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Improved Universal Wood Working Machine.

A primitive form of this machine was illustrated on page 79, Vol. XXIII., of this journal. In the machine, as herewith illustrated, the essential and valuable features of the original invention are retained, while its scope is so much enlarged that it probably performs a greater variety of work than any machine now in use, and the character of the work is very perfect, as shown in a large number of specimens sent to this office.

The specimens illustrate the following kinds of work, namely: squaring, planing out of wind, beveling, cornering, rabbeting, gaining and plowing, planing tapered sticks, gaining 4½ inches in width by 3⅛ inches in depth (done at one cut) gains cut so close to others as to leave only a mere film of wood between them, plowing and gaining with the same cutter head, gaining at different angles, glue joints of newel posts, mitering, tongueing, and grooving, rolling joints, table leaves straight molding (several specimens in hard and soft wood), circular and elliptical molding, raised paneling, (the panel being raised on both sides of the piece at one operation), journals for agricultural machinery, picket pointing, gaining cuts made in one operation for journal boxing of different shapes, routing for bed post irons, window sash, light molding, etc.

The machine differs from the one illustrated in our issue of August 6, 1870, in the following particulars:

The present machine is made entirely of iron and steel. It has a "sticker" attachment to plane one, two, three, or four sides at one operation, so that, as now made, it may be run with five heads, one of them on the front side, for the same purpose as stated in our former article, and four on the sticker side for the various purposes to which a "sticker," or molding, machine is applicable.

The feed of the machine is made stronger than formerly, and is improved in other respects, making it now, it is claimed, the best parallel feed in use.

The position of the outer side head is so changed that the belt pulls against the boxes, and not against the cap, as is generally the case with other stickers, by which means the side head is held steady and makes a smoother cut.

The drop of the sticker bed has been much increased, having now a depth of eighteen inches.

We may add, to what we have said above, with reference to the variety of work done by this machine, that our enumeration does not comprise all that is done by it. There is scarcely a shape in which it is desirable to form wood in carriage making, car building, or furniture manufacturing, which is beyond the limits of its capacity.

Referring now to the engravings, Figs. 1 and 2 show obverse sides of the machine. We must of necessity omit many of the details, but will point out some of the principal features of construction.

In Fig. 1 the vertical adjustment of the tables is shown, this being accomplished through the action of inclined planes, A, simultaneously and equally moved by hand screws, C. Upon these planes rest the inclines, B, which support the table. D is the fence made of iron, and capable of adjustment to any angle with the table. It will be seen in Fig. 1 that there are two independent tables, one on each side of the cutter head, so that the piece to be planed rests on a solid surface on each side of the cutter bits, and is thus planed out of wind. By adjusting the fence properly, any bevel may be planed.

The sticker side of the machine, shown in Fig. 2, is provided with boring, routing, and other attachments for performing the various kinds of work above specified.

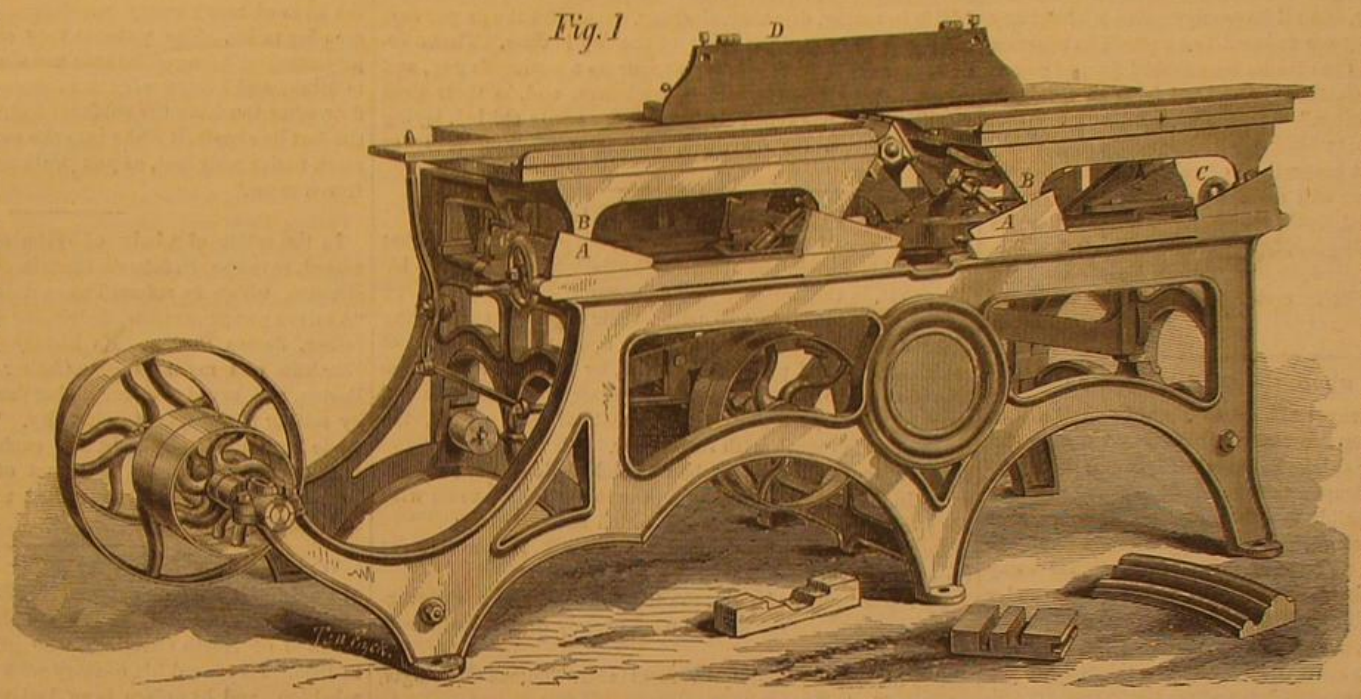
The manufacturers also make an universal wood worker with boring and routing attachment, without the sticker attachment.

The machine herewith represented has been used with great satisfaction in some of the best shops in the country, some manufacturers having purchased several machines for the same shop, after a trial of one. Among a large number of testimonials submitted to us, is one from the Barney & Smith Manufacturing Company, of Dayton, Ohio, an extensive car building firm, in which they say they consider that any one of the three machines they have purchased (the first in 1868, the second in 1869, and the third in 1870) paid for itself in the first four months of its use. The machines are used extensively in furniture and cabinet factories, car building, carriage and wagon manufacturing establishments, etc.

The advantages claimed for this machine are the great variety of work it will perform, the ease with which it can be adjusted, the accuracy of its performance, its strength, durability, and simplicity, its capacity to take the place of several distinct machines (while costing far less than the several machines whose place it fills), its power to plane light or heavy stuff out of wind and finish it at the same operation, and the economy of bench work it accomplishes.

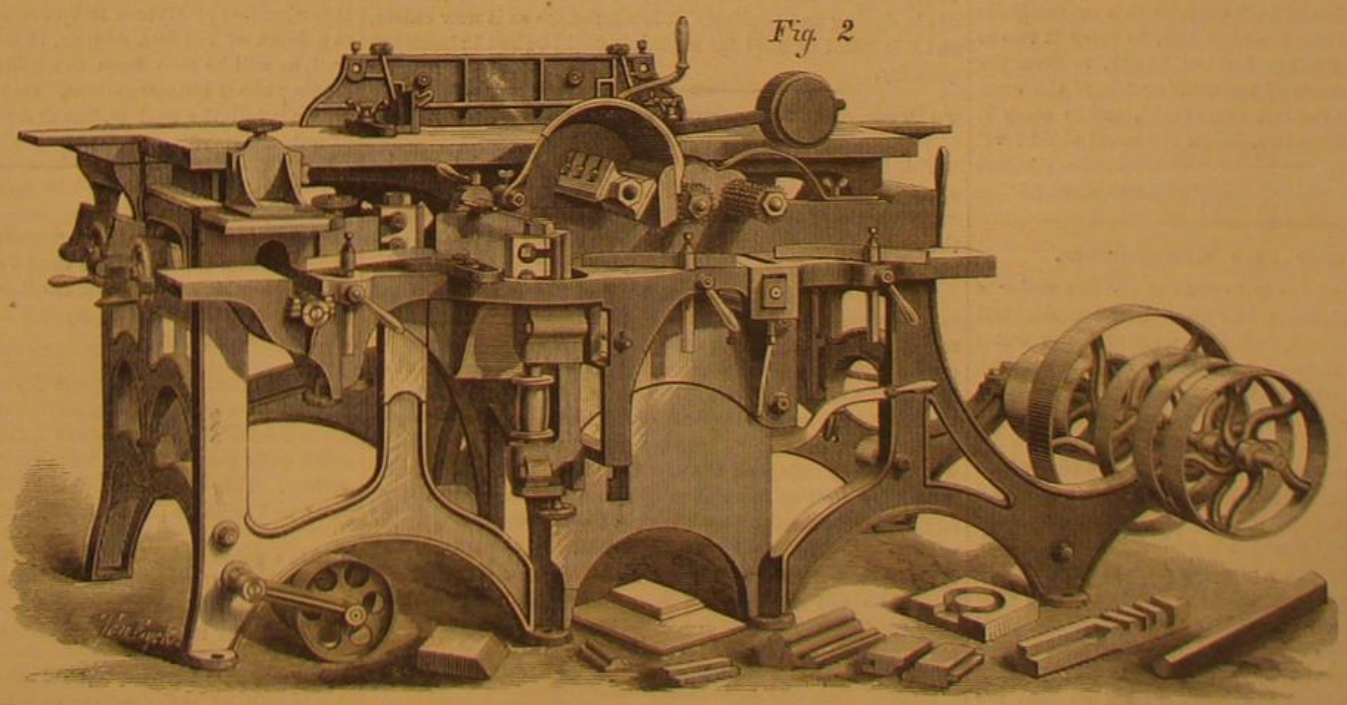
By changing the heads of the machine, it is readily adapted to the kind of work required, thus obviating the necessity of carrying the material to different parts of the shop to be worked. The machine is covered by several patents, all obtained through the Scientific American Patent Agency. For purchase of rights or machines, address McBeth, Bentel & Margedant, manufacturers, Hamilton, Ohio.

Fig. 1



McBETH, BENTEL & MARGEDANT'S UNIVERSAL WOOD WORKING MACHINE.

Fig. 2



Coloring Gold.

Gold is colored by two processes, called the dry and wet color; but the materials used in both cases are the same. They are as follows; one part salt, one part alum, and two parts saltpeter; each material to be pounded separately in a mortar, taking care they are perfectly clean—this is the dry process.

After being well pounded, they are put into an iron color pot and slowly heated over a fire. The color must boil gradually, and must be stirred with an iron rod. It will then rise, and then it is ready for the reception of the articles to be colored, which must be not less than 18 carat. They are suspended in the color by 18 carat wire, and kept in motion till the liquid begins to sink; then they are taken out and dipped in aquafortis pickle. The color will rise again, and then another dip, and sometimes two, is necessary to give the proper color. The wet color process is a much inferior method, except for gold of lower standard, and then not below 15 carat, as the alloy would suffer so seriously from the coloring. The fact is, coloring is no more than taking from the surface the inferior metals, leaving a thin coating of pure gold.

Breadstuffs and Cotton Imported into Great Britain.

The breadstuffs received by Great Britain during the half year ending June 30, 1871, were of the value of £16,170,861, being an increase of about 12½ per cent over the corresponding period of last year. The importations were derived as follows: From Russia, 40 per cent; America, 38 per cent; Germany, 9 per cent; Canada, 5 per cent; Turkey, 4 per cent; Austria, 1 per cent; Chili, 1 per cent, and other countries, 2 per cent. Compared with the first half of each of the preceding two years, Russia and Canada figure for a large increase, while Germany shows a decrease. The United States show a decrease from last year, but a large increase of 1869.

The importations of cotton for the first half of the present year have amounted to 9,708,245 cwts, at a cost of £33,506,876 while in the corresponding half of last year they were only 5,895,116 cwts, at a cost of £30,695,672. Thus an additional 65 per cent of material has been received at an additional cost of only 9½ per cent. Of the entire total, 73 per cent has been contributed by the United States, 13 per cent by India, 9 per cent by Egypt, 4 per cent by Brazil, and 1 per cent by other countries.

PREFER loss before unjust gain, for that brings grief but once, this forever.

COLORADO ORES.

An esteemed correspondent, Mr. Percival Stockman, in writing on the above subject, agrees with our editorial (published August 12, on page 103 of the present volume), that the enormous and shameful waste is a standing disgrace to technical science. He challenges the accuracy of Mr. John A. Church's statement (October 7, page 228), that "it is apparently impossible to amalgamate Colorado ores," and asks: "Why? The reason is that no process has hitherto been discovered to neutralize and separate the impurities invariably found in combination, not only with Colorado ores, but in all gold, and in different species of silver, ores." He describes arsenic, iron, and antimony, each in various forms, as the chief foreign bodies which cause difficulty, and states that "these impurities, coming in contact with the quicksilver, deaden and destroy its affinity for the precious metals;" but let the obstacles be removed, and then "tell any scientific man that gold and silver will not form an amalgam with quicksilver."

"The various different species of silver ores, that is, native silver, sulphuret of silver, brittle sulphuret of silver, antimonial silver, sulphuretted antimonial silver (red silver), carbonate of silver, muriate of silver (horn silver), and argillaceous muriate of silver, can all be amalgamated without any loss, provided that they are reduced fine enough to separate the metallic bodies. If the ores be not crushed fine, of course there will be loss, as quicksilver will not form an amalgam with the earthy substances."

He further asserts that:

"It matters not what proportions of gold and silver the ore contains, the quicksilver will amalgamate with one metal as well as the other, and both together. First remove its enemies, and give it fair play, before condemning it."

At all events, our correspondent throws light on a most important subject, too little understood by the persons most concerned.

Effect of Exercise upon the Bodily Temperature.

Dr. Clifford Allbutt says: "It seems absurd to tell a man who is toiling up a steep snow slope about 11.45 A. M., under a blazing sun, that, if he thinks he is decidedly hot, he is wholly in error, and that his temperature, if raised at all, is raised in a measure only perceptible to a very delicate thermometer. . . . . I may venture, perhaps, with more impunity to reassert this fact now, as most of my readers are far away from slopes of 45°, and are shivering in their easy chairs under the rigors of an English spring. Men of science have shown that all forms of force, such as heat, light, motion, chemical action, and the like, are mutually convertible, the one into the other. . . . It might be expected, therefore, that a man ascending the Alps would lose in heat what he expends in movement; for, on his arrival at the top, he represents a certain definite amount of force derived from combustion of food in his body . . . . . The average temperature of the human body is about 98·5° Fahr., and it may vary between 97·5° and 99·2°, with a few tenths of indifference above and below. To rise to 100° is, however, to become slightly but decidedly feverish, and temperatures of 105°—110° are positively and rapidly destructive. On the other hand, temperatures below 97° show danger of an opposite kind, and signify a depression of vitality below the limits of health. It is clear, then, that if the body is to survive, its temperature must preserve a constant level, or rather it must move in a definite curve, the place of which is constant for the same hour of every day, or nearly so. . . . . I am disposed to think that no better test could be found than the thermometer' to decide the wholesomeness of exertion in different persons; and if I may reason from myself to others I should say that the effect of hard exercise in a mountainous district is to accelerate the morning rise, to carry it two or three tenths above the average level of health, to favor the somewhat earlier occurrence of the evening fall, if the exertion be ended, to make the fall more rapid, and to carry it again one tenth, or perhaps two, below the usual night level of health. Also, that any depression during exertion signifies either deficiency of food or inefficiency of internal work.'"

Sinclaire's Boiler Fire Extinguisher.

The object of this invention is to put out the fire under a boiler, whenever the pressure has passed, by the slightest amount, the limit of safety, and also whenever the water has fallen so low as to endanger the boiler by over heating.

The first object is attained by means of a weighted lever in a locked and sealed chamber; the weight (to be set by the inspector,) controls a valve that, raised by any pressure beyond that to which the weight is set, opens a part which allows water to flow from the boiler into the furnace and extinguish the fire.

The second part of the invention is a pipe, in which a fusible plug is placed, leading to a plunger in a small cylinder. The pipe in the ordinary working of the boiler is filled with water, but when the water falls below the line of safety, it opens the end of the pipe which was closed by the water, and, the water being displaced by the steam, (the heat of which first melts the fusible plug,) the latter passes on into the cylinder, which forces up the plunger. The plunger in rising raises the weighted lever, and allows the water to flow into the furnace as above described.

The knowledge that neglect on their part will be revealed by the extinguishment of their fires, will tend to render engineers cautious, and thus reduce the number of accidents resulting from negligence.

This invention was patented Sept. 19th, 1871, through the Scientific American Patent Agency, by Thomas B. Sinclaire, of New York city.

Curiosities of Life.

Lay you finger on your pulse, and know that, at every stroke some immortal passes to his Maker; some fellow being crosses the river of death; and if we think of it we may well wonder that it should be so long before our turn comes.

Half of all who live die before seventeen.

Only one person in ten thousand lives to be one hundred years old, and but one in a hundred reaches sixty.

The married live longer than the single.

There is one soldier to every eight persons, and, out of every thousand born, only ninety-five weddings take place.

If you take a thousand persons who have reached seventy years, there are of

Clergymen, orators and public speakers	43
Farmers	40
Workmen	33
Soldiers	32
Lawyers	29
Professors	27
Doctors	24

These statements are very instructive. Farmers and workmen do not arrive to good old age as often as the clergymen and others who perform no manual labor; but this is owing to the neglect of the law of health, inattention to proper habits of life in eating, drinking, sleeping, dress, and the pr per care of themselves after the work of the day is done. These farmers or workmen eat a heavy supper on a summer's day, and sit around the doors in their shirtsleeves, and, in their tired condition and weakened circulation, are easily chilled, laying the foundation for diarrhœa, bilious colic, lung fever or consumption.

Pringle's Improvement in Oars.

By the use of these improved oars, the oarsman may either sit with his face in the direction he is rowing, or with his back to it, in the ordinary way of rowing.

The oar is made in two parts, their adjacent ends being pivoted to and between two plates, upon the outer sides of which are formed pivots or journals, by which the oar is connected to the oarlock. Upon the adjacent ends, of the two parts of the oar, are attached segments of gear wheels, the teeth of which mesh with each other.

By this construction, the handle and blade of the oar both move in the same direction when the rower desires to sit with his face in the direction toward which he is rowing.

By a peculiar construction of the rowlock, this movement does not prevent feathering the oar.

By the insertion of a pin, the toothed segments are prevented acting, and the oar is then used exactly like the ordinary oar.

The inventor of this improvement is Mr. Thomas G. Pringle, of New York City.

Extract of Horse Chestnut Wood.

For dyeing heavy black upon silk, an extract of horse chestnut wood has recently acquired great importance. It is preferred to nut galls or divi divi for this purpose. To what particular principle in the wood is to be ascribed the important property, of which use is now made, has not been determined with certainty, but it appears to be ascertained that the extractive matter of horse chestnut wood now plays an important part in the silk manufacture in Europe. The question is not one of so much importance in this country as as it is in France and Germany, but it ought to occasion a search to be made for some suitable substitute. We doubtless have in our forests trees that would yield a similar product if they were to be examined. There is a weed growing in great abundance in New England known as *hard hack*, which ought to be examined with reference to its possible use in dyeing and tanning, It is a nuisance as it now exists, and if it could be used for anything, could be had in immense quantity.

To Transfer Ornaments for Carriages, Wagons, etc.

This beautiful art is now practiced by many painters, who are either in a hurry with their work, or for economy's sake.

Pictures expressly designed for carriages are now sold at the leading periodical stores, and the amateur painter is enabled thereby to finish a job of carriage painting in fine style.

These pictures may be stuck on, and the dampened paper carefully removed, leaving the picture intact upon the panel, requiring no touching with the pencil. The proper way to put on decalcomine pictures is to varnish the picture carefully with the prepared varnish (which can be obtained with the pictures,) with an ornamenting pencil, being sure not to get the varnish on the white paper. In a few minutes, the picture will be ready to lay on the panel, and the paper can be removed by wetting it, as already described; and when thoroughly dry, it should be varnished like an oil painting. Be particular to purchase none of those transfer pictures, except those covered with gold leaf on the back, for they will show plainly on any colored surface, while the plain pictures are used only on white or light grounds. They may be procured at any stationery store, and the cost is trifling.—*Painter's Manual.*

To take Bruises out of Furniture.—Wet the part with warm water; double a piece of brown paper five or six times, soak it in warm water, and lay it on the place; apply on that a warm, but not hot, flat iron till the moisture is evaporated. If the bruise be not gone, repeat the process. After two or three applications, the dent or bruise will be raised to the surface. If the bruise be small, merely soak it with warm water, and hold a red hot iron near the surface, keeping the surface continually wet—the bruise will soon disappear.

EDITORIAL SUMMARY.

The wire rope works of Messrs. John A. Roebling & Sons are the largest in the United States, occupying an area of about ten acres, located on the Delaware and Raritan Canal and connected with the Camden and Amboy Railroad. Bright wire, steel, and galvanized wire rope in all sizes and lengths are made, and the machinery is capable of making as large wire rope as can be manufactured. One piece, 5,870 feet feet long, weighing 65,000 pounds, was recently made for the Lehigh and Susquehanna Railroad, costing $10,540. The business was first started in 1849, and now employs 125 hands and three engines, giving in all 350 horse power. A rolling mill in connection with the works has a capacity for forty tuns of wire per week. A new building, to be 200x40, is now being built for a galvanizing house.

Salt Lakes in Australia.—An interesting description of the salt lakes of Australia is given by a writer in the Sydney *Empire*, who, speaking of the salt lakes and mineral springs on the Paroo, says: "These wells are a real curiosity to many, if not to all. Mounds of earth rise about ten or fifteen feet over the surface, no doubt thrown up by the force of the water; they form a kind of oasis in the wilderness, and have saved the lives of many weary wanderers. These mounds can be seen for miles. The water is very clear and soft. It is impregnated with magnesia, soda and alum. It is very palatable to drink, and I think very wholesome. The water does not flow after touching the surface; but, as soon as it overflows the fort like basin, it sinks into the earth. The alum and soda crack under your feet, as you walk around these wells, like frozen snow."

In the estate of a lady of Wilmington, Del., recently deceased, says the *Printers' Circular*, there is a silver punch strainer, which is referred to as follows in the lady's will: "A silver punch strainer, belonging to my maternal grandfather, James Parker. Its history is briefly this: Dr. B. Franklin and my said grandfather were printer boys in Boston, and saved a silver dollar from their first earnings by selling newspapers in that city. They had these dollars made into punch strainers, and exchanged with each other, so that this strainer is made out of the dollar earned by Dr. Franklin. This is bequeathed to the Smithsonian Institute."

West Point Military Academy.—The post of Professor of Engineering at the national Military Academy has been given, by the Secretary at War, to Major Junius B. Wheeler, a native of North Carolina, who graduated at West Point in 1855. He served his country with great credit during the rebellion, and has since been Assistant Professor of Mathematics in the Military Academy aforesaid. The appointment will have the approval of the military profession and the public, as well of the cadets, with whom Professor Wheeler is already popular.

Inextinguishable Lamp.—A new light, which seems fitted to be of use in submarine construction of works, is in use in England. It is a cylinder of tin, with a top filled with a phosphide of calcium, prepared by the inventor, a Mr. Holmes. When the lamp is thrown into the sea or river, the water, entering the cylinder, decomposes the phosphide of calcium, phosphuretted hydrogen results; the latter escaping in great quantities ignites spontaneously, and burns with a brilliant light.

Large Well in Ohio.—A correspondent, Mr. John Boger, Jr., informs us of a large well near New Franklin, Ohio. It is nine feet by sixteen feet in superficial area, and is sunk to a depth of 140 feet, costing, in construction, $18,000. The well, as will be seen from the above figures, is capable of holding about 150,000 gallons. Our correspondent does not say how full the well is, but that "it has a constant supply of water."

The Fire at Chicago.—The area burned over by this almost unparalleled fire, approximates 4 square miles. Ten thousand buildings were destroyed, two thousand of which were business houses. The total loss as gathered from various estimates, cannot be much less than $ 200,000,000. The people rendered homeless by the disaster number probably not less than 100,000.

Tea Leaves a Remedy for Burns and Scalds.—A poultice of tea-leaves applied to small burns and scalds, afford immediate relief. The leaves are softened with hot water, and, while quite warm, applied upon cotton over the entire burned surface. This application discolors and apparently tans the parts, and removes the acute sensibility and tenderness.

It is a noble and great thing to cover the blemishes and to excuse the failings of a friend; to draw a curtain before his stains, and to display his perfections; to bury his weaknesses in silence, but to proclaim his virtues upon the house top.

Cement for Stoves.—Wood ashes and salt, equal proportion in bulk of each; reduce to a soft paste with cold water, and fill cracks when the range or stove is cool. The cement will soon become hard.

Justice consists in doing no injury to men; decency, in giving them no offense.

Our own heart, and not other men's opinions, forms our true honor.

An honest death is better than a dishonest life.

Don't Begin to Build in Autumn.

The *Technologist* for October has the following on "Building in Autumn:" There are several strong objections against beginning to erect a building with the intention of finishing it next season, or even completing the edifice before cold weather. Masons have often persuaded their employers to dig the cellar and then let them carry up the foundation walls late in autumn, so as to be ready very early the next season to erect the superstructure. Every intelligent mason knows that the practice is not a good one. Yet, as masons are always crowded with foundation work in the former part of the season,—which is the proper time to do such work,—if they can induce an employer to commence the foundation of a building in the fall, the masons will gain the benefit of a paying job, and frequently two jobs, as a cellar wall erected just before cold weather will often be so seriously damaged by bearing and settling that a portion—perhaps all of it—will have to be relaid the next season.

When a foundation wall is built with mortar filled in the interstices,—which is the only correct way to prepare a foundation for any building,—the mortar near the middle of the wall will not become really consolidated during a period of six months, if the weather be favorable. But, if a new wall is exposed to cold weather only a few weeks after it has been built, the green mortar at the middle will be frozen before it is dry, which will damage the wall by bursting the layers of stone or brick asunder, and by destroying the solidifying principle of the lime or cement. After green mortar has been frozen and thawed two or three times, there will be no more strength in a wall than if the stones and bricks had been laid in a mortar made of ashes, sand, and clay.

In most instances, the earth beneath a foundation wall will be frozen more or less, which will destroy its compactness to such an extent that the wall will settle unevenly, often cracking from top to bottom before the superstructure is erected. Besides this, the bank of earth outside of the wall will expand by freezing—especially where it is not of a dry and gravelly character—so that the whole wall will be thrust inward so far beyond a perpendicular position that most of it will have to be taken down and rebuilt. Cellar walls are frequently thrust inward by the frost, even when a heavy superstructure rests on them. It is sometimes as important to exclude frost from a cellar, to prevent freezing the earth outside of the walls, as to keep vegetables from being frozen. The disadvantages of shorter days also, and more stormy weather than we are liable to have in the former part of the season, must be encountered when one commences to build in autumn rather than in the spring. If the foundation wall is built early in the season with good mortar, the entire structure will have ample time to solidify before cold weather, so that it will resist all ordinary thrusts of the earth during the freezing process. When one commences in the latter part of the season, there will usually be more or less unavoidable hindrances when building almost any sort of edifice. Hence, if a builder commences early in the former part of the season, he will be able to meet hindrances without much, if any, real damage.

It is always objectionable to allow the foundation walls to stand any considerable time without the superstructure. The most complete preparation should be made before the ground is broken. All the lumber should be delivered and stuck up under shelter, so that it may have a long time to dry and become seasoned before it is worked. Then, as soon as the frost is really out of the ground in the spring, dig the cellar, carry up the foundation wall, erect and enclose the superstructure as soon as practicable, let it stand to season, settle, and shrink until autumn; then plaster and finish the inside before cold weather.

By building a dwelling in this manner, all the shrinkage and cracking of the woodwork and the cracking of the walls will be avoided; and the walls will be far more firm than if the plastering had been done in hot weather, when the mortar will dry too rapidly to make a strong wall. Building architectural structures, like the formation of character, is a job of a lifetime. In building a cottage or a palace, a hennery, piggery, or a spacious farm barn, a beginner should avail himself of the practical experience of such builders as have purchased their wisdom at the costly rate of damaging and expensive mistakes in beginning to build in the latter part of the season.

Balloon Ascension.

We find the following account of an ascension in July last, by Mr. John Wise, at Chambersburg, Pa., in the *Franklin Journal:*

At three P.M. a thunder gust was approaching us from the northwest, and, with a view of entering it, the balloon was cast loose at twenty minutes past three. The ascent was moderately rapid, and upon gaining an elevation of a thousand feet, it was discernible that the storm cloud was passing us too far to the east, leaving the balloon outside of its drawing-in influence. It was a mushroom shaped nimbus, bulged out above and below, trailing its lower ragged edge somewhat behind, and it seemed to labor between contending forces, as it swayed and halted in its onward march. The only great difference manifested now between former experiences and the present one, was the very low temperature of the air we were in. Looking upwards, I saw, at a considerably greater elevation, an isolated grayish colored cloud, of an oblong shape, occupying a space of about a thousand acres (I say a thousand acres, because its shadow covered a dozen or more of farms below, and this outline gave me an approximate idea of its dimensions), and it seemed to be quiescent.

My attention was now wholly directed to this, to me, new kind of meteor. The cold increased as we mounted up, and much faster than is usual in rising with a balloon. When yet at least a thousand feet below its apparent concave surface and ragged circumference, we entered a fine drizzling shower of snow, which became more copious as we rose towards the cloud, until we reached the point of the most visible deposition, which was equal to a regular snow fall; and as we rose from this point, it seemed to diminish in quantity, until we reached the lower surface of the cloud, where it ceased, but we could still see the snow falling below us. While it was at a freezing temperature below, as soon as we had fairly become involved in the cloud, the air began to grow warmer. In the cloud it was not nearly so dark and dingy as in a thunder cloud, but the light was of a greenish tint. When we emerged from the top of the cloud, the heat, or rather the increase of heat, was sudden, and the sun, shining on our necks and hands, produced an effect I can only compare to the contact of an acid spray, producing a burning sensation.

The cloud just mentioned showed no bubbling up upon its surface, as is the case over a thunder cloud, and whatever may have been the action taking place within it, it was of a most placid character. On suffering the balloon to drop down through it, we again encountered the snow, less in quantity, but the cold sudden and intense, and immediately both of us became hoarse, with a painful, irritating sensation in the windpipe, indicating a corrosive action there. May this be the action of ozone upon moist animal membranes? I have great reason to believe that such is the explanation of the fact, as it seemed to me that the mere change of temperature could not produce that marked effect. I may mention, in this connection, that I have frequently experienced the same sensation upon entering a storm cloud.

Lismann's Machine for Rolling Metals.

Mr. Abraham Lismann, of Munich, Germany, has invented a machine for rolling metal, which has for its object to effect the processes of thinning and drawing out plates of metal, which have heretofore been carried out by hand. These operations, which occur principally in coppersmiths' work, are now effected by hand, as follows: For thinning and drawing out the edges of circular plates, the latter are hammered in consecutive rows, commencing at the inner circumference of the part to be thinned, and extending in a tangential direction to the outer circumference of the plate. For thinning and drawing out the edges of square or polygonal plates, they are in like manner hammered in consecutive rows, extending from the inner portions of the plate in a slanting or angular direction toward the outer edges. For working the metal into dished or spherical forms, the plate is hammered in consecutive rings, extending from the center of the plate toward the outer edge, such blows being effected by a hammer head with a spherical or convex surface upon an anvil having a concave surface.

According to Mr. Lismann's invention, these operations are performed by rolls, having helical or screw like surfaces, so formed that, when revolved, they will act upon the metal in a series of consecutive cycloidal or tangential lines, extending, like the hammer blows, in oblique directions from the inner toward the outer edges of the parts of the metal plate to be operated upon. These helical surfaces are formed either convex, concave, or plane, as the nature of the work may require. Thus, for thinning and subsequently working up the edges of a circular plate into the form of a rim, a pair of rollers, having helical or screw like working surfaces, are placed upon the overhanging ends of two shafts, carried on suitable bearing in headstocks or framing, and adjustable toward each other by adjusting screws, hydraulic presses, or other means. The plate to be acted upon is, at its center, held by a stirrup frame, rendered adjustable to and from the rollers by being carried by a slide rest, which may be made to assume any desired angular position relative to the axes of the rolls.

The rim of the plate being introduced between the helical rolls, and rotary motion being imparted to the latter, they are caused to act upon the plate in a series of cycloidal or tangential lines extending from the inside of the plate to the outer circumference, as before described, the plate being, at the same time, caused by this action to revolve upon its center, where it is held by the stirrup frame.

The helical surfaces of the rollers may either be formed upon both rolls or one only; the other having a plane surface. Such plane roll may be made of less diameter than the other if circumstances should require it. The rolls may further, more be formed either with only one helical surface, extending right round the roll, or, if the nature of the work requires that the pitch of the helical surface shall be greater than is attainable by one such surface only, two or more helical surfaces of greater pitch may be formed on the rolls.

The rolls may be formed with projecting rims overlapping each other, so as to act as circular shears for shearing off any superfluous length of the rim of the plate after it has been drawn out and turned up, as described.

