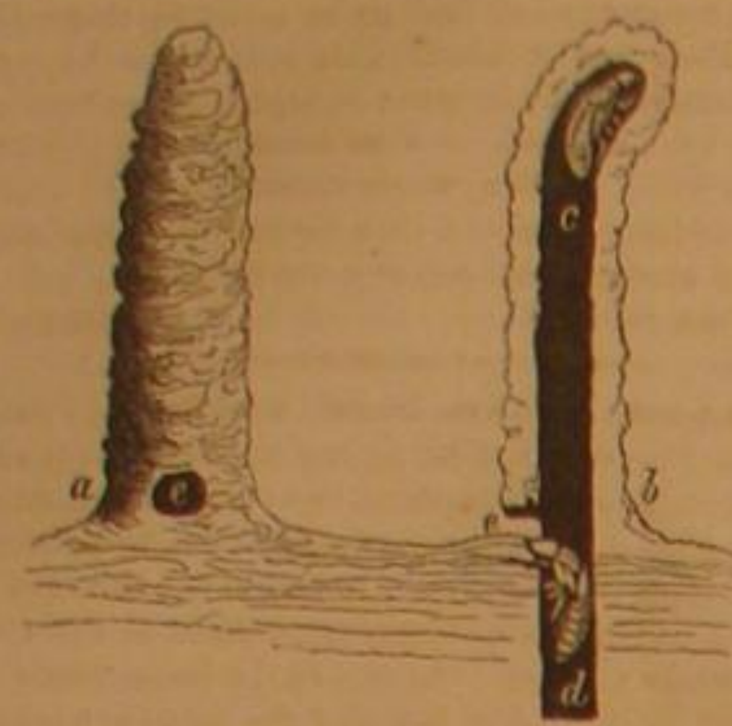
We have discovered that beside the 17-year broods, the appearance of one of which was recorded as long ago as 1633, there are also 13-year broods; and that, though both sometimes occur in the same States, yet in general terms, the 17-year broods may be said to belong to the Northern, and the 13-year broods to the Southern States. It so happened that one of the largest 17-year broods, together with one of the largest 13-year broods, appeared simultaneously in the summer of 1868. Such an event, so far as regards these two particular broods, has not taken place since the year 1647, nor will it take place again till the year 2089.

There are absolutely no perceptible specific difference between the 17-year and the 13-year broods, other than in the time of maturing.

The season of their appearance and disappearance differs somewhat with the latitude, though not so materially as one might suppose. According to the records, they appeared the past season earlier in the South than in the North; but the last half of May can be set down as the period during which they emerge from the ground, in any part of the country, while they generally leave by the 4th of July. As is the case with a great many other insects, the males make their appearance several days before the females, and also disappear sooner. Hence, in the latter part of the cicada season, though the woods are still full of females, the song of but very few males will be heard.

Their natural history and transformations have been sufficiently described in the standard works of both Harris and Fitch, and we shall simply mention a few facts not recorded by them.

Mr. S. S. Rathvon, of Lancaster, Pa., who has himself witnessed four of their periodical visits, at intervals of seventeen years, has communicated to us the following very ingenious provision, which the pupa made the past season, in localities that were low or flat, and in which the drainage was imperfect. He says: "We had a series of rains here about the time of their first appearance, and in such places, and under such circumstances, the pupas would continue their galleries from four to six inches above ground (*a*, full view, *b*, sectional view), leaving an orifice, *e*, of egress even with the surface. In the upper end of these chambers the pupas, *c*, would be found awaiting their approaching time of change. They would then back down to below the level of the earth, as at *d*, and issuing forth from the orifice, would attach themselves to the first object at hand, and undergo their transformations in the same manner."



Mr. Rathvon kindly furnished us with one of these elevated chambers, from which the above drawings were taken. It measured about four inches in length, with a diameter on the inside of five-eighths of an inch, and on the outside of about one and a quarter inches. It was slightly bent at the top and sufficiently hard to carry through the mail without breaking. It bore a great resemblance to the tube of the mason bee, but the inside was less smooth and covered with the imprints of the spines with which the fore legs of the builder are armed. In a field that was being plowed, about the time of their ascent, we found that single, straight, or bent chambers were the most common, though there were sometimes several branching near the surface from a main chamber below, each of the branches containing pupa. The same observations have been made by other parties.

When ready to transform they invariably attach themselves to some object, and, after the fly has evolved, the pupa skin is left still adhering. The operation of emerging from the pupa most generally takes place between the hours of 6 and 9 P. M.; and ten minutes after the pupa skin bursts on the back, the cicada will have entirely freed itself from it. Immediately after leaving the pupa skin, the body is soft and white, with the exception of a black patch on the prothorax. The wings are developed in less than an hour, but the natural colors of the body are not acquired till several hours have elapsed. These recently developed cicadas are somewhat dull for a day or so after transforming, but soon become more active, both in flight and song, as their muscles harden. For those who are not informed of the fact, we will state that the males alone are capable of "singing," and that they are true ventriloquists, their rattling noise being produced by a system of muscles in the lower part of the body, which work on drums under the wings.

Upon leaving the ground to transform, the pupas are attacked by different quadrupeds, by birds, by cannibal insects, such as ground-beetles, dragon-flies, soldier-bugs, etc.; while hogs and poultry of all kinds greedily feast upon them. In the perfect fly state they are attacked by at least one insect parasite; for dipterous maggots may occasionally be found in their bodies. In this state they are also often attacked by a peculiar fungus. One of our correspondents, Dr. W. D. Hartman, of Westchester, Pa., speaking of the occurrence of this fungus in 1851, says: "The posterior part of the abdomen, in a large number of male locusts, was filled by a greenish fungus. * * * The abdomen of the infected males was unusually inflated, dry, and brittle, and totally dead while the insect was yet flying about. Upon breaking off the hind part of the abdomen, the dust-like spores would fly as from a small puff-ball."

The injury to fruit trees, which the female causes by her punctures, is often quite serious. This is especially the case in a young orchard or in a nursery. When the wind is high the cicadas may, with its aid, be driven to some extent, but without the aid of the wind they cannot be driven at all; as when you start them they are just as likely to fly behind as before you. Indeed, when they are once in the fly state, and as numerous as we have seen them the past season, we are obliged to confess, after experiments involving about $200, that there is no available way of preventing their ruinous work. While in their feeble and helpless condition, however, as they leave the ground, they can be destroyed with but little trouble.

In the year 1869, and at intervals of seventeen years thereafter, they will probably appear in the valley of the Connecticut river. According to Dr. Asa Fitch, they appeared there in 1818 and 1835; although, strange to say, there seems to be no record of their having appeared there in 1852. Hence, this may be considered as a somewhat problematical brood.

In the year 1870, and at intervals of seventeen years thereafter, they will, in all probability, appear in what is known as the "Kreitz Creek Valley" in York county, Pa. This brood appears to be quite local.

In the year 1871, and at intervals of seventeen years thereafter, they will in all probability appear around the head of Lake Michigan, extending as far east as the middle of the State of Michigan, and west an unknown distance into Iowa. Also in Walworth county and other portions of southern Wisconsin, and southward into Illinois.

They will also appear in the same years in the southeast by eastern part of Lancaster county, Pa., in what is called the "Pequea Valley," having appeared there in vast numbers in 1854.—*American Entomologist*.

VELOCIPEDE SUMMARY.

The *English Mechanic and Mirror of Science*, gives an engraving and a description of a velocipede used in the last century by M. Richard, a physician of Rochelle, France, which is a singular affair. It is a four-wheeled vehicle, the two hinder ones being the drivers. It has a canopy to protect the rider from sun and rain, and a box for a footman behind the canopy. The footman was a footman indeed, as well as in name, and his office was no sinecure. While the doctor reclined at his ease and steered the vehicle by means of two cords attached to the opposite ends of a lever on the forward wheels like that used on the modern machine, the footman propelled the vehicle by means of treadles acting by pawls upon ratchet wheels attached to the hinder axle.

A correspondent of the same journal suggests the use of sails as an assistance in propelling velocipedes. It is well known that sails have been used with considerable success in propelling land vehicles and ice boats, and it is not improbable that an application of a small sail to the bicycle could be made that would materially aid in its propulsion. When a lad, we used to amuse ourself by using a hemlock bough as a sail when skating, and have found that we could thus make very considerable progress without using the legs as motors. A sail, having an area of from nine to sixteen square feet, would, with the wind well aft, give a propelling force sufficient to drive a velocipede on a smooth and level road, and would prove a great assistance in ascending a grade. A wind blowing at the rate of twenty-five miles an hour, which is only a brisk wind, would give a tractive force of nearly fifty pounds upon a sail four feet square.

The same journal also gives an account of some water velocipedes, which we think are inferior to some invented in this country. We have an engraving of a water velocipede in preparation, which will in due time be laid before our readers.

With the approach of the season for tours in rural districts by artists and sportsmen, considerable attention is being paid to accessories for velocipedes. Those which seem to have occupied the thoughts of foreign inventors most, are valises, lanterns, oil bottles, velocipede covers, supporters, and reckoners. These articles form quite a staple in the foreign patent business, but as yet very few applications in this field have been made in the United States. During the summer months there will be a demand for all articles of this kind, and inventors will do well to anticipate it.

The Prince Imperial of France has ordered twelve velocipedes, for the use of himself and friends. He is said to be passionately fond of the sport. In other parts of Europe, England in particular, the use of velocipedes is rapidly increasing.

We have been shown an ingenious model, calculated to adapt the velocipede to snow travel, the particulars of which we are not at liberty to publish. The same principle, if it proves successful, may be applied to velocipedes designed to be used on large and level tracts of loose sand.

There seems to be a fertility in invention in this field altogether surprising, and which is alone sufficient to guarantee the non-ephemeral character of the favor in which it is now held.

We herewith give a cut of a velocipede made in 1823, at Norfolk, Conn., and a communication in regard to it.

"In a small New England village, about the year 1823, a cute Yankee boy "might have been seen" (as G. P. R. James used to say), in fact, *was* seen tearing round on a VELOCIPEDE of his own construction, to the astonishment of the villagers and his own great delectation. The 'machine' was of rather a rude construction, as shown in the above cut, the wheels being of boards nailed together criscross, and the frame of such 'stuff' as a farmer's woodpile could furnish; but it would 'go like fun.' In principle, and even in form, it was identical with the present bicycle, the crank being omitted, and on which some one, more witty than wise, claims a patent. There were the two wheels, tandem; the forward one 'axled in the jaws of a depending bar, pivoted in the frame and turned by a horizontal lever bar;' and it is presumed to have been constructed after a 'description' in some 'printed publication,' boys in those days not being thought adequate to the *invention* of anything! It was propelled by the *toes* (not the flat foot) lightly touching the ground; and, though not as 'fast' as the crank-y concerns of the present hour, did very well for a little village and a country boy.

"That village was Norfolk, Litchfield county, Conn.; and the boy (an old boy now), your correspondent and admiring reader."

I. I. PEASE.

Stockbridge, Mass.

Another correspondent from Indianapolis, writing under date of Feb. 16, states that our weekly velocipede summary excites much attention and interest in that city, and gives us some items of interest. He says that perhaps no city has caught the fever more readily than Indianapolis. "As soon as velocipedes could be built they were eagerly bought up by our young men, who soon became more or less skilled in riding; and in order to test the adaptability of the machines to travel on common roads, a party has been formed to make a trip to Richmond, in this State, as soon as the roads are in good order, so that the cry among velocipedists now is 'On to Richmond.'

"Last evening, at the rink, a race for a silver cup was announced to take place between some professional riders and those of our young men who chose to enter the lists. After strong efforts, on the part of the professionals, to agree upon a distance of three times round the floor, it was decided to make it eleven times round, which is equal to a mile, and each one to run separately against time. Without specifying the performance of each of the ten riders, I will speak of the victor—a young gent of this city, who exhibited the most perfect control of his machine, riding with equal elegance and precision either with or without using his hands. He made the mile in three minutes and six seconds, which, as far as I have seen, is the best time yet made on occasions of this kind. The size of the wheels is thirty-six inches front and thirty inches back. The excitement of the great crowd of spectators was intense, as with perfect coolness and unerring regularity he made his rounds, apparently *sans* effort, in an average of less than seventeen seconds."

This correspondent also makes some good suggestions in regard to the construction of velocipedes which we omit, as they have been for the most part anticipated in our columns.

The *Velocipedist*, speaking of the expense entailed in the use of velocipedes, says:

"The two-wheeled velocipede is the animal which costs but little to purchase, and still less to keep. It does not, like one Zedechias mentioned by an old historian, eat cart loads of hay, with carts, horses, and drivers as a relish, just to amuse Louis le Debonnaire, or any other sovereign. It does not, like Jehu run, wax fat and kick. It is easy to handle. It never 'rares up.' It won't bite. It needs no check rein or halter, or any unnatural restraint. It is light and little; let alone, it will lean lovingly against the nearest support. It never flies off at a tangent unless badly managed, and under no circumstances will it shy at anything. It is not ludibrious, like the young mule, nor does it, like the Morgan colt, cut up in a ridiculously corybantic manner, nor does it in other ways disgrace the memory of its inventor. In its movements it is all grace. Its one gait is so uniform and easy and beautiful to look at, and simple to analyze, that it would be a shame to speak of a trot in the same breath. When its driver driveth furiously, even as did Jehu, the son of Nimshi, then there may be danger to him who obstructs the way, and will not make room for the flying steed. But otherwise not. When we have nationalized the stranger, do not let us forget his origin, but where many smooth roads meet, erect to his memory, and in honor of the inventor, a brave monument like that which surmounts the grave of him who first gave us pickles, and taught the world how to cure and barrel the bony herring. Let it not be said that the maker of the first bicycle went unrewarded by the descendants of that posterity who forgot Ctesibius, the first organ builder, or him who introduced the gridiron, or yet those other anonymous benefactors to whom we owe the benefits and blessings derived from the use of door knobs and buttons."

An exciting race took place very recently in the Horticultural Velocipede Academy, in Boston. It was both a fast and slow race.

The slow race was introduced first, there being about six entries, for a purse of $500, to be awarded to the rider making the circuit of the hall three times in the longest time, each contestant, in case of making a "foul," to have the second trial. The race lasted about an hour and a half, the following time being made: Mr. Geo. Marsh (the winner), 4.02; Mr. Hamblin, of East Boston, 3.54; Mr. Goddard, 3.34; Mr. Clark, 3.23; Mr. Sandford, 3.18; Mr. Gardner, 3.13.

The second or fast race was a match for a purse of $100, distance one mile or twenty-four times around the hall, between Mr. Clark, of Chelsea, and Mr. Hamblin, of East Boston, both riders to start at the same time from opposite sides of the hall. After some falls, and amidst vociferous cheering, Mr. Hamblin was declared the winner in 4.52.

A word of advice to the proprietors and conductors of velocipede halls. The congregation of "roughs" and rude boys at some of these places, is a serious drawback to the amusement of those who pay for their amusement. The interests of all concerned, and the prosperity of these popular resorts, will be consulted by the exclusion of such characters, by proper regulations.

INTERNATIONAL EXHIBITION OF HOUSEHOLD ARTICLES.—It is announced that information has been received at the Department of State, that the Society for the Encouragement of Manufactures and Mechanical Industry in the Netherlands, proposes to arrange an International Exhibition of articles for daily household use, at Utrecht, in the months of August and September, 1869. The principal object of this exhibition is to bring to the knowledge of the workman such articles of industry of different countries, at a low price, as may combine usefulness with durability, so that he may be enabled by judicious economy to improve his condition.

A RECORD of seventy-five boiler explosions in England shows that twelve were in mines and eleven in iron and engineering works.

Correspondence.

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

Single-acting Toy Steam Engine.

MESSRS. EDITORS.—The description of the toy steam engine, published with illustrations in No. 5, current volume of your valuable journal, was interesting to me, because I have one something similar which I built as evenings' amusements while an apprentice. I think it is easier to make than the one you describe.

The boiler head is a brass casting, A, of a triangular form, having a circular flange, B (dotted lines in Fig. 2), fitting into the boiler, C, which is of sheet copper or brass, spun from a single piece. The cylinder, D, oscillates on a screw, E, passing through the flange of the cylinder head, F, and the boiler head, and secured by a set nut, G, under the plate. The face of the flange of the cylinder head is held to the surface of the boiler head by a spiral spring under the head of the screw, as seen in Fig. 1, which is a side elevation or vertical section, while Fig. 2 is a plan, or top view. This spring forms also a safety valve by permitting an over-pressure of steam to lift the face of the cylinder head slightly, through the medium of the port seen leading from the boiler through the upright portion of the cylinder head to the cylinder. (The port shown by the dotted lines in Fig. 1 is the exhaust, the space between the two being shown in Fig. 2 where one is represented closed and the other open).

Fig.1.

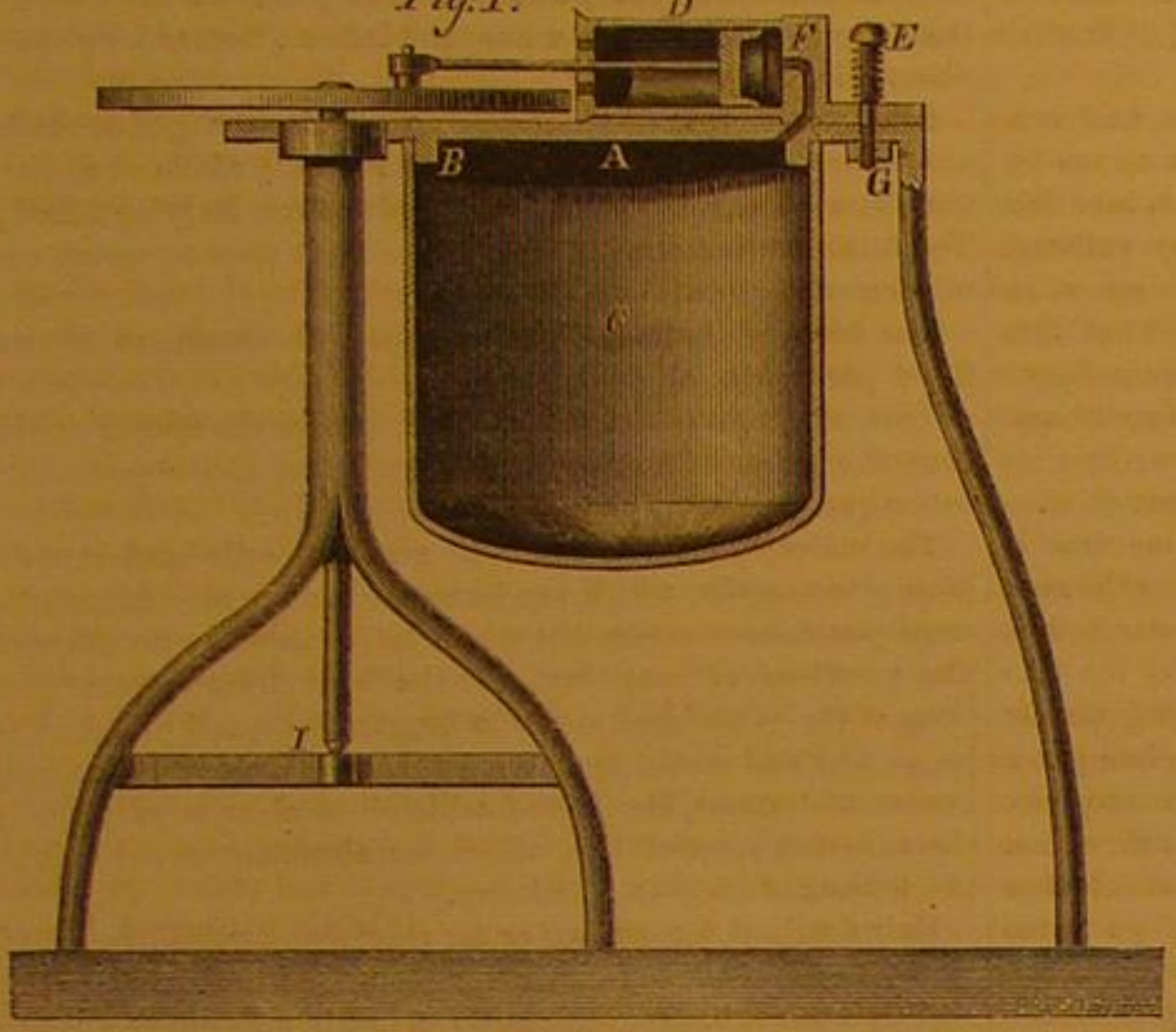
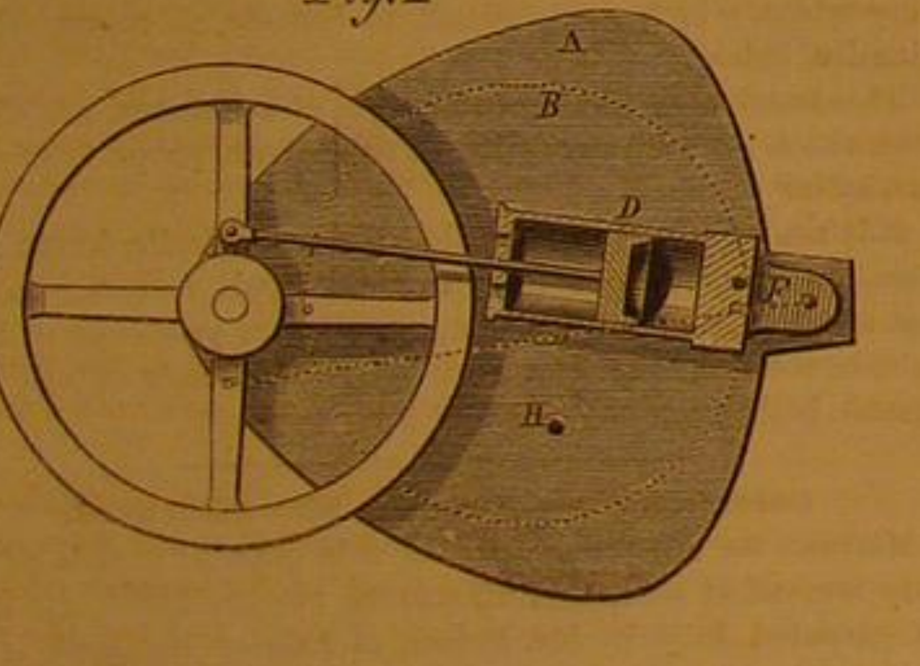


Fig.2



The piston is turned concave with a thin edge on the steam side, left slightly larger than the bore of the cylinder, and which may be spread with a burnisher when it leaks, thus forming a spring packing. The boiler has no gage cock, although one might be easily attached, and it is filled with water through a hole, H, Fig. 2, which may be plugged with a small screw. The leg at the wheel end is made of a tube through which the shaft of the wheel passes, its end resting on a step in a cross-piece, I, to receive which the pipe is split about half its length forming two feet. It will be seen that the wheel runs through a horizontal plane, being mounted on a vertical shaft. Heat is applied under the boiler by a gas jet or a small spirit lamp. The joints are all made with hard solder. Holes in the wheel end of the cylinder admit the atmosphere for the return stroke. The machine is very simple and easily constructed. It is a source of great amusement, as it hums like a top.