For working a metal plate so as to convert it into a dished spherical form, only one helical roll is employed, the other being replaced by a spherical surface carried by a suitable hinged frame. The helical roller is, in this case, formed with a number of separate short helical concave surfaces, with spaces between them, so that, as the joint action of this roller and the spherical roll has to take place in concentric rings upon the plate, the plate may be shifted for this purpose when, by the revolution of the helical roll, one of its spaces comes underneath the spherical roll.

THE intellect is superior to the physical system. While the world lasts, the sun will gild the mountain tops before it shines upon the plain.

The Pianoforte.

The improvement, on the old spinet, clavichord, and harpsichord, which gives the title of "PianoForte" to the instrument, was the invention of Bartolomeo Christofali, and was produced very early in the eighteenth century. The name was given to it in the year 1717, by Christopher Schröter, who observed that it could be played *forte* or *piano*. John Harris, in 1730, informed the English public that he had patented "a new invented harpsichord upon which (having only two sets of strings) may be performed either one or two unisons, or two unisons and one octave together; or the fortes and pianos, or loud and soft, and the contrary may be executed as quick as thought, and also double basses, by touching single keys."

We find the following in the *British Trade Journal*: "The first piano known to have been in England was brought from Germany in 1757, and ten years afterwards, in 1767, one was advertised at Covent Garden Theater as a new instrument. The earliest patent granted in England relating to this subject was taken out by Stodart, 1777, and the next by Broadwood, in 1783. After this, the number of patents became very numerous. The earliest entry of the sale of a piano on Messrs. Broadwood's books is 1771; of a grand piano, 1781. At that time the harpsichord (which was practically a harp played on by slips of wood called jacks) was being rapidly driven out of fashion by the piano, and the newer instrument, at first not very popular, was the only one mnde. The first patent of an upright piano was granted to W. Stodart, in 1795, and in 1807, Southwell made it less unwieldy, and gave it the name of "cabinet," which it has since kept. From 1831 to 1851, Messrs. Collard sold about 32,000 pianos, Messrs, Broadwood 45,863. In 1853, pianos were produced in England at the rate of 1,500 a week.

Music of Rolling Sand.

At the late meeting of the British Association for the Advancement of Science, Captain H. S. Palmer contributed an interesting paper on "An Acoustic Phenomenon at Jebel Nagus, in the Peninsula of Mount Sinai." Jebel Nagus is a peculiar sand slope, from which loud and mysterious noises are frequently heard to proceed, exciting the superstitions of the Bedouin and the wonder of travelers. The slope is about 200 feet in hight, and almost triangular in shape, eighty yards wide at its base, and narrowing towards the top, where it runs off into three or four small gulleys. Sandstone cliffs abound on either side, and, above the head of the slope, cliffs rise for about 150 or 200 feet more to the summit of the mountain. The sand, which is of a pale yellowish brown color, appears to be that of the neighboring desert, derived in the first place from the waste of the sandstone rocks, and then conveyed to its position on the hillside by the drifting action of high winds. Its grains are large, and consist entirely of quartz. The neighboring rock *in situ* is a soft, friable sandstone of a light brown, sometimes nearly white, color inside, and weathering to a dull brown on the outside.

The sand of the slope is so pure and fine, and in, its usual condition, so perfectly dry, and lies at so high an angle (nearly 30°) with the horizon, as to be set in motion by the slightest cause. When any considerable quantity is thus in motion, rolling slowly down the slope like some viscous fluid, then is heard the singular acoustic phenomenon—from which the mountain derives its name—at first a deep, swelling, vibratory moan, rising gradually to a dull roar, loud enough when at its hight to be almost startling, and then as gradually dying away till the sand ceases to roll. Captain Palmer said that this sound is difficult to describe exactly; it is not metallic, not like the sound of a bell, nor yet like that of a nagus. Perhaps the very hoarsest note of an Æolian harp, or the sound, produced by rubbing the wet rim of a deep toned finger glass, most closely resembles it, save that there is less music in the sound of this rolling sand. It may also be likened to the noise produced by air rushing into the mouth of an empty metal flask or bottle; sometimes it almost approaches the roar of thunder, and sometimes it resembles the deeper notes of a violoncello or the hum of a humming top.

Tricks of Jugglers.

Our sober Christian neighbors of the New York *Observer* are responsible for the following: We think Hermann and Heller are jugglers, but what can they do to compare with the Chinese tricksters? A traveler at Kinsai was entertained by the Viceroy, the Amir Kustai, and this was one of the amusements:

"That same night a juggler appeared, who was one of the great Kaan's slaves, and the Amir said to him, "Come and and show us some of your wonders!" Upon this he took a wooden ball with seven holes in it, through which long thongs were passed and, laying hold of one of these, slung it into the air. It went so high that we lost sight of it altogether. (It was the hottest season of the year, and we were outside in the middle of the palace court). There now remained only a short end of a thong in the conjurer's hand, and he desired one of the boys who assisted him to lay hold of it and mount. He did so, climbing by the thong, and we lost sight of him. The conjurer then called to him three times, but, getting no answer, he snatched up a knife, as if in a great rage, laid hold of the thong, and disappeared in his turn! By and by he threw down one of the boy's hands, then a foot, then the other hand and the other foot, then the trunk, and, last of all, the head! Lastly, he came down himself, puffing and blowing, and with his clothes all bloody, kissed the ground before the Amir, and said something to him in Chinese. The Amir gave some order in reply, and our friend then took the lad's limbs, laid them together in their places, and gave a kick, when, presto! there was the boy, who got up and stood before us! All this astonished me beyond measure."

Typhoid Fever Successfully Treated with Milk.

Alexander Yule, M. D., communicates, to the *Medical Times and Gazette*, the following paper:

There is nothing new about the treatment of this fever by milk. As such treatment may not, however, be the general one adopted, I have been induced to offer my testimony as to its efficacy. It stands to reason that people, suffering from disease, quite as much require food as those in health, and much more so in certain diseases where there is rapid waste of the system. Frequently all ordinary food in certain diseases is rejected by the stomach, is loathed by the patient. Nature, ever beneficent, has furnished a food that in all diseases is beneficial—in some directly curative. Such a food is milk. In the twenty-six cases we have treated of typhoid fever, its great value was apparent.

To be sure our number is not large, yet sometimes the small indicates the resultant on a large scale. The indications we followed were—1. To check diarrhœa; 2. To nourish the body; 3. To cool the same.

With regard to the diarrhœa in typhoid fever, we believe it ought, if possible, to be checked, or at least restrained; for you might as well think of leaving a sore-throat in scarlatina to take its course (being eliminative of fever poison), or irritate it a little, as of encouraging diarrhœa in typhoid fever. Astringents were used in all cases (with occasional doses of ipecacuanha), diluted sulphuric acid being found the most serviceable. The acid was used from beginning to end of the fever. We imagine that, in those cases which recover where diarrhœa is encouraged, the patient got well in spite of the treatment; for we believe that nothing so much tends to extending of ulceration, to hæmorrhage, peritonitis, and protracted convalescence as the use of salines or such like remedies. Who would think of healing an ulcer by irritating it by not allowing rest, for the reparative powers of Nature to do their work? An ulcer in the ileum requires rest quite as much as one in the leg.

When diarrhœa became violent, the most powerful astringents were used, and, when the bowels were once "locked up," they were so maintained for from ten to fourteen days, with not only no inconvenience, but with decided advantage. To cool the body and to nourish it were the other two indications:

1. As to Nourishment.—That the body in fever wastes rapidly is evident; and from the accumulation of waste material in the blood, and the want of pabulum to feed the fever, the most disastrous results eventuate—resulting in death—from the fever drying up the very issues of life. Now, if pabulum can be afforded to repair the textures that, from the action in the fever poison, are being used up, one great, if not the greatest, object of treatment is attained; for fevers obey, like every thing else in this world, certain fixed laws. Like an object in vegetable life, there is the seed, the bud, the unfolding, the full leaf, the withering away and decadence—so with fevers and their incubation, ingravescence, etc. Now, if the body can be sustained until the fever has gone its course, health will result. Milk, of all things, seems best adapted for this purpose; for it is digestible, is relished by fever patients, contains all the requisite material for the nourishment of the entire body—the nervous system in especial, which in fever is always greatly affected. Furthermore, in fever there is great thirst, and patients ardently long for that which will cool the parched mouth. Thus, by interdicting the use of water *in toto* throughout the fever, nourishment can always be given in the shape of cold new milk. Cold beef tea is by no means to be despised, but is much less relished, and not unfrequently loathed when the fever is intense, while milk is then taken with much gusto. Again, cold milk, when the diarrhœa is severe, exercises a most kindly action upon the ileac ulcerations. The rule we adopted was to allow milk *ad libitum*. In some cases quantities, far beyond what could be absorbedby a stomach whose powers of absorption were reduced to a minimum, were taken, a portion of the milk passing in an undigested state from the bowels. This, however, far from, in my mind, being an objection, was a decided boon, for the milk, as it passed over the inflamed and ulcerated ileum, exercised a soothing influence.

2. To Cool the Body.—Now, cold milk is an admirable agent for cooling the body (cold water would do as well, but then new milk nourishes and cools at the same time), and heat is a prominent symptom of fever (*ferveo*, I boil), and a measure of the activity of the fever changes in the body. Another agent used in all these cases was the diluetd sulphuric acid, which aided in redncing temperature, in restraining diarrhœa, and, if the theory is to be credited, diminishing the alkalinity of the blood.

Concluding General Remarks.—Such were the measures relied upon in the treatment of twenty-six cases of typhoid fever. Six of the cases were adults over twenty-two years of age, ten between nine and twenty-two, the remainder being under these ages. Wine was given in no case during the active continuance of fever, as it increased the diarrhœa (when tried), and promoted delirium. When the fever had left, and the patient became exhausted and sleepless, then wine in three cases did well. Never more than six ounces was required *per diem*, and that only for a few days (in an adult). In two cases where there was great pain in ileum, blisters applied there did good. A few doses of tartar emetic and tincture of opium were used in one case to procure sleep, which it sufficed to do. We believe that milk nourishes in fever, promotes sleep, wards off delirium, soothes the intestines, and, in fine, is the *sine qua non* in typhoid fever.

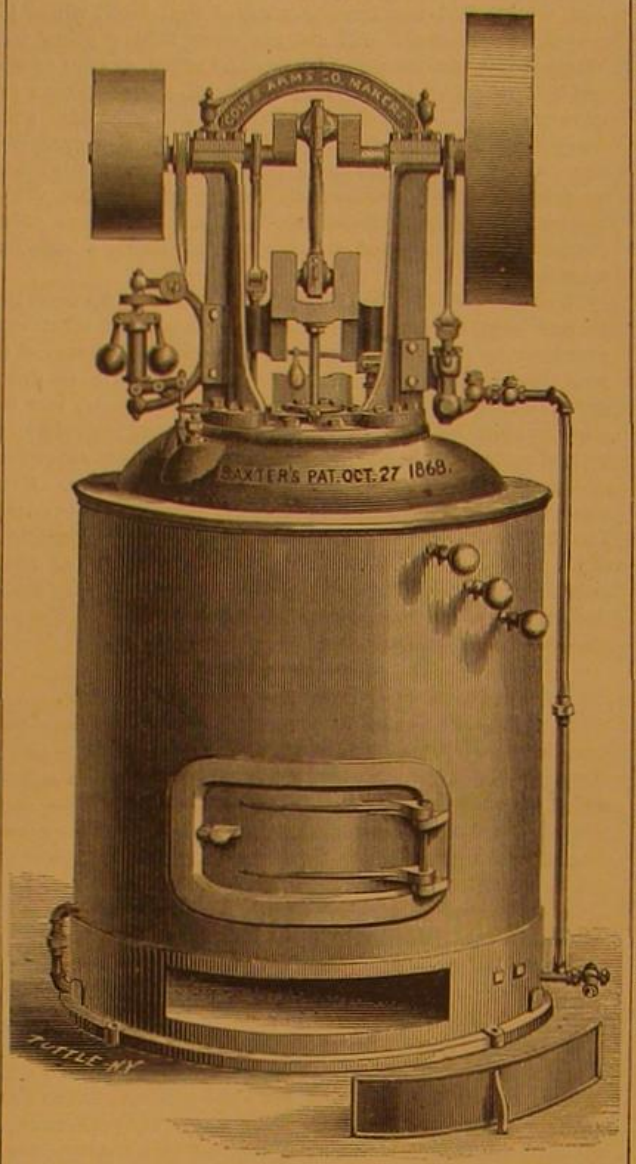
Though a taste of pleasure may quicken the relish of life, an unrestrained indulgence leads to the inevitable destruction.

Every man's life lies within the present; for the past is spent and done with, and the future is uncertain.

BAXTER'S PORTABLE STEAM ENGINE.

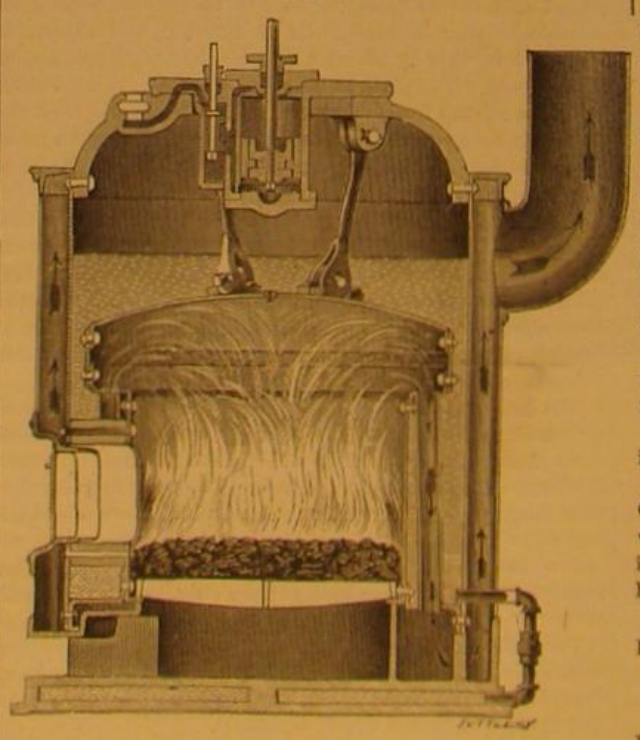
Very few inventions in modern steam engineering have so rapidly won their way into public favor as has this engine, since its first introduction to the public in an illustrated descriptive article published on page 353, Vol. XX. of the Scientific American.

Fig. 1.



But though as there described, it had sufficient merit to at once command wide attention, the short time which has elapsed since that notice has developed important improvements, not only in the construction of the engine itself, but in the method of its manufacture, the improvements being, as well as the original design, the result of long experience in steam engineering, which has enabled the inventor to combine, in a very efficient manner, the settled and well understood scientific principles of steam as a motive power, in an engine which, while it is free from novel complications likely to perplex the inexperienced, is still such as commends itself to the minds of experts.

Fig. 2.



A very compact, simple, and economical engine, one that could be taken down, transported, and set up with the utmost ease, and which, within a very small compass, should furnish from two to ten horse power, easily attended and run by those who know little of steam engineering, safe from explosion, and not increasing the risk of fire in small manufactories, printing offices, farm buildings, etc., was the aim of the inventor. The success attained in each of these particulars will be set forth in the description which follows.

We shall first notice the changes in construction made in the engine since our former article, referring to the engravings annexed, respectively a perspective view of the engine, a section, and a ground plan of boiler and furnace.

Foremost among these is the provision of a water bottom which serves a four-fold purpose. It prevents all danger of fire to the floor upon which the engine is placed. It furnishes a water heater, which utilizes the heat radiated downward, the water being forced into it on one side by the pump, and passing out, through a short pipe on the opposite side, to enter the lowest part of the boiler. It acts as an efficient mud drum, the slow passage of the water through it allowing the floating impurities to settle and be blown off as occasion may require. Lastly, it forms a substantial and ornamental pedestal for the boiler and engine, easily fastened down, and interfering in no way with the convenience of transportation.

The novel governor illustrated and described in our former article above referred to, in which the resistance of oil in a cylinder (the oil being forced through a small port from one side to the other of a plunger) was made to give a variable cut off, was found too complicated for common use, and has been replaced by one of the ordinary kind.

The pump, formerly placed between the uprights supporting the crank shaft, is now placed on the outside of these supports, so that now, to take down or set up the engine as it leaves the factory, the expanded head of the cylinder, to which all the upper working parts are attached, and to which the cylinder and steam chest are also attached, is released from the boiler by taking off the nuts from the bolts which hold it, and, with the parts attached, is packed for shipment, the valve being properly set, and all properly adjusted for work when it arrives at its destination.

A fire plug of lead is placed in the central and highest point of the crown sheet, which, should the water be allowed to fall so low as to endanger this sheet, will melt and allow steam to escape and extinguish the fire.

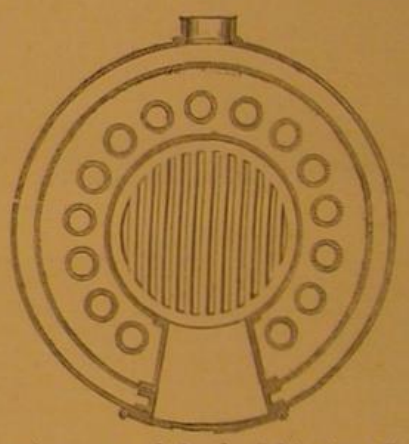
In the engine as first built there was no special steam chest, the steam entering the cylinder directly from the steam space in the boiler. As at present constructed, a steam chest is provided, shown in Fig. 2, which obviates all danger of water entering the cylinder.

The horse power of these engines is tested by dynamometer, with a pressure of 60 pounds in the boiler, and their power is rated accordingly. But though designed to run with 60 pounds, the boilers are tested by hydrostatic pressure to 180 pounds.

The tubes are easily cleaned by a scraper attached to a piece of wire rope, or any stiff brush attached to an elastic handle passed into the tubes from the furnace.

The one and two horse power boilers are made without tubes, but are cleaned in the same way as those with tubes.

Fig. 3.



These engines are made by the Colt's Arms Co., Hartford, Conn. Special tools are employed for all parts of the work, so that when it is desired to replace anything it can be ordered by number, and will be sure to fit.

It is now claimed that the economical production of power by these engines is unequalled by any in market, and any expert engineer, who examines them, must admit that the avenues of waste are closed almost as nearly as possible in the present state of engineering science. The steam is used expansively, in a cylinder jacketed by live steam, and the full theoretical economy of the expansion is thus secured. The exhaust is used in the smoke stack to assist the draft, and a very perfect combustion is thus maintained.

We are told that these engines are allowed in buildings, by the underwriters, without any increase of premium, they being regarded as safe as common coal stoves.

A very large number of them have been sold and are now in use, giving general satisfaction.

The features of the engine are covered by patents dated Oct. 27, 1868; April 13, 1869, and June 28, 1870. The engine was awarded a first premium at each of the Fairs of the American Institute, held in 1869 and 1870, and is or has been exhibited at all large fairs held during the present year.

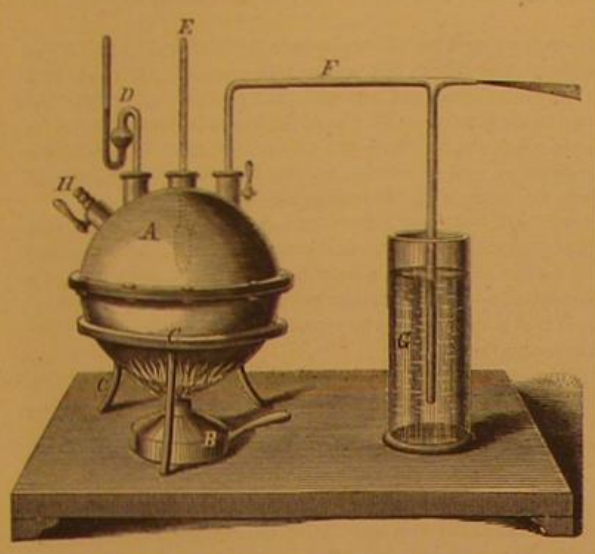
For further information the Baxter Steam Engine Company. 18 Park Place, New York, may be addressed.

Stick to the Fence.

The *National Car Builder* is responsible for the following: For fifteen years daily, at Stamford, Ct., a man has sat on the fence and watched every railroad train as it passed. He is probably trying to make up his mind if it would be safe to ride in the cars. Old fellow, you stick to that fence! If the top rail is sharp, turn it over or put a cushion on it. Fit up a smoking department on the next panel, if you like, and rig a luxurious couch on the next one to that. Bring out your baggage, take a check for it, and hang it on a post. Buy a ticket, and punch it yourself. Ask yourself the distance to the next station, and get insulted. Secure, as your means will permit, all the luxuries of railroad travel, but don't get off that fence to enjoy them. So shall you die a natural death, and the good wife shall not expend the farm in fighting the life insurance companies over your coldcorpse.

APPARATUS FOR EXHIBITING THE PROPERTIES OF VAPORS.

M. J. Benevides, a physician of repute at Lisbon, Portugal, has recently aided the teaching of physical science by inventing an apparatus for the purpose of demonstrating the chief characteristics of steam. This new arrangement consists of a hollow copper sphere, A, with nozzles in four places. In one nozzle is screwed a mercury manometer, D, graduated to ten atmospheres. To another nozzle is screwed the thermometer, E, with centigrade scale to 200°. In a third, there is a glass Giffard's injector, F. The fourth nozzle can be put in connection, by means of a tube of lead or india rubber, with the air, or with a force or air pump. The third and fourth nozzles are furnished with cocks. The sphere is placed on an iron trivet, C, and heated by means of a spirit lamp or a Bunsen's gas burner, B.



The following are the principal demonstrations which can be made with M. Benevides' apparatus:

1. Of the laws of ebullition. Absorption of latent heat. If water be put into the sphere, the cock of the fourth nozzle opened, and heat applied, the water boils, vapor is disengaged, and spreads in the atmosphere. The thermometer is observed to indicate 100° Cent., and the manometer marks vapor of the tension of one atmosphere.

2. Influence of pressure on the temperature of ebullition. If the fourth nozzle be connected with a force pump, and air be forced into the sphere, it will be observed that the boiling only takes place when the temperature or the tension of the steam equals the pressure exercised on the liquid; if, on the contrary, a vacuum be created in the sphere by means of an air pump, it will be seen that the water boils at a temperature, lower to the same degree as the air is rarefied.

3. Condensation of vapor. Development of latent heat. If the fourth nozzle be connected, by means of a lead pipe, with a glass full of cold water, and heat be applied, and the cock opened, the vapor, coming in contact with the cold water, is condensed, and its force is transformed into latent heat, which warms the water in the glass, of which the temperature will soon rise to 100° Cent.

4. Variation of the tension of vapors with the heat. On closing the cock of the fourth nozzle, after having caused the water in the sphere to boil, it will be observed that the thermometer and manometer indicate higher degrees, showing pressure corresponding with the temperature of the vapor. In an ordinary apparatus of this pattern, the pressure can be raised to five atmospheres; for higher pressures, a stronger copper sphere is necessary.

5. Action of vapor on the Giffard injector. The vapor being at a high tension, the cock of the third nozzle is opened. The vapor can be observed to pass through the injector, drawing water up the tube, and throwing it out by the opening.

6. Cold produced by the condensation of vapor of high tension. If the water be heated till the steam has a tension of five atmospheres, and the cock of the fourth nozzle opened, a jet of vapor is thrown into the air. On putting the hand into the vapor, at a distance from the nozzle, a sensation of cool freshness is felt.

7. Employment of vapor as a motor. The fourth nozzle can be connected with a model steam engine, and, on raising the tension to three or four atmospheres, if the cock be opened, the vapor will be observed to give motion to the engine; the heat is transformed into specific work.

So far as the action of the Giffard injector is claimed to be shown by the apparatus, we feel bound to say that the device of M. Benevides does not appear to us to explain the, to most minds, paradoxical action of that instrument. There is a wide difference between allowing the steam jet to escape into the open air, and first condensing it and then throwing it back into the boiler from which it issues, with an additional supply of water. Had the glass tube, which represents the injector on the apparatus, as shown, been brought around to and inserted into the copper sphere, the analogy would have been more perfect; but it then would have required some essential modifications before it would satisfactorily have shown the action of the injector of Giffard.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections during the month of August, 1871.

There were 716 visits of inspection made during the month, by which 1,418 boilers were examined—1,285 externally, and 358 internally,—while 127 were tested by hydraulic pressure. The number of defects in all discovered was 684, of which 121 were regarded as dangerous. These defects in detail were as follows:

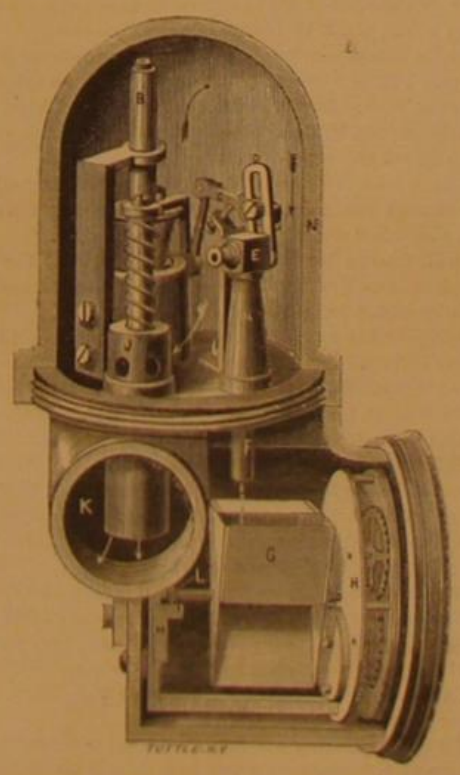
Furnaces out of shape, 47—2 dangerous; fractures in all, 42—17 dangerous; burned plates, 31—4 dangerous; blistered plates, 90—9 dangerous; cases of sediment and deposit, 132—13 dangerous; incrustation, 79—3 dangerous; external corrosion, 62—11 dangerous; internal corrosion, 49—13 dangerous; internal grooving, 35—6 dangerous; water gages out of order, 45—10 dangerous; blow out apparatus out of order, 25—1 dangerous; safety valves overloaded and out of order, 32—7 dangerous; pressure gages out of order, 88—13 dangerous, varying from — 22 to + 15; boilers without gages, 2—2 dangerous; cases of deficiency of water, 6—2 dangerous; broken braces and stays, 15—3 dangerous; boilers condemned, 13—2 dangerous.

We feel compelled to call attention again to the condition of steam gages. It will be seen in the above record, that those out of order varied from — 22 to +15. These are large variations, and when we consider how implicitly many engineers rely upon the steam gages, it is all important that they be known to be correct. We have known steam gages, that have been in use for years, to be relied on with as much confidence as when first put to use; and we have no doubt that many boilers in the country today are being used at excessive pressures simply because the steam gages are out of order, and indicate incorrectly. Steam gages are important attachments, and should receive all necessary attention. No engine or machine is expected to run for years without care and examination; and a boiler attachment so important as a steam gage should be examined frequently, that the engineer be not misled, relative to the pressure of steam carried, by incorrect indications of the steam gage. There were 10 serious explosions during the month, by which 27 persons were killed and 20 injured.

THE WATERBURY WATER METER.

The Waterbury Water Meter, manufactured by the Plume and Atwood Manufacturing Company, of Waterbury, Conn., is shown in the accompanying engraving. It received a short notice in our notes on the Fair of the American Institute in a recent issue, and our readers will now doubtless take interest in examining the details of its construction, as shown in an illustration. It claims superiority, over anything of the kind hitherto produced, on the grounds of durability, simplicity, and accuracy. It is subject to no wear of parts while measuring water, except such as occurs in the registering portion of the device.

A represents a circular orifice surrounding a cone valve, B, which is shown raised, as when measuring water, allowing enough to pass to keep the meter full and supply the outlet, J. It is evident that this valve will open more or less according to the demand made upon the water service, closing entirely when no water is drawn, and opening to its full capacity when the full flow of the outlet is maintained.



The cone or puppet valve, B, is connected by a series of levers, C and D, to a spindle valve in the post, E, which allows a proportionate amount of water to pass through the pipe, F. The meter is thus one of the proportional or differential class.

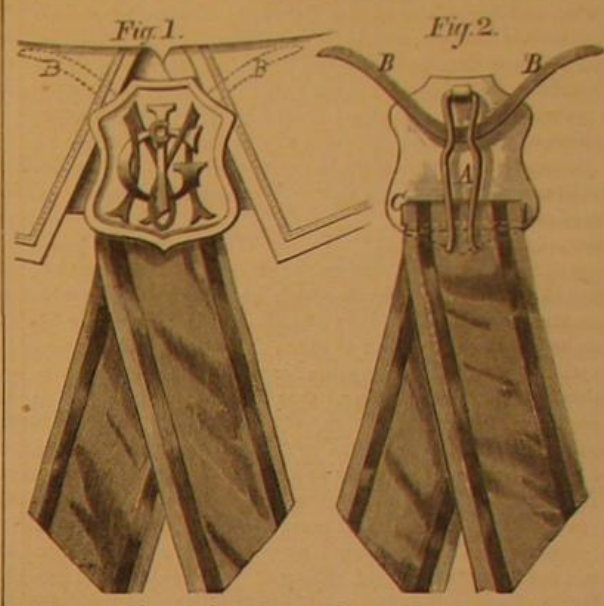
The water flowing through the pipe, F, is measured by a bucket wheel, G, the measurement being indicated, for the quantity passing through the valve, B, and outlet, J, by the register, H, the latter being a train of wheelwork with a dial, similar to that used on gas meters. The amount of this drip which is thus allowed to waste in operating the register, is about one ounce to every sixty-two and a half pounds delivered, that is, to one cubic foot.

Each bucket, when it has received its prescribed weight of water, gives place to its successor, and in so doing transmits motion to the register train. The intermittent motion of the bucket wheel is accomplished by a triangular piece of metal on its shaft, one of the sides of which rests upon the glass shelf, M.

The direction of flow through the cylinder or body of the meter, N, is indicated in the engraving by arrows. The patentee of this meter is Mr. J. P. Smith, of Buffalo, N. Y. The patent bears date July 12, 1870. For further information, address Plume & Atwood Manufacturing Company, Waterbury, Conn.

M'GEE'S COLLAR PIN.

Our engraving illustrates a very neat, tasty, and convenient device for adjusting neckties to gentlemen's collars, the improvement being in the peculiar construction of a collar pin which attaches the necktie firmly to the collar stud or button, and which is adapted to any style of collar, the tabs or ribbon which constitute the tie being also of any fashion or pattern to suit the taste of the wearer.



Obverse sides of the pin are shown, Fig. 1 representing the appearance of the pin as attached to the button, the style of the face plate of the pin, however, not being limited to the design shown, any form consistent with good taste being admissible.

Fig. 2 shows the peculiarities of the construction. A is a bent spring, which, when the pin is adjusted, is slipped over the shank of the stud or button, and embraces it firmly. To the spring, A, is attached, by soldering or otherwise, the spring plate, B, formed, as shown, of flat or round wire, which, when the pin is worn, passes under the fold of the collar, as shown by the dotted outline in Fig. 2. This spring prevents upward and lateral movement.

The tabs or rubber are attached to a loop, C, Fig. 2, in the manner there indicated, or in any other way appropriate to the fashion of the tie. The pin, with its attached tie, are very easily adjusted, and form together a very tasty design.

Patented through the Scientific American Patent Agency, July 18, 1871, by J. McGee, whom address for further information at Lancaster, N. H.

A Novel Railroad.

A novel tramway or railroad has been lately built in Turkey, by an English engineer, the propelling power of which is not steam but animal, horses or mules being employed. A single rail is laid on sleepers, and the carriage has wheels in the center on the same longitudinal line. Through the car runs a balancing pole, the two ends of which, projecting three feet or more, are secured to saddles on the backs of mules. The animals will thus be one at each side of the load instead of in front, as ordinarily. It would be impossible for the cart to turn over, because in order to do so, it would have to force one mule to the ground and lift the other in the air; and, moreover as the floor would only be six inches above the rail, an overtip would be of no account. All the weight in the cart, if evenly distributed, would bear upon the rail, and the animals, having no load on their backs, would be able to exert considerable traction power. The inventor suggests its employment not only for military purposes but also for tramways in large cities; and says that, where space is very valuable, a horse or mule on only one side of the cart would be sufficient. In towns, on bridges, and other important places, the rail might, for a short distance, be dispensed with; and the passenger vehicles should be fitted with a small friction wheel on either side, so that if a horse should fall down, the balance of the carriage would remain undisturbed.—*National Car Builder.*

Change which Flour undergoes in Barrels.

When flour is kept for some time in barrels, it assumes a certain smell, known as the barrel odor. In order to ascertain whether the bread making properties of the meal were deleteriously affected by this modification, the *Journal of Applied Chemistry* states that Professor Poleck has subjected several specimens to a critical examination, and he finds that the flour undergoes a decided change. The pure normal flour contained 11·06 per cent gluten and 1·44 per cent soluble albumen, but, after keeping, the following results were obtained:

	No. 1.	No. 2.	No. 3.	No. 4.
Gluten.....	8·37	7·40	7·23	6·54
Albumen.....	2·14	3·90	4·44	6·46

From this table it is manifest that the relations of the constituents were materially affected by storing the flour in barrels. The author found that greater deterioration took place in the interior of the package where the air could not get access to the flour than on the surface and that meal kept in bags was less likely to undergo change.

Correspondence.

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

The Psychic Force.

To the Editor of the Scientific American:

In a letter which you admitted to your columns on September 30th, I expressed my surprise at the line of argument taken by Dr. Vander Weyde on the above subject; and the eminent scientist, in your last issue, pleads guilty of entire ignorance of the experiments which were made by Professor Crookes and his two co-laborers, and admits that he cannot explain the phenomena in question. Why, then, did he cry "jugglery," and deem that the discussion was ended?

Professor Crookes, the "reporter" whose "credulity" Dr. Vander Weyde speaks of, is a most eminent scientific investigator, and the editor of the *Quarterly Journal of Science*, published in London; and, if he be necessarily insane on some point, no one familiar with the technical literature of the present day will assert that his particular mania is stupidity on points of fact in physical research. In truth, the whole position of the learned doctor is a false one. It is every bit as foolish and as unscientific to cry "jugglery" as it is to cry "spiritualism" whenever a new phenomenon is presented for investigation.

But, if further proof of Dr. Vander Weyde's want of knowledge of the position of this matter were needed, it would be found in the strange way in which he mingles the psychic force theory and spiritualism together. He may apply his reprobation to spiritualism as much as he likes, and few people will object; but the psychic force is another matter altogether, and any destruction of that theory must be sufficient to convince those who, like myself, demand strict scientific proof, and are not in the least inclined to a superstitious belief in the powers of jugglery or of anything else.

To return to the main question, which Dr. Vander Weyde has not yet considered: Is it possible that a power can emanate from a man's will or mind, over and above the mere dynamic force of his muscles? Many of your readers, and probably Dr. Vander Weyde himself, are familiar with instances of men performing feats of muscular power when under great mental excitement, that the strength of their bodies could not possibly account for. Is not this a "psychic" or mental force? And are these questions "unscientific" or "superstitious," when everybody knows that all muscular action emanates from the will, and derives its quantity or intensity from that same will?

I am a mere inquirer after truth, and my name and address matter nothing to the world: but why do scientific men talk of popular ignorance on these subjects, and then answer questions by muttering "jugglery," "superstition," and the like? When the true explanations of many results that now puzzle us are given, we shall find that they are strictly in accordance with natural laws, and are not produced by disembodied souls revisiting the earth, nor by the inventive genius of a charlatan, in whose talents Dr. Vander Weyde seems to have a most credulous faith.

B. D.

Jersey City.

Galvanic Experiments.

To the Editor of the Scientific American.

The interesting electrical experiment, described on page 203 of the SCIENTIFIC AMERICAN, reminds me of a series of galvanic experiments of a similar nature, which I made many years ago. As they have never been published, it may be useful to have them recorded in your widely read paper.

The house I occupied in Holland, in 1840, was situated a short distance from a river, to which, at high tide, the salt ocean water had access; but in which, at low tide, the fresh displaced the salt water. When the first mention was made about burying the plates of the galvanic battery in the earth, in order to procure a constant action, I conceived the idea of throwing a copper and a zinc plate into the river, each connected with a proper wire; and having conducted these wires to my house, and connected them with the galvanometer, a constant current was obtained which beautifully fluctuated in intensity, according to the degree of saltness of the water, but never became zero. When the copper plate was immersed in a fresh water well in the rear of the house, while the zinc plate remained in the sea water, so as to have a battery with two liquids and a porous cup (the earth) between, the current was almost as strong as when both plates were immersed in sea water, notwithstanding the plates were now several hundred feet apart; this proved practically, to me, that the earth offers little or no resistance to electric currents, a fact well established since the introduction of the electric telegraph.

The most curious variation of the experiment, however, was when immersing two copper plates of equal size—one in the fresh well water, and the other in the ocean water; at high tide there was a strong current, as the salt water acted on the copper; at low tide there was no current at all, as both plates were in equal circumstances in fresh water. The degree of saltness of the river water was beautifully indicated by the deflection of the galvanometer, going from zero, for fresh water at low tide, to the maximum at high tide: by slow changes in the surface of the plates, however (principally in that exposed to the action of the salt water), the maximums did not correspond every day, as was to be expected.

This experiment gave rise to a series of interesting and instructive investigations on a smaller scale, which I can highly recommend to all who want to become acquainted with the electric action of different liquids on metals, and also of liquids on one another. All that is wanted is a sensitive galvanometer, and some plates of different metals, of an inch high and two inches long, each soldered to a bent piece of thin copper wire, and sunk vertically in the liquids to be tested. The most practical way to insure perfect contact is to dip the ends of the galvanometer wire, in two separate cups with mercury, and to place these in such position, next to the trough containing the liquid, that when immersing the plates, the ends of the wires, soldered to the same, also dip in the mercury cups; in this way, a current is established at once, and if one plate is substituted for another, the difference of galvanic action is at once not only perceived but measured to a certain degree. The change of direction of the current, by changing one plate or the liquid, is also very interesting to observe, while it constitutes the simplest way to find out what acids or solutions may be available with different metals to make new galvanic batteries. So, for instance, I found in this way, now thirty years ago, that a solution of caustic soda or potash could be used between plates of zinc and copper in place of diluted sulphuric acid, while, some ten or fifteen years ago, such a battery came in use among electro-platers.

I am, of course, aware of the more complete experiments, since made in this same direction, by eminent electricians; but as these results are recorded in such a way as to be only available for the scientific, and not for the practical, man, I simply wish, by my remarks, to put our practical mechanics, of a scientific turn of mind, on such a track as they, with their previous training, can explore with much better success than they would find in digging into the transactions of the learned societies found in our libraries, in which many important facts and valuable truths are, as it were, buried out of sight of those who are most interested in their knowledge, by reason of the practical results they could obtain from them. The investigation I recommend is most assuredly a new field to many, and has the great merit of being economical, and thus within reach of all who would rather spend their spare money in experiments than in tobacco or rum.

The only slightly expensive piece of apparatus required in these experiments, is the galvanometer, if it has to be bought; but I will, in a future number, give the manner in which I constructed one, more than forty years ago—a very delicate instrument of this kind, which cost me almost nothing. I have used it ever since, and have it still in my possession. It reminds me of Berzelius, the great Swedish chemist, who states that, having lost the agate pestle of his mortar, he took an agate button from his coat, fixed it to a handle, and found it so convenient that he used nothing else for the rest of his life; and most practical men, no doubt, have found how often an improvised arrangement, made to serve a temporary purpose, is found to fulfill all the requirements of a permanently useful tool.

P. H. VANDER WEYDE, M. D.

New York city.

Changing of Color in Fishes.

To the Editor of the Scientific American:

I have been waiting in vain for some naturalist to reply to the interesting "Query" of S. M. G. (in your issue of July 15th) why two roaches in his aquarium change color three or four times a day, while two others do not.

The details accompanying the story are too meager to be of much use, but, as a cause inevitably precedes an effect, so there must be reason for the phenomenon described, although it may require the critical observation and sagacity of an Agassiz to detect and comprehend it.

It has been observed that fishes and reptiles sometimes suddenly change complexion during periods of amorous excitement, also when alarmed or agitated with rage.

It is a well known fact that many individuals of the animal kingdom have the power of accommodating themselves to the shades of the localities inhabited.

In the higher orders of animal life, this metamorphosis takes place slowly. Animals and birds, indigenous to the frigid zone, where the surface of the earth is covered with a blanket of almost perpetual snow, are white, probably to enable them to more effectually conceal themselves. Many animals belonging to the temperate zone have the power of changing their coats to suit the season—from dark or variegated hues in summer to white in winter: those living in tropical climates, where perpetual verdure reigns, are gorgeous in color, like the *flora* of the same region.

As we descend the scale, we find the lower forms less capable of defending themselves; and for the purpose of self protection, as well as to aid them in obtaining food, they are endowed with the power to change color more speedily. For instance, the chameleon, many species of the lizard, also many insects, worms, fishes, etc.

It is a disputed question whether the power to change color is voluntary or involuntary; whether it is due to deliberate intention of the will (however rudimentary in the lower forms) or to arbitrary material causes over which the subject has no control; in short, whether it is a vestige of the infinite intelligence bestowed upon the humblest creature for its self preservation, or to chemical law, the only "omnipotent god" of the positivist.

I will relate a little incident, and leave it for the disciple of the Positive Philosophy to explain upon his hypothesis.

In indulging in my favorite recreation one day along the meadow bank of a familiar brook, I discovered, lying quietly on the light sandy bottom of a deep hole, a magnificent dark trout among several beautiful fellows of a lighter color.

"Waltonizing" while attempting to capture this "monarch of them all," I remembered a tributary half a mile away, flowing from a large cold spring, and winding its devious way through black and mucky soil, deep among tangled roots, underneath fallen logs and overhanging alder bushes, from which I had before taken "comrades wearing the same livery." I said to myself, "Aha! here is a stranger; this fellow is a new comer from the spring brook."

Those of lighter hue rose eagerly at the fly, and two or three of fair proportions were soon laid at my feet in the cool green grass; while those remaining, with the single exception of my "colored friend," grew shy and excited, and upon tempting them with a worm, they suddenly departed to divers secret hiding places.

The dark trout alone remained behind, and manifested, as indeed he had done all along, a remarkable indifference to what was going on. At last the bait was carried near his nose, when suddenly, as if agreeably surprised, he was all alert, his red fins quivered, he moved nervously from side to side with curious indecision, he made several short, sharp advances with open mouth in different directions, then quieted down as if disappointed. He seemed eager, yet acted very strangely. At last, with the hook fairly touching his nose, he struck quick and sharp, but the struggle was soon over.

Upon landing him, I found to my surprise both eyes gone. He was totally blind; the wounds had healed, showing that the mutilation was not recent. He had evidently wandered from the dark recesses of the little brook above, down into the main stream, and was entirely unconscious of surrounding changes, and therefore, unlike his companions, *saw* no reason for exercising his powers of adaptation.

But I have spun out this yarn too long already, and conclude by saying, this little incident furnishes food for reflection; to my mind it is a very beautiful and conclusive demonstration of the dominant power of the will, even in its lowest and most rudimentary manifestations, over the physical organization.

"There is a natural body and there is a spiritual body," etc.

A. R. M.

Facts about Butter.---How it is made at the East.

To the Editor of the Scientific American:

Our English word, butter, is derived from the Latin *butrum;* while this Latin word is of exceedingly doubtful origin, but has most probably come from the Greek language.

It is not known positively whether butter was ever made previous to the Christian era, but, in our translation of the Bible, the word "butter" frequently appears. In Genesis chap. XVIII., verse 8, we read: "And he took butter and the calf which he had dressed, and set it before them," etc. And in Deuteronomy, chap. XXXII. verse 14, the phrase "butter of kine" is made use of. Also, in the Book of Proverbs, chap. XXV, verse 33, we read: "Surely the churning of milk bringeth forth butter." The word appears also in other passages. But in all these cases, the word refers to something of a fluid nature, and whenever the word "butter" appears in the Bible it should read, according to most biblical critics, "thick milk" or "cream." The original Hebrew words *meetz heleb* (translated churning) signify to squeeze or press, and therefore the latter quotation above should read, "the pressing of the milker bringeth forth milk," and this agrees better with what follows in the same passage, "and the wringing of the nose bringeth forth blood."

It is not until about the birth of Christ—probably before—that we have any definite mention of butter, as we understand the word. But it appears that at this time, and indeed for several centuries thereafter, that it was only used instead of oil, as an ointment or as a medicine. The ancient Burgundians were accustomed to besmear their hair with butter, and the ancient Christians of Egypt burned butter in their lamps at their altars instead of oil, a practice also accredited to the Abyssinians. Butter used to be allowed to be burned instead of oil in the Catholic churches during Christmas time, and this accounts for the name "butter tower" which we find at Rouen, in Nôtre Dame, and elsewhere. "In A.D. 1500, George d'Amboise, Archbishop of Rouen, finding the oil foul in his diocese during Lent, permitted the use of butter in the lamps, on condition that each person should pay six deniers for the indulgence, with which sum this tower was erected."

It is a very difficult matter to find out among what nation the practice of making butter originated. Some writers affirm that the ancient Scythians were acquainted with the art 400 years B.C.; and it appears also that the Ethiopians used the article as early as thirty years B.C., as also did the Indidians (inhabitants of India). Plutarch speaks of a visit, paid by a Lacedemonian lady, to Berenice, the wife of Deiotarus, and says that the one smelled so much of butter and the other of perfume, that neither of them could endure the other. But this must surely have been bad butter. Pliny says that the ancient Germans and Britons (barbarians in his time) made butter and used it as food, and ascribes the invention to these nations. And it is generally believed that the Greeks obtained their knowledge of butter from the Thracians or the Scythians, and the Romans from the Germans.

But whether the ancients knew how to make butter or not, it is quite certain that they did not know how to give it the firmness or consistency of the butter made at the present day. "With them it was poured out like oil; with us it is cut and spread." Their butter, too, must have been very inferior to ours in quality.

We are all well acquainted with our present mode of churning; other nations have some really funny ways of making butter.

In northern Africa, in Egypt, and Arabia, the cream is put into a goat's skin turned inside out, and pressed to and fro like kneading bread. And sometimes they place it on an inclined plane and let it roll to the bottom, and then replace it to run the same course. This method, it is said, produces

butter in a short time. Sometimes the skins are kneaded with the feet, as observed by Dr. Chandler while traveling in Greece.

In Bengal they churn every morning that they may have fresh butter for breakfast. They simply stir the milk rapidly with a stick. In some parts of the East they make butter of the milk of the buffalo; but this is in every way inferior to that made from cow's milk. W. R. S.

Action of Hydrogen on Red Hot Oxide of Iron.

To the Editor of the Scientific American:

In a late number of the SCIENTIFIC AMERICAN, there appeared an article on "Boiler Explosions" over the signature of John Lynch, M.D., Professor in South Carolina University, which makes an erroneous statement of chemical facts.

The writer, in discussing boiler explosions, comes to the conclusion that they are caused by the chemical combination of hydrogen and oxygen gases. His error consists in confounding the action of free hydrogen when in contact with free oxygen, with the action of free hydrogen when in contact with combined oxygen.

I quote a few words for the purpose of explanation: "While the machinery is not in motion, or the steam not escaping freely, the hydrogen fills the upper portion of the boiler, and does not come in contact with the red hot iron or its oxide; but any cause which may produce an expansion or disturbance of the gas, so as to bring it into contact with the oxide of iron, heated to the same temperature as will decompose steam, the gases will immediately become chemically combined, producing a most intense heat ('the most intense heat that can be produced is caused by the combustion of hydrogen gas') and *causing an explosion;* at the same time the "oxide of iron will be reduced to its metallic state." I have italicized the words to which attention is directed. No explosion will take place from the combination of the free hydrogen with the combined oxygen of the oxide of iron, supposing for a moment that such an unheard of state of things, as the contact of free hydrogen with red hot oxide of iron in an ordinary boiler, should exist.

An explosion from the combination of hydrogen and oxygen results only when these mixed free gases are ignited by intense heat. When free dry hydrogen is passed over red hot oxide of iron or copper, there is no free gaseous oxygen to combine with the hydrogen, but oxygen in a solid combined state. This oxygen, the hydrogen abstracts from the iron quietly and without explosion, forming vapor of water, while metallic iron remains behind.

In an ordinary steam boiler no free oxygen can, under any circumstances, be produced from the decomposition of the water or steam, and there is good authority for stating that no free hydrogen can be so produced. Consequently, no explosion can take place from the ignition of the mixed gases.

I agree with the writer that "the engineer should study thoroughly not only machinery but also chemistry, at least so far as it relates to those bodies which he is obliged to use."

But this study should not embrace any erroneous chemical theories unsupported by chemical facts; but should include especially the tensile strength of iron under the varying conditions of thickness and temperature, and the immense power capable of being developed by the generation of steam in a confined space.

The intelligent engineer should not be long in learning the fact (though Heaven save him from the personal experience so necessary in other matters) that, when a boiler explodes, it is because the shell of iron without is not strong enough to withstand the pressure of steam within.

West Farms, N. Y. JOHN F. GESNER.

Testing Boilers by Hydrostatic Pressure.

To the Editor of the Scientific American:

In your paper of September 2d, you published a letter from me in which I questioned the possibility of testing a steam boiler properly in the manner stated in the testimony of Inspector John K. Mathews. In your issue of September 30th, I find an answer, to my communication, signed by that gentleman, in which he explains how, by having a man at the safety valve, men stationed at the blow cocks, and men at the main valves of the engine, with the men, as sworn to, at the hydrant valve, and, I suppose, properly agreed signals, such a feat is possible. For so much of the communication I am thankful; the rest proves nothing except that Mr. Mathews is unable to discuss a simple question without showing his contempt for the witnesses of coroners' inquests (among which are some of the ablest and truest men in the country); no doubt he dislikes the whole institution, and particularly its characteristic prying into people's actions.

"That knaves and fools will exist with the human race" (to use his own words) is evident; and as long as men, innocent of overalls and too large to get through a manhole, take the oath and fee of inspectors, and certify to a thorough inspection of steam boilers, there is no danger of either the one or the other running out.

But, Mr. Editor, the question under consideration is a serious one, for on its decision depend the lives of the people. It is certainly very convenient to fill a boiler by a hydrant; and it would be more so to call this a thorough test. Yet the man must be very selfish and devoid of all regard to the sacred obligation of an oath who would not spend ten minutes to attach a pump and really and truly test the boiler under hydrostatic pressure. I am not willing to admit that men, at all the possible outlets of a boiler, could save the same from strain and injury; for water has no practical elasticity, and even lightning would not be quick enough to save the boiler from overstrain. But there is, fortunately, one security. Boilers, when subjected to hydrostatic pressure, gradually change their form, and assume the one which holds the largest amount of water. A barrel nearly approaching a cylinder will become a perfect one under *maximum* test; all stays are gradually brought to their true tension, and, if one should be too short, it will (being unable to stand the whole pressure of several hundred inches) be torn off; plates not properly cut and caulked will be strained and leak, and the whole boiler will assume the shape, appearance, and duty as though it was under the same pressure of steam, with this exception, that the solid pressure of water on a cold boiler is more severe.

The object of the law is manifest, and is intended to show what the condition of the boiler is under this test. For this purpose it is to be examined carefully outside while under pressure, and inside when the pressure is relieved. That this can be done thoroughly in the manner sworn to as having been done on the *Westfield*, I deny.

Unless Mr. Mathews will add to our information, and condescend to treat correspondents of the SCIENTIFIC AMERICAN as gentlemen, and not as fools and knaves, I cannot further recognize him. JOSEPH A. MILLER.

Boston, Mass.

Treatment of Colorado Ores.

To the Editor of the Scientific American:

I am much pleased to have, by means of my article upon this subject, drawn forth Mr. Church's letter in your issue of October 7th. I do not consider myself competent to judge of the correctness of the position taken by this gentleman; but I am glad to find that, by having the accounts at the mine, in which I am interested, kept in a systematic manner, and by contributing these details to Professor Hague, I have done something toward enabling Mr. Church to prove, as he believes, the correctness of his theory.

For one, however, I hope Mr. Church will not include me among the number of mine owners who have "systematically resisted all efforts to ascertain the truth." For some years I have sought, by having weekly returns of all costs and results, by having assays constantly made of the ores, and by all other means in my power, to ascertain "the truth;" and all facts I have gleaned have, in one way and another, been placed before those interested, with the desire that others might throw still more light upon the subject than I was able to.

Long since I came to the conclusion that concentration was the remedy, but how shall we effectively concentrate? I think the gold ores of Colorado will average not far from thirty dollars per tun. The smelter will pay us a much better proportionate price for an ore worth $150 than one worth $100 per tun. How can we concentrate to a value of $150 per tun? THOS. J. LEE.

Boston, Mass.

Ignition by Superheated Steam.

To the Editor of the Scientific American:

An accident occurred here recently to a Low steam automatic heating arrangement, whereby a valuable building and some lives were placed in great peril. The heating arrangement has attached to it a regulator which admits water to supply the loss by evaporation, connected to the boiler by two pipes, one at the top and one at the bottom. The bottom pipe became closed by rust, preventing the water from entering the boiler, while, at the same time, the glass gage indicated water at the usual hight. The consequence was the boiler became empty, and nearly white hot, creating superheated steam, which set fire to the felting or covering around the pipes. This was discovered just in time to prevent serious damage.

I would suggest that parties having these heaters should have the pipes that lead to the boiler taken off and examined, as that is the only way the evil can be detected; and then place a draw off cock on the same.

Canton, Ohio. G. W. D.

Liquid Measuring Can.

In this invention, an ordinary sheet metal can has a large vertical tube, and a smaller one, placed beside the large one, extending from the bottom or below the bottom to the top. A float in the larger one is intended to rest on the liquid and is partly suspended, by a cord passing up over pulleys, down the side of the can, around a pulley, and back over pulleys and down into a smaller tube to a weight suspended by it. One of the pulleys carries a notched disk, which will be turned the distance between two notches by the falling of the float when a given quantity of fluid is drawn, say a pint, the parts being accurately adjusted therefor. A pawl, resting on the edge of the disk and dropping into the notches as each one comes under it, shows when the given quantity has been drawn. The disk is held always in the right position, when the drawing begins, to be turned forward just one measure between the notches before the pawl drops. A three way cock for drawing from the large measuring tube has a branch leading from the bottom of the can, for allowlowing the liquid to flow into the tube through said cock when the flow from the tube is stopped; but when opened to draw therefrom, the cock is turned against the passage so as to shut off the flow therefrom. The disk may be notched to indicate any measures preferred, and it may be arranged on any approved part of the can. The weight need not necessarily be arranged in a tube, but is so preferred. Mr. Christopher Martin Bridges, of Leon, Iowa, is the inventor of this improvement.

THERE is perhaps no time at which we are disposed to think so highly of a friend as when we find him standing higher than we expected in the esteem of others.

[Special Correspondence of the Scientific American.]

THE CERULEAN PLEASONTON'S SUNSHINE PATENT.

Washington, D. C.

The cerulean Pleasonton (Gen. A. J., of Philadelphia, not the Hon. Boutwell Grant, Ex-Commissioner, nor even a brother) has just been successful in receiving a patent for his blue light vegetable and animal stimulator, fructifier, and panacea. Not an unpleasant entertainment, on the evening of our national extended-eagle anniversary, are those blue lights that shoot upward so zealously, and then suddenly vanish without even a tail to tell their story. The discussion, of the scientific and unscientific features of the blue light process, belongs to some other column of your paper, but you may be pleased to note the breadth of the inventor's views and the modesty of his expectations, as appear in the "breadth" of his original claim, which reads, we are informed, very nearly as follows: "I claim the use of the combined natural light of the sun in combination with the transmitted blue or electric light of the sky, to the growth of the animal kingdom of nature, to the growth of fruits, vines, flowers, plants, vegetables, etc., and to the cure of diseases in men and animals."

The term "combined natural" is good, being both scientific and complimentary to his solar majesty; and the discovery of the new dynamics of the sky in transmitting light deserves of itself a patent, with a seven years' extension thrown in. The examiner, in his treatment of the case, well observes that the applicant cannot properly claim the use of the unchanging forces of nature, and such a monopoly could not be granted. He can only claim new and useful devices for applying and controlling the powers of nature. The patent granted contains two clauses of claims, one for the method of utilizing the solar rays, another for the construction of buildings for the above purpose. The method consists solely, as far as we can discern, in combining the sunlight with the blue light by transmitting the solar rays through alternate portions of clear glass, and blue, purple, or violet colored glass, and the construction of the conservatory consists in making the roof and sides of such alternate portions of glass. What will the scientific men, who for many years have experimented in the most elaborate and thorough manner to ascertain the chemical effects of the constituent colored solar rays on vegetable life, say to this patent? In a published paper read before the Philadelphia Agricultural Society, Mr. Pleasonton says:

"If" (a brief but sensible preface, that word if), "by the combination of sunlight and blue light from the sky, you can mature quadrupeds in twelve months with no greater supply of food than would be used for an immature animal in the same period, you can scarcely conceive of the immeasurable value of this discovery to an agricultural people. You would no longer have to wait five years for the maturity of a colt; and all your animals could be produced in the greatest abundance and variety. In regard to the human family, its influence would be wide spread—you could not only in the temperate regions produce the early maturity of the tropics, but you could invigorate the constitutions of invalids, and develop in the young, a generation, physically and intellectually, which might become a marvel to mankind. Architects would be required to so arrange the introduction of these mixed rays of light into our houses, that the occupants might derive the greatest benefit from their influence. Mankind will then not only be able to live fast, but they can live well and also live long."

Mr. Pleasonton's faith in blue light is such that the address referred to is printed on blue paper, "to relieve," as he says, "the eyes of the reader from the great glare from white paper;" and he expresses the hope of seeing "this colored paper introduced for all books and periodicals." The effect of blue light on the human brain should be his next theme.

‡

The Approaching Solar Eclipse.

An eclipse of the sun will occur, on the eleventh of next December, which will be visible as a total one in India, Ceylon and Australia. Preparations are being made to observe the astronomical event in a manner worthy of its great scientific importance. The British men of science are already commencing energetic action to make the most of the occasion. The Astronomer Royal is superintending the adaptation of instruments already in his possession for use in his chosen locality in India. The President of the Royal Society has arranged to have instruments of the newest and most approved kind sent to Australia. The President of the Scientific Association at the recent meeting stirred up the members to vigorous action in order to gain all possible knowledge from the solar phenomenon. The Royal Society of New South Wales is organizing an expedition to Cape Sidmouth to observe the event, and it is expected that a staff of observers from England, will take possession of a fitting position in Ceylon. Government is to be petitioned for the means, which it will not fail to grant, and much enthusiasm and interest prevail among the British men of science, who are determined to utilize the solar ecclipse to add largely to the knowledge of solar physics. We are sure that our American astronomers, who earned great distinction by their observations during the last two solar eclipses, will not be behind the European co-workers in doing all that can be done to aid the cause.

MILK STATISTICS.—Sixteen quarts of pure milk are required to make one pound of butter, and 10 quarts to make one pound of cheese. When butter is 40 cents per pound, and cheese 11 cents: one pound of butter equals in value 16 quarts of milk and returns 2½ cents per quart to the dairyman. But one pound of cheese from 10 quarts of milk only gives him 1$\frac{1}{10}$ cents per quart for the milk.

Improved Railroad Rail Joint, with Nut Locking Chair.

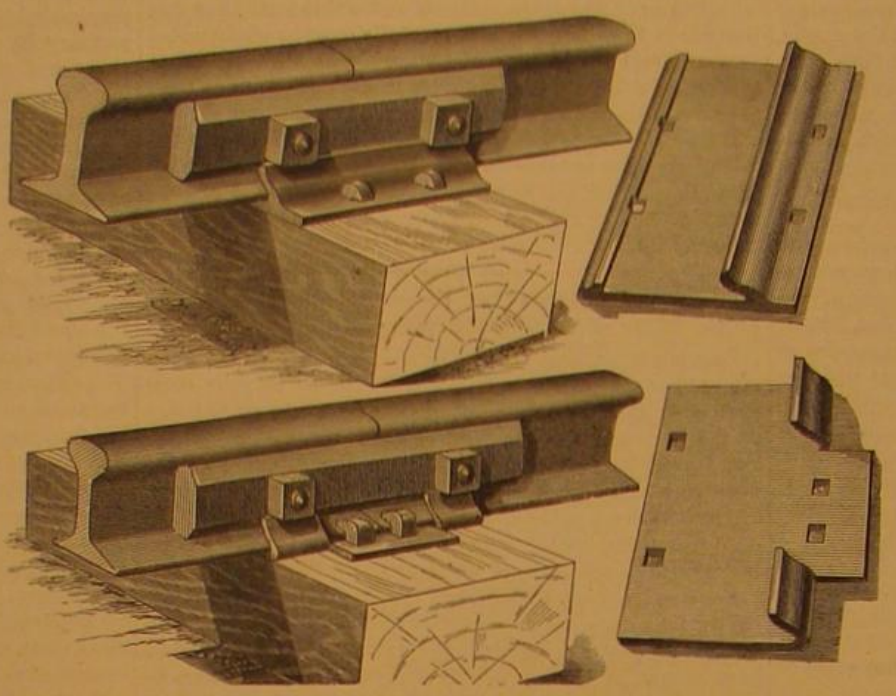
The object of the invention illustrated in the accompanying engraving, is the locking of the nuts of railroad fished joint bolts, by the prolongation inwards and upwards of the lip or lips of the chair, near to or against one or more of the horizontal, inclined, or vertical sides of the nuts, and to furnish also a better combination for a railroad rail joint fastening than has hitherto been used.

The views show the outer or nut side of the joint, and the method of locking the nuts of the bolts, by means of the lip or lips of the chair, and also the form of the chairs. One view is of a joint with a plate chair, with a lip under each nut; the middle portion being turned down upon the crosstie and punched to receive the spikes. The other view is of the joint with a form for a rolled iron chair, with a continuous lip, and a flange, resting upon the tie, punched for the spikes. The two forms of chair, one of plate and the other of rolled iron, are shown separately.

Many other forms of chairs may be made, if desired, of plate, rolled or cast iron, to fit and lock any form of nuts, whether square, hexagonal, octagonal, oval, etc., in any position in which they may be placed when screwed up.

By prolonging the lip or lips of the chair upwards between the nuts, or under and between them—the chair being spiked down firmly to the crosstie—the chair will hold the rail from "creeping," without slotting the rail, which is desirable for steel rails.

The fish plate on the nut side of the joint is made without a groove, to avoid the use of washers under the nuts. Upon the opposite side the fish plate is channeled to receive the heads of the bolts, and prevent them from turning when the nuts are screwed up.



BAYLEY'S RAILROAD RAIL JOINT, WITH NUT LOCKING CHAIR.

It is generally conceded that the fished or bolted rail joint is the best joint known, but, unless the bolt nuts are locked securely and permanently, they will work loose, and as the value and safety of the joint depends upon the plates being held firmly against the sides of the rail, the working loose of the nuts destroys, or very much impairs, the bolted joint. With the nuts locked perfectly and permanently, the bolted joint is the best joint known; without it, it is no better than, if at good as, some others.

As the fished joint is weaker than the rail itself, it should have a bearing upon the crosstie or sleeper; for any settling of the joint bends the plates, strains the bolts, and tends to force off or loosen the bolt nuts. The joint should rest in a chair of plate or rolled iron, to prevent the rail ends from being pounded into the sleeper by the wheels passing over them, and to prevent the hammering of the ends of the rails, in consequence of one end settling, under the load, below the level of the other. By locking the nuts by means of the lip of the chair, it is claimed, the joint is rendered perfect with the least number of parts possible, easy of manufacture, strong, durable, and cheap.

With the joint on the tie or sleeper, and in the nut locking chair described, the outer pair of bolts, commonly used for bolted joints, are unnecessary. The saving of the cost of these two bolts, and of the extra length of plates required for them, will more than equal the cost of the nut locking chair. It is claimed, therefore, that this joint can be furnished considerably cheaper, while it is much better and more reliable, and will last much longer than the four bolted fish joint now generally used.

It is claimed that this nut locking chair can be used for four bolted fish joints already laid down, to great advantage, for if the nuts of the two inner bolts are securely locked by means of it, the joint is safe, and there will be but little, if any, strain upon the outer bolt nuts to force them off; in point of fact the rail joint will be equally strong without them.

The use of a two bolt joint and the nut locking chair permits an increase of the section of the fish plates and the size of the bolts, if desired, and thus strengthens the joint, at a cost still considerablcy less than the ordinary four bolt joint.

Several of the best railroads in this country have used the chair with the bolted joint, and one of the very best—the Cleveland and Erie—has used the two bolt joint with a chair; but not with a nut locking chair. This alone, it is claimed, was needed to make the joint perfect, and the advantages to be gained, by so locking the nuts of the fish plate bolts, are manifest. We are informed that some important railways will soon introduce this joint, which has met with the approval of experienced railroad engineers.

The improvement is the subject of two patents, granted to G. W. R. Bayley, of Algiers, La., dated December 29, 1868, and March 2, 1869.

For further information address G. W. R. Bayley, Chief Engineer, New Orleans, Mobile, and Texas Railroad, New Orleans, La.

Awful Fate of a Balloonist.

At Paoli, Orange county, Ind., recently, Professor Wilbur made arrangements for a balloon ascension, accompanied by George H. Knapp, editor of the *Orange County Union*. As they were about getting into the balloon, the cord gave way, and they made a spring for the car, but only succeeded in grasping the ropes. As the balloon rose, Mr. Knapp let go, and fell from a hight of about thirty feet without serious injury. Professor Wilbur held on, and attempted to climb into the basket; but was unable to do so and the balloon shot up rapidly with the aeronaut.

At a hight of about one mile, the doomed man let go his hold and came whirling to the earth. At the hight he had attained, he looked like a small sack about a foot long. As he approached the earth he was coming down feet foremost, then spread out horizontally, then doubled up, turned over, and then straightened out with his head downward. As he struck the earth, he fell upon his head and back. His head was crushed into an indistinguishable mass, and his body was bruised and crushedhorribly. The body made a hole in the ground eight inches deep, and it rebounded four feet from where it struck.