DANIEL DAVIS, Jr.

Princeton, Mass.

Incrustations on Iron.

MESSRS. EDITORS:—I have just been reading in the SCIENTIFIC AMERICAN the article on boiler incrustations. I have frequently noticed in our kitchen an iron pot, smooth as glass on the inside, which the old cook keeps forever over the burning coals, with boiling water; beside that stands the tea-kettle, also iron, but rough as a grater inside. Now, in the pot the water never deposits crust, nor is there any sign of it; but in the kettle you might almost build a brown-stone house with the incrustation if you could get it off.

The idea occurred to me, that all boilers could be made smooth inside (and you could not have them too smooth), they ought to be slippery as ice; or why not line them with porcelain as all our cooking utensils are, which are often over tremendous fires? Let the inside only be smooth, and it appears water could not then incrust them. In our pump is sulphate of lime.

MRS. EDMUND PRATT.

Bridesburg, Philadelphia, Pa.

[Cast-iron cooking utensils are generally made of very hard iron. When of soft iron they are liable to corrode as well as to gather incrustations. The very hard iron will keep clean. It is obvious that such hard iron could not be used in making steam-boiler plates, for it could not be wrought, and would not have the requisite tenacity. The conditions of a culinary vessel and a steam generator are not the same. The temperature of the interior of a kitchen pot cannot rise much above the boiling point of water, 212° Fah., but that of the steam boiler not unfrequently rises to 365° Fah.—EDS.

Rat-proof Buildings.

MESSRS. EDITORS.—I noticed an article from the *American Builder* relative to the discomforts of the people of Chicago, occasioned by the vast number of rats which infest that city, and asking if any one can invent a style of building which shall be rat proof.

I have wondered many times, that the builders and proprietors of the grain elevators and large warehouses of the West have not ere this adopted the English plan of making their buildings rat proof. The same material, in a more finished state, is used for first class dwelling houses. If used by the people of Chicago, they will be free from the encroachments and destructiveness of rats,as well as the filth, bad odor, and the disagreeable gnawing sounds caused by them.

The plan adopted in England is to have the floor of slate, sawed and planed to uniform sizes and thickness. The walls are also covered in the same manner with sawed and planed slats, well jointed and secured to the wall or studding with screws, which makes each room as secure against rats as an iron or stone box would be. The slate used for the floor is from one to two inches thick, and that for the walls half an inch thick. For warehouses, elevators, and such buildings, it would be less expensive to use it as it comes from the saw and planer without being sand-rubbed; but for costly dwellings the slate for the walls is marbleized, by which process a perfect imitation can be made of any of the foreign marbles, rendering the rooms at once gorgeous and beautiful in appearance.

The Vermont slate, which is of handsome light variegated colors, polished to a glossy surface, would appear finely and be preferred by many. But the imitations of light foreign marbles, such as Sienna, Lisbon, brocatelle, porphyry, and the like, would be richer and livelier in color, making the rooms more pleasant and light. The slate is wrought into different shapes and forms to suit the taste; some in panels, others to represent blocks of marble of one or of different colors. For plainer dwellings it may be used in its natural color without polish or extra finish. There is no doubt but that slate used in its plain form for the floors and walls of stores, mills, and elevators, and even houses, would render them rat as well as fire proof.

I. I. W.

Fairhaven, Vt.

Crank Pins of Inside Connected Locomotives.

MESSRS. EDITORS:—I propounded the simple question, "Why the inside connected engine requires a crank pin so much larger than an outside connected one?" and by way of answer a gentleman, who is a first rate mechanic, asks, "Why does the axle of a locomotive need to be larger than the crank pin?" The crank pin and axle perform two different offices, and in the case of the inside connected locomotive there is very little difference between the sizes of the two parts.

I will answer my own question in this way: There is no need of the pin being any larger than for an outside connected engine, for it would break of any size if exposed to the same influences. Since the crank shaft is one solid forging, and of the worst form to bear sudden shocks or jars, it seems to me that the frequent breaking of them is from natural causes; that is, sudden strains from the track, unrelieved by any spring or counterforce. The action of the pistons, in addition to the sudden elevation of one side two inches or more from a plane, causes a very severe twist, which not unfrequently breaks the solid crank pin of six inches, while the four-inch pin (outside connected) escapes. The outside connected engine has no such strains to encounter in its crank pin, having merely to turn the wheel. I hope this is not "an evasive answer."

EGBERT P. WATSON.

Do We Measure Horse Power Correctly?

MESSRS. EDITORS:—When we wish to find the actual horse power of a steam engine, and compute the same by multiplying area of cylinder by stroke of piston, pounds of steam, and number of strokes per minute, *without other qualification*, the result is erroneous; as, for instance, apply the foregoing rule to a steam engine furnishing power for a machine shop, and running at the rate of seventy-five revolutions per minute, and let the result in horse power be thirty; then disconnect, throw the belting off the power wheel, use the same amount and pressure of steam, and the number of revolutions will be doubled on account of outside resistance being removed. Now, measure the horse power by same rule, and the result will be sixty-horse power, which is evidently absurd; for it is equal to saying that the engine uses most horse power when doing least work, and least horse power when doing most work.

It appears to me, that the actual horse power of an engine, is only and simply the amount of power thrown off and made use of, and should be competent apart and distinct from the power consumed in the engine, *per se*, and I therefore beg to suggest the following rule for computing true horse power.

Calculate, by present method, the horse power of any engine doing actual work, at any given number of revolutions, and then find the horse power consumed in producing the same number of revolutions when not doing any work; subtract the one from the other and the result will be the true horse power of the engine.

To assist purchasers, it should be incumbent upon all builders of, and dealers in steam engines, to know the exact horse power consumed at any given velocity in any engine, *perse*, they may have for sale. It must be admitted that a better test of the superior economy of one man's make of engine over another, could scarcely be had than that of the amount of steam consumed in running any engine alone.

New York city. MATHEMATICIAN.

Wonderful Results from Expanding Steam.

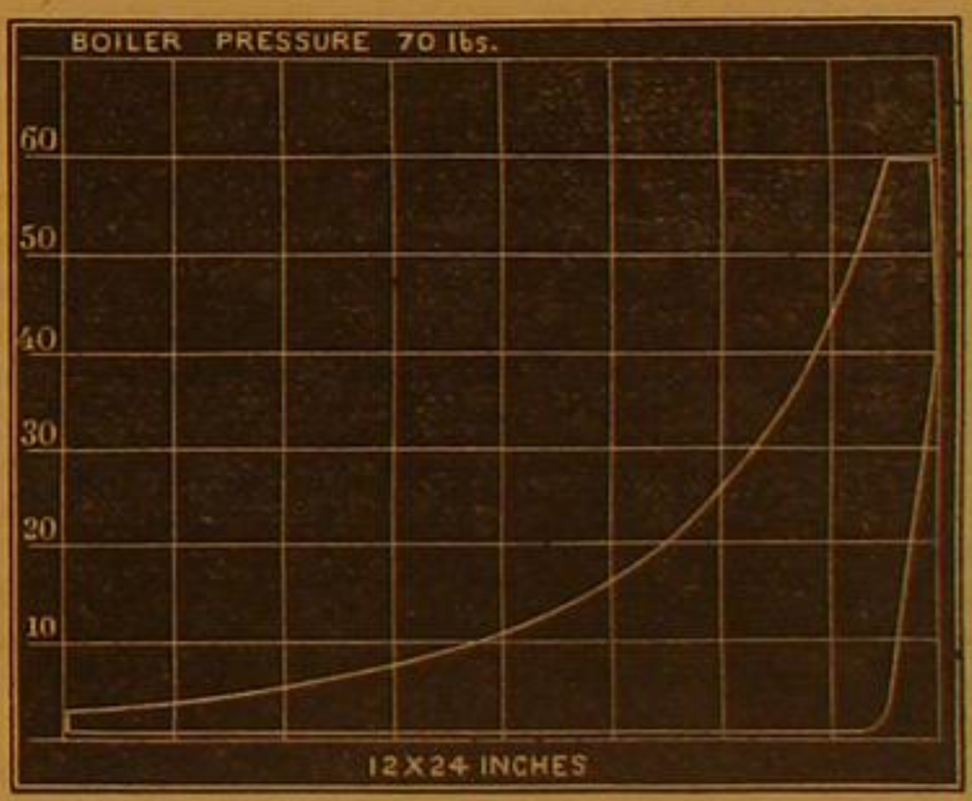
MESSRS. EDITORS:—A friend has handed me a pamphlet of 50 pages, elaborately illustrated, and said to have been extensively circulated, by a Steam Engine Company, who claim a capital of $200,000. In this pamphlet diagrams are given of cards, said to have been taken from some of the Company's engines while at work. As shown by these cards, their engines work in absolute defiance of the known laws of forces, and the men who circulate them evince a wonderful contempt for the science of the age.

To add still more interest to these curious diagrams, they are examined, commented upon, and greatly approved of, by a "Chief Engineer," "Inspector of Steam Boilers" in a certain Congressional District, and, as the Company assures us, "one of the most thoroughly informed engineers in the country." This surely gives them respectability.

Now, if indeed this Company, with their "Chief Engineer," can set aside the laws that have heretofore governed the movement of forces—laws that the steam engine has always most obstinately refused to disregard—it is a curious fact which your readers should know, and with your permission, I will describe, for their consideration, one of these wonderful diagrams with a brief analysis.

The one I select is said to have been taken from an engine 12x24 inches, making 90 revolutions per minute.

We are not told at precisely what point the steam ports open; but as the exhaust line on the card is down near to the atmosphere until within 1½ inches of the end of stroke, and there mounts almost perpendicular so as to reach 40 pounds at the end, it is evident the port is well open at the commencement.



The piston has scarcely moved forward when the pressure line reaches 60 pounds; which pressure is maintained exactly uniform for just 1½ inches, where, we are informed, "the steam is cut off short" and expansion commences.

When the piston has advanced 3 inches, and the steam expanded to just twice its volume, the pressure line is still up to 42. At 4½ inches, three volumes, it is up to 32, and at six inches, having expanded to four volumes, it still maintains a pressure of 23 pounds. At the end of the stroke, when it has expanded to sixteen times its original volume, although the initiatory pressure was but 60 pounds by the gage, or 75 pounds all told, it still maintains an effective pressure of 3 pounds, or 18 pounds including atmosphere, and, as we are assured by the builders and the "Chief Engineer," it has given an average effective pressure of 17½ pounds for the whole length of the cylinder.

Now, suppose this steam at 60 pounds, or really 75 pounds pressure, to have been a perfectly non-condensing gas, and to have been allowed to expand without resistance, say in a vacuum, to 16 times its volume, the pressure would be, 75÷16—4·68 pounds, or about 10 pounds below the atmosphere. This is in accordance with the well-known law of the pressure and expansion of gases—a law deduced from the great principle of equilibrium which controls the movement of all forces, and is the very soul of mechanical science, and demonstrated by a thousand experiments.

Every perfectly elastic fluid, when under pressure, possesses a power exactly equal to the *product of its volume and pressure*. If the volume is 5 and the pressure 100, the power is 5×100—500. If allowed to expand freely until the volume is doubled, the pressure will sink to one-half and we have, as the power, 10×50—500. If it expanded to 5 times the original volume, that is, 25, it must divide out its pressure equally between these five volumes, and can, of course, give to each but one-fifth of its original pressure, 20 pounds. We then will have 25×20—500, and so we may go on expanding to 100, or 1000, volumes with the same results so long as the expansion can go on without resistance. But to assert that this gas can, by the act of expansion, multiply the power, so that the product of its volume and pressure will be greater after expansion than before, is to assert that power can be created by merely a mechanical movement—the old dream of perpetual motion—simple absurdity.

But let us return to our diagram, and see just what our Steam Engine Company and their "Chief" do claim. Steam in cylinder before expansion, vol. 1, pres. 75; 1×75—75: after expansion, vol. 16, pres. 18; 16×18—288. These results show a multiplication of power more than three times. This is monstrous; but all is not yet told.

We are assured that the average effective pressure, that is, the work done by this steam, was $17\frac{1}{2}$ pounds for the whole length of the cylinder. However, before proceeding to inquire into this question of the work done, we must return for a moment to the law of expansion. We have seen that the mere enlargement of a perfectly elastic gas is but a division of its pressure among the several volumes into which it has expanded; the whole mass containing the same amount of force, after, as before, the expansion. Now let us inquire what is the effect when this expansion occurs under difficulties. When the expanding gas meets with opposing forces, where it must move from the path heavy obstacles, and work its way to an enlarged volume at great cost, as steam expanding behind the resisting piston; does any one claim that all this resistance is removed without cost? Can power be exerted without expending force? No more than God can be false. Then for every pound raised, or moved, by the expansive force of steam, or any other gas, it must yield an equivalent, and fall just so much below its original power.

Now as the measure of heat contained in steam, or gas, is the measure of its expansive force, and as heat and force, or motion, are equivalent, and when combined with an elastic fluid, are identical or convertible, it follows that in expending force, heat is lost. And it has been found by careful experiment that for every 772 foot-pounds of force exerted, a unit of heat—an amount of heat sufficient to raise a pound of water one degree in temperature—must be expended.

Now in the case under consideration, we are told that the effective power obtained was equal to an average pressure of $17\frac{1}{2}$ pounds for the whole length of the cylinder. The initiatory pressure of 60 pounds for $1\frac{1}{2}$ inches would make for the whole but $3\frac{3}{4}$ pounds; then there remains $13\frac{3}{4}$ pounds to be supplied by expansion. This requires a force equal to 3,107 foot-pounds. Again, the atmospheric pressure of about 15 pounds must be pushed back by the expansion, and will require a force of 3,178 foot-pounds. These together amount to 6,285 foot-pounds, equal to eight units of heat; which is necessarily withdrawn from the steam.

Let us see what this will leave. The amount of steam admitted to the cylinder is $169\frac{1}{2}$ inches, the pressure 75 pounds. Steam at this pressure has a volume of 5·7 cubic feet per pound, and a total heat of 1,175°, or units. As the steam admitted is but one fifty-eighth of a pound, it contains but twenty units of heat. We have seen that eight units have been expanded in the work done; we then have but twelve left in the expanded steam. How, I ask, in the name of all the philosophers, can saturated steam, at 75 pounds pressure, expand to 16 volumes against a resistance that will cost eight-twentieths of all its heat and still maintain a pressure of 18 pounds, when a perfect gas, starting with the same pressure expanded, without resistance, or loss of heat, to 16 volumes, will sink to 4·68 pounds.

The whole thing is absurd. The days of miracles have passed. No such card was ever fairly taken from any steam engine.

E. S. Wicklin.

Keokuk, Iowa.

[The writer of the above appears to reason and write "by book." His theory is right, but his assertion that the diagram to which he refers could not have been fairly taken from any engine, is not sustained by practice. We can show him many equally at variance with the theoretical diagram. One important point does not seem to enter into his calculation; that is what engineers call "clearance," which may be defined as all the space from the closing valve to the piston, when on the dead center, including the passage to the exhaust valve, which is a large percentage; in this case, by estimate, about one-twentieth of the whole cubical contents of the cylinder. Now the steam that fills this one-twentieth is not represented on the theoretical diagram, and hence it would have to be added to the practical, or actual diagram, and would make the terminal expansion higher, say by three pounds.

This does not, however, account for the whole of the discrepancy shown, and we must look for some additional cause. This is unfortunately, too common, and is occasioned by want of perfect workmanship. It is the leaking of the valves. This would, of course, keep the pressure of the expansion line above the theoretic line in proportion to the amount of steam admitted after the valve had closed over the port. A diagram representing the clearance, and carried below the atmospheric line would have shown, clearer than we can do by words alone, our idea. We publish our correspondent's article and his diagram, however, as they form an excellent exposition of the theory of expansion.—Eds.

For the Scientific American.

Our Sun the Origin of all the Forces on Earth.

When we trace backward the origin of all forces or motions on the surface of our planet, we come to the necessary conclusion, that they all, with the single exception of the ocean tides, are to be found in the heat of the sun. In fact, this heat causes air currents, and so the force of the wind; it evaporates the water of oceans and lakes, which, coming down on mountains as rain, forms streams, and gives water power in its descent. Again, this heat of the sun causes plants to grow, which, storing up heat in their fibers, procure us a fuel, either fossil as coal, or recent as wood; which fuel, by its combustion, gives us only the heat of the sun back, which heat is thus made available to us at any place, at any time, and is also easily transformed into motion by means of steam or caloric engines. Or, again, the vegetable matter formed by the light and heat of the sun, is consumed by animals as food; and the stomach of animals acting in certain respects like the furnace of a steam engine, sets partially the hidden heat free to keep the animal system at the proper temperature, and partially consumes this heat to produce muscular motion for moving the individual itself, and partially this muscular motion may be applied to produce motion of matter, overcoming all kinds of resistances to this motion, and this last is what is commonly called force.

The use of a number of pounds only, as a measure of a force, without referring to its motion, notwithstanding extensively applied, is, when critically examined, very erroneous; as is also the old definition of force as something which "can create or destroy motion of matter," as if force was something exterior to matter and independent of it.

Force, on the contrary, is the manifestation to us of something co-existent with and inseparable from matter; no force without matter, and, as far as our experience goes, no matter without force.

Matter shows itself to us under different forms, and continually undergoes the most stupendous transformations by chemical and other agencies. Sometimes a light, invisible gas like hydrogen becomes condensed without any external pressure, in the one-thousandth part of its former space, in the metallic state in palladium, increasing the weight of this last metal almost one per cent; or this same gas combined with another gas, nitrogen, making the mysterious metal ammonium, forms a perfect amalgam with mercury, swelling its bulk till it becomes lighter than water, and will float on it.