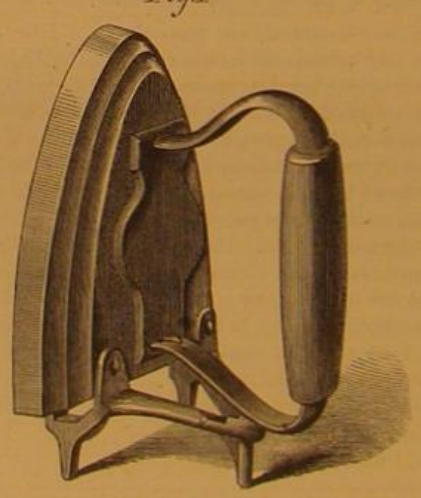
To add to the painful character of the accident, the Professor's young wife and little daughter were on the ground and witnessed the terrible affair.

COMBINED SADIRON AND STAND, AND COMBINED REVERSIBLE SADIRON AND POLISHING IRON.

The first named of these new inventions is shown in Fig. 1, and the second in Fig. 2.

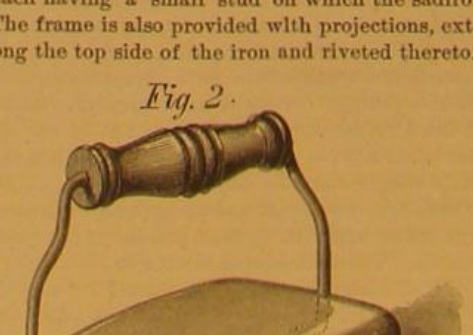
In the combined sadiron and stand, the stand is made separately, and riveted to the heel of the sadiron, so that the

Fig.1



iron stands upright when resting on the stand. The stand consists of three legs—two for the heel and one for the handle—connected by two bows of an approximately triangular shaped frame, having brackets extending under the end of the iron, each having a small stud on which the sadiron is seated. The frame is also provided with projections, extending up along the top side of the iron and riveted thereto.

Fig. 2.



The stand is made of malleable iron or any other suitable material, and its attachment adds but a trifling amount to the cost of the iron.

By this manner of attaching the stand to the iron, the former is always with the latter, ready for use. It prevents the smooth face of the iron from being scratched or otherwise injured. The sadiron can be placed on any part of the table, while adjusting the clothes, and will retain its heat longer than when placed on a separate stand, which latter subtracts heat from the iron every time the two are brought into contact.

It is claimed that the attachment of the stand in no way interferes with the ironing, and that it will not, unless greatly overheated, burn the table when placed upon the latter in the manner described, as the supports are so slender in proportion to their length that they radiate off the heat before it is conducted through them to the table.

The combined reversible sad and polishing iron shown in Fig. 2, is very simple and easy to operate. The iron is provided with a spring handle which allows it to be reversed.

The flat face is used as an ordinary sadiron, and the rounded face, which is highly polished, as a polishing iron. This form prevents the polished side from becoming injured in heating the iron, as the flat face only is placed upon the stove or heater for this purpose.

Several reversible irons have been invented, but it is claimed that the one herein described is the most simple and the cheapest yet devised, dispensing with all complications, catches, etc.

Patents for the above inventions have been secured in the United States and Europe. Any parties wishing to manufacture the same on royalty can obtain full particulars by addressing Myers Mauufacturing Company, 104 John street, New York.

Breeding Silkworms.

The doctrine of survival of the fittest is being enforced by the silk growers of Lombardy, who have adopted the cellular system of MM. Pasteur and Cantoin. Moths and eggs are both subjected to microscopical examination, and only the healthy are used for the purpose of perpetuating the race. This mode of inspection not only confines reproduction to the most vigorous specimens, but it insures the detection of the disease that has recently so virulently attracted the silkworms of northern Italy. Signor Cattaneo, of Milan, states that this disease is caused by the degeneration of the mulberry tree, and it seems that this opinion is well founded, as some trees grown from seed imported by that gentleman, from the north of China—the native land of the mulberry tree—are far more vigorous in growth than the white mulberry tree common in Italy; and their leaves contain much more of the resinous substances which are the nutriment of the worm, and from which the silk is produced. If Signor Cattaneo's view be a correct oneit will be necessary to import seed into Europe to re-invigorate the plantations, which are the chief subsistence of the silk worms. Our silk growers of the West will find it inter- esting as well as profitable to bestow attention on this subject.

Plants in Bedrooms.

Dr. J. H. Hanaford, in *The Household*, says that the idea that plants throw off nitrogen in the night to an extent to prove injurious, in any material degree, may have had its origin in the vagaries and speculations of some medical theorists, utterly forgetful of an over-ruling Providence who makes no blunders of this kind. These plants have their labor to perform, so to speak, and we need not trouble ourselves about that, but simply regard all as right.

While the breathing of every living creature, the combustion of fuel, etc., are constantly destroying the oxygen of the air, leaving an excess of nitrogen, the other element of air, (the two gases, oxygen and nitrogen, making pure air,) some means of restoring these relations would seem necessary. This is done by the vegetable creation, the leaves of plants, like lungs, absorbing this gas, and throwing off the oxygen or restoring the purity of the air.

The animal creation and combustion thus furnish carbon in the form of carbonic acid gas to the vegetable, while the vegetable creation kindly returns to us the oxygen in a gaseous form, and the carbon in a solid, in the form of food; an arrangement with which we need not quarrel. This work is constantly going on, illustrative of the wisdom and the goodness of the Great Father. It is a matter of little importance whether this is in vast creation, on a grand scale, or in our sleeping rooms. It may be remarked that it would be possible to fill our rooms with various articles to an extent to leave too little room for air, and thus deprive ourselves of this necessity of life We can scarcely have too much of it, as it is our life to a greater extent than many suppose. But even if there might be some of the evils referred to, it does not follow that these rooms should be so closed at night as to exclude all of the outward air or prevent the escape of a large amount of carbonic gas, or supposed excess of nitrogen from the plants. The breathing will leave such an excess, even with no plants in the room, which should be allowed to escape.

Such sleepers have more occasion to fear this deadly gas, constantly produced by breathing, than the "night air," so foolishly dreaded.

In short, while our sleeping rooms are so often too small, it may be advisable to have our plants in some other room, with open doors, that they may aid in purifying the air. We may rest assured that they will do us far more good than harm; that this law of compensation is in active operation all around us, and is merely another term for the goodness of the Creator.

To Violin Players.—A correspondent, Mr. J. R. Little, of Monmouth, Ill., suggests the use of chalk on the fingers of the left hand to prevent their slipping on the strings. Chalk will undoubtedly answer this purpose, and may be found useful to performers whose hands are subject to perspiration.

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Contents:

(Illustrated articles are marked with an asterisk.)

THE GREAT FIRE AT CHICAGO. A NATIONAL CALAMITY AND A TERRIBLE LESSON.

While, from pulpit and press, has issued and is still issuing a flood of lamentation over the great misfortune that has befallen Chicago, and which is not her calamity alone, but a national disaster: and when eloquence and rhetoric have striven to give forcible utterance to the intense sympathy for the sufferers that pervades the civilized world: we can add little, by any words we may pen, to the public realization of the magnitude of the catastrophe, or to the universal generous impulse to extend efficient material aid to the homeless and bereaved; an impulse that has not expended itself in useless talk, but in prompt, noble, and openhanded munificence.

Our sorrow is sweetened by the pride we feel in these generous deeds, which go far towards restoring our faith in humanity, severely tasked by revelations, of fraud and dark doing, lately brought to light in our midst. There must be some good left in the world when such spontaneous and genuine sympathy for suffering is displayed.

Is there no useful lesson taught us in this dreadful catastrophe? The fire record of this country is one which may be profitably reviewed, in connection with this last crowning event, in the dark catalogue which eclipses all that has gone before. New York, Troy, Portland, and Chicago have so far been the cities doomed to feel the fiercest wrath of the fire fiend.

All these great fires occurred under a combination of peculiar circumstances. There had been long drought, and everything combustible was in the proper condition to burn with the fiercest rapidity. There were quarters in each of these cities in which the fire could feed itself fat on wooden structures whose combined burning generated a heat too intense to be withstood by walls of brick or iron. In each case, there was a fierce wind that blew the flames directly upon the heart of the city, and speedily forced the conflagration far beyond human control. In each case, it was seen that so called fireproof structures are not proof against such a combination of circumstances; that walls of stone or brick, with beams and columns of iron, alike succumb to heat of sufficient intensity, and that in structures made of materials that will not of themselves burn, there are usually stored goods that, in the ovenlike heat which warps, crumbles, and cracks fireproof walls, take fire and increase the power of the conflagration to destroy other similar structures.

The wooden sidewalks and pavements which abound in Chicago no doubt did much, in their excessively dry condition, towards spreading and adding fury to the flames; and it is stated that the fire ran along these streets to great distances, interfering with the work of the firemen, and rendering their efforts hopeless.

It is safe to infer from the careful general study of fires in cities, and the consideration of all the circumstances of the four great fires above alluded to, that, were it not for wooden buildings massed together in cities, there never could be such extensive conflagrations. It is in these sections of summer-dried wooden buildings that the fire first gets beyond the means of control. In them it gathers its intense power of destruction, which every new morsel it licks up increases, until finally glutted, or obstructed by a providential change of wind or a heavy fall of rain, it falters in its work of ruin.

The ruin that has befallen Chicago awaits every city within whose bounds masses of wooden buildings stand, whenever a similar combination of circumstances shall arise.

The Brooklyn, Jersey City, Newark, and Paterson papers have been loud in their expressions of sympathy for the destitute of Chicago, and Brooklyn was among the very first to send a large sum of money to the sufferers. Let generous Brooklyn itself beware. It boasts that Chicago alone of all American cities has rivaled it in rapidity of growth. It may be that Chicago alone of all American cities can rival it in ruin. Nearly half the city of Brooklyn, as well as the other cities named, is built of wood. Some time will come the dry season, the fierce gale, blowing toward the heart of the city; and a fire, that under ordinary circumstances would be easily quelled, will spread into wide destruction.

After all these examples of the danger of massing wooden structures, it would seem we should learn wisdom. One third of a prosperous city now lies desolate; and, practically, its entire business, its means of recovering its loss, is destroyed. In this respect, as well as in the extent of area burned over, this fire has been more disastrous than any on record, except the great fire of London. It is no surface injury the city has sustained; she is hurt in her most vital part. She will recover, but for years will feel the effect of this blow. Regret is unavailing. We can only extend the hand of sympathy and assistance, and learn from her fate to avoid the danger that has proved the prime cause of her fall.

Among the many reflections that crowd themselves upon the mind, connected with this event, the evidence of the growing feeling of brotherhood among nations, is one that will not escape the notice of the thoughtful; and the means by which this feeling is nourished, will also be easily recognized. The news that Chicago was burning, reached London and Paris, and the chief European centers, only a little later than it was known in New York; and the telegraph wire that sent the sad news across the Atlantic, flashed back words of sympathy and cheer, and pledges of assistance, which will soon reach its destination. "Pay to the order of"—pulsates along the cable, and a check is drawn in New York for Chicago. Truly, this is like shaking hands across the mighty waters that, fifty years ago, separated two continents by months. Rapid communication has done more to unite the interests of the civilized world than all other influences put together.

The total amount subscribed up to Wednesday night, the 11th inst., was over two and one quarter millions dollars, and probably that amount will be doubled before this paper reaches its readers.

These timely succors, together with the insurance—at least fifty per cent of which will, in all probability, be paid—will do much toward restoring the business of the city, which had, before this trouble, immense vitality.

The wooden buildings, sidewalks, and pavements will be replaced by more substantial structures, and, in time, the Garden City will perhaps be all the stronger for this purification by fire.

AN EXAMPLE TO MANUFACTURERS.

A correspondent writes from Berkshire county, Mass., giving an account of what has been done in the village of Housatonic towards elevating the condition of the workmen in the mills, and rendering their lot as comfortable, refined, and respectable as that of any class of citizens in the community. It is an example worthy of imitation on the part of all manufacturers, and we should hear less about strikes, shut outs, and combinations, if a similar consideration for operatives was everywhere exhibited.

The Owen Paper Company, of Housatonic, has been celebrated for many years. It was one of the pioneers in this branch of industry, and has established an enviable reputation for the superior quality of its manufactures and the honorable dealing of all concerned. It is not, therefore, necessary to speak of the paper made here, or to give a gratuitous advertisement of the products of the factory. Everybody has used the paper, and many years of successful industry is a sufficient public notice; but there is one feature of the mills, entirely disconnected from its business affairs, which is not known to the world at large, but which ought to be, for the good example it affords; and it is of this that our correspondent speaks.

The present owners of the property have purchased all of the land on both sides of the river for several miles, chiefly for the purpose of controlling it and preventing the approach of any element discordant with the general principles they have adopted in their conduct of affairs. The moment the stranger crosses the line of the property, he is conscious of the presence of a presiding authority, as the road is kept in admirable order, the fences are neatly painted, shade trees are judiciously planted, and little parks laid out; and in front of the mills, instead of litter and dirt, boxes, bundles, and confusion, there are neat gravel roads, grassy inclosures, clumps of trees, and such order as one generally only sees about the grounds of a wealthy country gentleman. This at once gives an air of refinement and civilization to the place, and prepares the visitor for the neatness and discipline that reign within the walls.

The process of the manufacture of paper is always an interesting one, but when it can be followed from the rags to the finished "cap," in an establishment kept as neat and orderly as the Housatonic mills, it is not alone the beautiful application of mechanical genius that attracts us, but the practical solution of the question of how a business can be carried on as a pecuniary success, and, at the same time, with a constant regard for the comfort of the workmen. It is a place through which a lady could walk without fear of soiling her dress, even if she wore the unsightly train the sex affects so much under present fashions. The neatness of the place suggests the propriety, on the part of the visitor, of carefully removing all dust from his shoes before entering it. The appearance of the women engaged at work is entirely in keeping with the surroundings. They wear neat calico dresses, and have the air of being quite as refined and respectable as persons engaged in the more fashionable and aristocratic occupations of teachers, governesses, and the like. In fact, the woman question here meets with its proper solution. Women are enabled to support themselves, to lay up money, to carry their share of the burthens quite as respectably and independently as the men.

The company make more money, beyond a doubt, by having in their employ persons of such thorough respectability; and if it costs money to keep the place clean, to plant shade trees, and surround the operatives with refining influences, they more than get their return in the improved character of the work and the emancipation from discontent and strikes.

All of the persons employed in the mills are provided with homes. Comfortable cottages, surrounded by gardens and flowers, dot the hill sides, and adorn the banks of the river. They are all handsomely painted, and vary in size and elegance according to the business responsibility of the occupant. Some of the higher officers occupy what might be called villas—really architecturally beautiful houses, such as any gentleman from the city would like to own as a country seat. For the unmarried women, there is a fine boarding house, with its cupola, piazza, and every modern convenience, conducted under the careful superintendence of a matron. It looks more like a boarding school for young ladies, than a place in which women live who work hard to earn their daily bread. Ample provision is also made for the education of the children. And in order that the religious instruction of the community should not be neglected, the company have built a handsome church, and contribute liberally to the support of the minister. There is a fine circulating library and reading room attached to the mill, absolutely free to all; and the character of the books on the shelves, and the good use made of them, is one of the most interesting features of the place. There are often five hundred volumes out at a time, some of them histories, some novels, some travels, and all capital reading for instruction or amusement. There is a librarian paid by the company, an intelligent woman, who is in attendance from 11 A. M. until 9 P. M., who cheerfully gives any information to her patrons, keeps a record of the books, and takes care of the place. Between 12 and 1 o'clock, the usual time for dinner, after partaking of that meal, clusters of the men and women can be seen entering the reading room, to look over the files of papers; and in the evening, the place, being warmed and well lighted, is often full of persons who come to consult such books and journals as cannot be taken home. Religious papers of all denominations, several of the monthlies, illustrated papers, and the leading scientific journals, are kept on file, and among them the SCIENTIFIC AMERICAN is a great favorite, if marks of frequent handling may be taken as a test. There are no grog shops or nuisances of any kind, and if any of the workmen show a tendency to visit such establishments, they are immediately furnished with a permanent leave of absence—their room is counted much better than their company.

At the time of the French Exposition of 1867, a reward was offered to the owners of the best conducted manufacturing establishment, taking into consideration the care of the workmen, the moral features of education, lodging and general deportment of the men. There were numerous competitors, and we do not recollect who won the prize, but it is evident that the mills now owned by Mr. Cone, at Housatonic, ought to have competed for the honorable distinction.

Much is said, in this country, about the dignity of labor, but most people act as if they had no faith in it. A successful mechanic rarely wants his son to pursue the same calling; he sends him to college, and, after college, to a profession, where he often learns ways that are decidedly unprofessional and unworthy of his father. It is not the labor that dignifies, but the character of the man that makes any honest work respectable; and when manufacturers take this view of the question, and surround their work by refining and elevating influences, so that no one need feel ashamed to be found at his task, they become real benefactors of their race, and are reformers in the right acceptation of the term. There is no dignity in labor, if it be conducted in a low and groveling way. There is nothing more dignified than labor, when carried on with a pure and elevated spirit. The example set among the hills of Berkshire appears to be worthy of study aan dimitntio.

RECENT PROGRESS IN METALLURGY.

At the recent meeting of the Lyceum of Natural History, Professor Egleston, of the School of Mines of Columbia College, made a few extemporaneous remarks on the recent progress of metallurgy in Europe, whence he had just returned. The Professor stated that the Pattinson silver process was now almost entirely abandoned; and in its place had arisen, to great favor and almost universal adoption, the zinc process described in a former number of our journal. The advantages of the zinc process were set forth many years ago by Karsten, but, for some inexplicable reason, pronounced impracticable by the workmen who tried it. It was afterwards rediscovered and patented by Parkes in England, but then found no favor, and fell a dead weight in the repertory of new inventions; finally, in 1858, it again raised its head, and, after many modifications and revolutions, has driven all other methods from the field. The old Pattinson desilverization is now chiefly confined to very poor ores, and

such as contain antimony. What is called mechanical *Pattinage* is used at Stolberg, but the zinc method, employing steam and hand work, is now substituted for all kinds of ores, especially pyritous and blendes.

Another step in advance is the completion of the mechanical preparation works at Clausthal, commenced about eight years since. This immense establishment, more than 1,000 feet in length, is chiefly designed for silver leads, blendes, and the Hartz mountain deposits. It combines all of the latest improvements, and enables the government to economize all of the precious metals of that region, and serves for the education of a useful class of metallurgists.

Similar works have also been constructed at Ems, where the character of the ores is more in the yield of lead than of silver.

In the metallurgy of zinc, there has been a great improvement by the adoption of the regenerating furnace. At the extensive zinc works in Belgium, there is one furnace which runs 160 muffles, and the gas regenerating furnace has nearly everywhere superseded all other forms. In lower Silesia, they work ores of zinc which do not contain more than nine to ten per cent.

The economical use of iron slags has been pushed so far that Professor Egleston made the startling announcement that there are a good many furnaces on the Continent which actually sold their slags. The slags are either run directly into iron wagons or into water for granulation. They are worked up into cement and artificial building stones, are employed in chemical processes, especially the manufacture of alum, and are used to make crown glass where lime is required; and, in general, waste cinders are fast becoming a thing of the past.

The progress in steel manufacture has been very great, especially in the size of the pieces cast, and in mechanical contrivances for handling and working them. Twenty-five tun hammers are not uncommon. At Krupp's renowned establishment he was received with the utmost courtesy and shown everything. The great secret of the efficiency of these works is in the military discipline which prevails. The different gangs of men are marched up, deployed, and manœuvred precisely like companies and regiments of soldiers; and there is no haste and no confusion, so that any number of crucibles of melted steel can be brought and poured out without any company coming in contact with another.

Krupp now proposes to construct a hundred tun hammer. By a new contrivance of reversing the rollers, heavy steam carriages are superseded, and the armor plates or rails go back and forth.

The ideas in reference to the construction of blast furnaces are much modified. They now build them without the massive outer coating, and sometimes exclusively of fire bricks, and much more open and accessible below.

In general, according to Professor Egleston, the progress of metallurgy in Europe has been very great within a few years, and he promised to present the chief points, for the information of the Society, during the course of the winter.

MASTER AND APPRENTICE.

The relation of masters to their apprentices may form a theme upon which a few hints may be profitably thrown out, although unfortunately, as we think, for the industrial interests of the country, these relations have changed very materially during the last fifty years. The old system of binding boys to a term of service, for which their reward should be largely in instruction imparted to them, has given way, in good measure, to the method of paying stipulated money reward for very limited terms of service, instructing the youths so employed only in some few details of a trade, and then getting as much as possible out of them for the money paid.

The result of this is that the proportion of really skilled workmen, when considered with reference to the aggregate number engaged in mechanical avocations, has greatly diminished; while many who are called machinists, bootmakers, or carpenters, are really only competent to run a lathe, to peg on a sole, or to shingle or clapboard a building.

There are, however, some shops which adhere more or less to the old apprentice system; and, whether they do or not, there still remain certain duties which masters owe to the youths employed by them, which, we fear, are often too much neglected.

While the full parental power of control, and the father's right to exact obedience, are, under the modern system of limited service, perhaps not to be considered as vested in employers, the duty to watch, with some care, the habits of boys, and to counsel and admonish them when likely to go wrong, is a duty devolving upon every master, and one which he ought not to shirk.

It is his duty, also, to judiciously praise and encourage all that he sees commendable, in their habits or handiwork, thus cultivating their self respect, and that regard for the opinions of others which forms in youth one of the most powerful stimulants to well doing, and one of the strongest safeguards to morals.

It is his duty to reprove when reproof is deserved, and to set such an example to others that his reproof will deserve and command respect. But his reproof should be so tempered with kindness, and an earnest desire for the good of the one reproved, that evil passions shall not be roused into violent opposition. It is his duty to instruct, not only in the elements of the calling upon which his apprentices are entering, but upon all matters of life experience, upon which his age and knowledge of the world have rendered him wiser than his young assistants.

How many masters throughout this great country are performing these obvious duties with fidelity? How many of them can point to this or that young man who is going to the bad, and say, "My conscience is guiltless of neglect toward him?"

The dictates of common humanity, not to say Christianity, should prompt every master to watch, counsel, admonish, reprove and instruct, as seems necessary for the good of the young minds and hearts over which he has some measure of authority. The man who refuses or neglects to do this is neither humane nor Christian.

FAIR OF THE AMERICAN INSTITUTE.

ELECTRICITY.

Electricity, in one form or another, plays a prominent part at the exhibition this year.

RHUMKORFF'S INDUCTION COIL.

This wonderful instrument is exhibited by the Stevens Institute of Hoboken. Its length is 40 inches, hight 18½ inches, and it weighs 166½ pounds. The primary wire is 200 feet long, while the secondary wire is 234,100 feet, or about 44⅓ miles. The battery employed to charge it consists of three glass jars, 10 inches diameter and 12 inches high, into which are lowered, by a windlass, fifteen plates of zinc and fifteen of carbon, each 6×9 inches. The exciting liquid is the usual mixture of bichromate of potash and sulphuric acid. With the above battery freshly charged and immersed 1 inch, the coil freely gives sparks 21 inches long in air, and white Leyden jar sparks 14 inches long; and the spark can be made to penetrate glass 3 inches thick. This performance has never been exceeded by an induction coil, and it is satisfactory to know that it was constructed by our countryman, Mr. E. S. Ritchie, of Boston. A few years since, the coil belonging to Columbia College, also made by Mr. Ritchie, was carried to Paris by Professor McCullough, and shown to Rhumkorff, who was so much astonished at its superiority over anything that he had ever constructed, that he begged permission to dissect it. This permission was granted, and he found that Ritchie's insulation and manner of winding the wires was superior to his own, and he adopted the American form.

It is generally admitted by physicists that Ritchie's contributions to our coils have been of great value, and that he has built several instruments superior to any of European manufacture. The performances of the monster coil are highly suggestive of a severe thunder storm, especially when the Leyden jar is filled and discharged in rapid succession. The effect of these discharges is to fill the air with the odor of ozone, and it is a question whether the instrument could not be used, as a convenient generator of this form of oxygen, on a sufficiently large scale to be employed as a bleaching agent in the arts.

BURGLAR ALARM.

There is the usual ringing of bells and perpetual din made by the opening and shutting of doors, to which the wires are attached, while the efficacy of this system of security against unwelcome visitors is set forth by the inventor or his agent. The plan of having the bells continue to ring until the connection is broken by some one in the house, is a capital one; and, if a bell on the street could be rung at the same time to attract the notice of the police, the rogues would be apt to vacate such premises, as being too uncomfortable for quiet work.

ELECTRO-PROPULSION MOTOR.

This is the name given to an invention for working sewing machines by magnetism. To the end of a long lever are attached two iron armatures, and, by an ingenious pole changer, the magnetic force is made to operate first on one side and then on the other; and, as the lever oscillates, it turns the crank of the wheel which is to do the work. The inventor uses four large cells of a Bunsen bichromate and carbon battery, to charge the magnets. The novelty of the adaptation consists in the manner of applying the pole changer, in the cup shape of the armature, and perhaps in the peculiar form of lever.

The circular which was handed to us, says: "This apparatus can be applied for propelling sewing machines, as now on exhibition; also other machinery and street cars—as any power desired can be obtained by *magnates*." There is considerable truth in the latter part of the claim, as the magnates of our city can testify; as to the power of magnets to propel "street cars and other machinery," there appears to be some difficulty, as it has never been successfully accomplished. There is a small locomotive, driven by magnetism in another part of the building, but this moves in such a weak timid way, as to suggest a break down the moment a load is attached to it.

Of the Electro-Propulsion Motor, the circular further says: "It dispenses with the use of the feet, which, in the opinion of the medical faculty is so injurious." We agree with the medical faculty that it is injurious to dispense with the use of the feet, and are decidedly in favor of plenty of exercise. If it is true "that the apparatus can be *prefixed* to any kind of machine," we are likely to see much of it. It will be necessary, however, for the inventor to employ a more economical and convenient form of battery, before he can expect to induce many private individuals to try the new motor.

PHOTOGRAPHS OF MAGNETIC FORCE.

A beautiful application of photography, to the illustration of physical phenomena, is shown by Professor Mayer, of the Stevens Institute, who exhibits plates of the diagrams, formed by magnetic force, very much resembling the sound pictures, so long familiar to the students of philosophy.

Professor Rood made photographs of the electric spark in a manner somewhat similar to this, an account of which was published in Silliman's *Journal*.

Putting electricity and magnetism on paper is one of the best ways in which to study these phenomena, and is a feature in modern research.

ELECTRICITY APPLIED TO MEDICINE.

The number of pieces of apparatus for the use of the medical practitioner, shown in the Fair, is unusually large, and indicates greater attention to this branch of therapeutics than formerly. Some of the contrivances would be highly prized by teachers in our schools, if they were better known, and could be had of dealers in philosophical instruments. We have to note particularly cauterizing instruments, an improvement on Stoehrer's induction apparatus, a universal platina zinc battery (which would be an admirable thing for professors of physics, if they knew about it), and a battery for galvano-caustic, exhibited by Curt W. Meyer; to this list, must be added the electro-medical generator of Professor Steele, and the portable machines of the Galvano-Faradic Company. The electromagnetic machine of the latter company is highly commended by some of the best physicians in New York, and, from the cursory examination we were able to make of it, we are disposed to cordially unite in calling attention to its efficiency, convenience, ingenious adaptation to a variety of uses, portability, endurance, and simplicity. While it is specially constructed for the use of the medical profession, it has many points to command the attention of all persons who may have occasion to employ induced currents for any purpose whatsoever.

GALVANIC FLUID.

There are so many fluids that can be employed in galvanic batteries, that it is difficult to see how any one of them can be patented; and, after they are patented, we should suppose that most persons would prefer to know what they were using, rather than to blindly follow a prescription. This reminds us that we found one exhibitor who bought his bichromate of potash, at a high price, already in solution, under the head of a "yellow liquid," without knowing what it was. We suggested a saving of fifty per cent, by using the dry salt and Croton water.

OTHER APPLICATIONS.

We do not refer to the telegraph, as that has become an old story. Nickel plating, which a short time since, was uncertain, now comes out brighter and more durable than silver. Aluminum plating is yet to come, but can hardly rival the pure white of nickel. Galvanoplastic is represented in a few groups, and indirectly in ornamental decorations of machinery. It would have been instructive to the public to have had the whole process of electrotype deposit illustrated and explained.

Electric clocks, with self feeding battery, and bank alarms, were on exhibition, and there may have been other pieces, of apparatus in which electricity played a part, which escaped our notice. We should have been glad to see a good thermo-electric pile, a cheap ozone generator, a large Ladd's magneto-electric machine, a meteorograph, alarm thermometers, electric pianos, engraving by electricity, electric car brake, Casselli's telegraph for sending autograph messages, electric lights, electric safety lamps, and a suite of galvanic batteries, such as we have seen at exhibitions in other countries. Much more has been done in the line of the application of electricity to the arts than is commonly supposed, and it would be of great use to the community could all of the contrivances be collected into one exhibition for comparison and study.

BULKLEY'S PYROMETER.

In our recent notice of this invention, we gave the address of Mr, H. W. Bulkley as 10 Barclay street; it should have been 98 Liberty street, New York city.

A REMARKABLE HISTORY---A TRUE STORY THAT IS STRANGER THAN ROMANCE--HOW MISFORTUNE WAS CROWNED BY SUCCESS.

In 1858, Mr. Thomas Sheehan, now as well as then of Dunkirk, New York, foreman in the blacksmith department of the Erie Railway shops at that place, patented, through the SCIENTIFIC AMERICAN PATENT AGENCY, a submarine grapple, which, though an ingenious invention, proved to be one for which there was little demand.

This was his first invention; and the cost of its completion, together with one year's struggle to manufacture and introduce it, completely exhausted Mr. Sheehan's means, and reduced him to the extremest poverty. Now Mr. Sheehan, though not fortunate in inventing, making, and selling submarine grapples, had, in conjunction with his good spouse, been eminently successful in increasing his family, which comprised eight children at the close of the year of struggle above mentioned.

Eight children, and an empty larder, are rather stern facts when a father is called upon to meet them; and in this case our inventor's troubles were increased by the not unnatural complaints of his wife, who accused him of having left a good situation to pursue a chimera, thus reducing his family to pauperism. In fact, the good woman was decidedly bitter, and her acerbity, added to the really desperate condition of Mr. Sheehan's finances, produced in him a mental state under which some men would have permanently gone to the bad.

Not so our inventor. He kept a stiff upper lip, and sought long and anxiously to provide support for the hungry mouths that appealed to him for food.

It did not subtract from the trouble of this critical period in Mr. Sheehan's life, to discover that his failure had been due, in great measure, to the derelictions of a partner whom he had taken in with him to aid in conducting the grapple business, and who he found had taken undue advantage of his position, selling wares for which no returns were ever made to the firm, and otherwise misconducting himself.

Just at this crisis, Mr. S. D. Colwell, an old friend of Mr. Sheehan, and General Freight Agent of the Erie Railway at Dunkirk, chanced to meet our inventor in the streets of that thriving town, and accosted him, with

"Well, Thomas, how are the grapples? I hear they have used you up."

"Yes," was the answer, "the grapples have done my business; I wish I had never seen them."

"Throw 'em away," advised Mr. Colwell. "Have you any now finished?"

"I have one almost done," said Thomas.

"Finish that; I will pay you forty dollars for it, and have it used for picking up coal at the dock. The money will help you in your present emergency, and you can go back to your old place in the shop and earn a good living for your family."

"I will," said Thomas.

Back to his humble home, went our inventor with new hope in his breast, and set himself to finish the grapple with all due speed. But, alas, upon what slender threads do the fortunes of men hang! A tap, the only one our inventor had of the size required, suddenly snapped asunder, and, as it was essential to the progress of the work, he must have a new one or he could not go on.

In this strait, he applied to his wife to lend him twenty-five cents to buy the necessary steel to forge the tap. But she, having nb faith in the grapple, refused, for the two very good reasons—first, that she believed the money would be thrown away if she gave it to her husband; and second, that she had not the money to give him, even if so disposed. The refusal was seasoned with some very hot word-spice that made it very unpalatable to Thomas. But he bethought him of a merchant, who, in brighter days, had seen the color of his money, and who, perhaps, would now give him credit for the small modicum of steel he required for the tap.

To this merchant he hied, and, somewhat reluctant to prefer his request, began beating about the bush; and, finally straying into politics, hot words passed between them, and our friend, feeling his manliness would suffer too keenly by asking credit for the steel, came away without it.

With no definite purpose he went home, pondering upon how he should surmount this, now no trifling, obstacle of the broken tap.

He found his wife making ley for soft soap, but her acidity in no way neutralized by the alkaline reaction. Despondent and discouraged, he sat down, in no very enviable mood, when he chanced to spy a piece of iron lying near the tubs at which his spouse was working. Meditating upon how he could make that piece of iron hard enough for a tap, he was led to a rather rude experiment, the results of which have in the end made him a richer man than he ever dreamed of being.

It so happened that from a distant relative, a Roman Catholic priest in Ireland, our friend had inherited quite a library of works on chemistry; some of them rare and valuable. He had read some of these books to very good purpose. "There is surely carbon in that ley," thought he. "If I only could get that into this iron in the proper proportion, I should have steel, and from that my tap, and so finish my grapple."

With little hope or faith that he should succeed, he took some of the ley, and adding, without any particular reason for so doing, some saltpeter and common salt, made a paste with this solution and a hard grudged saucerful of the little remaining flour there was in the house. He then forged the tap, and, enveloping it in the paste, put the whole into a luted iron box and exposed it to heat for two hours in a blacksmith's fire. To his joy and surprise, when he took it out, it was hard enough to cut cast steel. The grapple was finished, and forty dollars flowed into the family treasury of Thomas Sheehan. He went back to his old work, disgusted with patents, and resolved never to have anything to do with one again. But the remembrance of the tap, hardened in so unique a manner, still haunted him. Having a great deal of case hardening to do, he thought one day he would repeat the experiment upon a large scale, which he did with perfect success.