Similar transformations we observe in force: one time it will manifest itself to our eyes as light streaming from the sun; then as an agent expanding matter, and giving to our bodies the sensation of heat; then changing the solidity of ice into the fluidity of water, and this again into the highly elastic vapors or steam—by every one of these molecular changes, a portion of heat disappearing, becoming latent, to reappear again when another change occurs in the opposite direction. By not only overpowering and destroying the natural cohesion of the waters molecules, but changing it in a powerful repulsion, this force increases the bulk of the water more than a thousand times, and enables it to exceed not only pressure, but to move heavy bodies; thus we may transform molecular force, or heat, into motion of the masses which then is distinctly observable to most of our senses. This constitutes what formerly, exclusively, was called a force, when heat was erroneously supposed to be some kind of imponderable fluid, having a separate existence, independent of matter.

Thus tracing back all motion on earth (always excepting the ocean tides) to the magical power of the sunbeam, the next natural question is, When e this light and heat of the sun? This question, of all-absorbing interest, I will treat in a following article.

P. H. Vander Weyde, M. D.

For the Scientific American.

THE TRADE IN HUMAN HAIR.

The trade in human hair has become quite important during these latter years, especially since it has been considered fashionable to replace by false hair, the deficiencies, real or supposed, of nature in this respect.

The origin of wigs is lost in antiquity; their use was abandoned during the middle ages, and was not renewed until the return of Saint Louis from the crusades, when he unfortunately became bald and was ordered by his physicians to keep his head constantly covered. Queen Blanche, his kind-hearted wife, inferring from this that it was hair that had kept her husband's head warm, obtained from all the surrounding courtiers a lock of their capillary appendages which she forthwith attached to the king's cap.

Ever since, Saint Louis has had the honor of being considered the patron saint of hair-dressers and wig-makers.

After this period wigs are not mentioned in history until the reign of King Louis XIV, who, in order to hide the unequal hight of his two shoulders, wore a long wig which covered this defect. No man of quality in France was allowed to wear his own hair, and Binette, the king's wig-maker, became quite a celebrated personage who sold some specimens of his handicraft as high as one thousand dollars.

In 1674 the wig-makers as a body were duly incorporated, the members being allowed to carry side weapons, and they held the exclusive monopoly of the trade in human hair, which they retained until the revolutionary period which swept all chartered privileges from the soil of France.

Notwithstanding many eminent professors of hygiene give reasons why the wearing of false hair is not healthy, and although it is also a well-known fact that a portion of it has been cut from the bodies of the dead, still the habit of wearing other people's hair has never been discontinued since the time of Louis XIV.

Hair, to be really first quality, should be taken from the heads of the living, who have had much exposure to the air and who have never employed curling irons. The hair taken from the dead is mostly used in the preparation of watch chains, bracelets, and similar articles.

France monopolizes the largest share of the trade in human hair. Paris, Marseilles, Lyons, Caen, Guibray, and Beaucaire, are the cities which do the largest part of this trade, the last three holding annual fairs for this specialty.

In Paris alone there are some thirty or forty dealers in hair, each of whom employs three or four regular cutters. These in their turn have several agents or decoys who visit the country, penetrating every village and hamlet through the land, where they try to induce the poor simple country girls to part with their hair for some trifling articles of barter, such as gaudy muslin handkerchiefs or false jewelry.

Some years back one firm in Paris traded in this way during one season nearly one hundred thousand dollars of merchandise; but the present merchants are compelled to pay in money instead of gewgaws. The peasants having learned the value of their hair, refuse to be swindled.

The exports of human hair from France to the United States recently increased so rapidly that the supply proved inadequate to meet the requirements and the price was doubled. Germany, Belgium, Poland, and Russia, have since joined to furnish us with our supplies.

Another reason for the high price paid for hair is the well-ascertained fact, that, as education spreads in France, the country girls refuse to sell their hair; one of the principal motives for which is, that many of the young Frenchmen who have been drafted into the imperial army, on their liberation from service and return home, are averse to marrying the short-cropped and disfigured sweethearts they find on their return from the garrison towns, where the ladies all wear long hair, waterfalls, or chignons.

Some years back the hair-cutting agents managed to obtain a full supply from Normandy and Brittany alone; but they have now to travel over the whole of France, Italy, and Sicily. The total annual crop of the globe is at present about one million of pounds.

The northern hair is fine and soft; the southern is best fitted for curling.

Two clippings are made annually, one in the spring of the year the other in autumn, the latter being considered of inferior quality.

The collected hair is tied into separate coils and thrown loosely into sacks, which are forwarded to the merchants who must purchase or refuse the whole lot, as they are not allowed the privilege of assorting. As the hair from different portions of the same head varies in length and quality, it has to be picked and sorted by being put through six or seven successive operations, the first of which is to clear it of nits, or the adherent eggs of lice, which are abundant in the hair of the women of Italy and Brittany.

Hair destined for curling or for ringlets is rolled on small wooden rollers about four inches long, covered with paper, tightly bound, boiled, and, lastly, dried in an oven at a moderate heat. The cost of hair nearly quadruples from the time it is cut until it gets into the hands of the retailer. He in his turns attaches a quite arbitrary higher price to the same, in accordance with the presumed fortune of his customers, or the difficulty he is supposed to have experienced in finding a particular tint suited to some special taste, or to the complexion of countenance. His price may vary, for a head of hair, from two dollars to three hundred times that amount.

The art of dyeing the hair has reached such perfection in our day, that, excepting very fiery red, fair blondes, and silvery white, which are difficult to imitate, all colors sell for identical prices.

Theatrical wigs having to be seen at a distance, are cheap, with the occasional exception of the private property of some particular star actor.

It is nearly useless to add that the cast-off coils, knots, chignons, fronts, curls, and wigs are collected, cleaned, carded, and serve over and over again, spread over paddings of horse hair, or some other material, to adorn the heads of our fashionable belles.

Corn Starch---How it is Manufactured.

Methods for the preparation of this popular article of food vary somewhat with manufacturers, but the following method, patented 1854, by Mr. Polsen of Paisley, Scotland, is perhaps as good as any. By this method the grain is first steeped either in alkaline water, or in water only, until the grain is thoroughly soaked. It is then reduced to pulp by the use of rollers, or other suitable machinery. It is next passed over a sieve through which the finer portions are forced by revolving brushes while the coarser parts remaining are returned to be reground. The husk or bran is thus separated, and may be used as food for cattle. A stream of water runs constantly down upon the sieve and carries the portion passing through, over an inclined plane or "run." The plane is divided into sections by wooden cleats which are laid across it. These cleats or dams intercept the starch which settles to the bottom, from which it is removed at proper intervals. The greater part of the glutinous and fibrous portions are carried along by the current, and are thus separated from the starch. The starch can be still further purified from the glutinous and fibrous matters by treating it with an alkaline solution which dissolves the gluten, running it through finer sieves, and rewashing it on the inclined plane.

Fictitious Gems.—A recent English work on diamonds says that but a small portion of the gems sold and worn is genuine. The diamond mines of Golconda have given out, and those of India are rapidly failing. Thus the scarcity of real gems has been met by the ingenuity of counterfeiters. As for these patent imitators, these indefatigable fabricators of gems, it is scarcely probable that the curious branch of industry will ever be relinquished; at least, it is certain that while poor humanity retains its present tendency to strive for that which is beyond its reach, and accept the shadow for the substance, paste diamonds, enameled porcelain opals, and pearls of fish scales will be marketable articles in the civilized world, as well as among the dusky tribes upon the coral strands of Africa.

THE MANUFACTURE OF IRON—THE RADCLIFFE PROCESS.

Attempts have been repeatedly made to economize in time, fuel, labor, and material, in the manufacture of iron, by welding several puddled balls into a homogeneous mass under the steam hammer; but never with good results. The difficulty lay apparently in securing a good weld between the surfaces, exposed as they were to the oxidation of the atmosphere. But, if we can credit *The Engineer*, Mr. Radcliffe, of the Consett Iron Works near Durham, England, has, for a year, been manufacturing, by this process, direct from the puddled ball, into bar, rail, or sheet.

In the usual process a charge of about four or five cwt. is used, and each puddled ball, when made, is taken separately to the hammer or squeezer to expel the cinder, and the rough bloom is then passed through rolls producing puddled bars. These are allowed to cool down until wanted for the next process. This consists in cutting a given weight of puddled bars into lengths of from 18 to 36 inches, and making them into a pile, which is placed in a heating furnace and raised to the proper heat, when it is rolled into a bar. This process is repeated—sometimes twice—to produce a superior article.

Now, each of these processes absorb fuel, labor, and time, and necessitate waste—waste in oxidation in the heating, as well as waste in the clippings of rough ends. The loss by oxidation cannot be less than five or six per cent, and the other waste as much, and probably more, at each re-heating. To the cost of the amount of the coal used in converting the pig iron—which is about four times the weight of the iron itself—must be added, at each re-heating, ten cwt. to each tun of iron. These costs do not comprise the extra labor, time, and wear and tear of machinery. If all these are saved by the Radcliffe process, it certainly deserves attention from iron manufacturers, as it does away with all cutting, piling, and re-heating. We copy from *The Engineer* the description of the process·

The details of the process, as carried out at Consett, may thus be described: Six, eight, or any required number of puddling furnaces are each charged with four cwt. of pig iron. The fettling consists partly of pulverized hematite ore from Ulverstone, partly of a very rich cinder obtained from the first pile heating furnaces in the rail mill, or from two furnaces specially employed in making cinder from small scrap. The iron is brought to nature as soon as possible, and the blooms are taken out while the iron is yet very young—as soon, indeed, as the balls will hold together.

The moment the iron is ready in a sufficient number of furnaces, the process of manufacture begins. A puddler takes a ball weighing about 80 lbs. to an eight-tun double-acting steam hammer. It is placed on the anvil and struck, first lightly and then, as the mass becomes consolidated, with more force. The cinder is expelled with considerable violence, and we have, at the end of twenty seconds, a flat cake of iron on the anvil perfectly quiescent. At this moment a second puddled ball is placed on the first. This receives, first a light, and then a couple of heavy blows. The hammer is raised for a few seconds, and then a curious action takes place. The first and second blows apparently expelled most of the cinder, and the mass, seemingly, tolerably solid, lies quietly on the anvil, but in a moment its surface rises like a cake of dough in a baker's oven. The surface seems to boil; little jets of flame sometimes start from the mass, and cinder pours in a torrent from every pore, flowing over the lump of iron, and running down all round. To what this peculiar action is due we cannot say. That this, in a sense, spontaneous evolution of cinder is a fact we can testify from close personal observation. A few blows from the steam hammer again consolidate the heaving mass. Another ball is placed on it; a few blows; a short pause. The rising of the mass and the flow of torrents of cinder follow as quickly as thought—and so the process is continued till eight balls are united. Then steam is brought to bear on the upper side of the hammer piston. The mass of iron is turned and re-turned, while the whole shop resounds with the sound of the hammer delivering blows with the speed of lightning on every portion of the red-hot mass, which finally assumes the form of a homogeneous slab some 3 feet long, 13 or 14 inches wide, and 8 or 9 inches thick. This slab is then taken up by a little steam crane at the side of the hammer, and, while hanging in the air, weighed. It is then run off to a heating furnace, preparatory to being rolled into a finished plate. The heating furnace is of the ordinary kind, and is only used to restore the heat lost by the outer surface of the mass. From the furnace it is taken to the roll mill, passed through the breaking-down grain rolls, and subsequently between a pair of chilled rolls in the same train, and finally it lies on the floor of the shop, a plate with whose appearance the most hypercritical can find no fault.

Mr. Radcliffe courts inquiry, and we were afforded the fullest possible opportunities for examining into the process known by his name. We witnessed the formation of many plates, and the following particulars of the manufacture of one, selected almost hap-hazard from our note-book, will show nearly at a glance of what the process is capable: At half-past three P.M. the first of eight puddled balls was brought from the furnace and placed on the anvil. In four minutes and a half this and seven other balls were welded into a slab weighing 644 lbs. At twenty-six minutes to four o'clock this pile was placed in the heating furnace; at nineteen minutes to four o'clock it was taken out and brought to the rolls; at fourteen minutes four o'clock it lay on the floor of the mill ready for shearing. Thus, precisely, sixteen minutes were occupied in producing the plate from the puddled ball. The weight of the plate before shearing was 574 lbs. It was then sheared to the finished size, 20 feet by 3 feet; thickness, 3-16th of an inch, nearly; weight sheared, 448 lbs. Is it necessary to point out here how much is gained in time, coal, iron, labor, and, finally, in money, by the Radcliffe process, as compared with old systems of manufacture? We think that they will be apparent at a glance to every ironmaster. What we have said in the beginning of this article should suffice to make them clear to others.

The question that here obtrudes itself is, what is the quality of the finished plate, bar, or rail? Unless the answer is satisfactory, the Radcliffe process—ingenious, cheap, and rapid as it is—is comparatively valueless. At Consett we examined some scores of specimens of sheets tested in every possible way. Plates 7-8 inch thick, bent cold to an angle of 90 deg. Thinner plates, bent upon themselves, coiled into a helix, split and bent backwards and forwards, dished up into troughs, twisted and tortured in every imaginable fashion, punched close to the edge—as close as holes would go—yet no symptom of crack or flaw. We have no hesitation in classing the specimens we examined with the very best ship-plates in the market; and yet these plates are produced at a price which has enabled Mr. Radcliffe to take very heavy orders from Dutch shipbuilders, beating Belgium out of the market, and yet leaving a fair profit.

MANUFACTURE OF PRESSED AND CUT GLASS WARE.

Having described, in former articles, the composition and modes of manufacturing bottles and window glass,our readers will understand the methods employed for pressed glass ware by a very brief description. The pressed glassware is made by pressing glass into molds of iron, and the articles thus formed approximate in beauty and regularity of form to those of cut glass, described further on. The operation requires less skill in manipulation than glass-blowing, but is, nevertheless, interesting.

It will be best understood by describing the manufacture of some special article—say a fruit dish, the bowl of which is saucer-shaped, and its foot formed like the bell of a trumpet. Such an article would be made in two parts, the bowl and the foot being pressed in separate molds, and afterward joined together. A boy takes upon the end of an iron rod or "punty," a quantity of glass from the melting pot,and holds it over the open mold. The weight of the molten glass causes it to depend in the form of a large pear-shaped drop. The principal workman, who has charge of the mold, cuts off this drop with a pair of shears,as soon as,in his judgment,enough has depended to exactly fill the mold. As soon as the glass has fallen into the mold, it is closed with a lever which forces the glass into every part of the matrix. The molds are made in two parts corresponding to the convex and concave sides of the piece. So accurate is the judgment of the skilled operators in this process that they rarely fail to properly apportion the glass to the capacity of the closed mold. The glass is removed from the mold as soon as it cools enough to become rigid, and is carried by an assistant to the annealing oven, if complete; or, if, as in the particular case of the fruit dish, it requires to be joined to another portion, it is cemented to its fellow by a small portion of plastic glass, and then placed in the annealing oven. Varieties of form and pattern may be attained by this method which are impossible in the blowing process, and the larger portion of goblets, salt-cellars, and other glass table ware, in common use, is made in this manner.

The finer and most costly articles of glass ware are finished by a process called cutting, which is, however, really a grinding process, performed by means of iron, sandstone, or copper disks, of various sizes and forms, according to the nature of the work to be performed. The disks are fixed, by proper chucks, to lathes, and are supplied with sand for rough grinding, and emery for finer work. A stone wheel is also used to efface the sand marks, and wood disks are used for polishing, supplied, at first, with a mixture of pumice and rotten stone, and finally with "putty powder," a preparation of tin and lead. Flint glass is the best for this purpose, as its superior hardness enables it to take a finer polish. Great skill and artistic taste is shown by the artisans, in this department, and cut-glass wares command a higher price than any others.

Plate glass constitutes a large and important branch of the glass manufacture, and may form the subject of a future article. The numberless uses to which glass is now applied, render all information, respecting its manufacture, of value, and although the manufacture of plate glass has not yet been successfully introduced into the United States, the extent of the demand here would seem to justify further attempts at home production.

THE NORTHERN PACIFIC RAILROAD.

A joint resolution has passed both Houses of Congress relieving the Northern Pacific Railroad Company of the prohibition against mortgaging the road. This resolution was adopted in consequence of a proposition by the company to build the road without further Government aid, in consideration of the authority thus given to them.

The *Superior Gazette* says an assurance has been given on the part of the company that the road will be commenced early in the spring, and pushed with a vigor worthy of so great an enterprise.

Now that the thing begins to look like work, we lay before our readers some facts showing the advantages this route possesses over that of the Union Pacific. The eastern terminus of this road is at Superior, situated at the western extremity of Lake Superior, and its western terminus is to be at the southern extremity of Puget Sound. Its length is 1,725 miles, of which the journal above quoted says:

"Not over 250 miles will have an elevation exceeding 3,000 feet above the sea, while of the Union and Central route, 1,100 miles are more than 4,000 feet above the sea, and more than 500 miles of it have an elevation of 7,500 feet above the ocean. Every 300 feet of ascent lowers the mercury one degree. The elevation of the valley of the Yellow Stone is scarcely above 2,000, while upon the same meridian the Union road reaches an elevation of 6,000 feet, and at the summit reaches 8,424, while the Northern route only attains 5,330—a difference of nearly 3,100 feet. Beside this, the fall of snow at the same elevation on the two routes is one-half less on the Northern than on the other, owing to the extreme dryness of the atmosphere.

"While a large portion of the lands granted to the Northern road is susceptible of a high state of cultivation, and of sustaining a dense population, not one acre in one hundred of the Union grant is susceptible of keeping alive more than one sage hen to the square mile.

"The Northern road will cross and drain from the north of it the country to which the United States must look for all time to come for its supply of wheat. The country which the hardy emigrant from the north of Europe will occupy in almost countless numbers, when this road is opened. On this route he will find his 'home' climate, and as they are the better class of immigrants will add millions to the wealth of the country through which the route passes. By the time the road reaches the mountains, at least two or three hundred thousand of population would be drawn to its line; while on the Union, except at two or three isolated spots, hardly as many hundreds have an abiding place. The arable portion of the great central plain of the American continent extends twelve hundred miles to the north and northwest of the head of Lake Superior; while it does not reach over half that distance to the west of Chicago. The distance from the former to Lake Winnipeg is less than from Chicago to the Missouri river

"The Northern route for six months in the year will not have a land carriage to exceed 1,750 miles, and from this point to the seaboard during the season of navigation, freights can be transported for one-third what railroads charge."

The latter advantage will also enable the company to do through business for a considerable portion of the year before the road is completed, by laying sections connecting the navigable waters which, for a large portion of the route, lie almost parallel to its general course.

Although this route lies so much farther north than the Union Pacific, its lower mean elevation compensates for the higher latitude in its climatic effects, and we regard it as established that there is less danger of snow obstruction than on the Union Pacific line. We have always regarded this route with favor, and are glad to see such good prospects for its speedy construction. When it is remembered that vessels coming from China make the North American coast near the straits of San Juan De Fuca, the entrance to Puget Sound, it will be seen that this road is destined to become, on its completion a formidable rival to the Union Pacific for the China trade. So far are we, however, from thinking either will ultimately suffer from competition, that we believe ere another half century shall have passed, the increase of population on the Pacific coast will necessitate the construction of a third trunk line connecting the great West with the Atlantic.

Mercury and Sulphur.

A few interesting facts,in which mercury plays a remarkable part are worth mention. Certain Dutch chemists discovered that plants cannot live in an atmosphere which contains vapor of mercury. Boussingault, of Paris, found that this noxious effect could be neutralized by introducing sulphur into the atmosphere; and farther, that sulphur, when exposed to vapor of mercury, takes on a coat which resembles iron, and does not easily rub off, or soil the fingers. This coat is sulphuret of mercury. Here, therefore, is a suggestion which may be turned to account by enterprising artists. Let them melt sulphur, and cast it into statuettes, friezes, moldings, flowers,and so forth, expose them to vapor of mercury, and they will obtain a number of articles, all wearing a metallic appearance, which may be found useful for ornamental purposes. The French chemist, taking a wide view of the subject, asks whether sulphur, which is at times found in the atmosphere, may not play an important part in neutralizing the effects of noisome vapors, or the deleterious miasm which rises from marshes and the banks of rivers in hot countries. And may we not ask, whether it will ever be found possible to stay the progress of an epidemic by flooding the atmosphere with fumes of sulphur?