For twelve months he went on to experiment, purchasing the materials with his own money, and working in secret by night, and at odd hours. At the end of twelve months, he reconsidered his sentence of condemnation on patents, and applied for one on his process, which was granted September 4, 1860, the claim being for a combination of damaged flour, potash ley, or ley from hard wood ashes, niter, common salt, and sulphate of zinc, for case hardening iron.

In 1867, he patented an improvement on the above named process, the improvement being the substitution of water impregnated with carbonic acid for the ley of potash or wood ashes.

In 1868, he took out another patent for an entirely new process, which consists in the use of raw limestone, charcoal, black oxide of manganese, sal soda, common salt, and pulverized rosin, combined, for converting iron into steel, which is now widely used, and from which he has reaped quite a fortune.

No less than twenty-three of the leading railways in America now use this process, under license from the patentee, for hardening the links, guides, pins, and nuts of locomotives, effecting, we are told, no less a saving than from five to six hundred dollars annually on each locomotive, in obviating the lost motion consequent upon the wear of links, guides, and pins.

The inventor has already received, for licenses under his patent of 1868, $29,650, and has just sold the remainder of his patent in America for $45,000. If on the day he broke his tap, in his cottage in Dunkirk, it had lasted till he finished his job, or if he had then had twenty-five cents, he would, in all probability, today have been a poor mechanic, working at his forge in the Erie Railway shops, and a process of national importance, in its effects upon the great railway system of the country, might never have been given to the world.

Never, perhaps, has the old adage, "Necessity is the mother of invention," received a more apt illustration, and never was the occasional value of an untoward accident more signally demonstrated.

MARQUARD'S ARTIFICIAL STONE.

If we watch the great amount of labor required to shape the rude stone, as it comes from the quarry, to the ornamental forms required for embellishing our modern architectural structures, we need not wonder that, long since, attempts have been made to produce these elaborate forms by molding. For interior work the plaster of Paris has been the successful substitute for ornamental stone, chiefly for statuary; its pure whiteness, nearly imperceptible shrinkage, and the ease wi'h which it is cast in forms, have secured for it the lasting favor of all. However it has grave defects; it is very opaque, of a dead white color, and lacks the semi-translucency of statuary marble, which causes this to be so far superior for all productions of high art; but its great defect is that it is too soft and cannot stand the weather at all; water dissolving it slowly, any product of plaster is ultimately destroyed by the rain. Therefore many attempts have been made to produce artificial stones having the advantages of plaster without the disadvantages just mentioned.

The *terra cotta* is nothing but a fine brick clay, requiring burning after being molded; but as in the burning it shrinks and changes its shape, it is unfit for fine work; a'so its color, which is either like brick or of a dirty brown or gray, is objectionable.

More successful have been those who experimented in another character, making use of the properties of the soluble silex, to combine with alumina, magnesia, lime, etc.; but here is a delicate distinction to be made, as the use of one or another of these ingredients, in different proportions, gives widely different results.

Among all the artificial stones which have recently fallen under our attention, w- noticed in particular a compound, the result of experiments made by Philip Marquard, of 468 Swan street, Buffalo, N. Y., which, at first sight, struck us by its pure whiteness, semi-translucency (like marble), and the ease with which it appears to have been molded, evident from the ornamental shape of the samples sent us; by further investigation, we found it to take polish like marble, and to stand the severest weather, as water does not penetrate it in the least. Chemically, it is silicate of lime, with an excess of the latter; it also contains some alumina.

The inventor states that it is far cheaper than any natural stone worked by hand; and does not shrink in burning, coming out of the fire exactly equal in size and form as it came from the mold. All that is wanted to introduce this invention is a partner with some capital; and we do not doubt that, taking in account the excellence of the article, this will not be a difficult matter for the inventor and patentee to obtain.

SCIENTIFIC INTELLIGENCE.

SIMPLE TEST FOR ARSENIC, ANTIMONY, AND PHOSPHORUS.

The solution of the substance to be examined is first considerably diluted with water, and poured into a wide mouthed bottle, to the cork of which are fastened a number of pieces of parchment paper, previously saturated in acetate of lead, nitrate of silver, and sulphate of copper. A few drops of sulphuric acid are now added, some pieces of zinc thrown in, and the cork put on. In case any gases are liberated, they will react upon the strips of paper, and the color will disclose to what particular element the reaction is due. Phosphuretted hydrogen does not blacken nitrate of silver and acetate of lead, but does act upon sulphate of copper. Antimonetted and arsenetted hydrogen do not affect the nitrate of silver and sulphate of copper, but blacken the lead salt. Sulphuretted hydrogen, however, blackens all three of the above metallic solutions. In order to decide what elements are present, the strips of paper are to be macerated in a solution of cyanide of potassium. If the coloration immediately disappears, it was due to sulphuretted hydrogen: if it slowly changes in cold and more rapidly in heat, it was caused by phosphorus or antimony; if it only bleaches a little and turns brown, and does not disappear when heated, it may be traced to arsenic. For ordinary purposes and rapidity of work, this method appears to be sufficiently accurate and will enable the operator to dispense with the more cumbersome Marsh apparatus.

THE COLORING MATTER OF SMOKY QUARTZ.

In August, 1868, the largest deposit of deep black quartz crystals was discovered, in the canton of Uri, that had hitherto been found. Some of the larger ones weighed respectively 267 pounds, 255 pounds, 210 pounds, 134 pounds, and 125 pounds; and the total weight of the crystals found in the cave was 33,000 pounds. The finest specimens of the collection were purchased for the Cabinet of Berne; and, on their arrival, the cause of the dark color of the crystals was made the subject of lively discussion at the meeting of the Bernese Academy. In order to solve the difficulty, Professor Forster undertook an exhaustive and elaborate study of the whole question. His paper, covering twenty-two octavo pages has just been published in a supplementary number of Poggendorff's *Annalen*; and, without going into the details of his method of research, we give below the results at which he has arrived.

1. The coloring matter of smoky quartz is disposed in more or less regular figures, which display the hexagonal structure of the crystals.

2. The specific gravity of the black quartz is 2·65027.

3. After exposure to a strong heat, the density is 2·65022.

4. The color of smoky quartz is due to organic matter containing carbon and nitrogen.

5. This organic matter is entirely decomposed by heat, and yields, by dry distillation in a current of hydrogen, pure carbonate of ammonia.

6. The dark color disappears on the application of heat.

The results at which Professor Forster arrives will be the subject of considerable discussion in the scientific world, as they seem to point out the organic and aqueous origin of quartz rather than to its igneous irruption, as a majority of geologists have maintained. The almost simultaneous publication of the investigations of Friedel and Crafts on the organic compounds of silica, and the conclusions of Professor Wurtz, published last year in this journal, will be read with renewed interest, now that the subject is attracting so much attention. It would be strange indeed if we were to look to life and organic growth for the source of our sandstones and sand banks. And yet, under present appearances, it is not at all unlikely that we shall be compelled to do so. We have observed in the Berkshire sand, employed in the manufacture of the best crown glass, that innumerable black specks were scattered through it, which we took to be oxide of iron; but we were informed by the director of the works that they were organic and wholly destroyed by heat, thus obviating the necessity of adding manganese to neutralize them. It would be interesting, in this connection, to see if the black sand of the West does not also owe its color to organic matter, instead of to iron as has usually been supposed. The fact could be easily determined by exposing a quantity of the material to a sufficiently high heat.

RAVAGES OF THE BOMBARDMENT OF PARIS.

M. Secretan, the well known manufacturer of philosophical instruments, writes as follows to Abbé Moigno:

"As you know, without doubt, since I have communicated the circumstance to a number of persons, I have al o cruelly suffered by the bombardment. On the 9th of January, at 7 o'clock in the morning, a large bomb fell and burst in my workshop in the *Rue Mechain*. The furniture was much damaged, and a considerable quantity of astronomical instruments, photographs, and optical glass was entirely destroyed.

"The damage amounted to from 18,000 to 20,000 francs. Fortunately my dividing engine was uninjured, my optical plane, for the construction of astronomical objectives according to Foucault, also received no harm; and I must confess that, considering the risk I ran, I am quite satisfied to have escaped as well as I did."

HYDRATE OF CHLORAL.

The hydrate of chloral, which in 1869 cost eighty dollars a pound, so that each sleep produced by it could be reckoned at one dollar, is now advertised on the list of a German chemical factory at about two dollars a pound. Such an enormous reduction in the price of a chemical product in so short a time has rarely occurred. Perhaps the only parallel case is metallic sodium, which, a few years ago, could not be had for two hundred dollars a pound, but can now be made for seventy-five cents. According to Dr. Richardson, the secret use of chloral in England has become so great that the victims must be put in the same class as the opium eaters. In proof of the enormous consumption, he states that, during the last year and a half, four dealers have sold forty tuns, sufficient to give narcotic doses to 36,000,000 people—in other words, every person in England could have had one good sound sleep out of the amount sold. In reference to the *maximum* dose that it would be safe to take, Dr. Richardson puts the amount at one hundred and twenty grains; he regards one hundred and eighty grains as likely to prove fatal. He also warns against the gradual increase of the dose, as its effect upon the organism is just the opposite of opium, the system, in fact, becoming more sensitive the longer it is used.

SOUTHERN LIGHTS.

We have all heard of the northern lights, or *aurora boreal*is, but we are not in the habit of reflecting that the same phenomenon is to be seen in the southern hemisphere, where it is called the southern light. In order to establish a relation between the magnetic disturbances in the north and south, and to prove that there is a perfect coincidence and simultaneousness in the auroral light of the two hemispheres, Professor Heis, of Munster, has entered into a correspondence with the directors of observatories at various stations in Australia and the East, and has been able to collect much interesting and novel information, which may serve as data in the solution of the question of the probable origin of this class of phenomena.

From records kept in 1870, it appears that the aurora of the 8th of January was observed at the same time in Oxford, Liverpool, and Melbourne. Magnetic disturbances were noted, on the 4th of January, in Melbourne, Rome, and various stations in France and England. The southern light of February 1, in Melbourne, was the northern light, at the same time, in Paris, London, Königsberg, Stockholm, and other European cities. March shows several instances of similar coincidence in magnetic and auroral phenomena. Some months were exceedingly rich in simultaneous auroras, and there was not a month in which coincident observations were not made. It adds very much to the grandeur of these phenomena to know that they are visible at nearly the same moment entirely around the globe, and, as soon as we have a long series of observations, we shall be better able to give a rational explanation of their probable origin.

[For the Scientific American.]

A LIGHT UNIT.

BY JOHN C. DRAPER, PROFESSOR OF CHEMISTRY, UNIVERSITY MEDICAL COLLEGE, NEW YORK.

The measurement of the intensity of artificial light is one of the problems that has not been satisfactorily solved, though many able physicists have given it their earnest attention.

Among the instruments that have been contrived to accomplish this result is the chlor-hydrogen photometer, first introduced by Professor J. W. Draper, and afterwards modified by Bunsen and Roscoe. Though this instrument is very beautiful and philosophical in its action, it is open to the objection that it measures rather the chemical or actinic than the illuminating power of a flame. The polariscope photometer of Arago, and the electro-photometer of Masson, are also very ingenious instruments; but the difficulties attending their use have, thus far, prevented their introduction.

The photometer generally employed is that of Ritchie or of Bunsen, and especially the latter. The principle involved in its action is the determination, by well known means, of the relative brilliancy of two lights, one of which is supposed to be invariable. Heretofore, the invariable light, or unit, has been a flame produced by a candle, which is defined as "a sperm candle of six to the pound, burning at the rate of 120 grs. per minute." With this the second flame is compared; and, if it is ten or fifteen times as strong, it is spoken of as being a ten or fifteen candle light.

Though this method is reliable in theory, in practice it is open to error, owing to the variability of what should be the invariable light or unit. If we could always obtain sperm candles possessing the same composition, the indications might be received with a certain degree of reliance; but when we remember that, at present, the so called sperm candles are made of different materials, in different proportions, we see how little confidence is to be placed on a light unit of this description; and it is the object of this communication to detail the results of an attempt to obtain a reliable and invariable light unit.

It is evident that, if a given solid is heated to a certain temperature, it will emit a light of a definite or corresponding intensity. At the same time, the solid will undergo a certain expansion which may be employed to indicate or measure the intensity of the light emitted. I therefore arranged a fine platinum wire so that it was heated by a Bunsen flame, and the amount of expansion and equivalent light determined. It was soon found that, though the arrangement was very well in theory, the practical difficulties in its construction and mode of action were such that it would not answer. I consequently resorted to the following modification, in which measurements of expansion of the wire are not necessary:

A flame of pure dry hydrogen, burning at a definite rate, was caused to impinge upon a platinum coil, when it was found that, so long as wire of the same diameter was used in constructing coils of the same dimensions, the latter, on being subjected to hydrogen flames issuing from burners that were similar in all respects, always emitted a light of the same intensity.

The dimensions of the coils and burners employed in my experiments were as follows: A platinum wire, one decimeter in length, and weighing twenty-five centigrammes, was wound into a close spiral coil of five turns, four millimeters in diameter on the outside. The remainder of the wire was then turned up parallel to the axis of the coil, and terminated in a hook by which it was suspended over the hydrogen flame.

The burner presented a circular opening, one millimeter in diameter. The platinum spiral was suspended over this so as nearly to touch it, and the supply of hydrogen regulated to produce a flame which kept the whole coil at a white heat.

Such an arrangement is easily reproducible in any locality, and when the rate of combustion of the hydrogen is the same, it must necessarily emit a light of the same brilliancy; it consequently provides a light unit, which meets all the conditions of the problem.

The want of intensity in the above described light unit may be urged as an objection, but it is rather an advantage than otherwise, when lights of low intensity are to be examined. If the brilliancy of the light to be measured is very great, any objection on this account is easily remedied by determining the value of an ordinary gas or candle flame in the above light unit, and employing it as an intermediate unit of comparison, from which the value of the brilliant light may be calculated in the proposed light units.

Among the advantages gained by such a light unit is the elimination of errors arising from the variation in the light giving power of the volatile hydrocarbons, produced in the combustion of a candle. According to Dr. Frankland, the luminosity of such flames depends—not on the incandescence of solid particles, but on the luminosity of the gases or vapors produced in the flame during combustion. Since the composition and luminosity of these gases must vary greatly with the temperature, rate of combustion, and nature of the material composing the candle, it is evident that there must be similar variations in the brilliancy of the resulting flame. The use of an incandescent solid, as the platinum wire, avoids this and other sources of error, and reduces the conditions for the production of the light unit to the simplest state.

Tunnel between England and France.

Another project for a submarine roadway under the English channel has been mooted, and a committee of engineers has approved the plan, which is the production of a Frenchman, M. Thome de Gamond. There is novelty in the scheme. It is proposed to tunnel under the channel between New Haven and Dieppe where the distance between the two countries is 64 miles, in preference to between the South Foreland, near Dover, and Cape Grisnez, near Calais, where it is only twenty miles. The reason for this choice of locality is not apparent.

Sheehan's Patent for Steelifying Iron.

In another column we publish the story of Thomas Sheehan, and how he happened to make an invention by which he has accumulated a fortune. Annexed is a list of the railroad companies who are using his process for steelifying iron, and the amounts paid for the privilege:

Chicago & Northwestern	$3,500
Michigan Central	1,500
Chicago, Burlington, & Quincy	2,000
Atlantic & Great Western	1,900
Pennsylvania Central	4,000
Pittsburgh, Fort Wayne & Chicago	2,000
Central, of New Jersey	1,200
Camden & Amboy	1,200
Little Miami, Columbus, & Xenia	800
Schenectady Locomotive Works	500
Chicago, Rock Island, & Pacific	1,200
St. Louis & Iron Mountain	800
North Missouri	800
Lake Shore & Michigan Southern	4,000
Vandalia, Terre Haute, & Indianapolis	950
St. Louis & Indianapolis	800

A number of other railroad companies are using his invention, that have not yet settled with the patentee, but who acknowledge their liability; and still others, against whom suits have been brought in the United States Courts, which have not come to trial. A judgment has been obtained against one of the companies very recently for $12,800, which has not been settled.

IT is a shameful thing to be weary of inquiry, when what we search for is excellent.

Recent American and Foreign Patents.

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

LAMP.—Dr. Franklin T. Grimes, Liberty, Mo.—The invention relates to the class of lamps in which a tube or funnel is combined with the bowl, the said tube or funnel extending from the top of the bowl of the lamp down to within a short distance of the bottom of the same, whereby the bowl is converted into a fountain reservoir, in which, when it is filled, there is a vacuum formed above the surface of the oil or liquid, which is consequently maintained at a higher level than it is within the lower mouth of the said tube or funnel where it is subject to atmospheric pressure. The invention consists mainly in a peculiar arrangement of the valve apparatus, whereby certain advantages are attained in the regulation of the supply of oil to the wick tubes, in filling the reservoir, and in other operations incidental and necessary to the use of the lamp.

INSECT TRAP.—Thomas Wier, Lacon, Ill.—This invention relates to the use of two or more pieces of wood, of any form or size, and fastened together in any way, and either with or without cracks, slits, or crevices made in them, said pieces being intended to be placed among the branches of fruit trees, or on the ground near fruit trees, and to serve as a trap for the larvæ of moths, and other noxious insects,

HANDLE STRAP FOR TRAVELING BAG.—Arthur Alexandre, o. New York city.—To the frame of a traveling bag are attached rings, which are preferably made square, as allowing the strap to be passed through them more readily. The strap is made of sufficient length to adapt it to serve as a shoulder strap, and may be made in one piece, or in two pieces connected by a buckle. The ends of the straps are passed through the rings, and are secured to the body of the strap by a button, by sewing, or by other convenient means. To the strap, at a distance from its ends equal to about one third the distance from the ends to the center of the straps, are attached two hooks. The middle part of the strap is made double by having the ends of a short strap attached to it, and has holes formed in the lower ply to receive the hooks. To adjust the handle strap for use as a handle, the hooks are passed inward through the rings and brought upward along the under side of the strap, and hooked into the holes in the lower ply of its double middle part. To adjust the strap for use as a shoulder strap, the hooks are unhooked, and the strap is drawn out to its entire length. Keepers or slides are placed upon the strap, near the hooks, and, when the strap is extended for use as a shoulder strap, are slipped over the hooks to cover them and keep them from catching upon anything with which the strap may come in contact.

FLAG HALYARD.—William Albert, Brooklyn, N. Y.—This invention relates to an improved manner of securing flag halyards; and it consists in attaching them to a weight or traveler fitted on a rod or guide attached to the royal backstays of a ship or other convenient place, or to the flag staff near its base, so that it can rise and fall as the halyards vary in length according to their condition of dryness, thereby always keeping them taut but not overstraining them, as they will be if made fast when becoming very dry and then becoming wet. This plan will not injure the halyards, while it will always keep them taut and trim. In the common way, they will sometimes be altogether too slack, and at others so taut as to be broken by the strain.

THILL COUPLING.—Coleman Bridgman, St. Cloud, Minn.—The object of this invention is to furnish a simple, convenient, and safe coupling for thills of buggies, wagons, etc. It consists in a jointed coupling pin and slotted ear, and also in a slotted washer, arranged to form a simple, durable, and perfectly safe coupling, without screws or spring, that can be adjusted without hammer, wrench, or other tool, without trouble, and in an expeditious and easy manner.

WASH BOILER.—Silas Bennett, Newcastle, Pa.—This invention has for its object to furnish an improved boiler for washing clothes, which shall be so constructed and arranged as to distribute the circulating suds evenly over all parts of the clothes, so as to wash the clothes evenly and avoid staining them, as is the case where large streams of suds are discharged continuously in one place. It consists in the construction and arrangement of the various pipes and distributing tubes, with a flanged and periorated bottom, vertical and cross stripe, constructed and arranged in connection with each other, to accomplish the purpose set forth.

FAN MILL.—Alexander Plymate, of Blue Earth County, Minn., administrator of Franklin H. Plymate, deceased.—This is an improvement in fan mills, which consists in a peculiar construction of the feed board, and in the use of a two part shoe for the support of the sieves, the parts being arranged in a peculiar manner, to make the machine effective and compact.

COUPLING HOOKS FOR COAL CARS.—Frank Bush, of Boonton, N. J.—In the ordinary coupling hook the inner link is passed through a hole in the forward part of the shank of the hook, and is then welded, so that when it is necessary to repair or renew the link, the entire hook has to be detached from the car and taken to the shop, where it requires at least three men to handle it upon the anvil while the link is being welded. To avoid this inconvenience and expense, the inventor forms a second or inner hook upon the shank of and just inside of the outer hook. The point of the inner hook extends back parallel with the shank of the outer hook, so as to enter a hole in a plate on the end of the draw bar. By this construction, by loosening the hook, the coupling link or ring may be readily placed in or removed from the inner hook, and when the hook is again drawn to its place it will be impossible for the link or ring to become detached.

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.

Examples for the Ladies.

Mrs. W—— has had a Wheeler & Wilson Machine since June, 1857; to January 1st, 1871, she had made 24,476 vests, (in 1870, 2,255 vests,) 17 coats and 50 pairs of pantaloons, besides doing the family sewing for six persons; all the work ranging from the finest muslin to the heaviest beaver cloth.

Answers to Correspondents.

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

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

COIL IN BOILERS.—In answer to M. S. M., in relation to coil in boiler, I would say that his plan of heating water is not practicable. The sudden contraction of his coil, when the water supply is turned on, will start any joint he can put in. I have tried 2½ inch wrought pipe (very heavy), running it through fire box, over bridge wall to back end of boiler; the pipe 8 feet long would contract 1 8-12 inches, as soon as water was turned on, and of course start a joint or burst the connections. If S. W. will use a heater of 5 inch pipe, such as is used for casing oil wells, say 10 feet long, and put in six lengths of 1 inch pipe, using return bends, and let his exhaust steam heat his water, he will be on a sure safe footing; and if he has it arranged so as to have a steady continuous feed on his boiler, so much the better, for he will use less fuel and have no explosion. —E. A., of Pa.

EXTERMINATING RATS AND MICE.—I saw an inquiry, from one of your readers, how to exterminate rats and mice. One of the best remedies I have used is an equal mixture of flour and plaster of Paris. It is preferable to poison, because it will not hurt cats when catching them. —F. S., of Pa.

FLOATING OF SOLID IN MOLTEN IRON.—Permit me to suggest, in answer to S. H. W., that the probable cause, of cold iron floating on melted iron, is the attraction of cohesion in the latter. Light pieces of metal, such as a piece of fine wire, a small sewing needle, or a flat piece of sheet lead will float on water, and the only satisfactory reason of its doing so which occurs to me is, that the attraction of the particles of water for each other is sufficient to resist the passage of such light objects through its surface.—W. J. B.

J. R., of Slippery Rock, Pa.—The mineral you send appears to be an earthy carbonate of iron, and should be assayed to determine its value. It would be of interest to know how it occurs, whether in beds or veins, in either case how thick, as well as the direction and amount of dip; the associated rocks, above and below, whether shale, limestone, etc.; whether reddish nodules, or lumps of an iron ore with concentric coatings, occur in the vicinity.

WHAT MUST I DO?—When botches want to borrow my nice tools, and when I will not lend them, they call me names. Must I stand and take it, or lend the tools?—J. P. W. . . . . Answer.—Read the Beatitudes, Matthew V., 10, 11, and learn the blessedness of persecution.

J. I. M., of Pa.—Relatively to the axle, all parts of a rolling wheel move with an uniform velocity. Relatively to the plane upon which it rolls, the advance movement of the top of the wheel is temporarily greater than that of the bottom; but as all parts of the perimeter are successively top and bottom, the average advance of each part is equal.

A. J. H., of Mass.—All else being equal, the mechanical powers of screws are relatively as their pitch, or the number of threads to the inch on each, without respect to their diameters; but the larger the diameter of the screw with a given pitch is, the less is its friction in working, owing to the reduction of the inclination of the thread. A screw of larger diameter will raise greater weight without stripping the thread, than one of smaller diameter with equal pitch. For these reasons, to make an easy working and durable screw, it is better to make them of larger rather than of smaller diameter.

G. K., of N. Y.—Friction does not increase with the increase of surface, but—with some slight variations, not yet fully accounted for,—directly as the pressure of the rubbing surfaces against each other. This answer refers to the static or fixed force required to overcome the friction of bodies, and not to the power consumed in overcoming it for a given space of time, which will be as the coefficient of friction in pounds, multiplied by the space it overcomes in each minute of time; this will be expressed in horse power by the quotient obtained in dividing the product by 33,000.

G. L., of Minn., sends us a bit of maple branch, containing a peculiar insect, nicely housed therein, and asks what the bug is. It is a Hymenopter, one of the "wood-wasps," as the Germans call them, or "horn-tails." The long horny borer at the end of the body, contains two fine, serrated needles for boring holes, in which they deposit their eggs. This species is the *Tremex columba*, and usually infests the elm, buttonwood, and pear. The grub or larva is yellowish white, about an inch and a half long, with a horn on the hind end.

J. C. C., of Pa.—Your mineral specimen is simply hornblende —of no use in the arts.

C. D. A., of N. Y.—The subject of balancing cylinders was treated at great length in Vol. XIII. of the SCIENTIFIC AMERICAN, and we do not wish to reopen it at present.

C. B. R., of N. B.—The draft of a furnace might undoubtedly be greatly improved in the manner described.

HINDRANCE TO THE FLOW OF WATER THROUGH PIPE.—J. R. B., query 17, page 187, says the descent in his pipe is even, but I presume an accurate profile would show a slight depression at some point, perhaps at the spring. A depression equal to the diameter of the bore would be sufficient to prevent the air from escaping at the upper end; and if the current is not rapid enough to carry it through, it will remain, and its accumulation is virtually so much subtracted from the fall, thus retarding the flow. When the hight of the column of confined air becomes equal to the difference of level between the spring and the discharge—that is, when its lower end reaches as much below the level of the discharge as its upper end is below the level of the spring,—the water pressure becomes equalized, and the flow stops. The remedy is very simple. Make a small hole or leak in the top of the pipe, at the summit, or highest point below the depression, and leave it open permanently for the escape of the air.—O. A. B., of N. Y.

GAS FOR TOY BALLOONS.—C. B. S. can make this gas by pouring slightly diluted muriatic acid upon an equal weight of zinc, in a covered vessel having a small tap or stop cock in the top for filling the balloons. The vessel should be made of lead, to prevent corrosion. It is impossible to estimate the amount of material, as the balloons generally vary greatly in size. He should be very careful with the gas; it is highly inflammable.—C. O. I., of Pa.

SKELETON LEAVES.—J. V. M., query 3, October 14, will find that strong vinegar will destroy all the pulpy matter of leaves, without injuring the fibrous parts. Leaves with woody fibers, such as those of the different species of ivy, require to be left in the vinegar for a fortnight or longer. The skeletons can be bleached by chlorine gas, of which commercial chloride of lime is the most convenient preparation for the purpose.—D. B., of N. Y.

ARTIST'S CANVAS.—J. T. M. C. can make a very cheap canvas by stretching a sheet of damp paper on a pane of glass or board, and, when partially dry, pasting on it four or five pieces of thin muslin, each piece being allowed to dry before another is put on; and all must be stretched very tight, and rubbed *smooth*. The paste should be made of isinglass rather than flour. Then cover it with white lead, using as *little* as possible, putting it on with a knife. After several days, give it a coat of paint and stipple it with a blender to give it a tooth. Leave it on the glass till the picture is finished.—E. S. S., of ——.

FORCE OF FALLING BODIES.—Let me inform J. E. that: As the accelerating influence of gravitation upon a falling body, and its retarding influence upon an ascending body, are equal, the force of the blow struck by the falling body, if all the force could be utilized, would be exactly enough to raise the body again to the place from which it fell. Hence, to find the force of a falling body, multiply its weight, in pounds, by the hight in feet from which it has fallen, and you have the force in foot pounds. And it may interest J. E. to know further that to find the striking force of a body moving in any direction, he may use the following formula: Divide the velocity, in feet, per second, by 8 (or, for greater accuracy, 8·04), and multiply the square of the quotient by the weight of the body. This gives the striking force in foot pounds.—W. H. P.

AQUARIUM CEMENT.—C. E. G. wishes to know how to make aquarium cement. Here is a receipt, which I think is good, taken from a newspaper: Take one part, by measure, of litharge, one of plaster of Paris, one of fine beach sand, and one of finely powdered rosin. When wanted for use, make into putty with boiled linseed oil.—E. M. D.

CORRECTION.—In publishing my answer to D. D. D., of N. Y., you made me say, "better not use back gear," or something near this: it should read: "better use back gear." It is essential that the speed be slow.—W. W. T., of N. Y.

INK STAINS ON LEATHER.—H. S., query 4, September 30, should try oxalic acid, or the so called salts of lemon. I have used the former, but it varies in its effect upon different leathers.—D. B., of N. Y.

HEATING SURAFCE OF BOILERS.—C. & H. A., query 1, Oct. 14, will find the following to be the proper proportions: For locomotive boilers, there should be about 80 square feet for each square foot of grate bars, and, on each square foot of grate bars, about 1 cwt. of coke or coal should be burned per hour. In stationary boilers, the number of square feet of heating surface required to evaporate a cubic foot of water per hour is about 70, in Cornish boilers; and the heating surface, to each square foot of fire grate, should be from 13 to 15 square feet in wagon boilers, and 40 square feet in Cornish boilers.—D. B., of N. Y.

BUGS ON PLANTS.—Insects and lice, infesting plants, may be effectually destroyed by the application of white hellebore in fine powder. —C. T., of Vt.

TENDER GUMS.—If your correspondent, W. W. G., will use common salt and a soft brush, when cleaning his teeth, his gums will soon get hard.—J. B. N., of Ohio.

TABLE CUTLERY.—The worst agent now known for the destruction of table cutlery, is the steel knife sharpener, recently invented, and in general use. I have been obliged to discard it, and to use the grindstone, as formally, and have no further trouble with my knives.—C. T., of Vt.

GRINDING CLAY.—Answer to D. H. S., Jr., query No. 15, Aug. 26. The means required are a pair of rollers, horizontally fixed on a substantial bed three or four feet in hight. One roller must travel faster than the other. A trough, with scrapers to throw down the detached clay, with suspended weights attached, will also be required.—J. M. Mc., of —.

CLOTH FOR BRICK HACKS.—D. H. S., Jr., query 16, August 26. Oil cloth or felting is used for this purpose, and should be nailed to strips of lathing, or better still, to iron strips bent at right angles, with a string to hook on to the bottom board of the hack.—J. M. Mc., of ——.

BURNING BRICK WITH WOOD.—D. H. S., Jr., query 17, August 26.—It is difficult to answer this query, without knowing the class of clay. J. M. McC., of ——.

Queries.

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

1.—TEMPERING SMALL STEEL GOODS.—How can I temper a piece of steel about four inches square and three fourths of an inch thick, with two holes in it, so as to keep the holes in shape, and the steel from cracking while tempering?—M. C. M.

2.—LINSEED OIL STAINS.—How can I take linseed oil stains out of rough cut stone or granite, without leaving any marks on the stone?—M. C. M.

3.—VARNISH FOR WALNUT FURNITURE.—How can I varnish old walnut furniture after rubbing it down with pumice stone? I get the surface smooth and clean, and apply varnish; but when it has dried, I find that it runs into holes as if the wood absorbed it in places. What filling can I use before varnishing? And how can I treat walnut so as to cave a bright gloss, without polishing with shellac polish?—M. C. M.

4.—CEMENT FOR IRON AND LEATHER.—What kind of cement shall I use to facten leather covering to iron pulleys, for running band saws upon?—E. D.

5.—PASTING GLAZED PAPER.—Is there any substance which will destroy the acid in flour paste, and further the drying of it when used on glazed paper? I think the acid and slow drying destroy all the glaze on paper. I have used hot and cold glue, gum arabic, and gum tragacanth, but they are too expensive for general use.—F. S.

6.—MARBLEIZING SLATE.—What is the process and the kind of material used for marbleizing slate? Is the art common to the public, or is it secured by patent? Has the patent expired?—T. S.

7.—CLEANING ZINC.—How can I clean zinc in ice chests to bring it back to its original color? What shall I use, and how shall I use it?—W. H. W.

8.—BUTTER WEED FOR PAPER MAKING.—Will some one of your readers inform me if the weed known as butter weed (which grows spontaneously upon all of our new rich lands to the extent of three to four tuns per acre) can be used for the manufacture of paper, or for any other purpose? If so, what is the probable value per tun?—W. M. B.

9.—AEROSTATIC TOY.—A neat toy is often constructed thus: Take a large currant, thrust a pin through its center, place it carefully upon the upper end of a dandelion stem or other small tube, holding the other end in the mouth, blow a strong, continuous blast, and the currant will remain suspended in the air as long as you continue to blow, even when the tube is considerably inclined from the perpendicular. What is the explanation? Has the principle, upon which it depends, been applied to any practical purpose?—H. T.

10.—IMITATION AMBER COMB.—Can any one give me the *modus operandi* of making such an imitation?—S. B. I.

11.—CONTENTS OF A PYRAMID.—Is there any rapid method of computing the number of cannon balls in a triangular pyramid?—T. G. T.

12.—FALLING BODIES.—T. E. N. E., of Mass., in answer to query of J. E., Sept. 2d, gives: T equals the square root of Q S divided by G; as a formula applicable to falling bodies, in which Q equals the quantity of matter. Will he explain what the quantity of matter has to do with a falling body, apart from its momentum, especially in a vacuum? He speaks of space, velocity, quantity, and time without designating whether he means feet or inches, minutes or seconds, pounds or tuns; and in case J. E. gets a single one wrong, the formula will mislead him.—H. A. W.

13.—STAINS ON GILDING.—I have got a French gilt mantelpiece clock on which are a number of spots, which look like verdigris. Can any of your numerous correspondents tell me how to get rid of these? The clockmakers I have taken it to say they can do nothing with it.—A. M

14.—CLEANSING THE HAIR.—What is the best method of cleansing the hair of gum or dirt, without injury to the hair or scalp? This is asked by many engineers who are often compelled to work all the week and late on Saturday night, making a visit to the barber impossible. Also, what preparation is commonly used by barbers for shampooing?—H. L. J.

15.—VINEGAR FROM SOUR ALE.—Can any of your correspondents give me a good recipe for making sour ale into vinegar?—C. H. F.

16.—BACK PRESSURE IN EXHAUST PIPE.—We run our exhaust steam from a 150 horse Corliss engine, through 1,200 feet of five inch steam pipe. The pipe runs from one end of the dry house to the other twelve times, the turns being made by elbows of the same size as the pipe. At the end the steam is allowed to exhaust in the open air without any check. Query—Is there any appreciable back pressure? If so, how much? —J. W. H.

17.—ALLOY.—How can I make an alloy that will melt at 1,000 degrees, which will possess sufficient strength to make a steam cylinder, three inches in diameter, to withstand a pressure of fifty pounds?—J. B. N.

18.—PROPORTIONS OF STEAM BOILER.—If a steam boiler of four feet diameter and one fourth inch plate will stand a pressure of sixty pounds, is it not reasonable to conclude that a bhiler one foot in diameter and one sixteenth inch plate will stand the same strain with equal safety?—J. B. N.

19.—PRESERVING SHINGLES.—Can any one furnish a recipe for a wash to apply to shingles to prevent decay?—J. M. G.

20.—PROPORTIONS OF CYLINDER.—Can any one solve the following problems: Given the hight and number of gallons of a cylindrical vessel, to find the diameter. Given the diameter and number of gallons of a cylindrical vessel, to find the hight. Given the area of a circle, to find the diameter (in feet and inches).—W. G. N.

Declined.

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

BOILER EXPLOSIONS.—C. E. G.—W. M.
CANAL BOATS.—W. W. R.
COIL OF PIPE.—B. G.
ETHER CONTROVERSY.—C. T. J.
INFLUENCE OF COLOR IN DEVELOPING LIFE.—C. F. P.
METAPHYSICAL ARTICLES.—F. G.
NARROW GAGE RAILWAYS.—J. P.
PAINE'S ELECTRO-MOTOR.—S. J. K.
PROPERTY IN INVENTIONS.—J. E. S.
SELF-ACTING BLOWPIPE.—W. J. C.
THE GULF STREAM.—J. P. W.

Official List of Patents.

ISSUED BY THE U. S. PATENT OFFICE.

FOR THE WEEK ENDING OCTOBER 10, 1871.

Reported Officially for the Scientific American.

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119,684.—HARNESS.—I. H. Alexander, Newfield, N. Y.
119,685.—STEAM ENGINE.—J. F. Alexander, Shelby, N. C.
119,686.—TREADLE.—R. N. Allen, Pittsford, Vt.
119,687.—POTATO PLANTER.—L. A. Aspinwall, N. Y.
119,688.—BED.—F. P. Baldwin, C. T. Segar, Utica, N. Y.
119,689.—SPIKE MACHINE.—M. Belknap, Philadelphia, Pa.
119,690.—SEWING MACHINE.—R. Blees, Brooklyn, N. Y.
119,691.—HEEL.—E. P. Bray, Elizabeth, N. J.
119,692.—SADDLE BOX.—W. H. Brough, Coatesville, Pa.
119,693.—ROLLING MILL.—W. H. Brough, Coatesville, Pa.
119,694.—EVAPORATOR, ETC.—F. G. Butler, Bellows Falls, Vt
119,695.—TURNING, ETC.—R. M. Clapp, Vergennes, Vt.
119,696.—SAW FRAME.—W. Clemson, Mid letown, N. Y.
119,697.—HARNESS.—C. H. Drury, Osceola, Ill.
119,698.—CANOPY.—J. Ellisdon, Liverpool, Eng.
119,699.—LIQUID METER.—N. Finck, Elizabeth, N. J.
119,700.—SAUSAGE STUFFER.—C. Forschner, New York city
119,701.—SAWING MACHINE.—J. Groat, Peru, Ind.
119,702.—BENDING WOOD.—G. staf Gustafson, Chicago, Ill.
119,703.—IRONING TABLE.—C. C. Hardy, Rutland, Vt.
119,704.—RAISIN SEEDER.—J. Harrington, New London, Conn.
119,705.—CUSPADORE.—E. A. Heath, New York city.
119,706.—CUSPADORE.—E. A. Heath, New York city.
119,707.—POLISHER.—C. H. Helms, Poughkeepsie, N. Y.
119,708.—CLOTH PRESSER.—P. Howe, Boston, Mass.
119,709.—WATER METER.—H. J. Hyams, Pittsburgh, Pa.
119,710.—INLAYING.—J. W. Hyatt, Jr., Albany, N. Y.
119,711.—STAPLE MACHINE.—W. Malick, Erie, Pa.
119,712.—HARVESTER. L. J. McCormick, W. R. Baker, Chicago, Ill.
119,713.—FIRE ALARM.—J. N. Pitts, J. E. Russell, Niagara, N. Y.
119,714.—WATER METER.—A. O'Leary, Iowa City, Iowa.

119,715.—STAMP.—G. Pardy, San Francisco, Cal.
119,716.—BENDING TIRES.—D. F. Pomeroy, Painesville, Ohio
119,718.—STOVE.—A. C. Rand, Chicago, Ill.
119,719.—STOVE.—A. C. Rand, Chicago, Ill.
119,720.—HYDROCARBON BURNER.—A. C. Rand, Chicago, Ill.
119,721.—HAY RAKE.—M. C. Remington, Weedsport, N. Y.
119,722.—CARRIAGE CURTAIN.—W. H. Rhodes, Lancaster, Pa.
119,723.—FIRE BRICK.—E. F. Rogers, Chelsea, Mass.
119,724.—TREADLE.—H. C. Smith, Cleveland, Ohio.
119,725.—HOLLOW WARE.—N. Thompson, Brooklyn, N. Y.
119,726.—PLIERS.—N. Thompson, Brooklyn, N. Y.
119,727.—BED BOTTOM.—C. Van Deusen, Clarksville, N. Y.
119,728.—BUGGY TOP.—J. B. Weller, Bellbrook, Ohio.
119,729.—GRAPPLE.—H. Whitall, Philadelphia, Pa., and J. Burson, Yates City, Ill.
119,730.—SASH HOLDER.—E. S. Wills, Philadelphia, Pa.
119,731.—COTTON PRESS, ETC.—J. M. Albertson, New London, Ct.
119,732.—CHAIR.—W. Aldrich, Proctorsville, A. F. Spaulding, Northfield, Vt.
119,733.—CUTTER.—C. C. G. Armerling, Philadelphia, Pa.
119,734.—HOOF PARER.—I. Baker, Long Branch, Mo.
119,735.—MOVEMENT.—A. Benneckendorf, Hoboken, N. J.
119,736.—WAGON BRAKE.—G. M. Bennett, Burlington, Iowa.
119,737.—STENCIL PLATE.—H. Bolthoff, Central City, Col.
119,738.—COAL SCUTTLE.—J. A. Bragaw, New York city.
119,739.—KNOB.—J. Britton, Williamsburgh, N. Y.
119,740.—CURTAIN FIXTURE.—N. Campbell, Rochester, N.Y.
119,741.—SHANK LASTER.—O. R. Clark, La Fayette, Ind.
119,742.—RAISING VESSELS.—T. Collier, New York city.
119,743.—BOARDING LEATHER, ETC.—O. Coogan, Pittsfield, Ms.
119,744.—CANAL BOAT.—O. Coogan, Pittsfield, Mass.
119,745.—BROOM NEEDLE.—G. M. Cowardin, Gardner, Tenn.
119,746.—GRINDING MILL.—W. H. Culver, West Troy, N. Y.
119,747.—DRYING ROOM.—R. Dalrymple, Galt, Canada.
119,748.—INHALER.—E. E. Duncanson, Chicago, Ill.
119,749.—STUD.—W. R. Dutemple, Providence, R. I.
119,750.—CULTIVATOR.—D. B. Eberly, Pine, Ind.
119,751.—LUBRICATOR.—E. Ehlin, San Francisco, Cal.
119,752.—WIRE BRUSH.—F. F. Field, Stapleton, N. Y.
119,753.—PHOTOGRAPH.—C. A. Gale, Piqua, Ohio.
119,754.—CHAIR.—W. Gardner, Glen Gardner, N. J.
119,755.—VALVE.—F. Glasson, New York city.
119,756.—DEODORIZER.—P. N. Goux, Paris, France.
119,757.—VALVE.—S. E. Griscom, Mahanoy Plane, Pa.
119,758.—LOCK.—F. Gyss, New York city.
119,759.—DITCHING MACHINE.—O. F. Hale, Irvington, Iowa.
119,760.—PIANOFORTE.—A. H. Hastings, New York city.
119,761.—GAS HEATER.—J. P. Hayes, Philadelphia, Pa.
119,762.—STREET LANTERN.—M. A. Heath, Providence, R. I.
119,763.—ELECTRIC BATTERY.—V. Himmer, New York city.
119,764.—RAM.—C. Hodgkins, Marlborough, N. H.
119,765.—SLING.—F. Hohorst, New York city.
119,766.—RAILWAY CAR.—K. E. Holmes, Cambridgeport, Mass.
119,767.—LOCK NUT.—W. P. Horton, Milwaukee, Wis.
119,768.—DUST RING.—G. Hunt, Springfield, Mass.
119,769.—SLIDE VALVE.—C. H. Hutchinson, Concord, N. H.
119,770.—EXTRACTOR.—W. H. Ives, Luzerne, N. Y.
119,771.—PRESS.—J. B. Jones, Williamsburgh, N. Y.
119,772.—SOAP.—C. R. Kicherer, Brooklyn, N. Y.
119,773.—CHANDELIER CENTER.—J. Kiatz, West Meriden, Ct.
119,774.—HORSE POWER.—J. W. Knox, Winona, Miss.
119,775.—COLLAR.—H. A. Lee, New York city.
119,776.—FRUIT BOX.—E. D. Lewelling, San Lorenzo, Cal.
119,777.—DOUBLE TREE.—A. Lomax, Laporte, Ind.
119,778.—TANNERS' WHEEL.—P. Lull Norwich, N. Y.
119,779.—SAP BUCKET.—R. Marshall, Hobart, N. Y.
119,780.—CENTER.—J. Meah, Meriden, Conn.
119,782.—COMPOUND.—F. M. Moore, Chico, Cal.
119,783.—FLOUR BOLT.—T. G. Morgan, Murfreesboro', Tenn.
119,784.—SEWING MACHINE.—C. Parham, Philadelphia, Pa.
119,785.—CANDLE BURNER.—J. A. Pease, Catskill, N. Y.
119,786.—CULTIVATOR.—F. L. Perry, Canandaigua, N. Y.
119,787.—STOVE GRATE.—J. A. Price, Scranton, Pa.
119,788.—WHEEL.—W. F. Ray, Fort Wayne, Ind.
119,789.—SLIDE VALVE.—J. Rigby, J. Holt, Marquette, Mich.
119,790.—LOCOMOTIVE.—A. M. Rodgers, Brooklyn, N. Y.
119,791.—PAN SCRAPER.—G. Scherer, Boston, Mass.
119,792.—CANAL BOAT.—C. Schilling, New York city.
119,793.—STOOL.—C. A. Schindler, Hoboken, N. J.
119,794.—DESK.—A. Schlag, Brooklyn, N. Y.
119,795.—ICE MACHINE.—C. A. Seely, New York city.
119,796.—ENDLESS SIDEWALK.—A. Speer, Passaic, N. J.
119,797.—ROTARY ENGINE.—J. Scott, Burlington, Iowa.
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119,799.—DUMPING GRAIN.—J. Sypes, Fairbury, Ill.
119,800.—BRAKE.—T. Thorn, St. Clair, Pa.
119,801.—PEAT MACHINE.—W. S. Tisdale, New York city.
119,802.—BOTTLE OPENER.—C. B. Trimble, New York city.
119,803.—HUB.—O. Vanorman, Fond du Lac, Wis.
119,804.—SLEIGH.—R. Webb, Star Prairie, Wis.
119,805.—SHUTTER.—J. Weed, Muscatine, Iowa.
119,806.—FRUIT BOX.—C. W. Weston, San Francisco, Cal.
119,807.—HANDLE.—J. G. Wilbur, H. H. Hulbert, Kilbourne, Wis.
119,808.—SMOKE STACK.—E. H. Winchell, New York city.
119,809.—VENTILATOR.—E. H. Winchell, New York city.
119,810.—TURNING LEAVES.—A. Altenburg, G. J. Lambrix, Buffalo, N. Y.
119,811.—WHEEL.—E. Ball, Jr., Canton, Ohio.
119,812.—COMPOUND.—R. Bevill, Bowie County, Tex.
119,813.—SAW BLADE.—B. S. Bishop, Menasha, Wis.
119,814.—SEWING MACHINE.—O. C. Blakemore, Zanesville, O.
119,815.—BRUSH.—C. Brintzinghoffer, Philadelphia, Pa.
119,816.—HEATER.—G. F. Burkhardt, Boston, Mass.
119,817.—CONDENSER, ETC.—A. Cail, Paris, France.
119,818.—LARD COOLER.—A. E. Camp, C. L. Reid, Louisville, Ky.
119,819.—RUNNING GEAR.—E. P. Carter, Arcade, N. Y.
119,820.—SHINGLE BAND.—C. B. Choate, East Saginaw, Mich.
119,821.—MOVEMENT.—A. Clark, Albany, Ill.
119,822.—TANNING.—J. W. Coburn, Walpole, E. F. Winslow, Dedham, Mass.
119,823.—SPRING.—J. W. Cochran, New York city.
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119,825.—INDUCTION COIL.—D. M. Cook, Mansfield, Ohio.
119,826.—ANIMAL TRAP.—J. F. Coppock, Dexter, Iowa.
119,827.—PAPER CUTTER.—E. Cowles, Cleveland, Ohio.
119,828.—TRAY.—D. M. Cummings, Enfield, N. H.
119,829.—RAILWAY TIE.—J. P. Dirner, Honesdale, Pa.
119,830.—COMPOSITION.—C. G. Dodge, Marshall, Mich.
119,831.—AXLE.—E. Doty, G. W. Miltimore, Janesville, Wis.
119,832.—FIRE BOX.—J. Durand, Columbus, Ohio.
119,833.—CLOCK.—S. F. Estell, Chicago, Ill.
119,834.—FIRE ARM.—G. H. Ferriss, Utica N. Y.
119,835.—STEAM BOILER.—C. G. Fisher, Washington, D. C.
119,836.—PAVEMENT.—M. Fitzgibbons, New York city.
119,837.—TOOL.—S. J. Forbes, Marshalltown, Iowa.
119,838.—PIPE WRENCH.—D. Frank, T. Snyder, Allentown, Pa.
119,839.—BURNER.—T. S. Gates, A. H. Fritchey, Columbus, O.
119,840.—CHURN.—J. Gire, Louden City, Ill.
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119,843.—PAPER.—B. E. Hale, New York city.
119,844.—HOOP.—E. C. Hamlin, Pavilion, N. Y.
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119,847.—CAR.—C. L. Hoag, E. Ely, Lockport, N. Y.
119,848.—LOOM.—J. Holding, J. Eccles, Manchester, Eng.
119,849.—CHAIR.—C. A. Jackson, Boston, Mass.
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119,853.—MATTRESS.—W. B. Judson, Poughkeepsie, N. Y.
119,854.—HORSE NAIL.—E. W. Kelley, Hamilton, Scotland.
119,855.—BATTERY.—J. Kidder, New York city.
119,856.—DUMPING CAR.—S. D. King, Middletown, N. Y.
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119,858.—WATCH.—J. Laurent, New York city.
119,859.—WASHING MACHINE.—J. H. Lee, Marshall, Texas.
119,860.—BREAST PIN.—J. A. Lehman, Philadelphia, Pa.
119,861.—BREAD CUTTER.—C. Lemke, Cincinnati, Ohio.
119,862.—BED BOTTOM.—G. D. Leonard, Chicago, Ill.
119,863.—AXLE.—W. A. Lewis, Chicago, Ill.
119,864.—AXLE, ETC.—W. A. Lewis, Chicago, Ill.
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119,885.—CHIMNEY COWL.—J. G. Roth, New York city.
119,886.—SUGAR.—J. Schroder, Petschek, Austria.
119,887.—LAMP.—I. W. Shaler, Brooklyn, N. Y.
119,888.—UMBRELLA.—J. Shepherd, New Britain, Conn.
119,889.—WATCH.—H. B. Smith, R. Folsom, Cincinnati, Ohio.
119,890.—CLEANER.—I. Smith, New York city.
119,891.—INDICATOR.—J. S. Smith, Middletown, Conn.
119,892.—BROILER.—O. J. Smith, Wauwatosa, Wis.
119,893.—FIRE KINDLER.—R. P. Smith, Dubuque, Iowa.
119,894.—BOOK BINDING.—D. M. Smyth, Orange, N. J.
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119,896.—TONGUING MACHINE.—D. F. Sutton, B. Meilink, Toledo, Ohio.
119,897.—COUPLING.—J. B. Tracy, Lincoln, Del.
119,898.—CHURN.—A. Traver, P. Nichols, Troy, N. Y.
119,899.—MAGNETIC MOTOR.—M. H. Utley, A. Ross, Montreal, Can.
119,900.—PUNCHER.—W. H. Van Cleve, Ypsilanti, Mich.
119,901.—DREDGER.—I. D. Vandecar, Chicago, Ill.
119,902.—BLASTING.—A. W. Von Schmidt, San Francisco, Cal.
119,903.—DRYER.—C. H. Wakelee, San Francisco, Cal.
119,904.—CULTIVATOR.—H. Weld, Black Walnut, Ill.
119,905.—INSECT TRAP.—T. Wier, Lacon, Ill.
119,906.—HORSE BOOT.—R. Williams, Philadelphia, Pa.
119,907.—CARRIAGE SPRING.—D. D. Wisell, Zanesville, Ind.
119,908.—CUT OFF.—W. Wright, New York city.
119,909.—HORSE POWER.—W. R. Wright, Barnwell Co., and D. A. Warnock, Beaufort Co., S. C.
119,910.—CUTTING STONE.—H. Young, Stamford, Conn., J. T. Young, New York city.

REISSUES.

4,579.—CLEANING RICE, ETC.—W. Ager, Washington, D. C.,—Patent No. 18,177, dated Sept. 15, 1857; extended seven years.
4,580.—HARNESS.—J. Bauer, Newark, N. J.—Patent No. 116,536, dated July 4, 1871.
4,581.—CULTIVATOR.—T. F. Bertrand, P. Sames, Rockford, Ill.—Patent No. 60,916, dated Jan. 1, 1867; reissue No. 4,209, dated March 28, 1871.
4,582.—HARVESTER.—E. D. Buckman, Philadelphia, Pa., S. A. Simson, Hoosick Falls, N. Y.—Patent No. 16,957, dated April 7, 1857; extended seven years.
4,583.—MOVEMENT.—J. Hanley, New York city.—Patent No. 18,845, dated Dec. 15, 1857.
4,584.—AXLE.—W. A. Lewis, Chicago, Ill.—Patent No. 108,607, dated Oct. 25, 1870.
4,585.—Division A.—BASE BURNER.—D. G. Littlefield, Albany, N. Y.—Patent No. 30,333, dated Oct 9, 1860; antedated July 3, 1860; reissue No. 1,303, dated April 22, 1862.
4,586.—Division B.—GRATE.—D. G. Littlefield, Albany, N. Y.—Patent No. 30,333, dated Oct. 9, 1860; antedated July 3, 1860; reissue No. 1,303, dated April 22, 1862.
4,587.—PACKING.—W. H. Miller, Philadelphia, Pa.—Patent No. 73,454, dated Jan. 21, 1868.
4,588.—INDUCTION COIL.—P. W. Page, Washington, D. C.—Patent No. 76,654, dated April 14, 1868.
4,589.—TRUSS.—J. W. Riggs, Brooklyn, N. Y.—Patent No. 22,674, dated Jan. 18, 1859.
4,590.—SPRINKLING CART.—P. Rodenhausen, Philadelphia, Pa.—Patent No. 67,805, dated August 13, 1867.
4,591.—ARTIFICIAL ASPHALT.—A. B. Vandemark, Jersey City, N. J.—Patent No. 117,946, dated August 8, 1871.

DESIGNS.

5,307.—SUGAR TONGS.—J. Hall, 2d, Wallingford, Conn.
5,308.—SASH HOLDER.—A. W. Lawrence, Raleigh, N. C.
5,309 to 5,311.—OIL CLOTH.—C. T. Meyer, Lyon's Farm, N. J.
5,312.—TABLE CASTER.—D. Sherwood, G. D. Dudley, Lowell, Mass.
5,313.—SEWING MACHINE COVER.—J. Wilson, Boston, Mass.

Inventions Patented in England by Americans.

September 19 to September 25, 1871, inclusive.

[Compiled from the Commissioners of Patents' Journal.]

BRUSH.—C. D. Rogers, Utica, N. Y.; M. P. Wilkins, Jersey City, N. J.; H. A. Harvey, Orange, N. J.
FIRE ARM.—F. J. Abbey, J. H. Foster, Chicago, Ill.
GLASS LIGHT.—V. E. Mauger, New York city.
LUBRICATOR.—J. Harper, New Haven, Conn.
PICK, ETC.—C. A. Hardy (of Philadelphia, Pa.), and A. E. Stayner (of Halifax, N. S.), Sheffield, and J. Harrison, Eastwood, England.
PLAITING MACHINE.—G. E. King, New York city.
PREPARED PAPER.—S. S. Lewis (of Boston, Mass.), London, England.
QUILTING MACHINE.—W. J. Tate, H. R. Mitchell, Philadelphia, Pa.
SHAFTING PICKS, ETC.—C. A. Hardy (of Philadelphia, Pa.), and A. E. Stayner (of Halifax, N. S.), Sheffield, England.
SPRING.—B. Hershey, E. Geer, R. Dudley, R. F. Gaggin, Erie, Pa.
TYING PARCELS.—M. A. Mauger, New York city.
TYPE COMPOSING AND DISTRIBUTING MACHINE.—V. E. Mauger, N. Y. city.
VALVE MOTION.—W. Livingstone, Brooklyn, N. Y.

APPLICATIONS FOR EXTENSION OF PATENTS.

MOWING MACHINE.—Henry Fisher, Canton, Ohio, has petitioned for an extension of the above patent. Day of hearing, December 27, 1871.

CARPENTER'S RULE.—L. C. Stevens, Pleasant Valley, Conn., has petitioned for an extension of the above patent. Day of hearing, December 27, 1871.

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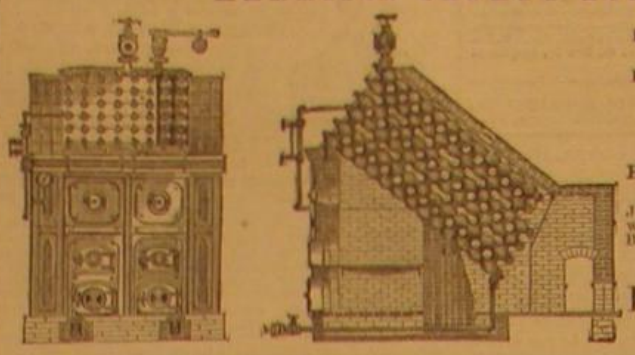

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PROPOSED MONUMENT IN ATHENS TO COMMEMORATE GREEK INDEPENDENCE.

On the anniversary of the declaration of the independence of Greece, this year, King George announced his intention to erect a monument, to commemorate the event, in the Square of Concord, at Athens: and he charged Mr. Ziller, the architect of the Academy, to prepare a design for carrying into effect the project of a monument which his Majesty had formed. This design we now publish.

The principal figure on the summit of the monument represents Hellas. The four seated figures on the base represent the four territorial divisions of the Hellenic kingdom —Northern Greece, Peloponesus, the Archipelago, and the Ionian islands. The circular frieze round the base is composed of the most memorable scenes of the history of Greek independence. Among these representations are: Germanos, the archbishop of Patras, raising and blessing the standard of independence on the 25th of March (6th of April), 1821; the siege of Missolonghi, the battle of Navarino, the arrival of Capodistrias, and the landing of King Otho.

Two inscriptions are placed on the column: "The Nation to its Liberators," "Union gives Strength."

The monument will be of pure Pentelic marble, 60 feet high, occupying a commanding position, visible from the six principal streets of Athens, and at the termination of that which runs in a straight line from the Piræus.

The foundation stone will be laid next year, on the fiftieth anniversary of Greek independence. Invitations will be sent to the Greeks in every part of the world to attend the ceremony, which, it is hoped, will inaugurate a period of future progress as well as commemorate past glory.

The monument is to be raised by subscription, and subscriptions will be received by all the Greek consuls.

PROPOSED MONUMENT IN ATHENS TO COMMEMORATE GREEK INDEPENDENCE.

Boiler Incrustation.

Water is rendered hard by the presence of earthy salts, such as carbonate of lime and magnesia, and these are kept in solution by the aid of the free carbonic acid gas which the water contains. By boiling, the gas is expelled and the salts precipitated, when they appear as a crust on the bottom and sides of the vessel, as may be seen in any old teakettle where hard water has been habitually used.

Dr. J. G. Rogers, in an important paper read at the recent meeting of the American Association for the Advancement of Science, after enumerating the various substances which, in boiler waters, contribute toward the formation of this crust, gives us some valuable practical information concerning the effect of the crusts upon the boilers, and how their formation may be prevented. Both dissolved and suspended matters are thrown down by boiling and evaporation, and slowly accumulate as a whitish, tough, porcelain like layer, which may attain an unlimited thickness. The evil effects of this formation are due to the fact that it is a poor conductor of heat. Its conducting power, compared with that of iron, is as one to thirty-seven and a half. This known, it is readily appreciated that more fuel is required to heat water through scale and iron than through iron alone. It has been demonstrated that a scale one sixteenth of an inch thick requires the extra expenditure of fifteen per cent more fuel. As the scale thickens the ratio increases: thus when it is one fourth inch thick, sixty per cent more fuel is required; at one half inch, one hundred and fifty per cent, and so on. To raise steam to a working pressure of ninety pounds, the water must be heated to 320 deg. Fah. This may be done through a one fourth shell by heating the external surface to about 325 deg. Fah. If a one half inch scale intervenes, the boiler must be heated to 700 deg. Fah., almost a low red heat. The higher the temperature at which iron is kept, the more rapidly it oxidizes; and at any temperature above 600 deg. it soon becomes granular and brittle from carbonization or conversion into the state of cast iron. Weakness of boiler thus produced predisposes to sudden explosions, and makes expensive repairs necessary. To prevent the formation of scale, the author recommends the use of tannate of soda. This is put into the boiler at regular intervals in amounts proportioned to the hardness of the water. It quickly dissolves, and, without foaming or injury to the boiler, effectively accomplishes the desired result. In the reaction which takes place, the tannic acid leaves the soda and combines with the lime of the carbonates to form tannate of lime. This is precipitated as a light, flocculent, amorphous substance, which does not subside, but eventually finds its way to the mud receiver, in the comparatively still water of which it is deposited as a mushy sediment that may be readily blown off as often as required. The sulphate of lime is decomposed by the carbonate of soda of the first reaction, soluble sulphate of soda and carbonate of lime being formed. The latter is converted into tannate of lime by fresh portions of the tannate of soda. The presence of the alkali prevents all action of the acid on the iron. Extensive trial of this method has demonstrated its utility in all kinds of boilers, and its efficacy, safety, economy, ease of application, and adaptability, will commend it for general use.—*Galaxy.*

THE LATE REV. W. V. HARCOURT'S RESEARCHES ON GLASS.

Abstract of a Paper read by Professor Stokes, British Association, 1871.

My own connection with these experiments commenced at the meeting of the Association at Cambridge in 1862, when Mr. Harcourt placed in my hands some prisms formed of the glasses which he had prepared, to enable me to determine their character as to fluorescence. I was led incidentally to observe the fixed lines of the spectra formed by them; and as I used sunlight, which he had not found it convenient to employ, I was enabled to see further into the red and violet than he had done, which was favorable to a more accurate determination of the dispersive powers. This inquiry, being in furtherance of the original object of the experiments, seemed far more important than that as to fluorescence, and the increased definiteness caused Mr. Harcourt to resume his experiments with the liveliest interest, an interest which he kept up to the last. Indeed, it was only a few days before his death that his last experiment was made. To show the extent of the inquiry I may mention that at least 166 masses of glass were found, and cut into prisms for measurement, each mass doubtless involving, in many cases, several preliminary experiments, besides disks and masses for other purposes.

It is well known how difficult it is, in working on a small scale, to make glass which is free from striæ and imperfections of the kind. Of the first group of prisms, 28 in number, 10 only showed a few of the principal dark lines of the solar spectrum; the rest had to be examined by the bright lines in artificial sources of light. These prisms seemed to have been cut at random by the optician from the mass of glass furnished to him. Theory and observation alike showed that striæ interfere comparatively little with an accurate determination of refractive indices when they lie in planes perpendicular to the edge of the prism Accordingly, in the rest of the research, the prisms were formed from the glass mass, that came out of the crucible, by cutting two planes passing through the same horizontal line a little behind the surface, and inclined 22½° right and left of the vertical, and polishing the inclosed wedge of 45°. In the central portion of the mass, the striæ have a tendency to arrange themselves in nearly vertical lines by the operation of currents of convection; and by cutting, in the manner described, the most favourable direction of the striæ is secured for a good part of the prism. This attention to the direction of cutting, combined no doubt with increased experience in the preparation of glass, was attended with such good results that now it was quite the exception for a prism not to show the principal lines. Some of the latest prisms were almost equal to prisms of good optical glass.

On account of the difficulty of working with silicates, arising from difficult fusibility and the pasty character of the glasses, Mr. Harcourt's experiments were carried on with phosphates, combined in many cases with fluorides and some times with borates, tungstates, molybdates, and titanates. The glasses formed involved the elements potassium, sodium, lithium, barium, strontium, calcium, glucinium, aluminium, magnesium, manganese, zinc, cadmium, tin, lead, thallium, nickel, chromium, uranium, bismuth, antimony, tungsten, molybdenum, titanium, vanadium, phosphorus, fluorine, boron, and sulphur. A very interesting subject of inquiry presented itself collaterally with the original object, namely, to ascertain whether glasses could be formed which would achromatise each other so as to exhibit no secondary spectrum, or a single glass, which would form, with crown and flint, a combination achromatic in that sense. This inquiry presented considerable difficulties. The dispersion of a medium is small compared with its refraction, and if the dispersion be regarded as a small quantity of the first order, the irrationality between the two media may be regarded as depending on small quantities of the second order. If striæ and imperfections of the kind present an obstacle to a very accurate determination of dispersive power, it will readily be understood that the errors of observation thus occasioned go far to swallow up the small quantities, in the observation of which the determination of irrationality depends. Accordingly little success attended the attempt to draw satisfactory conclusions as to irrationality from the direct observation of refractive indices; but by a particular mode of compensation, in which the experimental prism was achromatised by a prism built up of a combination of slender prisms of crown and flint, I was enabled to draw trustworthy conclusions as to the character, in this respect, of these prisms, which were good enough to show a few of the principal dark lines of the solar spectrum.

Theoretically any three different kinds of glass may be made to form a combination which shall be achromatic as to secondary as well as primary spectra; but for a long time little hope of a practical solution seemed to present itself. A prism containing molybdic acid was the first to give fair hopes of success. Mr. Harcourt warmly entered into the subject, which he prosecuted with unwearied zeal. The earlier molybdic glasses prepared were, many of them, rather deeply colored, and most of them of a perishable nature. At last, after numerous experiments, molybdic glasses were obtained, nearly free from color, and permanent. Titanium had not yet been tried, and about this time a glass containing titanium was prepared. Titanic acid proved to be equal or superior to molybdic in its power of extending the blue end of the spectrum more than corresponds to the dispersive power of the glass; while in every other respect—freedom from color, pernanence of the glass, greater abundance of the element—it had a decided advantage; and a great number of titanic glasses were prepared, cut into prisms, and measured. Some of these led to the suspicion that boracic acid had an opposite effect to titanic, to test which Mr Harcourt formed some simple borates of lead, with very varying proportions of boracic acid. These fully bore out the expectation; the terborate, for instance, which in dispersive power nearly agrees with flint glass, agrees on the other hand, in the relative extension of the blue and red ends of the spectrum, with a combination of about one part (by volume) of flint glass with two of crown.