The Hydroscope.

An instrument called the Hydroscope has recently been invented in England, and is intended to be used for the purpose of measuring the distance of an object from a coast battery, situated at least one hundred feet above the sea level. The construction of this instrument is described as being exceedingly simple, and the apparatus, it is asserted, can be used with great ease. The hydroscope consists of a piece of ordinary gas pipe, about six feet long, to the extremities of which upright tubes are attached. The whole is filled nearly full of water, and in each upright tube is inserted a tin float, carrying a crosspiece, and weighted so that when the long tube is in a horizontal position the cross bars are on an exact level.

An upright tangent scale, graduated for yards of distance, is attached to the sight end of the tube, which moves on its center in both a horizontal and a perpendicular direction. The instrument is placed in any part of the battery which commands an open view, and the observer revolves the tube until it is in a line with the object, and then raises the tangent scale until he can just see the object in a line with the two cross bars. The range is then read off in the tangent scale, and the gun is placed in the direction thus ascertained.

WELL-DIRECTED LIBERALITY.—Mr. Peter Cooper, the founder of the Cooper Union in this city, has furnished the Trustees with the sum of $20,000, to be applied to purchasing a complete set of mechanical models, illustrating every conceivable form in which power can be applied to machinery. The models will be procured in Darmstadt, in Germany, and will be about 2,000 in number.

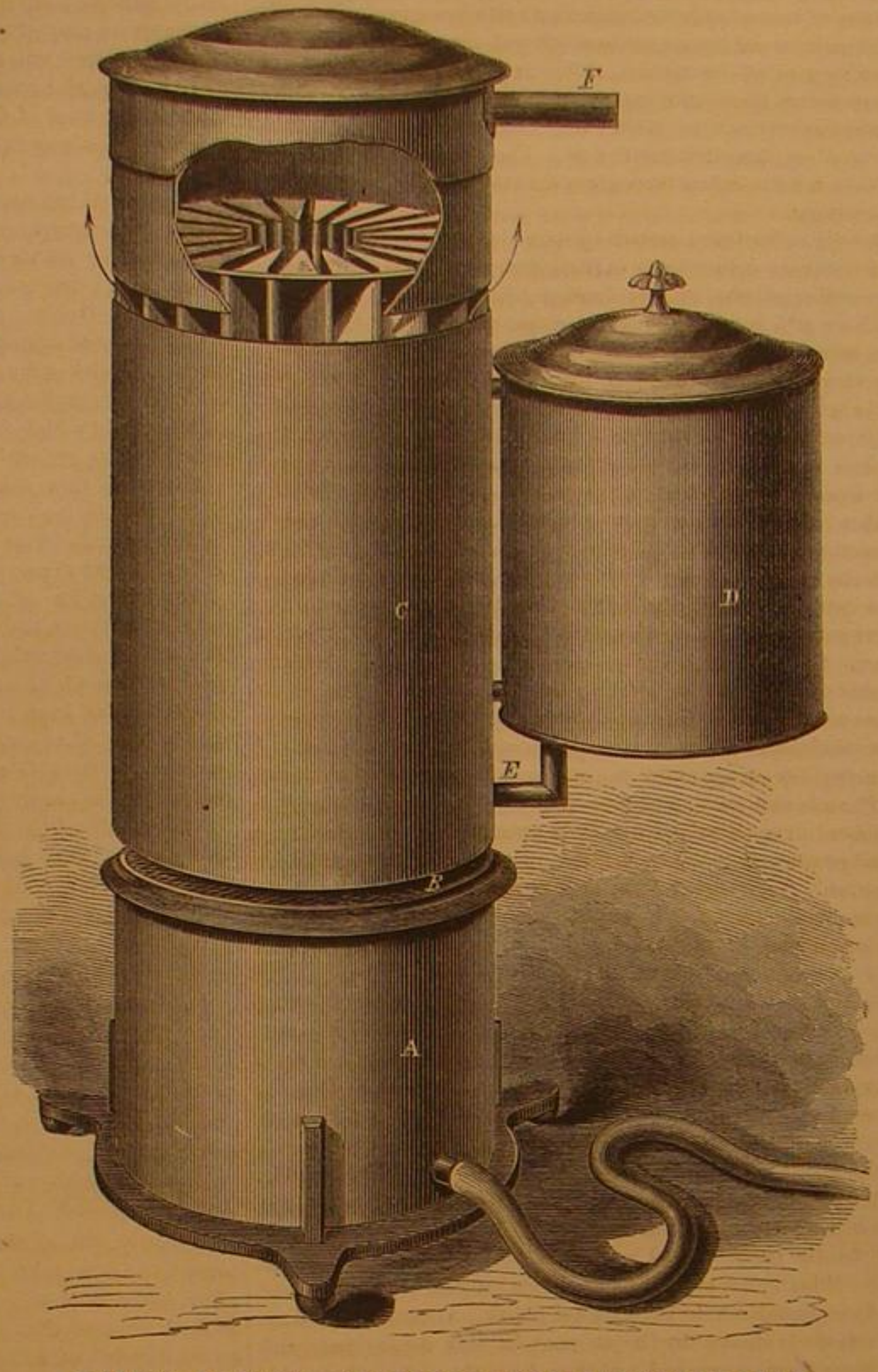
PROPOSALS have been published in Berlin for the formation of a company to lay down a new telegraph line between Europe and America, to be called the International People's Cable. One part of the arrangement is, that the subscribers are to receive bonds which will be accepted in payment for the transmission of messages when the line is in working order.

Improved Steam Cooking Apparatus.

It is well known that steam is a valuable agent in the cooking of food, and it is utilized, to a great extent, not only in large establishments, where food is cooked by wholesale, but in private families. The design of the apparatus shown in the accompanying engraving, is not only to afford a means for generating steam for this purpose, but to generate it rapidly and continuously, with the expenditure of but little fuel.

The lower portion, A, is the furnace, or the compartment into which gas is introduced by the flexible pipe. The top of this department consists of a fine wire gauze, through which the gas passes and is rendered combustible by means of the oxygen of the atmosphere, that gains access through the space, B, between the gas chamber and the generator, C. The construction of this portion is peculiar. It is seen plainly near the top of the figure, where the shell is shown as broken away. The water spaces are radial, interspersed with similar radial spaces for the products of combustion, their cross-sectional area being two or three times greater than that of the water spaces. The latter communicate with a central cylindrical chamber.

It will be seen that the heat entirely envelops the water, and, passing up through the interspaces, escapes, as seen, in the direction of the arrows. The relative area of heating surface, compared with the water surface, is very great, insuring a rapid boiling, and a constant and equable heat of the fluid, notwithstanding the influx of water to supply that thrown off as steam. The water tank, or reservoir, is represented at D. This may be connected to the generator, as shown, or may be distinct and apart from it, as desired. The water passes from it to the water spaces of the generator by the pipe, E, by which the hight of water in the generator is kept always at the same hight as that in the reservoir. The steam is delivered to the food to be cooked through the pipe, F. The principal advantages claimed for this apparatus, are the rapidity and equability of the generation of steam for cooking purposes. The heating surface, compared with the water surface, is enormous. It is evident that gas is not absolutely necessary as a fuel, as any lamp, or even charcoal, may be employed with a slight modification of the furnace portion. The inventor has, also, other arrangements of this device, adapting it on a larger scale to the generation of steam for yielding power. Patents were issued to Job A. Davis, Nov. 3, 1868, and Feb. 2, 1869 Communications and orders should be addressed to the patentee, Watertown, N. Y.



DAVIS' PATENT CULINARY STEAM GENERATOR.

Improved Three Wheeled Velocipede.

An objection strenuously urged by physicians against the velocipedes, now so popular, which are driven by the feet, is that the labor demanded by the lower limbs tends to produce hernia, or rupture. We question the ground for this objection, but if any exists, the vehicle shown in the accompanying engraving obviates it, being impelled wholly by the hands and arms, the feet and legs merely guiding the machine.

The front, or driving wheel, may be made of any size required, within practicable limits, that represented in the engraving being about four feet diameter, with which the inventor says he can make twenty-five miles per hour on a level. This wheel is held in the forks of an arched reach, the rear end of which is pivoted to an arched axle, the ends of which form journals for the two guiding wheels which are about two feet in diameter. The rider sits on a saddle connected to the reach by an upright sliding bar, and is sustained by a spiral spring to give ease of motion. Directly in front of the rider is an upright, through the crosspiece of which runs a shaft, having on each end hand cranks, from which rods run to corresponding cranks on the driving wheel shaft. These cranks are placed at right angles so that the machine may be put in motion from a state of rest, in whatever position the cranks may be.

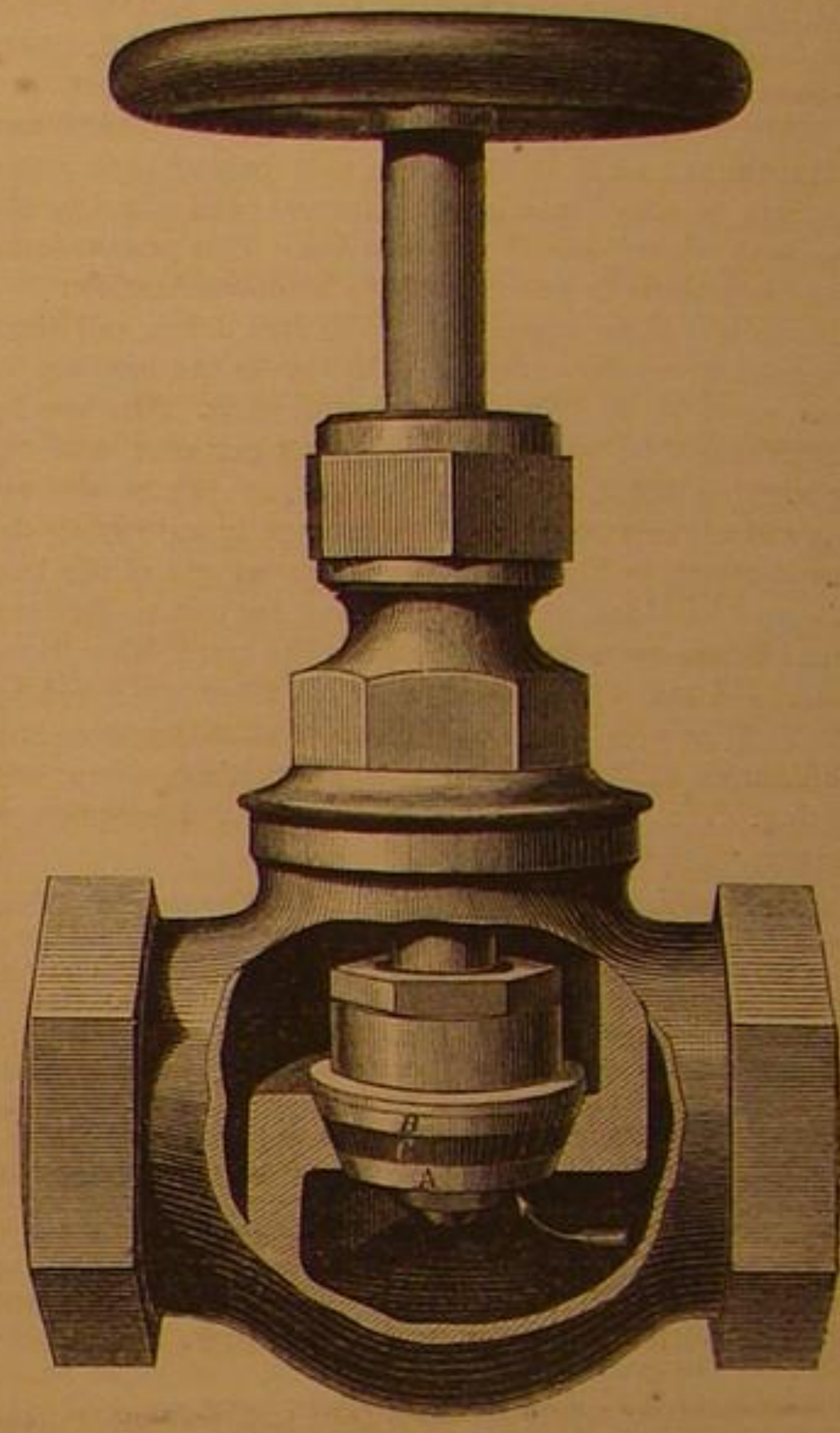
Stirrups, in which the rider places his feet, are attached to cords that run to the rear axle and serve to guide the machine, as may be plainly seen. When the vehicle is to be run straight forward a spring fixed to the center bolt of the rear axle, that passes through the end of the reach, holds the axle in the proper position. This yields when pressure is brought to bear on the stirrups, but when the pressure on either stirrup is released the spring brings the axle to its normal transverse position.

The inventor states his claims of superiority of his velocipede thus: Greater speed with less labor and fatigue; a more perfect control of the machine than has been obtained by others; in going down hill the speed of the machine is entirely under the control of the rider; capable of ascending steeper inclines than can be done by other machines; cannot be easily overturned and occupies less space and is lighter than others, one that he uses sustaining three hundred pounds and weighing only forty pounds, although clumsily constructed. By substituting a side saddle and shortening one of the stirrups, the vehicle may be adapted for ladies' use without change of the ordinary costume, and is adapted equally well to children or grown people of either sex. The inventor also considers rubber tires preferable to those of unyielding iron. Patented through the Scientific American Patent Agency, Feb. 23, 1869, by Isaac Samuels, of Marysville, Kansas, who may be addressed for rights, etc., as above, or Box 773 New York city.

SAMUELS' PATENT HAND CRANK VELOCIPEDE.

DOUGLAS' IMPROVED PATENT GLOBE VALVE.

One of the greatest annoyances to which the occupants of buildings fitted with steam and water pipes are subjected, is the leakage of the valves. It is a well-known fact that the best fitted metallic valve will become leaky very quickly, if a particle of scale or dirt from the pipe is caught between the valve and its seat while under pressure; and a leak, however slight, will cut a channel that continually grows larger. Devices have been contrived for re-grinding valves when leaky. This, however, is attended with inconvenience. The accompanying engraving illustrates a valve that seems to obviate these difficulties.



The shell is made in the usual way, but with somewhat greater depth of seat than others, the stem, stuffing-box, etc., being the same as those ordinarily used. The valve is attached loosely to the stem by ball and socket joint allowing slight play. The valve proper is composed of three parts, the lower disk, A, and the upper one, B, embracing between them a vulcanized rubber disk, C, held securely by a screw forming a part of the upper disk, and a nut, as seen. Either A or B, alone or combined, form perfect valve plugs as safe as any used on ordinary valves. In addition the flexible disk renders assurance doubly sure. The steam coming in the direction of the arrow and pressing upon the disk, A, expands this elastic disk, so that the greater the pressure the closer the fit. When worn or injured this disk may be quickly removed and another substituted. These parts are all manufactured in duplicates. This is valve adapted to steam, gas, water, and other liquids.

Patented March 17, 1868, by Frank Douglas, Norwich, Conn., who may be addressed for the right to manufacture or for the valves. They may be obtained also of Belknap & Burnham, who manufacture them at Bridgeport, Conn.

American Antiquities.

At the meeting of the American Association for the Advancement of Science, recently held in the city of Chicago, many of the papers indicated considerable activity in the researches into the antiquity and character of the early races of men who inhabited America. Col. Charles Whittlesey, in a paper on the "Geological Evidences of Man's Antiquity in the United States," maintained that four American races preceded the red man:—First, the mound-builders; second, a race in the territory now called Wisconsin; third, a warlike race in the region south of Lakes Ontario and Erie; and, fourth, a religious people in Mexico. Pottery, arrow-heads, etc., have been found in conjunction with and beneath the mastodon and megatherium. Human remains have also been found during excavations at New Orleans at a depth of sixteen feet. Mr. Foster exhibited a copper knife found in New Orleans, which he believed was a relic of the mound-builders. A water-jug, surmounted by a human head, and a statuette of a captive, with his hands bound behind him, both from Peru, and evidently of extreme antiquity, attracted much attention. It may also be mentioned, that the recent explorations of Mr. E. G. Squier, in Peru, and the curious photographs of ancient temples, dolmens, etc., which he has brought back, have renewed some old theories as to a connection in origin between the earliest inhabitants of America and those of the oriental countries.

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Contents:

(Illustrated articles are marked with an asterisk.)

THE MECHANICS OF WALKING.

A discussion has commenced in regard to the asserted gain in the application of power by the use of the velocipede. One party states there is a decided gain by its use. The negative argument may be fairly put as follows: Equal bodies moving with different velocities require different powers to maintain their motion, that moving with the greater velocity requiring the greater power. If moving at equal velocities the powers required to move them will be equal. The amount of power necessary to transport a man say ten miles, will be the same, no matter how it may be applied, hence it takes the same muscular exertion to propel him ten miles on a velocipede as it would to walk the same distance. Now, so far as the gain in the application of power in the use of the velocipede is concerned, there can be no doubt of its existence on level and descending grades. The facts prove it indubitably. It may not be amiss however to reconcile facts and theory, and thus show how the gain is made. Those who take the negative side in the argument, and whose position we have fairly stated above, are right in their views so far as premises are concerned, but wrong in their conclusions. If all the power exerted in walking were expended in propelling the body forward, and friction were the same in both cases, there would be no gain in the use of the velocipede. But only a small portion of the power expended in the act of walking or running is applied to forward propulsion, as will be seen upon a review of the mechanics of walking.

In walking the heel is first placed on the ground; the weight is next thrown on the ball of the foot, and the body is raised so as to permit the free limb to swing by the one upon which the body rests. As soon as the free limb has passed the center of gravity, the body is allowed to descend, until the heel on that side receives the weight, when the body is again raised. This alternate rising and falling of the body causes the center of gravity to pass through an undulating curve. We have performed a series of experiments to graphically determine the amount of this undulation, and find it to average about three inches in adults of different hights, and varying lengths of the lower limbs.

Now, allowing the rate of speed attained in walking to average three miles per hour, and the length of step to average three feet, we find that the body is raised in walking 5,280 times during a walk of one hour or three miles. Reckoning the average weight of men to be 140 lbs. we have for the work expended in raising the body during an hours walk $\frac{5280 \times 3 \times 140}{12} = 184{,}800$ foot-pounds per hour, or 3,060 foot-pounds per minute.

According to Silliman, the power of a man when applied to the best advantage (the treadmill) is equal to 2,000,000 foot-pounds for eight hours or 4,166·6 foot-pounds per minute. We see then that fully three-fourths of the entire muscular power of the lower limbs is expended in raising the body during the act of walking, less some deductions to be noticed hereafter.

It is not to be inferred on this account, that the apparatus for locomotion provided for us by Nature is defective. On the contrary we shall find when we examine it, that it is a marvel of perfection. Nature's is "nae journey wark" in any of her constructions. Direct forward propulsion is only *one* of the requirements of the feet and legs. They are adapted to climbing steep ascents, stairs, ladders, etc.; for descending abrupt declivities, for leaping, turning, and a variety of other movements, which wheels are incapable of performing. They possess great elasticity to save the body from injurious shocks. Their joints are self-lubricating and their weight is the smallest possible relatively to the work they are required to perform. No art would be able to fulfill all these conditions as nature has done, but art, has in the velocipede been able to apply power to direct forward propulsion better than Nature has done, hampered as she is by all the other requirements of the case.

It is undoubtedly true that a small portion of the power expended in raising the body while walking is converted into forward motion when it descends, and is thus utilized. It is also true that the elasticity of the limbs, stores up a portion of the power acquired in the descent of the body and applies it to the ascent of the body in each succeeding step. The loss of power is thus somewhat diminished, but making these deductions there must remain a large loss, when walking upon level ground. In walking up a grade there would be less loss in proportion to the steepness of the ascent. In going up hill, where the grade is over one inch to the foot, the power lost in walking upon level ground will be entirely utilized. In any steeper grade than this, the unassisted legs would be able to accomplish a greater distance than the velocipede, provided the latter utilized all the power of the lower limbs, which, of course it does not. There are losses from friction, and other causes, so that the legs would be found to have an advantage over the velocipede in ascending grades of considerably less than one inch to the foot; our opinion is that they would be found by experiment to be about on an equality in ascending gradients of one-third of an inch to the foot. On the contrary in going down a grade the velocipede has an increasing advantage with the steepness of the grade.