By combining a negative (or concave) lens of terborate of lead with positive lenses of crown and flint, or else a positive lens of titanic glass with negatives of crown and flint, or a positive of crown and a negative of low flint, achromatic triple combination, free from secondary dispersion, might be formed, without encountering formidable curvatures, and by substituting at the same time a borate of lead for flint glass, and a titanic glass for crown, the curvatures might be a little further reduced.

There is no advantage in using three different kinds of glass rather than two to form a fully achromatic combination, except that the latter course might require the two kinds of glass to be made to order, whereas with three we may employ, for two of them, the crown and flint of commerce. It is probable that enough titanium might be introduced into a glass to allow the glass to be properly achromatised by Chance's "light flint."

In a triple combination of lenses, the middle lens may be made to fit both the others, and be cemented. Terborate of lead, which is somewhat liable to tarnish, might thus be protected by being placed in the middle. Even if two kinds only of glass be used, it is desirable to divide the concave lens into two for the sake of diminishing the curvatures. On calculating the curvatures so as to destroy spherical as well as achromatic aberration, and at the same time, to make the adjacent surface fit, very suitable forms were obtained with the data furnished by Mr. Harcourt's glasses.

After encountering great difficulties from striæ, Mr. Harcourt at last succeeded in preparing disks of terborate of lead and of a titanic glass, of about 3 in. diameter, almost homogeneous, and with which it is intended to attempt the construction of an actual object glass, which shall give images free from secondary colour.

HORSE SHOEING.

By G. FLEMING, Royal Engineers, Chatham, England.

The horse's foot is a most wonderful piece of mechanism, and excites far more surprise and admiration than the feet of all other creatures. So wonderful, indeed, is it, that any one who had not closely studied its structure and functions would scarcely believe the hard, insensible hoof could contain such a multiplicity of beautiful arrangements, all adapted to serve most important purposes, and to render this noble animal so useful to mankind. The bones are constructed and placed with a view to speed, lightness, and strength; ligaments of marvellous tenacity bind them together so firmly that disunion is all but impossible; while they are so ingeniously disposed as not to hinder, in the slightest degree, the remarkably swift and easy movements of the bones upon each other; elastic pads and cartilages are situated in those parts of the foot where they are most required to protect it from jar, and serve to compensate for the absence of the toes which are seen on the feet of all other creatures except the horse species. All these parts are covered by a living membrane, which envelopes them like a sock, and is exquisitely sensitive, in addition to being everywhere covered by fine networks of blood vessels in the greatest profusion. This membrane endows the foot with the sense of touch, without which the horse could not be so sure-footed, nor run with such astonishing speed; and it also furnishes the blood from which the hoof is formed. The hoof itself, so rough, insensible, and to all appearance scarcely worthy of observation, reveals a world of wonders after we have exhausted those to be found in its interior. It is made of fibres, all growing in one direction—towards the ground, and that direction the most favourable for sustaining strain. These fibres are extremely fine, and they are hardest and most resisting on the outer surface; each is a tube, composed of thousands of minute cells, so arranged as to confer strength and durability, while the tubular form of the fiber ensures lightness. Each part of the hoof has its own share of responsibility in protecting the living parts it contains. The *wall* is the portion we see when the horse is standing firmly on the ground. It grows from the upper part of the foot, the *coronet*; and this growth is always going on to counterbalance the wear that is taking place at its lower border. Its outer surface is beautifully dense and smooth in the natural state; and altogether the wall is perfectly adapted to meet the wear that occurs when the horse is running at liberty in an unshod state. This is also the part on which the shoe rests, and through which the farrier drives the nails that attach it.

When the foot is lifted up backwards, we see the sole and the frog. The sole is the part that lies within the wall; it is slightly hollow in a good foot, and is thick, strong and covered with flakes of loose horn in one which has not been pared by the farrier's knife. The frog is a soft triangular piece of horn in the middle of the sole, towards the heel. It is very elastic, and serves a most important purpose, as it acts as a cushion to prevent concussion, and also hinders the horse from slipping. The sole, frog, and lower border of the wall have all to come in contact with the ground and loose stones; therefore nature has furnished them with an abundance of horn to make them strong enough to bear the horse's weight, withstand wear, and keep the delicate parts inside from injury.

So long as the horse is not compelled to work on hard roads, its hoofs are well suited to all that is required of him; but our civilization demands that we should have paved and macadamized streets, and on these the hoofs would quickly be worn away, especially if the horse had to draw or carry heavy loads; consequently lameness would ensue. It is therefore absolutely necessary to prevent this mishap by shoeing the hoof with iron, as we shoe carriage wheels with tires, the ends of walking sticks with ferrules, &c. This shoeing has been a great boon to mankind, as it has rendered the horse a hundredfold more useful than he would otherwise be and has made him independent of the kind of road over which he has to travel.

The number of horses tortured and ruined by unreasonable paring and rasping, in addition to the heavy shoes, too small for the feet, and badly formed, is beyond computation. The frog and sole should never be pared; they flake off gradually when they have reached a certain and proper thickness; and as they have to come in contact with the inequalities of the ground, and with the loose sharp stones so frequently on its surface, is it not reasonable to urge that they should be allowed to retain their natural condition? Whoever pares, or causes to be pared, a horse's soles or frogs, is guilty of cruelty to the horse whose feet are so mutilated.

The front of the wall should never be rasped. It destroys it, and makes it thin and brittle. It ought to be allowed to retain its close, glossy, tough surface, so well adapted for resisting the weather and holding the nails. As the wall is always growing, and as the shoe prevents its being worn down to a natural length, when the old shoe is taken off, in the operation of shoeing, the lower end only of this part of the hoof should be rasped down until the excess of length has been removed; nothing more.

The shoes should be as light as possible, and fastened on with as small a number of nails as will retain them. They ought to be the full size of the circumference of the hoof, and the hoof should never be made to fit the shoe, but the shoe to fit the hoof.

A proper and rational method of shoeing is a boon to the horse and its owner; an improper method, which destroys the integrity of the hoof and wearies the limbs, is a curse and a torture to the one, and loss and annoyance to the other.

When horses go to be shod at a forge, care should be taken that they are not ill-treated or frightened, particularly young horses. By bad treatment, or unskillfulness in handling their legs and feet, they are frequently made so timid and vicious, that severe measures have to be resorted to, in order to ensure safety to the farrier while he is shoeing them. A few kind words, a few pats on the neck, a few gentle strokings of the limbs, and a little persuasive coaxing, will prove a thousand times more effectual in inducing horses to be patient in shoeing than all the harsh, loudpitched words, ard knocksch twitches on nose, and other unmeaning and unhorsemanlik, proceedings can do. A humane and intelligent farrier is a boon to every community; but one who is harsh, inobservant, and pays no attention to perfecting his most useful art, is a torturer of animals and a destroyer of property.

Farriers, of all men who have to do with horses, can confer upon these good creatures the greatest amount of relief and comfort, by attending to the simple indications of nature, and using their own common sense and judgment, instead of adhering to stupid and blind routine, which never improves, but, on the contrary, retrogrades. Every lover of the horse should see that its beauty is not deformed, or its utility marred by a system which is as outrageous to the meanest comprehension as it is disgraceful to the age we live in. The more we understand the Great Creator's merciful intentions, the less likely are we to thwart them.

Ice Fleas.

During a recent ramble upon the Morteratsch Glacier, turned over some of the isolated stones which lie upon its surface, partially imbedded in the ice; under many of them I found hundreds of a minute jet black insect, which jumped many times its own length at a single spring, in a manner somewhat resembling the performance of a common flea. The ice flea is about one twelfth of an inch long. Viewed through a pocket lens, it was seen to have six legs, supporting a body obscurely jointed like that of a bee, and furnished with two jointed antennæ. The total length of the insect appeared to be about six times its thickness, the antennæ being about one fourth as long as the body. The insects were not found under every stone; they generally occurred under flattish fragments of rock, presenting a surface of about a square foot, and having a thickness of from 2 to 4 inches. Stones of this size are sufficiently warmed by the sun's rays to melt the ice beneath them more rapidly than it is liquefied by the direct solar beams. A surface of rock absorbs luminous thermal rays better than does a surface of comparatively white ice, and it transmits these rays to the ice beneath it, partly by conduction and partly by radiation from its under surface. The stone thus melts its way an inch or two deep into the ice, forming for itself a kind of basin. Sometimes these cavities are watertight, and then any space between the stone and the walls of its basin is filled with water derived from the melting ice. Under such conditions I have never found any fleas beneath the stone. But occasionally the ice basin is drained, and it was under stones resting in such comparatively dry basins that the insects were found. In all cases, nearly the whole of the fleas were found upon the ice, very few being attached to the stones. They were grouped together in shoals, so that probably forty or fifty of them frequently rested upon a single square inch of ice. On removing the stones, the insects were very lively, but this might be owing to their sudden transition from comparative darkness to direct sunlight.

I saw no indications of food of any kind beneath the stones, but we have not to search far for a possible source of food The cold of the glacier benumbs and kills thousands of insects which alight upon its surface, and bees, wasps, flies, and moths are frequently seen dead upon the ice. Then there is the so called "red snow," and other allied organisms of similar habits, which may perhaps minister to the wants of this singular insect. Is the ice flea, like its irritating cousin, a nocturnal predatory insect, and does it issue from its abode at nightfall in search of frozen bees and butterflies?—*E. Frankland, in Nature.*

PAPER MAKING IN JAPAN.

[Condensed from the Mechanics' Magazine.]

A parliamentary report on paper making in Japan, consisting of information supplied by the English Consuls in that country, which has been recently issued, is illustrated by a number of rough but very effective colored sketches, designed to elucidate the details of the various processes of manufacture described.

The extent of the paper manufacture in Japan may be estimated from the fact that, in the report before us, Consul Lowden gives a list of 260 varieties which are produced for the different exigencies of book making, letter writing, and drawing; the manufacture of umbrellas, fans, screens, mats, handkerchiefs, hats, coats, lanterns, the wicks of candles, tobacco pouches, artificial flowers, etc.; and for sundry curious special purposes, such as wrapping up incense and presents from the temples to the Government, and gifts from the Government to those whom it delights to honor.

Japanese paper is made—not from rags—but from various kinds of bark, and especially from the cuttings of the paper mulberry (*Broussonetia papyrifera*) a shrub which was introduced into the country about A. D. 610. Up to the year A.D. 280, silk with a facing of linen was used for writing upon, and thin wood shavings were also employed. In that year, however, paper was imported from Corea, and this appears to have been the only paper known to the Japanese until the year 610, when two priests were sent over to Japan by the King of Corea. The introduction of an useful art from a country which has ever been, and still is, perhaps the least known of any inhabited region on the face of the earth, is a circumstance worthy of note. One of these two missionary priests—Doncho—is said to have been a clever man, learned in the Chinese classics, and, moreover, a skillful artist. Besides the manufacture of paper, he also introduced that of writing ink and mill stones. A son of the reigning Mikado learned of Doncho how to make paper. But although the paper made by Doncho was very good of its kind, it did not take ink well; it was easily torn, and was liable to become worm eaten. We are not informed in the report before us as to the material from which this early Japanese paper was made; but it appears that the young prince, referred to, improved upon the original Corean processes by employing the cuttings of the paper mulberry, which tree he caused to be extensively cultivated throughout the country. At present, in the island of Kiusiu, the *makodzu*—as the shrub in question is called by the natives—is planted in the ninth and tenth moons (October and November); but in Kioto and its vicinity, in the first moon (February), the time varying according to the climate of the place. Each year, in the tenth moon, the plants are cut down to the roots, and from each stalk five branches appear the next year; so that in five years a large dense shrub is developed. The cuttings of the fifth year are used for making paper. The stalks, having been cut into lengths of two and a half to three feet, are steamed in a vessel which, curious to say, is made of straw, the boiler which supplies it being about 2ft. 6in. inches in diameter. This steaming process separates the outer skin or bark from the stalk, which in itself is useless except for firewood. The skins are then dried, and afterwards washed for a day in running water to facilitate the removal of the inner fiber, which is used for making the best kinds of paper; the outer dark skin being only fit for the manufacture of a very coarse and inferior material. The finer inner fiber, which after the sap has been thoroughly expressed, is called *sosori*, is then boiled, washed, strained, pounded (by beating it on a wooden table with stout cudgels), and the pulp thus obtained is made up into large balls. From these balls lumps are broken off, as required, and mixed with a kind of paste made from the root of the *tororo* plant—a shrub not unlike cotton. The mixture is stirred thoroughly till a proper consistency has been attained, which is indicated to the ear of the operator by the noise which the mixing rod makes when passing through the pulp. If not sufficiently sticky, more *tororo* paste must be added, but the exact proportion of the ingredients can only be learned by long practice. This process is performed in a wooden trough 6ft. long by 3ft. broad, called a "boat," and fitted with a perpendicular rest for leaning the straining frames against. There are two of these frames employed—an outer one and an inner one. A false bottom is fixed in the outer frame, into which a portion of pulp is then poured. The inner frame is next fitted in, so as to keep the false bottom steady, and a peculiar and dexterous jerk is given to the whole, which sets the paper. The frame is then leaned against the upright rest, to allow the water to drain off while another similar frame is being prepared. By the time the second frame is ready, the first may be removed. This manipulation can be performed very quickly by experts in the manufacture. The sheet of paper is removed from the frame with a piece of bamboo, by dexterously curling the thicker end of the paper round it; a brush is taken in the right hand and with it the paper is laid on the drying board, the side next the board being the "face" of the paper. Five sheets are placed on each side of the board, which is six feet long. In fine weather the paper dries quickly, but in wet weather artificial heat is frequently employed for the purpose. Each manipulator requires forty drying boards. The process of manufacture is then complete; and the sheets being collected, two or three straws are placed between every 20, we presume to facilitate counting them. A parcel of 100 sheets is then placed upon a table, and a heavy ruler put on the top of it, and kept steady with the right hand. The paper is held in the left, and the edges cut smooth with an knife. It is then packed in bundles ready for the market.

The paper currency of Japan is made exclusively from the bark of a tree called *mitsumata*, which is expressly reserved for the purpose, being but little used in the general manufacture. The bark of the *kaji* tree, which resembles our common willow and thrives well near water, is, however, very extensively employed for making the different peculiar kinds of paper and papier mâché, in the manufacture of which the Japanese specially excel. It is wonderful how proficient they are in imparting to paper the hardness and weight of heavy wood, and in manipulating it in all sorts of shapes. Some of the common paper is so tough as to be torn with difficulty.

The Blue Grass Region of Kentucky.

The fame of this section of Kentucky is widespread. It is esteemed a prolific region for agricultural products. Its fame is not in excess of the reality. For the raising of animals it is probably not surpassed by any region on the globe.

It is called the "Blue Grass Region," from the luxuriant growth of a particular grass (*Poa pratensis*) on which animals feed with great eagerness. The horse, the mule, the cow, the hog, and even fowl seem to relish its sweet blades. There are five counties that are, *par excellence*, the "blue grass region." It occurs in patches in other sections of Kentucky, and in other states where it has been introduced, but nowhere does it spread itself as in this region. If we recur to botanists for information regarding this grass, we shall be informed that it was indigenous to many sections, even to the White Mountains and northward, and that it was introduced from Europe. We think there is some confusion in the matter. We learn from the oldest inhabitant there, that, as now, so in all past time it has covered the rolling lands of this fertile region. It does not make good hay; its leaves are too firm. It is evergreen, not killed by the winter frosts, and when not covered by snow, is grazed upon by the animals. It forms a perfect mass of roots and *stolons* (underground stems). It grows like the Bermuda grass of more Southern States, but has not the vitality of that grass, and does not, like it, become a pest to the planter; but the thickest sward may be turned under and corn planted over it; the grass, with its numberless vital points, dies away and forms a rich mold.

Bourbon County is the principal of these five counties. There is no doubt that the geological character of this section gives character to its productions. It is most emphatically limestone. The soil has been made in great measure from the slow wearing away of the rocks. It is also exceedingly firm and contains large proportions of potash, soda and the phosphates. The waters are very impure, containing similar ingredients to the soil. It is believed that the peculiar constitution of the water gives character to the famous Bourbon whisky. We have in New York and Brooklyn many signs reading "Kentucky Bourbon Whisky." The real Bourbon is believed by many to have special medicinal properties. We do not vouch for it. There are immense stills there, where the real Bourbon was once made, which are cold now; their fires are out. The temperance movement has quenched their burning. But Bourbon county ought to be more celebrated for its animals than for its whisky.

The fair of the Bourbon County Agricultural Society was recently held in Paris, the county site of that county. The display of hogs was good in numbers and quality. They were mostly of the Berkshire breed, and some of them very large. One of the Chester breed weighed over 800 pounds, and there were others but little behind him in gravity. One sow was sold for $810, and was a noble animal. One that had twelve pigs of only a few weeks old, which, from their size and weight, have been judged as many months, was in a sad condition. The pigs had exhausted their mother, and she was an object of pity. The stock of cows was splendid. They were mostly of the Durham breed. The farmers there do not appreciate very highly the Jersey stock. They do not make beef. The variety produces butter and cheese, and these are not a speciality here. Eight thousand dollars were refused for a heifer. But when we come to horses, the half cannot be told. We question if, in any spot on this planet, such horses can be found as in this blue grass region. One seldom sees a poor horse. We doubt not that many of those that excite our admiration on the avenues of New York and in the Central and Prospect Parks, have their parentage here. The horses were exhibited for various qualities and from various ages, from the sucking colt to the fully developed animal. A most unique and interesting exhibition was announced in the following terms, "Mare with four of her colts." When the time for the exhibition arrived, the dam was ridden into the ring, the very picture of sedate motherhood, proud of her offspring, and sleek and healthful looking as great care and high feeding could make her. Then came two of her oldest, harnessed to a carriage, and noble animals they were. Then the third, with a rider, and the fourth, a one year old probably, led by the halter. When they stood ranged in order, they presented a subject for the pencil of Rosa Bonheur. There were only two entries on these conditions. We did not see the exhibition of the mules, but they may be seen daily of the most perfect character.

It is common there for gentlemen to make a speciality of some animal. One devotes his time to horses, another to mules, and another to hogs. That is the way to make sure of success in any line.

The surface of the country is undulatory, not rising into high hills, but spreading into extensive plains. We could not advise any of our enterprising young men readers to go there to buy rich farms, and abundant as are the productions. The medium price of lands is one hundred dollars per acre. We learned recently that a gentleman, wishing to sell his farm, put it up at auction, and $126 was bid per acre, and he withdrew it from sale as it was not enough; and there was nothing remarkable about the farm. To buy a farm in Bourbon county requires a fortune.—*The South.*

Another Side to the Tobacco Question.

There is much to be said for and against tobacco, and as to arrive at truth on any important question requires an examination of both sides, we herewith present views of the *Dental Office and Laboratory* which are decidedly opposed to those of the *Food Journal*, published in our issue of the 7th October. These views relate more especially to the effect of tobacco upon the teeth and mouth, and are as follows:

"If we subject this tobacco question to the *experimentum crucis* of figures, we will arrive at conclusions which will astonish us. Let us consult our arithmetic:

A habitual "chewer" will consume four ounces per week of hard tobacco. This is two hundred and eight ounces—seventeen and one half pounds per year! In twenty-five years, more than five hundred pounds—more than a hogshead will hold—of "hard stuff," mingled with sand, copperas, stems, impure molasses, olive oil, chips, and filth; the sweat from men's hands, the impurities from their bodies, saliva, and all the concentrated dirt and refuse of all kinds.

One of the speakers at the State Dental Society spoke well when he said that the destructive effects of tobacco upon the teeth were to be attributed to mechanical action, but he spoke better who said that tobacco destroyed the teeth by both mechanical and chemical action.

A word as to its mechanical attrition upon teeth. What force would be required to comminute and reduce to fineness five hundred pounds of the black mixture of sand and poisons sold under the name of chewing tobacco? Why, one steady force of many thousand pounds, continuously applied for months. The burred millstone, the most elaborately finished and finely tempered graver's tool, would wear out in the process. What, then, must be the effect of so much grinding upon the finely arranged cusps and delicate enamel of the human teeth?

It is not necessary to detail the effects of tobacco upon the general health. The habitual smoker looks as if he had just stepped out of his coffin to take a little walk, and was anxious for somebody to carry him back. Who ever knew a heavy chewer or inveterate smoker whose teeth were not cracked and split into blackened fragments, and whose breath did not remind one of—something which does not smell as sweet as perfumes from "Araby the Blest"?

Returns from Guy's and St. Bartholomew's hospitals tell us that, in all cases of cancer of the mouth, the patient had been using a pipe.

Nervousness, loss of appetite, bad dreams, vertigo, indigestion, consumption, sterility, and all the other ills which affect the nervous system, may be traced to tobacco.

A lady once said to us, when we found her husband in dressing gown and slippers, enveloped in a cloud of smoke, and surrounded with all the confusion of a disordered house, "Oh, doctor, do not disturb my husband at his smoke. I am fond of the martial cigar. The smoke covers the ugly scenes in the field of battle." Poor lady, she was willing to endure the fumes of the "fragrant Havana" for present peace; but we lived to see the bad effects of the vile habit upon the gentleman. Let the profession set their faces steadily against this vile habit. Tobacco is the twin brother of rum, and they are usually found together at last."

English Gunnery Experiments.

At a recent trial at Shoeburyness, a noteworthy incident was the penetration of the 13 inch iron target by the 10 inch gun, firing the recently improved Palliser 400 pound projectiles, with an increased charge of 70 pounds of pebble powder. This target, it will be remembered, consists of a face plate 8 inches thick backed with 6 inches of teak, behind which is a 5 inch plate, with another 6 inches of teak beyond it, and a 1½ inch iron skin plating in the rear. The penetration was very complete, and gave rise to no little astonishment, especially as the plate stood the shot remarkably well, neither crack nor fissure occurring. It is, however, to be borne in mind, says *Engineering*, that is by no means unusual to find that, of several shots fired under precisely similar conditions at the same target, some will effect penetration, whilst others will fail in so doing. Hence, although the 10 inch gun may appear to have done wonders, it may be after all that it has only done its own proper work, the penetration of the shot having been assisted by some local weakness in the plate at the point of striking.

Smoke and Dust Deflector.

It is a great comfort to be enabled to have a car window open on a hot day and not be annoyed by dust, or smoke and cinders from the locomotive. Mr. Winslow, the Superintendent of the Cape Cod Railway, has devised a very simple arrangement which secures this. Outside of this window is a movable sash, a little longer than half of the window, set at an angle of about forty-five degrees; towards the head of the train it fits tight to the window casing, and when the train is in motion, it throws the dust, smoke, and cinders away from the window, leaving the passenger in comfort, his sight not obstructed, and the car well aired. Some half a dozen of these sashes are grouped on a slight iron frame, the frame resting on the window sills, which are extended outward to give the necessary bearing. When it becomes necessary to reverse these sashes, the breakman unfastens the iron frame, which works on a pivot, and turns the whole group of sashes in the other direction at once. It takes but a very short time to reverse the sashes for the whole car. This is a very simple and inexpensive device, and the comfort which it gives the passenger is a good reason for having it applied on all passenger cars.—*Railway Times.*

Musical Dancing Toy.

The spectacle of dancing figures has always a particular charm for youthful minds; and those of riper years, who have not become wholly case-hardened by contact with the stern realities of life, can scarcely look upon the saltatory feats of the images represented in the annexed engraving without feeling a strong impulse to hearty laughter, indulgence in which would not be a bad stimulus to digestion after a hearty dinner.

Most of our readers have seen such comic images, with legs of bristle, performing their polkas and waltzes on the sound board of a piano; but that position is not well calculated to display their accomplishments to the best advantage and to the delight of a mixed assembly.

The inventors of the toy represented herewith, have therefore provided an elevated and ornamental dancing floor, on which these little masqueraders may pirouette to the amusement of many, keeping time to the music of a performer on the piano in a most exact yet amusing manner, the vibrations of the bridge of the piano being transmitted through the upright support to the circular floor upon which the images are placed.

The bottom of this support or pillar is provided with a screw clamping device, by which it is firmly attached to the base end of the sounding board bridge, which we need hardly explain, is a strip of wood upon the sounding board over which the strings pass, and upon which they are stretched tight by the pegs.

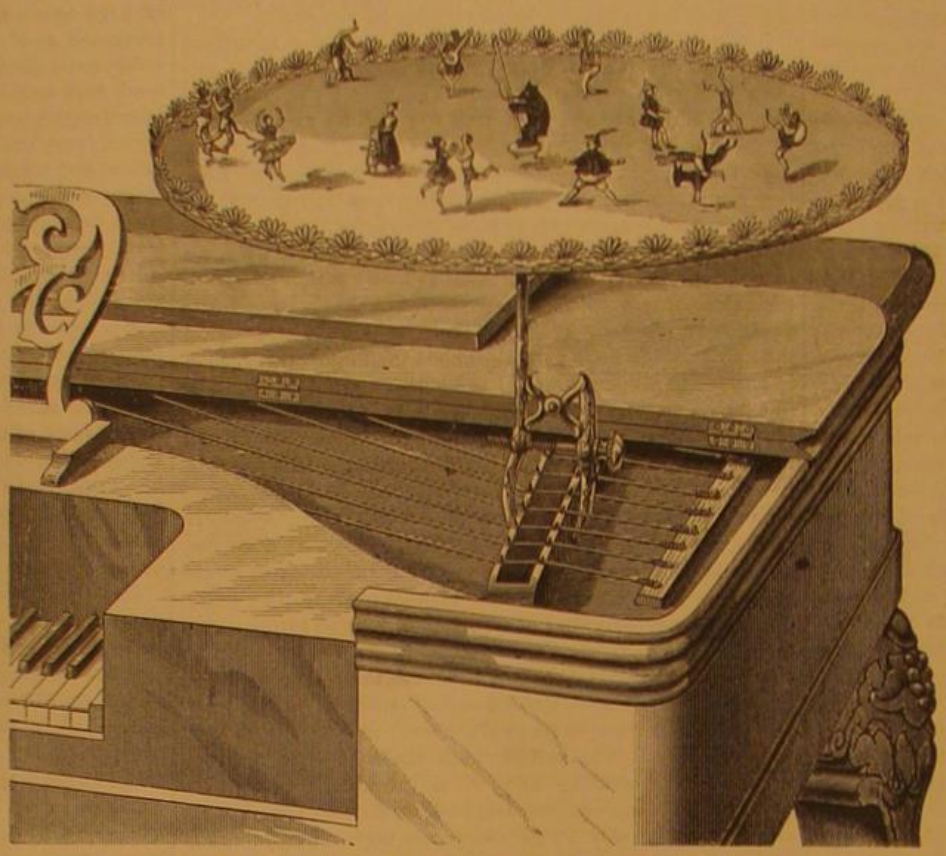
In overstrung pianos the bridge is divided into several pieces. In this case the toy is attached to any one of them. In case these pieces do not extend beyond the top of the piano, the top must either be raised or the toy attached to the main bridge.

In attaching the toy, it is not necessary that the lower end of the stand and clamp pass through between the same two strings, but either end may skip one or more strings back or front of the other, as will best adjust the clamp to the width of the bridge.

The cheaper styles have spring clamps instead of the screw clamps shown.

The vibrations transmitted through the pillar set all the images into ecstacies of motion, which imitate, in a most amusing manner, all the varieties of dancing, from the stately minuet to the hilarious vaultings of the negro minstrel "walk around."

Patented Nov. 29, 1870. Address, for further information, G. L. Wild & Bros., 420 Eleventh street, Washington, D.C.



WILD & BROTHER'S MUSICAL DANCING TOY.

Yielding's Improvement in the Manufacture of Soft Iron and Steel Castings.

The first part of this invention consists in making soft steel or iron castings by casting molten metal in hot molds capable of inclosing the metal, so as to protect it from atmospheric action, and then placing the molds in a hot oven and letting them and the contained metal cool down gradually, in such manner that the castings will be annealed when cool, and thus save the expense of reheating the castings for annealing, besides making better, softer, and more homogeneous metal; and secondly, it consists in forming the molds with a lining of decarbonizing substance to more completely decarbonize the metal, after being poured into the mold, than it can be in the conductor and remain sufficiently fluid to pour to make soft castings of the nature of wrought iron, or to make castings of steel with less carbon than can be cast in the ordinary way.

Molds of plumbago and fire clay, ground carbon, and other like substances capable of resisting great heat are used, and heated in an oven or by any other means to a white heat or thereabout before pouring the metal into them, the oven being arranged to admit of pouring the metal to be cast into the molds while in it; or the molds may be removed for filling and then replaced; they are then covered, when they are of such character as to require it, to protect the metal from the atmosphere, and the oven closed. This removes any possibility of chilling the cast metal, and subsequently the heat of the oven is gradually cooled down.

In this way the inventor claims to produce more soft and homogeneous castings than can be done when they are allowed to cool before being annealed, at less expense than when the casting heat is allowed to be lost and they have to be reheated for annealing. Another point gained is that the iron, not being chilled, does not shrink as ordinary castings do, and retains an elasticity due to the fine pores not being contracted, as they will be when subjected to chilling. This elasticity preserves the metal from cracking and breaking when subjected to blows or pressure, as it will when hard and brittle.

As a further means of softening the castings, the inventor uses in the molds decarbonizing linings, of such substances as bituminous coal treated with black oxide of manganese or chromate of iron, to remove the sulphur; or the coal and oxide of manganese may be used in combination, or the latter in combination with other substances; or linings of magnetic iron and clay, charcoal, or micaceous rock, saturated in alum and water, in the proportion of one to two per cent of alum, in combination with fire clay or fire brick or ground carbon, or any other solid, liquid, or mineral of the requisite strength. The molds having linings of this character will also be heated to receive the molten steel, first decarbonized in the refining furnace as much as it can be and remain fluid, which, being cast in them, will be wholly decarbonized and produce very fine castings of the character of wrought iron; or the decarbonizing may be stopped or regulated, to any degree required, by the time the molds are allowed to remain heated and the degree of heat they are subjected to. Thus carbon enough may be retained for high or low grades of steel, or may be removed altogether to make soft iron.

The linings will be renewed from time to time by washing or coating them with decarbonizing substances in a pasty condition.

Up to this time it has been impossible to produce wholly decarbonized castings, because the metal will not flow when decarbonized below two per cent of carbon or thereabout, but, by this improvement, the inventor claims to have accomplished this desirable result.

This method of casting is the invention of Richard Yielding, of New York city.

THE AMERICAN SAFETY STUDENT LAMP.

It is believed that the lamp, an engraving of which is annexed, affords immunity against explosion of kerosene oils, or of those mixtures of kerosene with lighter petroleum products, fraudulently sold under the name of kerosene.

Fig. 1

Fig. 2

The construction of the lamp is such that the reservoir of oil is placed below and to one side of the burner, when only one burner is used, or between two burners, as shown in our engraving, its distance from the flame being so great as to insure its contents from over heating, and thus generating vapors that, mixed with the air, may become highly explosive.

At the center of the top of the reservoir is a cap which, when removed, allows the lamp to be replenished with oil. The opening has, however, a protective diaphragm of fine wire gauze, through which flame cannot pass, and which effectually prevents ignition of the fluid in the lamp when filling it. This diaphragm is shown in detail in Fig. 2. It will be seen that it is an adaptation to common lamps of the principle upon which the famous miner's safety lamp of Sir Humphrey Davy is based, namely, that flame or gas, heated to incandescence, becomes cooled below the point of ignition in passing through wire gauze.

The oil is conveyed to the burner through a wick, the tube which contains the wick being so long as to effectually prevent the heating of the thin film of oil, always present on the sides of the reservoirs of lamps, and which, by such heating, is vaporized into a highly inflammable gas.

The removal of the burner to one side of the reservoir also increases the effective light of the lamp, obviating the downwardly projecting shadow of the reservoir.

Superior cleanliness is also claimed for this lamp, which can be sold cheap enough to meet the popular want.

We need not say to the readers of this journal that anything that will lessen the number of—not to say totally prevent—the terrible accidents with kerosene, now of such frequent occurrence, will receive our warmest approval, and we doubt not this invention will prove an important safety appliance for the use of the too often unsafe oils now thrown upon the market, though we trust it will not lead people to relax their care in purchasing the best oils. There are many dangers in the storage and handling of highly inflammable and volatile liquids, which no lamp, however safe in itself, can prevent.

This lamp has been commended by the United States Lighthouse Board, and by several eminent scientists, among whom we may mention Professors Doremus and Chapman; and it is the invention of a surgeon, Dr. John F. Sanford, of Keokuk, Iowa, who was led, by his frequent experience in treating patients injured by kerosene explosions, to give attention to the subject. The invention was patented February 9, 1869. The lamps are now manufactured by Hawkins & Tunison, 48 Courtland street, New York, who may be addressed for further information.

Gunpowder.

A little sulphur, a little charcoal, and a little niter, ground together, and we have that wonderful mixture which rules for good or for evil the destinies of men. When gunpowder is ignited, the solid is almost instantly converted into gas, which, were it fired under water, and the gas cooled down to the ordinary temperature of the air, would be found to occupy about 900 times the space of the solid powder. Gases are, however, known to expand with an immense force when heated; and as the gases of gunpowder are in ordinary projectiles generated at a red heat, they are consequently greatly expanded, amounting, it is estimated, to more than 2,500 times the volume of the powder burned; and it is here we see whence springs the power of projection of firearms. Great as are the evils of wars, the use of gunpowder has shortened their duration from years to days.