The advantage possessed by the velocipede on level ground consists in the more economical application of power to direct forward propulsion, than can be obtained in walking or running, and is another illustration that a simple rotary motion is the most economical way in which power can be applied to the production of simple effects.

PRETENDED MECHANICS.

A correspondent, writing from Springfield, Mass., speaks in very harsh terms of a class of men who offer their services as those of competent machinists, yet have never served an apprenticeship and do not understand, either theoretically or practically, the business. He calls them "dead beats," a term perhaps more expressive than elegant. He says: "The proprietors of shops are imposed upon by their assumption and pretension, the trade injured by their incompetency, and the capable workman disgraced by their ignorance. Their 'cheekiness' is equaled only by their perseverance, for if discharged in one shop for spoiling a job (their usual way of finishing work) they go to another, making plausible representations as to ability, etc. They are generally graduates of some gun-shop, where they run a drilling or milling machine, and, at the close of the war when this occupation was gone, went forth full-fledged machinists. Hardly a foreman of a machine shop in the country but has been imposed upon by these trade impostors; the consequence is that bosses have no confidence in the statements of strangers applying for work, and honest and capable men suffer because of ignorant pretenders. Now, Messrs. Editors, something ought to be done to remedy this state of affairs. Can you help ?"

The above is the "gist" of the communication the language of which we have somewhat changed, as the indignation of the writer seems to have governed his style. The statements he makes are, however, undoubtedly correct; the trade is cursed with a class of hangers-on, who, incapable of doing journeymen's work and too proud to take apprentices' position, force themselves, temporarily, into places they are unfit to fill, by simple audacious pretension. It will be seen our correspondent does not include in his strictures honest workmen, who, not having served an apprenticeship, make no pretension to qualifications they do not possess, but only those who impose by misrepresentation.

The evil is not a small one, and the complaints of our correspondent have more foundation than a low jealousy; but it seems to us that the remedy is easily found. First, these pseudo-machinists must inevitably find their level in the shop. It is so everywhere; pretension will not always keep the leaky hulk afloat on the sea of life under the influence of the gale of experience. In our late war, many an officer who went out to the field with the insignia of rank returned discomfited, while many an enlisted man rose by rapid gradations to the proper level. The skilled and competent machinist cannot hide his light; he will be appreciated. The pretender will invariably subside to his proper position of obscurity.

Second, the impositions practiced upon foremen and employers can be prevented by themselves. Let them adopt a rule not to engage an applicant unless he can bring recommendations or certificates of competency from his former master or employer; or, in case this is impossible, as when the applicant cannot, on account of distance from his former place of employment, produce, at once, his evidences of capability, let him be taken on trial, after an examination by interrogations, and let his work be his recommendation. One week will be amply sufficient in any case to determine the proper status of the new comer. Then, if he proves to be a workman whose services are valuable he may be employed, and if he proves to be a pretender, incapable of carrying his professions into practice, his services will not be required.

THE EAST RIVER BRIDGE.

The Board of Consulting Engineers of the East River Suspension Bridge, to connect Brooklyn with New York, have lately held several meetings to consult on the plan of the proposed structure in its details, with such results as will serve to remove many of the doubts in the minds of the unprofessional and induce them to share the confidence of the Board. The gentlemen comprising the Board are the well-known engineers, Horatio Allen, W. J. McAlpine, J. Dutton Steel, Benjamin H. Latrobe, John Serrell, J. P. Kirkwood, and J. W. Adams. They unanimously decided, after a careful and detailed examination of Mr. Roebling's plans, that there is no insurmountable obstacle to building a suspension bridge of 1,600 feet span and even much greater.

The problem of a proper foundation for the towers presents the greatest difficulties. On the Brooklyn side it had been found by borings that there was a substratum of boulders which could not be disturbed by the current, and here a firm foundation could be obtained. But on the New York side the borings indicated only sand and decomposed rock, and the question was earnestly discussed whether the current of the estuary might not, in time, wash and scour out this sand, rendering the foundation of the tower insecure. By careful comparison of old charts with the present state of the river bed the Board concluded that the narrowing of the channel by artificial encroachments while increasing the force of the current, had not materially affected the margins, nor tended to scour the New York shore. Mr. Roebling firmly believed that it would not be necessary to dig as low as 107 feet below low water mark, at which point solid rock was found, and his opinion that a depth of 70 feet would be sufficient was concurred in by the Board. On digging the foundation for the dry dock, which is near the proposed site of the New York tower, Mr. McAlpine found the sand capable of sustaining a weight of ten tuns per square foot. The weight of the bridge towers is to be only four tuns to the square foot. The area of the foundation will be 165 by 100 feet, composed of heavy timber, the mass to be 20 feet thick and securely bolted together. On this the tower, of heavy stone masonry, is to be erected, 300 feet high. On the Brooklyn side it is believed no timber substructure will be required, the masonry resting directly on the rock. The rigidity, sustaining power, and durability of the bridge were severally considered, and the plans submitted to secure each of these elements were unanimously adopted; the great work will, it is believed, be very soon commenced. The Cincinnati bridge (of which we shall shortly give an engraving and description) has a span of 1,057 feet, and the second Niagara bridge one of 1,264 feet,—336 feet less than that of the proposed East River bridge.

ALEXANDER T. STEWART.—A NOBLE CHARITY.

In the last number of the SCIENTIFIC AMERICAN, we congratulated our readers upon the selection, by President Grant, of Alexander T. Stewart, of this city, to take charge of the Treasury Department. The appointment was unanimously confirmed by the Senate, but the discovery of a law made in 1789, which prevents an importer from holding the office of Secretary of the Treasury, operated to compel Mr. Stewart either to retire from business or to resign. Previous to sending in his resignation, Mr. Stewart signed an agreement to make over the entire profits of his business to trustees, to be applied by them to charitable uses; but this did not meet the legal objection. It is estimated that had this noble proposition been carried into effect, upward of six millions of dollars could have been distributed to charitable purposes within the next four years. The appointment of Mr. Stewart inspired general confidence in business circles; gold went down and Government securities went up; but the law was in the way, and it was deemed unwise to repeal or modify it to meet an individual case.

Mr. Stewart is about to carry into effect, in this city, his long contemplated project of erecting a home for the working women of this city, and hundreds of men are now employed in digging for the foundations on Fourth avenue, between Thirty-second and Thirty-third streets, and opposite the Harlem tunnel. The plot of ground contains twenty-two city lots, and cost $220,000, upon which Mr. Stewart proposes to erect an iron fire-proof building 198 × 205 feet, at a cost of $2,000,000. This is to be the working women's hotel, where sewing girls, female clerks, hard-working women of every trade, are to be provided with board and room for the smallest possible sum, and the house is to be managed in the best manner. The ground floor is to be let out for stores, the proceeds to be applied to the building of other similar institutions. The edifice will not be completed in less than two years. It is understood that Mr. Stewart also proposes to put up, in time, a working men's hotel on the same plan.

CANADIAN PATENTS--HOW NOT TO GET THEM.

We have received a printed circular, addressed to American inventors, by Alexander Anderson, of Canada, wherein he states "that the Canadian Government provides that its subjects may make discoveries of inventions in any foreign country, where the subjects of that country are prohibited from obtaining patents in the usual way; the British subject making an improvement on it, and combining his improvement with the discovery, may obtain a patent. I feel confident, from my long experience in the patent business, and my inventive powers, that I can make an improvement on almost every invention taken out. I can thus obtain the patent deed and then transfer it to the inventor."

This is a very astute proposition, and is well calculated to mislead inventors who are ignorant of the exact scope of the Canadian patent system, which provides "that *any person, a* *subject of Her Majesty, and resident in this Province, having discovered or invented any new and useful art, machine, manufacture, or composition of matter, the same not being known or used in this province by others, may petition and obtain a patent.*" Another section provides that a patent shall be held to be void "*on the ground that the patentee, in his specification of claims, has embraced more than that of which he was the first inventor or discoverer.*" This puts a complete extinguisher upon the proposition made by Anderson in his circular, and we consider it our duty to "American inventors," to warn them that a patent obtained through fraud so transparent as this, would not be worth the parchment. The Canadian patent system is a mockery of justice, and we advise "Mr. Alexander Anderson, Inventor and Patent Agent, Dominion of Canada," to stop sending out such circulars, and to turn his brilliant talents toward securing an amendment to the law of patents, such as will protect the rights of all inventors alike.

THE GAMGEE PROCESS.

Professor Gamgee's process for preserving meat, accounts of which we have heretofore published, has lately been put in operation in this city; and we recently had the pleasure of inspecting the apparatus at the establishment of the Holske Machine Co., 528 Water street. Here we found a large air-tight chamber, in which a dozen or more carcasses of sheep were placed for treatment. The process consists, substantially, in submitting the meat to the action of carbonic oxide and sulphurous acid, under pressure which is maintained for several hours.

The carbonic oxide combines with the coloring matter of the blood, forming a more stable compound than when that substance is combined with oxygen—thus preserving the fresh color of the meat and assisting in preventing decomposition. But the real antiseptic agent is the sulphurous acid, which may act in two ways: First, by entering into combination with the bases of the meat to form sulphites; and, secondly, by destroying the living germs, which, according to Pasteur's theory, are the active cause of decomposition in animal and vegetable matter.

Nothing can be more complete or successful than this method of preserving meat. We tried, at home, some joints of mutton which had been treated as above, and the meat after hanging ten days or more in the air appeared to be as fresh as ever; when cooked no difference could be observed between it and the ordinary fresh meat of market. We regard it as a very important and valuable discovery.

GAS MONOPOLIES.

The Legislative Committee at Albany, continue the taking of testimony in regard to alleged abuses on the part of the gas companies. Probably a government does not exist on the face of the earth so ready to grant franchises without guarantees as that of the Empire State.

Mr. Valentine T. Hall, Secretary of the Brooklyn Gas Light Company, testified before the committee that the company is acting under special charter, dated 1826, which has been several times amended. "It contains *no regulations as to price of gas, or quality we must furnish, we may charge anything we please.*"

Having thus obtained the privilege to lay their mains, and having got thoroughly under weigh; having at the outset a capital of $250,000, which has increased so that it could not in the opinion of Mr. Hall, be replaced for less than $4,000,000, with market price of stock 240 per cent when "last any was offered for sale," this unrestricted monopoly has everything in its own hands. What chance would a new company have in the attempt to compete with it? The franchise possessed by the Brooklyn Gas Light Company is so valuable that they could well afford to *give away* gas for two years to swamp an opposing corporation.

"Verily to him that hath, shall be given, and from him that hath not shall be taken away that which he hath:" and when this impoverished company asks for further grants from the generous New York Legislature, it will doubtless get what it wants. We have little faith that the present investigation will result in the revocation or limitation of the charter of any gas company. Such an expectation is not justified by any precedent.

BEET ROOT SUGAR.

No. I.

In No. 4, current volume of the SCIENTIFIC AMERICAN, we expressed our belief that at some future day the United States would manufacture the whole amount of the sugar needed for home consumption, and we further stated that this sugar would, in all probability, be made from the beet.

We now think the time has come for the country to free itself, at as early a date as possible, from dangerous dependence on the foreign production of this staple, so as to avoid sudden variations in prices, and inconveniences arising therefrom, such as have actually occurred in consequence of the recent revolt in the island of Cuba.

We consider the subject of beet root sugar production in the United States to be of such vital importance to the interests of the whole community, that we have determined on publishing a series of articles, illustrated with the necessary engravings, concisely elucidating the whole question, statistically, economically, agriculturally, and technologically. This is the more necessary, as no really reliable and complete treatise on beet root sugar has ever been, to our knowledge, published in the English language.

We sincerely hope by so doing to be the means of stimulating the monied men and the agriculturists of the country into active measures, which we are fully convinced must result advantageously, both to the public in general and to themselves in particular. Should we succeed in this object, we shall consider ourselves fully rewarded for our efforts toward its attainment.

The island of Cuba has been making about half a million of tuns of sugar annually upon 1,365 estates; this quantity approximates to one-third nearly of the consumption of the world. Our refiners have been in the habit of drawing their principal supplies of raw sugar from this source, but they will soon have to look to some other, as nobody can doubt that the day of the emancipation of the Cuban slaves is fast dawning, and that a repetition here of what took place in the island of Jamaica, under similar circumstances, is to be expected, namely, a sudden falling off in the production of over eighty per cent.

Let us not be unprepared for such an emergency, which would inevitably force us into purchasing European beet root sugars at much more onerous prices than would make their home production a profitable industry.

Below we give a table exhibiting the total consumption of sugar in the United States along with the amount of foreign imports for the last eight years. This conveys to the mind a better idea of the magnitude of the sugar trade than any lengthy dissertation of ours could do. These statements are compiled from the Reports of the Chamber of Commerce of the city of New York.

Years.	Imports of foreign sugar.	Annual consumption of foreign sugar.	Total annual consumption of both foreign and native sugars in the U. S.
	Tuns.	Tuns.	Tuns.
1860..........	341,532	296,950	415,281
1861..........	242,908	241,420	363,819
1862..........	247,015	241,411	432,411
1863..........	243,137	231,308	284,308
1864..........	214,099	192,660	220,660
1865..........	362,243	345,809	350,809
1866..........	403,497	383,178	391,678
1867..........	355,801	378,068	400,568

From the above figures we compute that, we, as a people, are paying for sugar to foreigners, with whom we have comparatively no exchanges, a sum, which for the year 1867 alone, and at ten cents per lb., amounted to no less than $84,687,232; a sum which, if paid yearly for ten years, with interest compounded, would be considerably more than the equivalent of one-half of our present national debt.

By manufacturing our own sugar the whole of this large amount of capital would remain in the country.

If the population of the United States, including negroes, in 1867 be estimated at 35,000,000, we find that the consumption per capita (including both races) was 28·97 lbs. per annum, an increase of 2·5 per cent over the preceding year.

The consumption of the Pacific States in 1867 was 18,000 tuns. During this period 22,000 tuns of maple sugar were also manufactured.

The whole production of the Southern States did not, in 1867, amount to over 5 6-10ths of the whole consumption of the country.

The average yield of Louisiana before and since the war, is interesting:

From 1822 to 1825 it averaged		30,000 hogsheads	
" 1842 to 1843	"	140,316	"
" 1844 to 1845	"	204,913	"
" 1845 to 1850	"	211,825	"
" 1850 to 1856	"	276,640	"
" 1856 to 1859	"	287,944	"

In 1865, Louisiana made 5,000 tuns of sugar; in 1866, 8,500 tuns; in 1867–68, 22,500 tuns, or only 20,000 hogsheads more than she had produced forty years before.

The average price of Southern sugar, from 1845 to 1850 was $52·50 per hogshead of 1,000 lbs.; in 1853 it fell as low as $35, and rose in 1855 to $110.

If our average imports of cane sugar should continue to be about one billion of pounds, as at present, we have calculated that this amount could be made from the beets grown on less than 555,555 acres of good land, a quantity which we could readily spare from other crops without interfering materially with the prices of ordinary farm produce.

In order to show the extent of the beet root sugar interest in Europe, we indicate the production for the year 1867–68; it is as follows:

	Tuns.
France..............................	220,000
The Zollverein......................	165,000
Russia..............................	97,500
Belgium.............................	32,500
Poland and Sweden...................	15,000
Holland.............................	7,500
Austria.............................	92,500
	630,000

The gradual increase in production has been remarkably illustrated in France, which, in 1827, had 39 factories making 1,218,000 kilogrammes of sugar, and in 1860 had 336 making 126,180,000 kilogrammes.

The German Zollverein averaged from 1840 to 1846 about 129 factories, which made 241,487 cwt. of beet root sugar; in 1865 the production had reached 3,300,000 cwt.

Russia, in 1866–67, in the departments of Kiew, Podolia, and Volhynia manufactured 1,153,880 cwt., where, fifteen years before, not one pound had been grown.

The gradual increase in the consumption of sugar by the working classes of Europe is singularly indicative of the effects of abundance and low prices. In 1822, the consumption of sugar for every inhabitant in Germany amounted to only 1½ lb. per annum; from 1830 to 1840 it rose to 4 2-5ths; in 1848, it had reached 5¾; in 1857, it was 6½, and to-day it is a little over 10 lbs.

The improvements in the manufacture of beet root sugar have followed the increasing demand, and the gradual augmentation of internal revenue levied on it.

In 1845, the average product in raw sugar did not exceed 5 per cent of the weight of the beets; three years later it had reached 6¾, and to-day it is about 8 to 8½ per cent.

The objections made by many persons to the establishment of this branch of industry on the continent are generally specious. They are comprehended in the following queries:

"Can American beet root sugar compete in price with the colonial sugars, or even with Louisiana cane sugar, and is not our labor too high to permit of any comparison being made between European manufactures and our own?"

"Are our conditions of soil and climate as suitable to the growth of the beet as they are on the other side of the Atlantic?"

"Does the beet grown in the United States contain as much sugar as it does in Europe, and can it be as readily extracted?"

In answer to the first of these questions (which we shall fully enter into with necessary figures to sustain our assertions in a future issue), we must content ourselves for the present with stating that the protective duty on foreign sugars, combined with the absence of any tax on home made beet root sugars, and the fact that good beet lands can be purchased in fee simple in America *for less than one-quarter of the annual rental* of such lands in Europe, are in themselves sufficient to allow us to hold our own against all outsiders.

To this may be added a peculiarity of the beet, that of leaving no waste or residue, as is the case with the cane. The beet, after all the juice has been extracted, is not merely valueless *bagasse*, but constitutes a most excellent material for the fattening of live stock during the winter months. Beet root molasses makes good brandy and alcohol. The residue of distillation furnishes potash. The green leaves at the time of harvesting are used as a manure, being rich in ammonia, and when dried, are largely consumed as an admixture with the lower grades of manufactured tobacco.

The production of beet sugar is well known to be one of the most remunerative investments in Europe, where the number of sugar establishments is constantly on the increase, and yet beyond what has been done by one small, but apparently prosperous German establishment in one of our Western States, not a single field of fifty acres of genuine sugar beet has ever been grown in America.

We have recently heard of a company in California who intend starting an establishment in that State within a short period of time. We wish them success, and hope that their example will be followed on the more eastern portions of the continent by some of our men of enterprise.

The beet in America, wherever it has been analyzed, and this has been done to our knowledge in the States of Illinois, Massachusetts, New Jersey, New York, and others, has never been found to contain less than 11 per cent of sugar, and has generally tested 12 per cent. Of this quantity, we extract, by our modern processes of manufacture at least, eight-tenths.

The results of numerous experiments on a scale of sufficient magnitude to be conclusive, made in the States of New Jersey, Illinois, and elsewhere, have proved that 20 tuns of beets is a very ordinary crop in this country. This being the case, we may expect to make, at the rate of 8 per cent of sugar, the large quantity of 3,584 lbs. out of the 44,800 lbs. of the beet produced on one acre.

In Louisiana the average quantity of cane sugar per acre seldom reaches two hogsheads.

With the exception of the extreme North and Northwestern States, and the far South, the whole extent of the territory of the United States, wherever the soil is of the right quality, such as we shall indicate in our next article, may be made to produce the sugar beet.

Our manual labor is said to be too high; but if this be the case, may we be allowed to ask, how our producers manage to ship to European ports our flour, wheat, cotton, tobacco, and many other articles?

The secret rests with the fact that the cheapness and natural fertility of our lands, more than compensate for superior cost of labor.

We do not fear to express the opinion that Yankee beet root sugar will, at no very distant day, be offered in the markets of the world in successful competition with both colonial or European brands.

In our future articles, we shall attempt to show how this result can be attained.

Variation in our Domestic Productions.

It has been boldly maintained by some authors that the amount of variation to which our domestic productions are liable is strictly limited; but this is an assertion resting on little evidence. Whether or not the amount in any particular direction is fixed, the tendency to general variability seems unlimited. Cattle, sheep, and pigs have been domesticated and have varied from the remotest period, as shown by the researches of Rutimeyer and others, yet these animals have, within quite recent times, been improved in an unparalleled degree; and this implies continued variability of structure. Wheat, as we know from the remains found in the Swiss lake habitations, is one of the most anciently cultivated plants, yet at the present day new and better varieties occasionally arise. It may be that an ox will never be produced of larger size or finer proportions than our present animals, or a race horse fleeter than Eclipse, or a gooseberry larger than the London variety; but he would be a bold man who would assert that the extreme limit in these respects has been finally attained. With flowers and fruit it has repeatedly been asserted that perfection has been reached, but the standard has soon been excelled. A breed of pigeons may never be produced with a beak shorter than that of the present short-faced tumbler, or with one longer than that of the English carrier, for these birds have weak constitutions and are bad breeders; but the shortness and length of the beak are the points which have been steadily improved during at least the last one hundred and fifty years; and some of the best judges deny that the goal has yet been reached. We may also reasonably suspect, from what we see in natural species of the variability of extremely modified parts, that any structure, after remaining constant during a long series of generations, would, under new and changed conditions of life, recommence its course of variability, and might again be acted on by selection. Nevertheless, as Mr. Wallace has recently remarked with much force and truth, there must be both with natural and domestic productions a limit to change in certain directions; for instance, there must be a limit to the fleetness of any terrestrial animal, as this will be determined by the friction to be overcome, the weight to be carried, and the power of contraction in the muscular fibers. The English racehorse may have reached this limit, but it already surpasses in fleetness its own wild progenitor, and all other equine species. It is not surprising, seeing the great difference between many domestic breeds, that some few naturalists have concluded that all are descended from distinct aboriginal stocks, more especially as the principle of selection has been ignored, and the high antiquity of man, as a breeder of animals, has only recently become known. Most naturalists, however, freely admit that various extremely dissimilar breeds are descended from a single stock, although they do not know much about the art of breeding, cannot show the connecting links, nor say where and when the breeds arose. Yet these same naturalists will declare with an air of philosophical caution, that they can never admit that one natural species has given birth to another until they behold all the transitional steps. But fanciers have used exactly the same language with respect to domestic breeds; thus an author of an excellent treatise says he will never allow that carrier and fantail pigeons are the descendants of the wild rock pigeon, until the transitions have "actually been observed, and can be repeated whenever man chooses to set about the task." No doubt it is difficult to realize that slight changes added up during long centuries can produce such results; but he who wishes to understand the origin of domestic breeds or natural species must overcome this difficulty.—*Darwin's Animals and Plants under Domestication.*

The Dighton Rock Inscription Disappearing.

A correspondent of the Taunton (Mass.) *Gazette* says the inscription on the celebrated Dighton rock, near Taunton, is slowly disappearing, owing to the effect of ice upon its surface during the winter. The solution of this singular inscription, says the writer, has given rise to much speculative inquiry, and a great diversity of opinion. It has challenged the attention of many scholars learned in antiquarian lore. Mr. Harris, the learned orientalist, thought he found the Hebrew word *melek* (king) in the inscription. Colonel Vallancy considered it of Scythian origin. The Rhode Island Historical Society caused a carefully prepared drawing of the rock to be sent to the Royal Society of Antiquaries of Copenhagen, by whom it was submitted to Professor Rafn, the eminent Runic scholar, and learned associate, Professor Finn Magnusson. A part of the inscription they declared to be in the Runic character, and to read: "On this spot landed Thornfenn with one hundred and thirty-one men." Various drawings have been made of the rock and its inscription, from that of Cotton Mather to the present day, all of them differing in essential particulars; but last summer a successful attempt was made to photograph the rock with a large plate, as well as stereoscopic size, and the inscription may now be critically examined by the antiquarian.

Insulation of the Atlantic Cable.

The *Boston Journal of Chemistry*, asserts on the authority of a gentleman intimately connected with the working of the Atlantic Telegraph Cable that the insulation is growing monthly more perfect, and that the first cable, laid four years since, leaks less than the last one. The loss, at the present time, does not reach *half of one per cent* upon both cables. This is surprising, and very encouraging to the owners of the line. The extreme cold of the deep sea basin, in which the wires repose, is favorable to the retention of the electrical impulses in the channel provided for them. The time consumed in charging and discharging the conductors is a bar to rapid communication; but this is to be overcome by new methods of insulation. A device has recently been brought forward which promises to fully remove this obstacle, and thus enable submarine cables to perform double the work in the same length of time. The success of deep sea cables is now fully assured, and we may look for a large increase in the number during the next quarter of a century.

INTERNATIONAL BRIDGE OVER NIAGARA.—The special committee of the city of Buffalo, appointed to confer with the railroad companies interested in the erection of an international bridge over the Niagara river, have submitted voluminous and favorable reports. They recommend an iron bridge with stone piers and abutments, and that the city of Buffalo guarantee for fifteen years the payment of six per cent interest on $1,350,000, on certain conditions, to be agreed to by the companies holding the charters from the respective governments. The Grand Trunk Railway obligates to pay $50,000 annually for the privilege of passing trains over the bridge. The city council are favorably disposed, and it is thought that the terms will be agreed to.

Editorial Summary.

CEMENT FOR LEATHER.—The *Coachmakers' Journal* says, of the many substances lately brought very conspicuously to notice for fastening pieces of leather together, and in mending harness, joining machinery-belting, and making shoes, one of the best is made by mixing ten parts of sulphide of carbon with one of oil of turpentine, and then adding enough gutta-percha to make a tough thickly flowing liquid. One essential pre-requisite to a thorough union of the parts consists in freedom of the surfaces to be joined from grease. This may be accomplished by laying a cloth upon them and applying a hot iron for a time. The cement is then applied to both pieces, the surfaces brought in contact, and pressure applied until the joint is dry.

MATURITY OF WINES.—Dr. Dupré, lecturer on chemistry at Westminster hospital, states in a paper on wine, recently published, that pure natural wine may be considered to have arrived at maturity at the end of from five to twelve years. In that time, he remarks, the slow chemical changes which bottled wine undergoes will have produced their best effect; and after that, "the wine no longer improves by keeping, except to the taste of a few would-be connoisseurs." But there are exceptions to this rule—namely, wines unusually rich in quality, and those which are "fortified" by alcohol. Such wines continue to improve up to the end of fifteen years.

THE supposed cavities in diamonds, described by Brewster, are shown to be in reality inclosed crystals; and the conclusion arrived at, from the consideration of the whole structure of the diamond, is not opposed to its having been formed at a high temperature. The crystals inclosed in diamonds are frequently seen to be surrounded by a series of fine radiating cracks, which are proved to have been the result of the contraction suffered by the diamond in solidifying over the inclosed crystal. This explanation has been artificially verified by examining crystals formed in fused globules of borax g ass, cooled slowly, when the same phenomena are seen.

INTELLIGENCE OF ANTS.—Each ant in an ant-hill knows its companions. Mr. Darwin several times carried ants from one hill to another, inhabited apparently by tens of thousands of ants; but the strangers were invariably detected and killed. Thinking that there might be a family odor by which they were recognized, he put some ants from a very large nest into a bottle strongly perfumed with asafœtida, and restored them after twenty-four hours. At first they were threatened by their companions, but soon recognized, and allowed to pass.

VARNISHING PRINTS.—The following method of varnishing photographic prints is recommended by a correspondent: A piece of plate glass is heated, and, while yet warm a little wax is rubbed over it by means of a piece of cotton wool; water is then poured over the plate, and the moistened picture laid thereon and pressed closely down by means of a piece of filtering paper. When dry the picture is removed and will be found to possess a surface of the greatest brilliancy, which is not injured by the process of mounting.

A FRENCH JOURNAL publishes the following cure for hydrophobia. When a person has been bitten by a mad dog let him take seven (7) vapor baths, called Russian baths, ranging in temperature from fifty-seven to sixty-three degrees. This is the preservative treatment. When the disease shows itself let the bath be rapidly brought up to fifty-seven degrees and then slowly increased to sixty-three degrees. In the latter case one bath suffices, but the patient must carefully keep his room until he is thoroughly cured.

COCOANUT FIBER.—At a recent meeting of the Polytechnic Society of Liepsic, one of the members asserted that belting for machinery could be made of cocoanut fiber, possessing for this purpose many advantages in economy, durability, and applicability, over leather, rubber, and other substances most commonly used. How the proposed belting is to be made we have not learned.

CHIEF ENGINEER JAMES W. KING has been nominated to be Chief of the Bureau of Steam Engineering. President Grant states at the bottom of his order "in place of Isherwood whom I desire removed." It is very evident that the President means reform and we are glad to see him striking at the root of the matter.

PATENT CASE---DESULPHURIZING ORES.

BEFORE JUDGE BLATCHFORD.

The Gold and Silver Ore Separating Company vs. The United States Disintegrating Ore Company and Melchor B. Mason.—The plaintiffs in this cause were the owners of a reissued patent, No. 1,988, reissued June 6, 1865, to the Hagan Manufacturing Company and William E. Hagan, as assignees of William E. Hagan, for an improvement in furnaces for washing ores by superheated steam. The defendants were the owners of a patent issued January 3, 1865, to C. V. De Forest, Amos Howes & Co., and Geo. E. Vanderburgh as assignees of Melchor B. Mason, for an improved method of desulphurizing and oxidizing metallic ores.

The plaintiffs alleged in the bill in this action that Hagan was the inventor of the impr vements claimed in the reissue, No. 1,988, and that said invention was identical with that covered by the defendants' patent, and they prayed that the defendants' patent should be adjudged void.

The defendants' answer set up that the original patent was not for the same invention as that covered by their patent, and that the reissue, No. 1,988, was procured for the purpose of fraudulently covering the inventions made and patented by Mason, and was fraudulent and void; that Hagan was not the first inventor, and that Mason was, and it prayed that the court would decree that the plaintiffs' patent was void, and the defendants' patent valid.

On the argument, it was claimed by the defendants that the reissue, No. 1,988, and the defendants' patent did not claim the same thing, and were not, therefore, "interfering patents," in the sense of the thirty-sixth section of the act of July 4, 1836.

Held by the Court.—That the answer does not set up that the two patents do not claim the same thing, but does allege in substance that they do cover the same thing. That independent of the admission in the answer, there can be no doubt that the two patents do cover the same invention. That the first claim of one patent is identical with the first claim of the other, and the first claim of the defendants' patent must be held to interfere with the first claim of the plaintiffs' patent. That the second claim of the defendants' patent does not interfere. That on the evidence there can be no doubt that Hagan was the first inventor of the invention claimed by him in this first claim, or that he intended to claim it in the original patent, or that the reissue, No. 1,988, is for the same invention. That the weight of the evidence is very preponderating that Mason borrowed from Hagan all that is embodied in the first claim of the patent, No. 45,868. Decree, therefore, for plaintiffs, adjudging the patent No. 45,868 to be void so far as the process therein described for removing sulphur, arsenic, phosphorus, and antimony from auriferous, argentiferous, and other metallic ores, and for oxidizing the ores by treating them with hydrogen and carbonic acid gases, employs or applies superheated steam, substantially as described in the reissue, No. 1,988, and that the defendants must pay the costs.

For plaintiffs, C. M. Keller; for defendants, G. Gifford.

Hagan's patent, as reissued June 6, 1865, claims

First, The employment or application of superheated steam, in the manner set forth, for the purpose of refining or reducing metals, and for the removal of sulphur, arsenic, phosphorus, or other impurities from ores or minerals.

Second, The employment or application of superheated steam, for the purpose of calcining and disintegrating quartz rock containing silver, gold, or other metals.

Third, The employment or application of superheated steam for the refining of iron, and for the converting of iron into semi or pure steel, in the manner set forth.

This invention is said to be a very valuable one, hence the decision is important to the whole mining interest.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

At the Wilder Works, in East Tennessee, good iron is now being made out of raw coal and raw ore. Colonel Wilder recently said: "At the Hollidaysburg mines, in Pennsylvania, they dig 250 feet for a vein of fossiliferous ore only seven to thirteen inches thick, and here we have it above ground from three to fifteen feet thick. It costs in Pittsburgh more for the limestone than it costs us here for all the materials to make the iron."

It is reported that there are at present one hundred and seventy-eight different places in San Francisco where cigars are made, and about one thousand persons are engaged in the business. These establishments turned out 50,000,000 cigars the past year. About fifty factories are exclusively controlled by Americans, and about one hundred are managed by Chinamen. The to bacco plantations in the southern portion of the State promise heavy and fine crops this year.

An old Indian silver mine has been found in Indiana. Over one of the furnaces was found a tree that had attained a diameter of fifteen inches, showing the great antiquity of the mine. A quantity of fine metal was found at the bottom of one of the furnaces.

Since the last "shaking up" in San Francisco, the mechanics of that city have turned their attention to the contrivance of earthquake proof chimneys for the large factories. An immense iron smoke stack, forty feet high, eight feet in diameter, has just been raised upon a sugar refinery, the roof of which is sixty feet from the ground.

The Bank of California, in San Francisco, is said to employ Chinamen in half dozen gangs to count silver coins. They are said to possess marvelous skill in detecting spurious coins or those of light weight.

The land sales of the Hannibal and St. Joseph Railroad Company during the past year amounted to over million seven hundred and fifty thousand dollars.

A Pennsylvania firm have bought the Roup's Valley Iron Works, and propose to invest $500,000 in them.

Forty whiskey distilleries in the sixth district, Kentucky, each use three hundred bushels of corn per day. The total amount used by the distilleries in the district is estimated at three million bushels per annum.

The tobacco sales at Paducah, Kentucky, during the last week were the heaviest ever known there.

The rubber works at Sandy Hook, Newtown, have received an order for a rubber belt three hundred feet long and four feet broad. It the works can turn it out, it will be the largest rubber belt ever made.

The Hoosac Valley Mills, at Pownal, Vermont, manufactured thirty-five thousand yards of cassimere during the twenty-four working days of February.

The largest single nugget ever found in any part of the world, weighing twenty-eight pounds of pure gold, was found in Cabarras county, North Carolina, in 1803.

The *St. Louis Republican* says, that the Iron Mountain Railroad brings into that city more car loads of freight than any road terminating there.

The new iron used on the Iron Mountain Railroad is of the T pattern with fish joints and weighs fifty-six pounds to the yard.

A machine shop in Lowell is building a lathe that will weigh seventy tuns when completed.

The snow along the line of the Grand Trunk Railway, in Maine, is in many places higher than the tops of the cars.

The boot and shoe manufacture is everywhere progressing with the utmost briskness.

The snow fall in Montreal during the month of February is said to have been seventy-three inches.

Oregon has twenty-one quartz mills in operation.

Nevada has a million and a quarter mulberry trees.

Recent American and Foreign Patents.

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

CAR DOOR.—Thomas R. Leighton, Cameron, Mo.—This invention consists in a lower door, which is attached by hinges to the bed frame of the car, so as to open outward and downward, and thus form a short platform as part of the car.

EXTENSIVE PRUNING SHEARS.—John Stark, Thomasville, Ga.—This improvement relates to lever shears for pruning fruit and other trees, whereby the shears may be extended so as to be used as either hand or pole shears.

COOKING STOVE AND RANGE.—E. C. Little, L. E. Clow, and D. H. Nation, St. Louis, Mo.—This invention relates to improvements made in cooking stoves or cooking ranges, whereby they are made much more useful and economical than stoves or ranges of ordinary construction.

MARBLE SAWING MACHINES.—C. H. G. Pease, Danbury, Conn.—The object of this invention is to accomplish the sawing of marble and other stone in circular blocks, with a simple and effective apparatus. It consists in suspending the block to be sawn in trunnions before a horizontal reciprocating saw.

PEA RAKE.—Sylvester Skinner, Clayton, N. Y.—This invention relates to a new and useful improvement in pea rakes, and which consists in a malleable iron socket or a double ferrule welded, or otherwise joined to a curved brace or extension of the same material, which is connected to the rake head by rivets, or in other suitable manner, thus forming a suitable bend or curve, so that the handle will need no crook or bend to put the head and blade in a proper angle for cutting, and furthermore, will not loose its bend or curve as the ordinary bent wooden handles invariably do after using but a short time.

ROAD SCRAPER.—Wm. W. Rumrill, Roanoke, Ind.—This invention relates to the construction of revolving road scrapers.

MITER BOX.—John Pons, Baltimore, Md.—The object of this invention is to construct a cheap and convenient miter box, of such a nature that it can be gaged at any angle without difficulty and in a moment of time.

MACHINE FOR MAKING MOLDS AND CORES FOR CASTINGS.—William Hainsworth, Sharpsville, Pa.—This invention consists in fastening the pattern in the flask in proper position, and then as the sand is filled in, raising both pattern and flask together to a considerable hight and dropping them upon a solid bed, so that the concussion produced by the fall may pack the sand closely and evenly in the flask in and around the pattern.

PEA PICKER.—Abner Quinn, Wilmington, N. C.—The object of this invention is to provide for public use a cheap, simple, and effective machine, to be operated by hand or other power, by which pea nuts, or the pods of leguminous plants, can readily be separated from their vines and thoroughly cleansed 1om dirt.

FIRE KINDLER.—M. E. Ezell, Hatchechubbee, Ala.—The object of this invention is to provide for public use a simple, cheap, and convenient instrument by which a fire can be kindled in the stove, or a lamp or gasjet lighted at night without the necessity of [any one's rising from bed for the purpose. By means of the same instrument the opening of a door or window may be caused to light the fire, lamp, or gas, the apparatus thereby operating as a burglar alarm.

CHURN.—Manuel Witmer, Cedar Rapids, Iowa.—This invention relates to improvements in churns, whereby it is designed to provide an improved arrangement of vibrating and swinging churns.

HINGE.—Wm. Wells, Ashtabula, Ohio.—This invention relates to improvements in hinges the object of which is to provide a locking device for spring hinges whereby the door may be held open; also an improved construction of loose jointed hinges.

COMPOUND FOR PRESERVING HAIR.—A. L. Baker, Newark, N. J.—This invention relates to an improved compound for the hair, designed to preserve it and restore its growth in cases of baldness, which will be designated "Calla Cream."

CORN CULTIVATOR.—D. C. Stover, Lanark, Ill.—This invention relates to improvements in the construction of cultivators, the object of which is to make them more useful than as at present arranged, and it consists in an improved manner of constructing the sulky or carriage and connecting the plow beams to the same.

FEEDING SHOES FOR GRINDING MILLS.—John C. Andrew, Seventy-six, Ky. —This invention relates to improvements in feeding shoes for grinding mills, the object of which is to arrange them so that they will also serve as sieves for separating chess, dirt, and other foul matter. It also consists in constructing the bottom of the shoe of any suitable reticulated substance through which the fine grains of foul matter may be separated from the good grain, and providing under the said bottom a spout for conveying it away.

STENCIL PLATES.—J. L. and H. L. Tarbox, New York city.—This invention relates to improvements in stencil plates, designed to provide a simple and convenient arrangement whereby the stencil letters may be readily connected together for forming words, and be as readily disconnected for changing their combinations without the employment of frames for holding them when set up, as is now commonly practiced.

MACHINE FOR SCRAPING AND LOADING EARTH INTO WAGONS.—Albert Ward, New Michigan, Ill.—This invention consists in suspending scrapers from the frame of a wagon between the front and hind wheels, by an adjustable apparatus, whereby the front ends of the said scrapers may be let into the earth at any required depth, which scrapers are provided at their rear ends with inclined tubes, up which the earth is forced, and delivered to a carrier operated from the hind wheels of the wagon transversely of the said wagon, and which projects from one side thereof in an elevated position, whereby the earth may be delivered to another wagon moving alongside the scraping apparatus.

BLIND FASTENING.—Wm. J. Decker, Nyack, N. Y.—This invention relates to a new combined apparatus for holding blinds and shutters closed, open, or partly open, for locking them safely to the window frame and sash and or setting the slats. The apparatus is of very simple construction, readily applied to old and new blinds and not liable to get out of order.

FISHING NET.—F. A. Werdmuller, New York city—This invention relates to a new apparatus for catching fish, crabs, lobsters, and other animals in deep water, and consists of a rigid frame, which forms the upper edge of a shallow bag, and the outer support for a flat ring, both the bag and ring being woven in suitable material. When this net is let into the water, and some bait placed into it, it will form a secure trap for the animals entering it, as the same cannot escape except by direct upward motion, which is scarcely ever attempted, and which is made impossible when the net is being drawn up.

WASHING MACHINE.—H. B. Tibbits, Vineland, N. J.—This invention relates to a new machine for washing clothes; and it consists in the application of a rubber and box bottom of peculiar form and construction, whereby when the requisite motion is imparted to the rubber, a combined rubbing and striking action is produced. The lower face of the rubber is V-shaped and corrugated or roughened. The bottom of the suds box is also V-shaped and roughened or corrugated. The rubber working on it will be drawn from one inclined face of the bottom to the other, and will rub the clothes as it travels on each face, striking or pounding them as it reaches the end of a stroke. The invention also consists in providing a device for supporting the rubber above the box, to allow garments to be put in or removed from the box.

TOY BALL EJECTOR.—E. S. Belton, New Orleans, La.—This invention relates to an improved toy for amusement of children and others, and it consists of a cup or mortar, having a handle for holding the mouth of the cup upward, in which a piston is arranged for suddenly ejecting a ball from the cup into the air.

WATER WHEEL.—D. Holdiman & S. Goodwin, Waterloo, Iowa.—The object of this invention is to provide an improved water wheel of the turbine class. It consists of a horizontal wheel, having the buckets arranged to be acted upon by the direct action of the water, and also by the reaction of the same, having a contracted discharge tube to produce an effect by suction, and a series of adjustable gates arranged to act as expansible sheets to convey the water to the wheel; also an improved arrangement of means for actuating the said gates. The buckets are so constructed as to discharge a portion of the water sidewise toward the center of the same, and another portion downward through the bottom.

TRITURATING AND AMALGAMATING APPARATUS.—Leonard Wray, Ramsgate, England.—This invention of improved methods of, and apparatus for obtaining or separating metals from their ores, matrices, slimes, tailings, or other substances containing them, is applicable to those kinds of minerals, earths, clays, sands, gravels, or conglomerates which contain gold or silver in any form, shape, or combination, and which may or may not require to be pulverized, washed, concentrated, triturated, or amalgamated in order to facilitate the great object of separating and obtaining the precious metals existing in these substances by washing, as in the case of tin, and some other of the refractory minerals, such as auriferous and argentiferous pirites, sulphides, sulphurets, antimoniates, or other combinations containing gold or silver, or by direct amalgamation, as in the case of the precious metals. This improved apparatus for effecting these objects consists of a machine which has for its object to triturate the ore or substance containing the metal until it is reduced to an almost impalpable powder; and secondly, of a machine for washing the mineral matters, and for catching or securing by amalgamation the precious metals, even to those finest particles which, in ordinary processes, float away with the water, and are lost.

BRAID REELS AND GUIDES FOR SEWING MACHINES.—William Carpenter, Fairbury, Ill.—The nature of my improvements relates to the application to sewing machines of a means for supplying braid to be sewed on to the cloth, and for guiding the same in a more perfect and satisfactory manner than can be done by the means now in use; and it consists in attaching to the frame of the machine a braid reel in a position above the work so as not to obstruct or be in the way of the same, and arranging it in combination with guides on a braid foot of peculiar construction, whereby a braid of any width may be easily and truly guided to the needle so as to be sewed to the cloth in the middle, or on either edge, as may be desired, and whereby the angles may be made much more perfect than by the means now in use.

FENCES.—Joseph B. Tedrow, Chillicothe, Ohio.—This invention relates to improvements in fences, the object of which it is to render them cheaper of construction, more durable, and to arrange them so that they may be protected from floods when located in river bottoms subject to be overflowed. It consists in providing sectional posts, to be constructed partly or wholly of metal, and joining the sections, either by bringing them together or driving the one into the socketed end of the other. They are also constructed sometimes wholly of metal, and in one piece.

SOLDERING APPARATUS.—Chas. Pratt, New York city, and Conrad Seimel, Greenpoint, N. Y.—This invention relates to an apparatus intended for holding sheet-metal vessels and cans which are to be soldered at their edges; the part of such apparatus holding the same being made adjustable, so that the can or vessel can be immersed in the solder to the requisite depth and be raised out, when soldered, in a straight line, thus preventing the unequal distribution of solder occasioned by careless handling. The invention consists chiefly in retaining the can or box to be soldered, in a proper position by means of a frame or float, which can be depressed and elevated at will, to allow of the can or box being uniformly immersed in and raised out of the solder to the extent required.

CULTIVATOR PLOW.—William Looker, Graham, Mo.—This invention has for its object to furnish an improved cultivator plow, simple in construction, effective in operation, and easily operated, each of the plows operating independently of the others.

CAR AXLE.—E. T. Ligon, Demopolis, Ala.—This invention has for its object to improve the construction of car axles, so as to make them stronger, less liable to break, and less liable to fail or part suddenly when injured, or when there may be a flaw in the metal.

STIRRUP STRAP LOOPS.—A. B. Zellner, Monticello, Ark.—This invention has for its object to furnish an improved stirrup-strap loop, which shall be so constructed and arranged, that, should the rider be thrown or fall from the horse, the stirrup strap may be disengaged from the loop, so as to guard against the person's being dragged by the foot, should it accidentally become caught in the stirrup.

HOEING MACHINE.—Horace C. Briggs, West Auburn, Me.—This invention has for its object to improve the construction of the improved hoeing machine, patented by the same inventor, Nov. 17. 1868, and numbered 84,165, so as to make it more convenient and effective in use.

SKYLIGHT AND VENTILATOR.—George Hayes, New York city.—This invention relates to a new and improved method of constructing and arranging skylights and ventilators on dwelling houses and other buildings; and it consists in securing the glass of the skylight in a metallic frame without the use of putty or other equivalent material, and arranging it so that all leakage is avoided, and in the method of operating a series of skylights or ventilators, either in a cluster or range.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; beside, as sometimes happens, we may prefer to address correspondents by mail.

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 advertisemets at $1·00 a line, under the head of "Business and Personal."

☞ *All reference to back numbers should be by volume and page.*

G. W. K., of D. C.—We have seen tolerably good specimens of American Russia-sheet iron, but nothing equal to the imported.

C. A. S., of ——Gasoline is so exceedingly volatile that its evaporation can be prevented only by keeping it in hermetically sealed vessels, of non-porous material. You will find answers to your other inquiries in any elementary text-book on chemistry.

J. T., of N. Y.—No substance known can be positively asserted to be a simple substance or element. The possibility of discovering elements in the baser metals, which will unite to form the precious metals, of course implies the recombination of those elements to form the baser metals.

E. M. S., of La.—A splendid blue writing fluid can be made as follows: Take pure Prussian blue six parts, and oxalic acid one part, mix with a little water and rub it into a perfectly smooth paste. Then dilute with rain water to the proper consistency, and add a little gum-arabic to prevent the spreading of the ink.

R. R., of Ohio, writes us that in the discussion relative to the floating of solid on melted iron, the fact that white or chilled iron will sink and gray iron will float has not been mentioned. Reference to this statement may serve to throw some light upon the discrepancies in experiments as hitherto recorded. We would inform this correspondent in reply to his inquiry that, red hot iron has as high a temperature as the flame generated in the combustion of many substances.

H. and Co., of W. Va.—The "proper speed of a mulay saw to cut the most lumber" depends on the quality of that lumber. It will vary according to this circumstance from 200 to 300 revolutions, or double strokes per minute. The proper speed of a circular saw is 9,000 feet per minute for the edge; thus in case of your 54-inch circular saw it would be: 14 feet, the circumference, 9,000 feet, the speed, product by division 643, the number of revolutions. If the lumber is soft wood and clear 700, or even 720 revolutions may be advantageously used.

J. H., of N. J., can bronze his gun barrel by diluting either nitric or sulphuric acid with its volume of water and applying it to the barrel with a rag. Be sure the barrel is perfectly clean. This cleanliness can be assured by washing the barrel with lye or soap suds and rubbing dry with cocoanut husk. Several applications of the acid may be required, but one is usually enough. When the tint is obtained wipe off with an oily rag.

U. E., of N. J.—We do not approve of leading the exhaust steam into a brick chimney stack, as it tends to disintegrate the mortar It will, however, increase the draft. Better build the chimney higher.

B. H., of Mich.—We have already given detailed descriptions, generally illustrated, of all the notable improved firearms in this country and Europe. They are to be found in back volumes from XIV. up. The galvanic or electro-magnetic battery is fully described in almost any work on chemistry or natural philosophy.

W. W. T., of R. I., says he has a gear of 100 teeth, pitch 18 to the inch, what thread shall he cut on a worm to drive it? If the gear teeth are 18 to the inch, of course the worm must be the same pitch—18. one revolution of the worm moves the gear the space of one tooth.

J. N. H., of Canada, asks where the best smoke consuming apparatus, the best paint and putty mill, and the fixtures for using liquid fuel may be obtained.

D. W. H., of Iowa.—Your explanation of the inside and outside crank pins in reply to the inquiry on page 151, current volume, SCIENTIFIC AMERICAN, is correct, but altogether unnecessary.

A. B., of Tenn.—We cannot understand how you can use the *condensed* steam for a blast or draft after heating your feed water with it. Condensed steam is water. The capacity of a boiler *is* increased by heating the feed water—we mean the capacity for producing a given amount of steam in a given time. A pipe one-and-a-fourth inches diameter is sufficient to supply a steam cylinder 8x18 inches unless the pipe is very long, crooked, and unfelted.

J. W. H., of Minn., asks if a belt running at a speed of 2,400 feet per minute will transmit more power than the same belt running 1,600 feet per minute. Of course it must; it requires more power to drive it at the greater velocity and that power is not thrown away. Velocity is one of the manifestations, if not an element, of power.

C. H. P., of Ill.—We have lately published recipes on cements and mucilages. The bases of them are starch, gum-arabic, dextrine, or gum tragacanth, dissolved in water and preserved by a small addition of alcohol or acid.

E. E. P., of N. Y.—The occurrence of a partial or complete explosion in a kerosene lamp upon the slight turning down of the wick, may be accounted for by supposing the heat to have generated gas in the lamp, which could not readily escape, until the turning of the screw opened some small aperture. This view is sustained by the sound you describe as of escaping steam. If the wick was drawn in tight, when saturated with oil it would prevent the escape of the gas, until lowered. The orifices by the side of the burners you describe might easily become stopped by concreted oil. The best kerosene oil will be converted into gas by heat.

J. B., of Pa.—This correspondent asks how many horse powers are required to drive an eight or ten inch circular saw, running entirely in wood. He says he runs an eight inch saw through one inch board, turning with one hand. The question is indefinite. The speed of the saw, its thickness, whether ripping or cross-cut, the sort of wood sawed, etc., should be known before a definite reply could be made.

M. E. H., of Iowa, says he has laid 4,000 feet of two-inch pipe from a spring which is 30 feet higher than the delivery end, but the water rises at that point only 15 feet. The pipe runs in a straight line, having a descent of 18 feet the first 1,000, the remainder level to the upright delivery. In this case there can be no reason why the water will not rise to the level of the head, less the friction, which, however could not retard the water to the amount of 15 feet. The pipe has a leak somewhere in its length.

H. M. S., of Ohio.—We do not remember one instance in which Congress has ever been asked to repeal a patent. It is not likely that any such application would be acted upon, unless very special reasons could be shown.

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.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING MARCH 9, 1869.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT OFFICE FEES:

On each caveat	$10
On filing each application for a Patent (seventeen years)	$15
On issuing each original Patent	$20
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
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On an application for Design (seven years)	$15
On an application for design (fourteen years)	$30

In addition to which there are some small revenue-stamp taxes. Residents of Canada and Nova Scotia pay $500 on application.

Patents and Patent Claims.—*The number of patents issued weekly having become so great, with a probability of a continual increase, has decided us to publish, in future, other and more interesting matter in place of the Claims. The Claims have occupied from three to four pages a week, and are believed to be of interest to only a comparative few of our readers. The publication of the names of patentees, and title of their inventions will be continued; and, also, as heretofore, a brief description of the most important inventions. We have made such arrangements that we are not only prepared to furnish copies of Claims, but full Specifications at the annexed prices:*

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87,532.—Railroad Car Heater.—William H. Beal, Philadelphia, Pa. Antedated Nov. 16, 1868.

87,533.—Plow.—James F. Benton, Penn Yan, N. Y.

87,534.—Feather Renovator.—Lafayette Blair, Painesville, Ohio.

87,535.—Cotton Gin.—John B. Brackett and Wyman Dearborn, Boston, Mass. Antedated March 2, 1869.

87,536.—Potato Digger.—John I. Brinkerhoff, Auburn, N.Y.

87,537.—Apparatus for Continuous Distillation.—Chas. H. Budd, Philadelphia, assignor to himself, and G. D. Wolff, Norristown, Pa. Antedated Feb. 28, 1869.

87,538.—Steam-Engine Rotary Valve.—A. R. Buffington, United States Army.

87,539.—Mowing Machine.—George E. Burt, Harvard, Mass.

87,540.—Thresher and Separator.—John W. Cardwell, Richmond, Va., assignor to himself and Samuel Freedley.

87,541.—Cotton Bale Tie.—John S. Carson, Brookhaven, Miss.

87,542.—Gravel Spreader.—John S. Casement, Cleveland, Ohio, and John Elliott, Erie, Pa.

87,543.—Portable Head Rest.—H. E. Churchill, Portland, Me.

87,544.—Fire Extinguisher.—George Clark, Jr., Boston, Mass.

87,545.—Apparatus for Pasting and Hanging Wall Paper.—A. H. Clay, Pottsgrove township, Pa.

87,546.—Machine for Threading Screws.—J. A. Cleaveland, Logansport, Ind.

87,547.—Wrench.—Loring Coes, Worcester, Mass.

87,548.—Animal Trap.—Henry H. Cottrill, Vinton Station, Ohio.

87,549.—Catch for Carpet-Bags.—George Crouch, New York city.

87,550.—Direct Acting Steam Engine.—G. H. Deane, C. P. Deane, and J. B. Gardiner, Springfield, Mass. Antedated Dec. 21, 1868.

87,551.—Revolving Frame for Showing Goods.—Thomas Dickinson, Jr. (assignor to himself and Thomas Dickinson), Buffalo, N. Y.

87,552.—Machine for Marking Corn Ground, with Rake Attachment.—Morris Dickle, and E. P. Cowan, Ottumwa, Iowa.

87,553.—Fingered Scoop.—Harrison Doolittle, East Cleveland, Ohio.

87,554.—Hose Coupling.—Jacob Edson (assignor to John Clark), Boston, Mass.

87,555.—Rotary Wire Feed.—Wm. A. Foskett, Meriden, Conn.

87,556.—Gas Apparatus.—Wm. Foster, Jr., and G. P. Ganster, New York city.

87,557.—Machine for Manufacture of Wire Strips.—T. Fowler, Seymour, Conn.

87,558.—Fence.—Melvin J. Gaskill, Pleasant Plain, Ohio.

87,559.—Sewing Machine for Making Shirt Bosoms.—E. D. Gird, Cedar Lake, N. Y.

87,560.—Register Frame.—Bartholomew Gommenginger, and Chas. W. Trotter, Rochester, N. Y.

87,561.—Harvester.—A. B. Graham, Waukegan, Ill.

87,562.—Mode of Preserving Eggs.—J. H. Hall, New York city. Antedated March 3, 1869.

87,563.—Buckle.—Martin Haneline, Huntington, Ind. Antedated Feb. 27, 1869.

87,564.—Grate Bar.—Michael Helbling (assignor to himself and John F. McKinney), Allegheny City, Pa.

87,565.—Horseshoe.—John A. Heyl (assignor to himself and J. H. Wiggins), Boston, Mass.

87,566.—Bridge for Playing Pool.—O. A. Hill, Westbrook, Me.

87,567.—Apparatus for Heating Water by Steam.—H. S. Huidekoper, Meadville, Pa.

87,568.—Fireproof Grain Bin.—George H. Johnson, Buffalo, N. Y.

87,569.—Bracing for Cylindrical Structures.—Geo. H. Johnson, Buffalo, N. Y.

87,570.—Coffin Bier.—Patrick Joyce, Rochester, N. Y.

87,571.—Axle Set.—H. R. Ladd, Orwell, Ohio.

87,572.—Substitute for Tobacco.—J. C. Lange, Pittsburgh, Pa.

87,573.—Machine for Grating Fodder.—Jason Lusk, Fredonia, Mich.

87,574.—Dinner Pail.—Alfred McQueen, Philadelphia, Pa.

87,575.—Regulator for Gas, Steam, and other Fluids.—E. C. Maldant, Paris, France, assignor to Marius Caune, Crawford, N. J.

87,576.—Seed Sower.—F. H. Manny, Rockford, Ill.

87,577.—Harrow.—N. B. Marsh (assignor to himself and I. R. Miller), Marengo, Ill.

87,578.—Puddling and other Furnaces.—Hugh McDonald (assignor to himself, and Wm. Stuart), Pittsburgh, Pa.

87,579.—Velocipede.—Wm. McKerahan, Pittsburgh, Pa.

87,580.—Wagon Axle.—F. McManus, Ellenburg Center, N. Y. Antedated Feb. 27, 1869.

87,581.—Machine for Figuring Carpenters' Squares, etc.—Norman Millington (assignor to Eagle Square Company), South Shaftsbury, Vt.

87,582.—Car Coupling.—Henry T. Moody, Newburyport, Mass.

87,583.—Combined Pen and Pencil Holder and Knife.—Wm. A. Morse, Philadelphia, Pa.

87,584.—Work Bench.—H. W. Neary (assignor to himself and Nathaniel Schenck), Princeton, N. J.

87,585.—Turbine Water Wheel.—Jesse Newlin, Philadelphia, Pa.

87,586.—Dovetailing Machine.—Charles Ohlemacher and Otto Kromer, Sandusky, Ohio.

87,587.—Register Point for Printing Presses.—Andrew Overend, Philadelphia, Pa., assignor to Richard M. Hoe, New York city.

87,588.—Branding Iron.—Frank L. Penney, Boston, Mass.

87,589.—Canopy, or Mosquito Bar.—Jacob B. Platt, Augusta, Ga.

87,590.—Last.—Micah H. Pool, East Abington, Mass.

87,591.—Portable Map Holder.—George Rice, Framingham, Mass.

87,592.—Tube Well.—Reuben Rich, Dorchester, Mass.

87,593.—Cartridge-making Machine.—Benjamin S. Roberts, United States Army.

87,594.—Plow and Subsoiler.—Gain Robinson, Plymouth, Ohio.

87,595.—Sewing Machine.—Daniel H. Rogan (assignor to himself and Cyrus L. Hall), Hudson, Wis.

86,596.—Velocipede.—M. B. Stafford, New York city.

87,597.—Farm Fence.—John K. Staman, Mansfield, Ohio.

87,598.—Paper File.—Anson P. Stephens (assignor to himself and Benjamin F. Stephens), Brooklyn, N. Y.

87,599.—Manufacture of Spirits.—George B. Stone, Chicago, Ill.

87,600.—Farm Gate.—John G. Talbot, Sloansville, N. Y.

87,601.—Lamp Burner.—Alexis Thirault, Brooklyn, N. Y., assignor to Holmes, Booth, and Haydens, Waterbury, Conn.

87,602.—Straw Cutter.—Edward R. Thompson, Lansing, Mich.

87,603.—Inhaler and Remedy for Throat Disease.—Geo. Humphrey Tichenor, Canton, Miss.

87,604.—Soldering Iron.—William H. Trissler, Cleveland, Ohio.

87,605.—Medical Compound.—Philip W. Vaughan, Columbia, Ky.

87,606.—Harness Saddle.—John Waite, Palmer, Mass.

87,607.—Starch or Gloss for Use in Laundries.—Peter W. Welda, Philadelphia, Pa.

87,608.—Paper-bag Machinery.—Joseph Wells (assignor to Orlando A. Wilcox), Brooklyn, N. Y.

87,609.—Carriage Axle.—John T. Wilson (assignor to himself and Coleman, Rahm & Co.,) Pittsburgh, Pa.

87,610.—Hot-air Furnace.—Isaac T. Winchester, Boston, Mass.

87,611.—Meat Cutter.—O. B. Woodruff, Southington, Conn.

87,612.—Equalizer.—G. W. N. Yost, Corry, Pa.

87,613.—Grain Dryer.—Edson A. Abbott, Baltimore, Md.

87,614.—Blacking Brush.—Robert Adams, Cincinnati, Ohio. Antedated February 26, 1869.

87,615.—Feeding Shoe for Grinding Mills.—John C. Andrew, Seventy-six, Ky.

87,616.—Loom for Operating Shuttle Boxes.—John Ashworth (assignor to George L. Davis, John A. Wiley, and Joseph M. Stone), North Andover, Mass.

87,617.—Washing Machine.—T. Bailey and Virgil W. Blanchard, Bridport, Vt.

87,618.—Compound for Renewing Hair.—A. L. Baker, Newark, N. J.

87,619.—Pad and Lining for Horse Collars.—Seth W. Baker, Providence, R. I. Antedated March 4, 1869.

87,620.—Machine for Twisting Bullion Fringe.—Edwin Barton, Paterson, N. J.

87,621.—Toy.—E. S. Belton, New Orleans, La.

87,622.—Car Coupling.—Benjamin Bevelander, Boston, Mass.

87,623.—Pinion.—V. W. Blanchard, Bridport, Vt.

87,624.—Artificial Leg.—Douglas Bly, Macon, Ga.

87,625.—Exterior Casing for Turbine Water Wheels.—John W. Bookwalter, Springfield, Ohio.

87,626.—Glass Board and Apparatus for Cutting Glass.—Franklin Bowly, Winchester, Va.

87,627.—Hoeing Maching.—Horace C. Briggs, West Auburn, Me.

87,628.—Wind Wheel.—A. P. Brown, Syracuse, N. Y.

87,629.—Grate Fender.—George Buchanan, Washington, Pa.

87,630.—Velocipede.—Jabez Burns, New York city.

87,631.—Fly-net for Horses.—Joseph Cantner, Millheim, Pa. Antedated February 27, 1869.

87,632.—Cutting Threads on Pipes, etc.—J. M. Carpenter, Florence, Mass.

87,633.—Embroidering Attachment for Sewing Machines.—William Carpenter, Fairbury, Ill.

87,634.—Grain Storehouse.—George Clark, Buffalo, N. Y.

87,635.—Cotton Gin.—Robert J. Clay, Greenpoint, N. Y.

87,636.—Clothes-Line Fastener.—F. Clymer, Galion, Ohio. Antedated March 5, 1869.

87,637.—Harvester.—J. F. Coddington, Newark, N. J.

87,638.—Churn Dasher.—C. L. Cole, Bushnell, Ill.

87,639.—Churn.—E. Coleman, Woburn, Mass.

87,640.—Mash Tub and Vapor Cooler.—A. W. Cram, St. Louis, Mo.

87,641.—Plow.—Hiram Culver, Dansville, N. Y.

87,642.—Combined Harrow and Cultivator.—H. Culver, Dansville, N. Y.

87,643.—Horse Hay Fork.—J. Cummins, Perry, Mich.

87,644.—Elastic Seat and Back for Chairs and Bottom for Beds.—Leo Daft (assignor to himself and John Wood), New York city. Antedated Nov. 20, 1868.

87,645.—Portable Key-Hole Guard.—W. E. Dante, Washington, D. C.

87,646.—Wind-Wheel Water Elevator.—G. W. Darby, New Vienna, Ohio.

87,647.—Blind and Shutter Fastening.—Wm. J. Decker, Nyack, N. Y.

87,648.—Brace and Suspender Combined.—E. L. Demorest and W. G. Cook, New York city. Antedated March 5, 1869.

87,649.—Railway Car Coupling.—L. M. Doddridge (assignor to himself and J. N. Templar), Portland, Ind.

87,650.—Manufacture of Artificial Fuel.—Chas. du Lin, Mans, France.

87,651.—Corn Planter.—J. W. Eardly, Cascade, Mich.

87,652.—Thimble Skein for Axles.—M. Ehrgott (assignor to himself and James Parker), Pittsburgh, Pa.

87,653.—Artificial Bone Black.—H. Endemann, New York city.

87,654.—Fire Kindler.—M. E. Ezell, Hatchechubbee, assignor to W. S. Gordon, Russel county, Ala.

87,655.—Boot and Shoe Lacing.—P. S. Foster, Richmond, Me.

87,656.—Millstone Balance.—A. Frederick, Toledo, Ohio.

86,657.—Churn.—A. S. Galliher, Bristol, Tenn.

87,658.—Process of Preparing Petroleum to be Used in Lubricating Wool.—S. Gibbons, Freedom, Pa., assignor to Excelsior Oil Manufacturing Company of Pennsylvania.

87,659.—Churn.—John Glattner, Suspension Bridge, N. Y.

87,660.—Churn.—J. L. Good, Elizabethtown, Pa.

87,661.—Pen.—H. S. Goodspeed, New York city.

87,662.—Stair Rod.—W. B. Gould, New York city.

87,663.—Method of Constructing Molds for Metallic Castings.—Wm. Hainsworth, Sharpsville, Pa.

87,664.—Water Meter.—A. W. Hall, New York city.

87,665.—Rotary Motor and Meter.—Wm. Hamilton and Wm. Hamilton, Jr., Toronto, Canada.

87,666.—Step and Extension Ladder.—H. J. Hancock, New York city.

87,667.—Portable Mill.—B. Harnish and R. J. King, Lancaster, Pa.

87,668.—Skylight and Ventilator.—G. Hayes, New York city.

87,669.—Blacking Staff for Facing Millstones.—Abram Heartsill, Louisville, Tenn.

87,670.—Packing for Artesian Wells.—Peter C. Heinz, Pioneer, Pa.

87,671.—Reflector for Head Lights.—H. L. Hervey, Philadelphia, Pa.

87,672.—Material for the Manufacture of Cabinet and other Work in Wood.—August Herzog and John G. Roth, (assignors to American Ornamental Wood Manufacturing Company), New York city.

87,673.—Water Wheel.—D. Holdiman and S. Goodwin, Waterloo, Iowa.

87,674.—Billiard Game Register.—E. Holmes and H. C. Roome, New York city.

87,675.—Spring Seat.—C. H. Hudson, New York city.

87,676.—Corn-Stalk Cutter.—H. Jackson, Elmira, Ill.

87,677.—Sulky Plow.—John R. Jackson, Pelahatchee Depot, Miss.

87,678.—Band Tightener for Shocks of Corn.—James C Jay, Bear Creek township, Ind.

87,679.—Fireproof Granary.—G. H. Johnson (assignor to himself and G. Milsom), Buffalo, N. Y.

87,680.—Vapor Burner.—Joshua Kidd, New York city.

87,681.—Carbureting Gas, and Oil for the Same.—J Kidd, New York city.

87,682.—Apparatus for Carbureting Gas.—J. Kidd, New York city.

87,683.—Sash Holder.—D. P. Lacey, Orfordville, Wis., assignor to R. R. Ball, West Meriden, Conn.

87,684.—Brush Handle.—C. L. Larder, Brooklyn, N. Y.

87,685.—Railway Car Door.—T. R. Leighton, Cameron, Mo

87,686.—Hames Ring.—J. Letchworth (assignor to Pratt and Letchworth), Buffalo, N. Y.

87,687.—Railway Car Axle.—E. T. Ligon, Demopolis, Ala.

87,688.—Cooking Stove.—E. C. Little, L. E. Clow, and D. H. Nation, St. Louis, Mo.

87,689.—Paper Bag Machine.—H. C. Lockwood, Baltimore, Md.

87,690.—Cultivator Plow.—Wm. Looker, Graham, Mo.

87,691.—Churn.—J. L. Marsh, Centerville, Ind.

87,692.—Sheet-Metal Seaming Machine.—John Mays and E. W. Bliss, Brooklyn, N. Y., assignors to Devoe and Pratt Manufacturing Company, New York city.

87,693.—Machine for Paging Books.—John McAdams, Brooklyn, N. Y.

87,694.—Covering for Blind Ditches.—T. M. C. Lutes, New Mount Pleasant, Ind.

87,695.—Printing-Press Fly Frame.—T. H. Mead, Boston, Mass., assignor to R. Hoe and Company, New York city.

87,696.—Horse Hay Fork.—J. A. Miller, Shippensburg, Pa. Antedated Feb. 27, 1868.

87,697.—Truck for Moving Buildings.—John S. Millikan, Thorntown, Ind.

87,698.—Registering Apparatus for Stills.—John Minor, Peoria, and M. W. Nesmith and G. W. Nesmith, Metamora, Ill.

87,699.—Harvester Rake.—John B. Morse and Loren L. Carter, Lafayette, Ind.

87,700.—Sawing Machine Guard.—A. W. Pagett, Springfield, Ohio.

87,701.—Marble-sawing Machine.—C. H. G. Pease, Danbury, Conn.

87,702.—Tweer.—J. J. Pierce, Emmett, Mich.

87,703.—Miter Box.—John Pons (assignor to himself, J. S. Russell, and Henry Vogler), Baltimore, Md.

87,704.—Soldering Machine.—Charles Pratt, New York, and Conrad Seimel, Greenpoint, N. Y., assignors to Charles Pratt.

87,705.—Pea Picker.—Abner Quinn, Wilmington, N. C., assignor to himself and A. E. Wright.

87,706.—Fanning Mill.—B. F. Randell, Des Moines, Iowa.

87,707.—Chronometer Escapement.—George P. Reed, Boston, Mass.

87,708.—Sash Holder.—A. C. Rodgers (assignor to himself and J. and G. H. Gibson), Philadelphia, Pa.

87,709.—Shingling Bracket.—Abner Rollo, Friendship, Wis.

87,710.—Ice-cream Receptacle.—Edward A. G. Roulstone, Boston, Mass.

87,711.—Road Scraper.—W. W. Rumrill, Roanoke, Ind.

87,712.—Grain Drill and Corn Dropper.—J. D. Sater and Turner Barns, Greensburg, Ind.

87,713.—Velocipede.—L. W. Serrell, Brooklyn, N. Y., assignor to Robert Foulds, Passaic, N. J.

87,714.—Keyhole Guard.—Edmund E. Shepardson, Providence, R. I.

87,715.—Bitstock.—W. H. Sible, Harrisburg, Pa.

87,716.—Clay Pulverizer and Stone Separator.—F. H. Smith, Baltimore, Md.

87,717.—Screw Bolt and Lock Nut.—J. B. Smith, Milwaukee, Wis., assignor to himself and G. R. Chittenden, Chicago, Ill.

87,718.—Pea Rake.—Silvester Skinner, Clayton, N. Y.

87,719.—Extension Pruning Hook.—John Stark, Thomasville, Ga. Antedated Feb. 27, 1869.

87,720.—Branding Iron.—Lewis Stark, Chelsea, assignor to himself and F. L. Penney, Boston, Mass.

87,721.—Revolving Cultivator.—Abraham J. Stevens, El Dorado, Wis.

87,722.—Shank.—H. P. Stewart, Bath, Mich.

87,723.—Tympan Frame for Printing Presses.—David U. Stoner, Mount Joy, Pa.

87,724.—Cultivator.—D. C. Stover, Lanark, Ill.

87,725.—Furnace for Smelting Ores.—C. H. Swain, Brooklyn, N. Y.

87,726.—Seed Sower.—H. R. Swank, West Jersey, Ill.

87,727.—Stencil Plate.—J. L. Tarbox and H. L. Tarbox, New York city.

87,728.—Valve for Blowing Engines.—Lewis Taws, Philadelphia, Pa.

87,729.—Fence.—J. B. Tedrow, Chillicothe, Ohio.

87,730.—Preserve Jar.—Nathan Thompson, Brooklyn, E. D., N. Y.

87,731.—Washing Machine.—H. B. Tibbits, Vineland, N. J.

87,732.—Bottle-corking Apparatus.—Hiram Unger, Logansport, Ind.

87,733.—Composition for Recutting Files and Rasps.—A. Van Camp, Washington, D. C.

87,734.—Composition for Fire-kindling.—A. Van Camp, Washington, D. C.

87,735.—Cartridge.—J. R. Van Vechten, New York city.

87,736.—Machine for Scraping and Loading Earth.—Albert Ward, New Michigan, Ill.

87,737.—Backband Hook.—Seth Ward, Princeton, Ind. Antedated March 4, 1869.

87,738.—Wheel.—J. C. Welch and M. A. Ammeden, Edgerton, Ohio. Antedated March 5, 1869.

87,739.—Hinge Pintle.—William Wells, Ashtabula, Ohio.

87,740.—Fishing Net.—F. A. Werdmuller, New York city.

87,741.—Iron Bridge.—T. B. White, New Brighton, Pa. Antedated Feb. 27, 1869.

87,742.—Bedstead.—H. K. Whitner, Philadelphia, Pa.

87,743.—Churn.—Manuel Witmer, Cedar Rapids, Iowa.

87,744.—Machine for Pressing Hats.—F. Wolfram, New York city.

87,745.—Measuring Funnel.—H. J. Wolters, Salem, Mass.

87,746.—Car Wheel and Axle.—J. A. Woodbury, Boston, Mass.

87,747.—Device for Heading Bolts.—J. M. Woods, Washington, Mo.

87,748.—Triturating and Amalgamating Apparatus for Treating Ores of Gold or Silver.—Leonard Wray, Ramsgate, England.

87,749.—Stirrup-strap Loop.—A. B. Zellner, Monticello, Ark

REISSUES.

9,781.—Mop Head.—Dated June 14, 1853; extended seven years; reissue 2,957, dated June 2, 1868; reissue 3,188, dated Nov. 10, 1868; reissue 3,323.—Colby Brothers & Co., Waterbury, Vt., assignees, by mesne assignments, of Harvey Murch.

60,657.—Cushion for Billiard Tables.—Dated Dec. 18, 1866; reissue 3,323.—Levi Decker, New York city.

70,668.—Extension Table.—Dated Nov. 5, 1867; reissue 3,324.—F. R. Wolfinger, Chicago, Ill.

EXTENSIONS.

Method of Working Franklinite Ore.—Thaddeus Selleck, Greenwich, Conn.—Letters Patent No. 12,329, dated Jan. 30, 1855.

Harvester.—Cyrenus Wheeler, Jr., Auburn, N. Y.—Letters Patent No. 12,367, dated Feb. 6, 1855; reissue No. 971, dated June, 5, 1860; reissue No. 2,632, dated May 28, 1867.

Elliptical Rotary Pump.—Birdsill Holly, Lockport, N. Y.—Letters Patent No. 12,350, dated Feb. 6, 1855.

Base-burning Stoves.—James Easterly, Albany, N. Y.—Letters Patent No. 12,382, dated February 13, 1855; reissue No. 3,009, dated June 30, 1868.

Base-burning Stoves.—James Easterly, Albany, N. Y.—Letters Patent No. 12,282, dated Feb. 13, 1855; reissue No. 3,010, dated June 30, 1868.

Augers.—Russell Jennings, Deep River, Conn.—Letters Patent No. 12,318, dated Jan. 30, 1855; reissue No. 2,081, dated October 3, 1865; reissue No. 2,146, dated Jan. 16, 1866.

Screw Jack.—Thomas C. Ball, Bellows Falls, Vt.—Letters Patent No. 12,464, dated Feb. 27, 1855.

Method of Operating Steam Valves.—Norman W. Wheeler, Brooklyn, N. Y.—Letters Patent No. 13,389 dated July . 855. Antedated March 1, 1855.

NEW PUBLICATIONS.

Annual of Scientific Discovery; or Year Book of Facts in Science and Art, for 1869. Exhibiting the most Important Discoveries and Improvements in the Arts and Sciences, together with Notes on the Progress of Science during the Year 1868; a List of Recent Scientific Publications, Obituaries of Eminent Scientific Men, etc. Edited by Samuel Kneeland, A. M., M. D., Fellow of the American Academy of Arts and Sciences, etc., etc. Boston: Gould & Lincoln, 59 Washington street; New York: Sheldon & Co.; Cincinnati: George S. Blanchard & Co.

The year of our Lord 1868 has been so crowded with discoveries and improvements, that the volume before us could scarcely be otherwise than one of unusual interest. The able manner in which the editorial work has been performed adds greatly to the intrinsic value of the recorded facts. The index (a matter of vital importance in a work of reference, although some compilers seem to think it otherwise, judging from the careless manner in which indexes are often prepared) is prepared with judgment and accuracy. The work is embellished with a very fine portrait of James D. Dana, Professor of Natural History and Geology in Yale College, which adds to the attractions of the volume.

The Architectural Review and American Builders' Journal, for March, is published at Philadelphia, and fully sustains the excellent character heretofore noticed in that publication.

Van Nostrand's Eclectic Engineering Magazine, New York, for March, is also at hand, with a variety of well-selected articles.

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Inventions Patented in England by Americans,

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

333.—Apparatus for Filtering Saccharine Solutions.—R. W. Bender, New York city. Feb. 3, 1869.

387.—Knitting Machine.—F. Gardner, Hamilton, Canada. Feb. 8, 1869.

403.—Apparatus for Heating and Ventilating.—John Johnson, Saco, Maine. Feb. 9, 1869.

431.—Harvester.—Elisha Foote, Washington, D. C. Feb. 11, 1869.

443.—Rotary Engine.—William Owen, Toronto, Canada. Feb. 12, 1869.

455.—Saws.—G. Maulick, T. P. Marshall, and G. W. Rowley, Trenton, N. J. February 15, 1869.

458.—Mechanism for Changing Shuttles and Shuttle Boxes in Looms.—J. Brierly, Worcester, and J. Brierly, Millbury, Mass. February 15, 1869.

460.—Extracting Copper from its Ores.—T. S. Hunt, Montreal, and J. Douglas, Jr., Quebec, Canada. Feb. 15, 1869.

463.—Devices for Lacing and Buttoning Boots and Shoes.—Boston Shoe, Stud, and Button Company (Incorporated), Boston, Mass. February 16, 1869.

472.—Brick-Making Machinery.—Knight Brothers, Washington, D. C. February 16, 1869.

485.—Adhesive Stamps for Postal, Internal Revenue, and other Purposes.—A. C. Fletcher, New York city. Feb. 17, 1869.

486.—Permanent Way of Railways.—C. H. Collins, New York city. Feb. 17, 1869.

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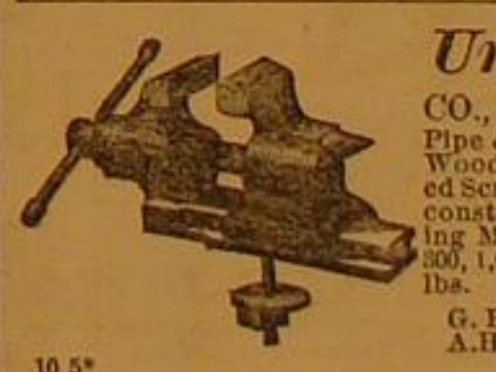

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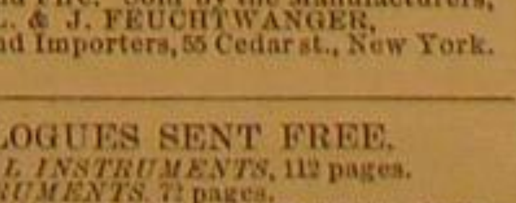

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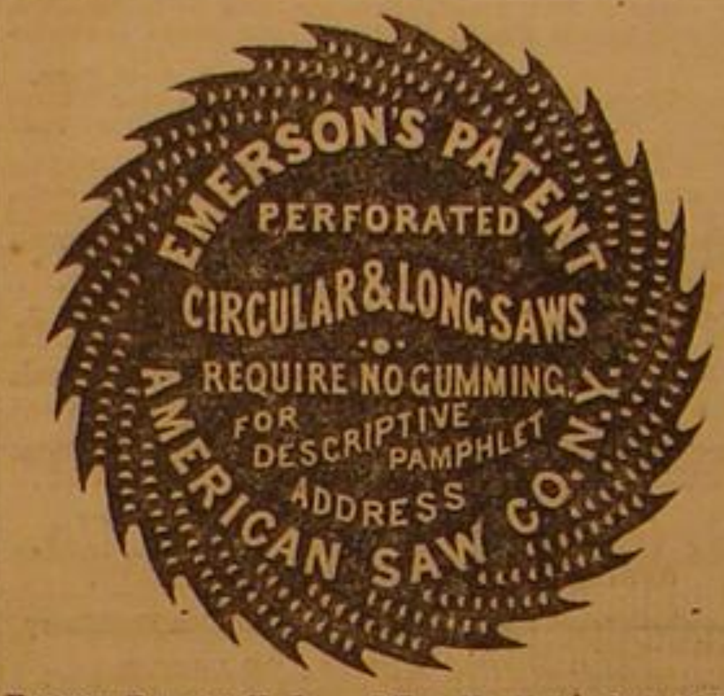

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