Dunbar's Improved Horse Collar and Hames.

Alexander Dunbar, of Woodstock, Ontario, has invented a new construction of horse collar and hames, which consists principally in the use of a wire frame, which sustains the covering and padding, and is claimed to constitute an elastic, durable, and reliable support for all the parts of a collar, which is thus rendered lighter and cheaper. It is made of one continuous wire, bent so as to form a skeleton for the support of the padding and cover, and connect the sides of the collar beneath. At the sides of the collar, the wire is bent to form the edges, and laid over the top. At the connection beneath, however, the two thicknesses of wire are brought close together, and form a strong spring connection for the parts of the collar. Wooden plates, grooved at the edges, are fitted into the sides of the skeleton frames, and held in place by the wires entering the grooved edges. These boards extend up and down only far enough to back the padding, which is put against them and then covered by leather or other material. The padding is preferably made of an inner layer of hay or straw, covered by canvas, and an outer layer of hair, between the canvas and leather. The draft hooks are, before the covering is applied, laid over the outer faces of, or through the boards, and hooked over the wires in front. Suitable buttons, or other trace fasteners, are formed at the outer ends of these draft hooks. By hooking them over the front of the collar, a powerful leverage is obtained as well as a full support to the boards, to which the hooks may be fastened in any suitable manner.

Crocker's Improvement in Strap Cutters.

Mr. Richard Crocker, of Marshalltown, Iowa, has patented a new way of cleaning the rotary knives of a strap cutting apparatus by passing them between the teeth of a comb as they revolve, and immediately after the cutting operation has been performed.

The mode of operation is as follows: The gage being set to the width of the sheet of leather to be cut, the leather is placed on the table and fed to the rotary cutters. The strips, when cut, have a tendency to work tight between the knives and to wind around the shaft. To remove this difficulty, the comb then comes into important use, and strips the pieces of leather from the knives as fast as they are cut.

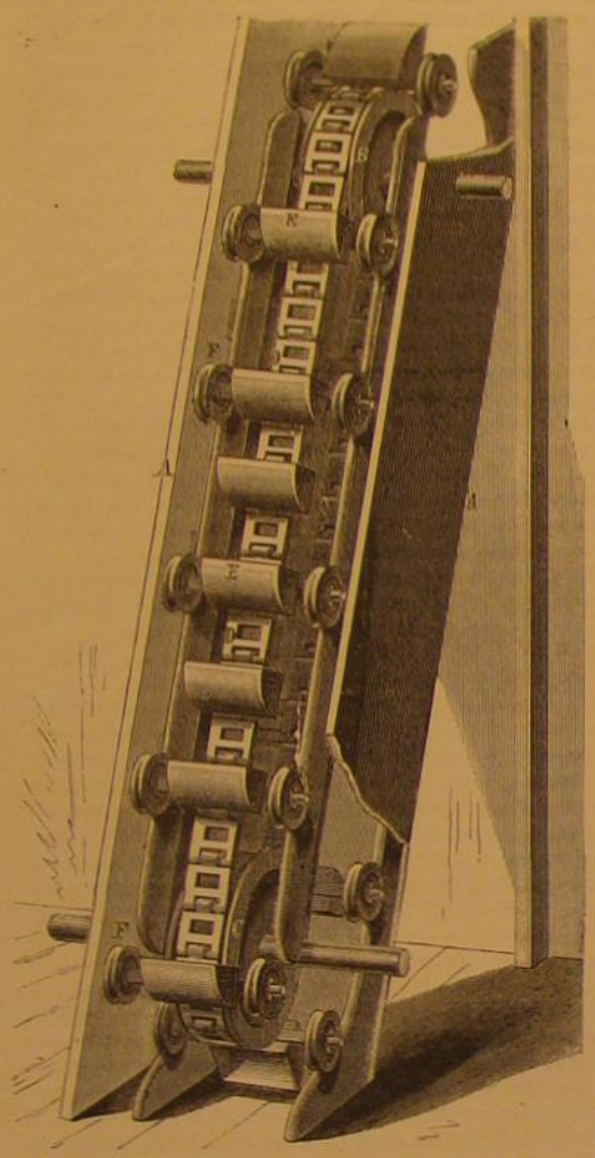
LOWE'S BUCKET ELEVATOR.

Our engraving illustrates the construction of a new bucket for sand, grain, lime, and other materials, patented August 8, 1871, by Gilbert B. Lowe, of Jamesville, N. Y., for which superior durability and ease in working are claimed.

The various parts of the invention are simple and practical in their details, and are as follows:

A is the casing, B the driving wheel, C the lower guide wheel; D is a chain belt, to which the buckets, E, are attached as shown. To the chain, at suitable intervals, are attached shafts extending laterally, and provided, as shown, with grooved rollers, F, which roll along guide ways to steady the chain belt, to lessen its friction and prevent its sagging.

The chain belt is driven by the sprocket or rag wheel, B, and is made of malleable cast iron links pivoted together, and the buckets are riveted upon it at regular intervals.



In the engraving, however, the buckets are placed in greater number at certain places than at others, to show that the roller shafts need not necessarily be as numerous as the buckets. The links are cast in such a way that they can be joined by bending a projecting piece, formed on each around a cylindrical crossbar on the one next it, and the joint is thus very quickly and easily made.

The sprocket and lower wheel are made with open work peripheries, so that, in elevating coarse material, they will not be obstructed by the lodgment of lumps between the wheels and the chain. By this arrangement, the elevator consumes less power in overcoming friction, and the rapid wear of belts in elevating sand, lime, etc., is obviated.

Address Mr. Lowe, as above, for further information.

The Best Engineering.

The following sensible remarks are culled from an able address delivered, before the Pardee Scientific Department of Lafayette College, by Ashbel Welch, C.E., at the opening of the college year, August 31, 1871:

That is the best engineering which accomplishes the purpose most economically.

The purpose may be utility, or in part ornament, or something else, of the propriety of which those only who are to pay for it should judge.

The economy must be ultimate, taking into consideration rates of interest, renewals, risks, interruptions, repairs, attendance, watching, chance of becoming obsolete, or of being disused on account of change of location, and the like.

Work is sometimes done unnecessarily expensively. For example, in some situations, railroad masonry of dressed stone, that costs twelve dollars per cubic yard is used, which, though theoretically and in itself better than masonry of rough stones that would have cost only half so much, yet is practically no better, for either would answer the purpose. The present value of the difference between the cost of renewal in one century or two centuries, is not one tenth of one per cent.

Employers have before now been ruined by splendid engineering, but it was not good engineering, for the result showed that it was too costly for its purpose. Magnificent errors sometimes gain popular applause for the moment, but not the applause of the profession, nor of employers.

The mere scientific mechanic may use a great deal of skill and science to attain certain physical results, without regard to cost or profitableness. The good engineer aims not only to attain his results by the best means, but to attain only such results as will pay.

In order to judge whether his works will pay, and what ultimate economy requires, the engineer must understand the operations to be performed on them, and the interests connected with them. A considerable amount of knowledge of collateral subjects is therefore necessary.

While everything is changing so fast, we should not build expensively for perpetuity. A thing right now may be wrong in the future. Changes in locations, in the modes of operating, in circumstances a thousand ways, may take place. For example, the locks on the Erie canal were built in the most expensive manner—to last forever. Very soon they were behind the times, and now they are the great obstacles to the improvement of that important work.

Engineers have no right to build monuments to perpetuate their own names at the expense of their employers. Instead of monuments of their skill, they become really monuments of their shortsightedness.

An engineer's capital in business, consists of his ability, arising from science, knowledge, experience, and brains, his industry, including with it health and endurance, and, not least, his character for integrity.

An engineer, to succeed, must be a laborious man. He must not only study science, but when necessary, roll up his sleeves and not be afraid of the smutch. If you don't intend to work hard, go at something else.

Men who place property and business of great value in the hands of others, will, if they are wise, select those who are known to be honest, and pay them whatever they must, to secure their services. If the circumstances are such that a dishonest man might steal many thousands a year, it is wise to give an honest man a few hundred a year more salary, by way of insurance against stealing.

The dishonest agent wastes more than he steals. To put a thousand dollars into his own pocket, he takes several thousand out of the treasury of his employer. He buys unnecessary things on which he gets a commission, or has unnecessary work done, out of which he somehow makes something. He thus throws away ten thousand dollars of his employer's money to make one thousand for himself. To allow an employé to make up the deficiencies of his salary, by helping himself, is an expensive mode of payment.

The interests put into the hands of engineers are becoming greater and greater; there is more and more to be stolen; and employers are beginning to see that it is wise to pay well for the insurance, against fraud, derived from character for integrity. I think, therefore, that such character will be hereafter of very great pecuniary value.

No system of public works, or business of any kind, can exist without the public confidence, founded on integrity of agents. An eminent English engineer once told me that a then late prime minister of a great continental government had recently expressed to him the opinion that they could not have railroads in his country, for they could not find a board of directors with whom capitalists would trust their money. Whether or not the ex-minister was right then, his statement would not be correct now, for there are both confidence and railroads in that country; but it illustrates the absolute necessity of confidence, and, therefore, of integrity.

Edgerton's Improvement in Gas Retorts.

This invention relates to a new gas retort, more particularly intended for machines in which hydrocarbon vapors are converted into illuminating gas. It consists principally in the introduction of perforated tiles within the retorts, which are in line with other tiles which support the retorts on the outside. These tiles serve to brace the retort, and prevent it from settling in case the outer tiles are broken or injured. The tiles are put in position within the retort while the same is heated and has attained its full expansion. Longitudinal or diagonal ribs or studs, framed on the top of the retort, hold a cap of luting of sand or clay, whereby the top of the retort is rendered more enduring, the bottom being protected by fire tile in suitable manner. Retorts were heretofore supported in such manner that those below supported those vertically above them. It is evident that thereby the lower retorts were exposed to an undue proportion of strain, which is taken off by the use of the external supporting tiles. This invention has been patented by Henry H. Edgerton, of Fort Wayne, Ind.

Forty Years in the Grave.

The remains of the Italian patriot, poet, and scholar, Ugo Foscolo, were lately exhumed at Chiswick churchyard, England, after forty-four years of interment. The inner shell was found to be filled with sawdust, which, having been brushed, away disclosed the body. The form was intact, and the features were still perfect. At the foot of the grave stood the doctor who attended the great Italian in his last hours, and also the hairdresser who used to shave him, and they at once simultaneously exclaimed, "That's the man!" The whiskers, peculiar in shape, which Ugo Foscolo wore in his lifetime, were still there. His skin, which was now of a pale gray color, remained unshrunken, and effectually hid all traces of the skeleton, the pores and textures being also uninjured. With the view of making a historical painting, Signor Caldesi took a photograph of the body as it lay in its coffin, and of the surrounding assemblage; the coffin was closed again, and, being bound round, was officially sealed by the Italian Minister. Dr. Piesse, who is one of the Chiswick Commissioners, attended with sanitary views; but his services were in no way required, as the body was odorless.

[For the Scientific American.]

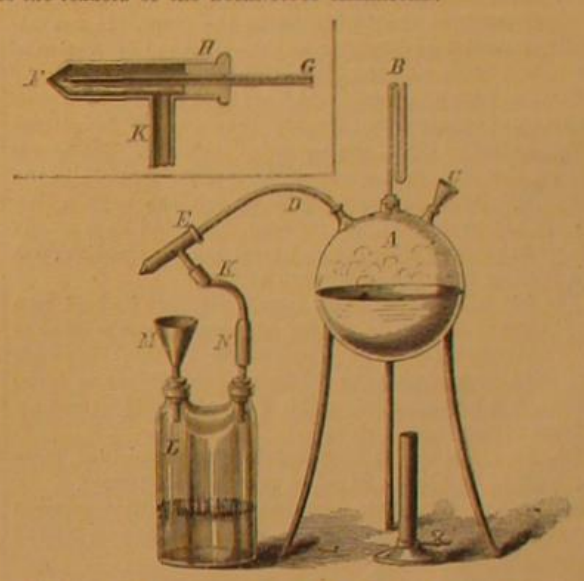
FILTRATION IN REFINERIES AND MANUFACTORIES.

BY JOHN C. DRAPER, PROFESSOR OF CHEMISTRY, UNIVERSITY MEDICAL COLLEGE, NEW YORK.

In the London *Philosophical Magazine*, for May, 1870, I published an account of an apparatus for rapid filtration, which might be applied in the washing of the bone black filters used in sugar refining, in hastening and perfecting the passage of the sirup through the bone black, and in gaining time in any manufacture in which a process of filtration is employed.

In principle, this apparatus is similar to that introduced by Bunsen, in that it depends upon a more or less perfect vacuum for its action. But in the manner of obtaining the vacuum it is essentially different, for in place of the almost unlimited supply of water at a considerable pressure, which the method of Bunsen demands, I have substituted an easily obtained jet of steam, and have thereby rendered the process of rapid filtration possible on the scale required in manufactories.

The direct application of the steam to the object desired, without the intervention of any pump or other complicated machine that might get out of order, or which might be injured by acid or corrosive fumes, is, I think, of sufficient importance to make a description of the apparatus interesting to the readers of the SCIENTIFIC AMERICAN.



In the above figure, A is a stout boiler, with three openings accommodating, respectively, a pressure gage, B, a supply funnel, C, closed by a stop cock, for the introduction of water, and a tube, D, connecting with the exhausting arrangement or steam vacuum tube, E, represented in section at F, in which F is a brass or glass tube one half inch in diameter, terminating in a small conical opening or nozzle one thirty-second of an inch in diameter. In the interior of F, and passing air-tight through the stuffing box, H, there is a similar tube, G, about one eighth inch in diameter, and terminating in a nozzle or opening like F, and about one sixty-fourth of an inch in diameter. At K, a tube one fourth inch in diameter opens into F.

The nozzle tubes, F G, being placed in position as shown in the figure, steam is raised in the boiler A; this, passing through the tube, D E, to G, issues with violence from the nozzle, and, in passing through the nozzle of F, produces an exhaustion in the interior of the tube, F, which may be applied, as desired, by a flexible tube attached to K. The vacuum produced depends partly upon the shape of the nozzles, and partly on their relative position. The latter adjustment is obtained by slipping the tube, G, through the stuffing box, H, until the proper position is found. In the arrangement employed by me, I have without difficulty obtained, with a pressure of one atmosphere of steam in the boiler, an exhaustion capable of raising mercury eight inches perpendicularly in a tube attached to K, the exhaustion increasing steadily as the pressure of the steam increased.

At L M, a simple form of filtering apparatus is represented as attached to the steam vacuum tube, F, by the flexible india rubber connection, N.

Facts about Ropes.

"Alston's Treatise on Seamanship" gives the following facts and rules for computing the strength of ropes:

To find what size rope you require, when roven as a tackle, to lift a given weight. Divide the weight to be raised by the number of parts at the movable block, to obtain the strain on a single part; add one third of this for the increased strain brought by friction, and reeve the rope of corresponding strength.

One sixth of 40 tuns is 6⅔ tuns, which, with one third added, is 9 tuns nearly, for which you should reeve a six inch or six and a half inch rope.

Conversely:—To find what weight a given rope will lift when rove as a tackle: Multiply the weight that the rope is capable of suspending by the number of parts at the movable block, and subtract one fourth of this for resistance.

Thus: 8·9 tuns, the strength of the rope, multiplied by 6, the number of parts at the movable block, minus 13·3 or one fourth, gives 40·1 tuns as the weight required.

Wire rope is more than twice the strength of hemp rope of the same circumference; splicing a rope is supposed to weaken it one eighth.

The strongest description of hemp rope is untarred, white, three stranded rope; and the next in the scale of strength is the common three strand, hawser laid rope, tarred.

Correspondence.

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

Psychic Force.

To the Editor of the Scientific American:

I have been much interested in reading the articles lately published with regard to the so called new force. It has at least established for itself a claim to investigation.

Human nature is strongly inclined to believe in the marvelous and the supernatural, however insufficient the evidence may be, and even when it is entirely lacking. In combatting this tendency, scientific men are apt to lean to the opposite extreme. It must be remembered that many important facts, now incontrovertibly established, were, at their first announcement, declared, by high authority, to be ridiculous and impossible. It must also be remembered, that we know absolutely nothing with regard to the mode in which mind operates upon matter. It is easy to say that the muscle raises the arm, but who can tell us what force contracts the muscle?

In our confessed ignorance, therefore, it is rash for any one to say that mind may not, under certain circumstances, operate directly upon inanimate matter. When I grasp a fifty pound weight, and extend my arm, the will exerts an enormous mechanical force in overcoming the action of gravitation; for, if we locate the mind at all, it will be evident that it must operate at the short end of the lever. Is not this really as great a phenomenon as the six pound depression of the spring balance, in the Home-Crookes experiment?

Skillful feats of legerdemain have been alluded to in your columns, as evidence that we may thus account for all the performances of those who are called mediums. But here is a point that has been overlooked; namely, that while the prestidigitator invariably understands and can explain how his trick is performed, the medium does what he is utterly unable to explain, although an honest and conscientious person, seeking for truth on his own account.

The fact is that *pure* error cannot maintain its hold, on a large class of society, for a series of years. There must be at least a foundation of truth. I apprehend that thinking people generally are accepting the following propositions as facts; indeed, it is becoming impossible for an intelligent and observant person to deny them:

1st. That, underlying much humbug and imposition, there is a basis of fact in the so called spirit manifestations.

2d. That, under certain circumstances, there have occurred phenomena of material motion, which our known laws of philosophy will not account for.

3d. That, whatever their origin, the term supernatural cannot properly be applied to them, since they undoubtedly belong to some unexplored field of nature, and have well defined laws.

4th. That, as a means of obtaining information, either concerning this world or any other, they are unreliable and practically worthless.

Brooklyn, N. Y. HENRY C. WORK.

The Resurrection of Chicago.

To the Editor of the Scientific American:

The hearty and unprecedented response from all parts of the civilized world to the terrible catastrophe in Chicago augurs well for the sometimes doubted progress of humanity. It is confessedly a time for prompt, generous action, rather than advice, and yet a word of the latter will be ventured.

Half a century ago there were probably many places on the shore of Lake Michigan as well fitted for the site of a great city as that which Chicago lately occupied, but there is none which can now offer any comparison; for, to say nothing of the portion yet intact, her many converging railroads, her great tunnels, her breakwater, and many other proud monuments of matchless enterprise and courage, give assurance that she will rise from her ashes with a splendor and rapidity that will eclipse her marvelous beginning. Scarcely will the smoke have been cleared away from her ruins ere the spade and trowel will be heard resounding in every direction—signals of a stronger life and more superb renaissance. But just in this activity is the danger; even in the brief youth of this lacustrine giant, social science and an improved hygiene have brought to light numerous desiderata which those, who perforce must build a new city, may advantageously consider.

Only two such opportunities have occurred in modern times—at London, in September, 1666, and at Moscow, in September, 1812.

The "great fire of London," which was said to have begun in Pudding Lane and to have ended at Pie Corner, commenced on the 2d of September (Old Style), 1666, raged for several days, and destroyed upwards of 13,000 houses and eighty-nine churches, all the Inns of Court, Guildhall, the Royal Exchange, the Mayor's Palace, and the venerable minster of St. Paul—in a word, the London of two centuries back was more completely blotted out than even Chicago is now; and here we come to our point.

The celebrated Christopher Wren, being delegated to rebuild the minster and numerous other public edifices, designed and submitted to the authorities a masterly plan for an entire remodeling or reconstruction of the metropolis. In this plan broad and straight avenues were to replace the narrow tortuous streets of mediæval times.

Although straight lines and right angles pervaded the design, it is worthy of remark, just now and here, that his plan had not the monotonous and unrelieved rectangularity of which Philadelphia seems to have set the example for all American cities; but was alleviated to the eye by broad sweeping boulevards, whose intersections with the prevailing rectilinear thoroughfares were marked by noble circular esplanades. London, thus resurrected, would have been the wonder of the world; but thoughtful, large minded, and far seeing men like Wren were an exceptional and exceedingly small minority of Englishmen of the seventeeth century; for, to say nothing of the rabble, the educated men of that day were, with few exceptions, either narrow minded bigots or else frivolous libertines.

Just at that juncture, the libertines, with their very merry but exceedingly mean and unprincipled monarch, were uppermost, and they were too much occupied with their intrigues and debauches to give a thought to so trivial a matter as a rejuvenated capital; so the opportunity of a thousand years was thrown away, and the London of today stands on the narrow irregular lanes of antiquity, and daily witnesses long lines of vehicles helplessly jammed by the hour together.

A word in conclusion as to a few of the conveniences which no modern city should lack:

1. An arched subway to every street, approachable at convenient points, and of sufficient capacity to receive all the drainage, gas, water, and other pipes that will ever be needed, and which will permit the pavement bed—whatever surface roadway may be resorted to—to be laid solidly as a rock and never afterwards disturbed.

2. Edifices constructed on the associative principle, with a complete system of warming, ventilation, motive power, suppression of dust, vermin, fire, and other nuisances.

3. The innumerable chimneys which crown every wooden house with ugliness, and threaten the head of the passer-by with descending bricks, should give place to one or more stacks, of such elevation as to ensure ample draft and combustion, which stacks, simulating towers, campaniles, minarets, spires, pagodas, etc., might be an element of grandeur instead of deformity, and which, by abolishing smoke, would render the house tops available for gardens, terraces, etc.

4. Architects should be called upon to devise a substitute for the present absurd and dangerous lath and plaster finish of interiors, by which the man of the period builds one house for himself and two for the rats, and by which every dwelling is pervaded with a labyrinth of interstices, up which the first conflagration has unrestricted passage.

5. The time honored shingle of our forefathers should be abolished as an intolerable fire trap and nuisance. No city of ten thousand inhabitants should tolerate a shingle roof.

6. Party walls should have a thickness of at least twelve inches, and chimneys sixteen inches, clear of combustible material, and should of course extend above the roof.

7. Stud partitions should be grouted to at least a foot above each floor, and the latter rendered non-combustible by kyanizing or otherwise, and grouting underneath.

Such and other like precautions will prevail whenever the sentiment of the community subordinates mere personal advantage to the higher and nobler benefits of intelligent cooperation. G. H. KNIGHT.

Cincinnati, Ohio.

Incautious Advice regarding Steam Boilers.

To the Editor of the Scientific American:

In your issue of October 14th, page 244, Mr. Joseph A. Miller appears to throw ridicule upon all alleged causes of boiler explosions other than gradual overpressure. In support of his position, he relates the explosion of a kier and the bursting of some pipes in a sectional boiler. His doctrine can do no manner of good in preventing disasters, and certainly a great deal of harm in leading others to assume safety where there is none. His proof is not to the point, and not satisfactorily explained. Why do not promulgators of such dangerous notions illustrate their case by explosions not so readily forced into the narrow limits they cling to at any risk? No one asserts that explosions cannot occur from overpressure; why try to prove that which no one denies?

The kier exploded, instead of being ruptured only, because there was no local expansion, overheating, or other causes which weakened it more in one place than in another, resulting in its giving way across a large area at the same time; not, however, with the tremendous force, portrayed, it must be supposed, by misprint or a slip of the pen. (Query, what is "a horse power in a second of time," expressed in foot pounds or some other definite measurement of active force?) The kier contained not over 100 cubic feet or 6,250 pounds of water, embodying 1,525,000 units of heat, of which only 387,500 units were available to produce the mischief. How can these produce "a 345,600 horse power in a second of time"? It is useless to state what power is stored in the water, if it cannot become active in doing mischief.

The sectional boiler did not explode, but ruptured only, because the tubes which gave way were weakened by overheating, and relieved the boiler before the balance reached a breaking strain. Mr. Miller says: "Each section was connected with the rest by two one inch pipes, giving an area of one and a half square inches, or a force of 120 pounds, with a reacting force of 60 pounds." Was not the pressure 120 pounds on both ends? We may as well keep these little matters straight, or some one in search of knowledge may receive erroneous impressions.

A Mr. Joseph A. Miller, of New York, in April, 1868, has given some very valuable results of experiments he made, proving the importance of perfect circulation, which I have taken the liberty to insert in a collection of matter headed, "What is being done to prevent Steam Boiler Explosions," to appear in Van Nostrand's *Eclectic Engineering* for November. To that I would refer Mr. Miller, Mr. Brayton, Mr. Guthrie, and others who deny the existence of physical phenomena bearing on explosions, referred to in the article.

Does Mr. Miller mean to say that sectional boilers have not exploded and cannot explode? Would not such an assertion lead to carelessness on the part of the inexperienced engineer in charge of such boilers? ROBERT CREUZBAUR.

Williamsburgh, N. Y.

Fast Railroad Time.

To the Editor of the Scientific American:

Thinking that a short account of what is being done in the United States, by men deeply interested in the motive power of our railways, and in the transportation of passengers with the utmost dispatch, and with a degree of safety approaching the maximum, I give you an account of a trip that was made over the Central Railroad of New Jersey, on Saturday, October 7th. The train, consisting of three cars, in charge of Superintendent Ricker, drawn by engine 120, run by Chief Engineer John Mulford, made the run coming from Easton, Pa., to Jersey City, 74 miles, in 89 minutes running time, an average of 50 miles per hour, or at the average rate of 1 minute and 12 seconds for each mile. The distance from White House to Somerville, 9½ miles, was run in exactly 10 minutes from a start to a dead stop. Two miles of the distance between the last named points was up a grade of 27 feet per mile. From Somerville to Plainfield, 11¼ miles, was run in 13¼ minutes; and from Plainfield to Elizabeth, 12 miles, in 12¾ minutes. This includes starting, making a full stop at Cranford, and coming to a dead stop at Elizabeth. Three miles of the distance, between Plainfield and Elizabeth, is an ascending grade of 30 feet per mile, up which the train flashed at the rate of 29½ yards between two beats of a common clock. This run is, perhaps, without a parallel on the continent of America.

The engine, an anthracite coal burner, is one of twelve first class passenger engines, built according to the specifications of Mr. Ricker, at the Baldwin Locomotive Works, Philadelphia. Her cylinders are 15 by 22 inches, and her drivers 5 feet 2 inches over the tires. The area of the steam ports is 16 square inches; of the exhaust ports, 32 square inches. Her valves have ¾ inch outside lap, and line and line exhaust. The throw of the eccentrics is five inches, with one sixteenth lead. The engine weighs 33 tuns.

This is taken from a true copy of the actual running time.

Brooklyn, N. Y. CHARLES WARD.

To Find the Contents of Pyramids of Balls.

To the Editor of the Scientific American:

I notice, on page 269, current volume of the SCIENTIFIC AMERICAN, the query, "if there is any rapid method of computing the number of cannon balls in a triangular pyramid?" And I answer that there is. This is the rule: Multiply the number of layers with this same number plus one, and again with this same number plus two, dividing the product by 6; the quotient will be the number of balls in any triangular pyramid. Suppose, for example, you have one of 100 layers; multiply 100 by 101, and again by 102, which gives 1,030,200, this, divided by 6, gives 171,700 cannon balls in the triangular pyramid. If the pyramid is incomplete, in place of being built up till there is only one ball at the top, you must consider that the number of balls at the lower side is equal to the number of layers of the complete pyramid; take this number and calculate the complete pyramid, then calculate in the same way the portion wanting, and subtract. Suppose a triangular pyramid has 40 balls on one side below, and 25 on one side in the top layer; we say $40\times41\times42$, divided by 6, gives 11,480 for the complete pyramid, and $15\times16\times17$, divided by 6, gives 680 for the top (wanting); thus the truncated pyramid = 11,480—680, or 10,800 balls.

This rule is founded on the formula for the summation of triangular series of the second order.

$$\frac{n(n+1)(n+2)}{6}$$

I may as well add, here, the formula for pyramids with square bases; it is:

$$\frac{n(n+1)(2n+1)}{6}$$

And for rectangular pyramids, calling the number of balls at the shortest side at base (which is equal to the number of layers), n, and that of the longest side of base, m:

$$\frac{n(n+1)(3m-n+1)}{6}$$

P. H. VANDER WEYDE, M. D.

New York city.

Cast Iron Railroads.

A novel use for cast iron has been introduced in Scotland, which is the adoption of the metals for railroads and tramways, at least thus far to a limited extent. At a meeting of the trustees of the Clyde Navigation Company, of Glasgow, the engineer reported that a cast iron tramway, which had been laid down on the South Quay for trial, had stood in a most satisfactory manner the most severe tests for more than four months. During this period the passing of railway and cart traffic had been almost continuous, but the tramway showed no signs, either of displacement in line or level, or of any wear or need of repair in any way, being, to all intents and purposes, as perfect as when first laid down. Under the circumstances of the severe tests to which the tramway had been submitted, the results were considered highly satisfactory, and the further use of this style of roadway was recommended. Cast iron tramways are, therefore, to be laid upon all the quays and yards of the Navigation Company, in Glasgow, with a prospect of good results and great economy. Here is an opportunity for American inventors in the street railway line.—*Iron Age.*

THE Northern Pacific Railroad survey party, with escort numbering some 800 men, is making good progress in Montana, and has found an excellent route so far.

FAIRLIE'S IMPROVEMENTS IN LOCOMOTIVE ENGINES.

Robert Francis Fairlie, of Victoria Chambers, Westminster, England, has invented important improvements in locomotive engines, which he has just patented in the United States, through the Scientific American Patent Agency. His invention relates to a method or methods of supplying steam from the boiler of a locomotive to the cylinders which propel the wheels of swiveling or bogie frames working on eccentric pivots under the boiler, the whole forming a locomotive engine on the double bogie principle; also of a method or methods of carrying the exhaust steam to the chimney or chimneys for increasing the draft of the boiler fire or fires.

In carrying out his invention he conveys the steam, to each pair of cylinders for propelling the engine or engines, by means of a pendulous connecting pipe, which is joined at its upper end to the end of the fixed steam pipe (which usually passes through the steam space in the boiler to the smoke box tube plate), and at its lower end by universal ball and socket joint fixed direct to a steam chest between the cylinders, or to a branch pipe of which the ball and socket is the unction of the branches, which convey the steam to one or more steam chests attached to each of the cylinders.

Provision is made for the elongation or telescopic action of the pendulous pipe, as follows; the upper end of the ball oint, at the bottom of the steam pipe, is made to form what is usually termed a stuffing box, with a gland to be screwed in and out in the ordinary manner, with this difference, that metallic packing is employed instead of the ordinary kinds. Through this stuffing box the end of the pendulum pipe, which is turned true to one diameter on its plain part, is passed leading down to within three or four inches of the ball, so that there may be an elongation or contraction of the length of this pipe to the extent already described. Thus, by the vibrating or pendulous movement of the steam pipe at its connection with the interior steam pipe, at its tube plate, by the telescopic action of its length, and by its radial action to any angle, by the ball and socket joint at the bottom, the bogie frames can oscillate or revolve, or alter their positions in relation to the boiler in any direction, and the steam pipes are perfectly free to follow all the motions, and at the same time the joints will remain perfectly steam tight.

The exhaust steam may be conveyed to the smoke box by pipes also made with ball and socket joints at their lower ends, and provided at the upper ends with a ball or spherical enlargement sliding in the lower end of the blast nozzle, which is made cylindrical to receive it.

Thus, instead of using an expansion or telescope joint in the exhaust pipe, as is done in the steam pipe, the enlarged spherical end of the pipe is made to fit the part of the fixed blast nozzle so that, the spherical end fitting the cylinder like a piston, it is still free to move up and down in it, and thus compensate for any independent vertical movement of the frame toward the boiler.

According to another method, he conveys the steam from the boiler to the cylinder of each bogie engine through its bogie pin to the steam chests of each cylinder, the pipe radiating from and swiveling around the bogie pin as the bogie itself does. He also reconveys the exhaust steam back to an outer chamber, round the bogie pin or swiveling center, and thence to the smoke box by rigid pipes fixed between the smoke box and bogie pin.

By another method he conveys the steam from the boiler to chambers fitted on the bogie pin or pivot which works in the center of each swiveling engine frame. To these chambers, which are allowed to revolve or swivel on the pivots, pipes are jointed which convey the steam to the cylinders, and which are provided with metallic or other stuffing boxes to allow for expansion or contraction caused by heat or any movement which may arise from undue play in the swiveling centers.

The exhaust steam is conveyed from the cylinders to the lower end of the bogie pivots by pipes jointed in the same manner as those described above for conveying the steam to the cylinders. The exhaust steam is then conveyed through the center of the pivots to the upper end, to which the pipes, which convey the steam to the smoke boxes or to the lower ends of the blast pipes, are connected.

From this description, engineers will gain some idea of these very radical improvements, which will attract much attention, not only from their unique character, but from the wide fame of their inventor as an engineer.

Incongruous Metal Work.

We have often, says the *American Builder*, remonstrated against the incongruous character of our metal work. Here there is a comparatively untrodden path of art. Cast and wrought iron work are extensively employed in building. These are as capable of artistic treatment as the brick or stone building with which they are incorporated. Generally however, they are either covered up, or else made in the forms of stone architectural features, as though metal were something to be ashamed of; as though it had no properties that did not suggest life and beauty in artistic design, allowing the metal to appear, and making its use, strength, and appearance forcible; marking it and emphasizing it in the building; and, instead of hiding it, or making it appear like some other material, giving it a definite design and character of its own Thus by its force and contrast, it would very greatly add to the effect of the building where it was employed. There is no exception in the case. All kinds of purposes for which metal is used in buildings might be marked and emphasized by artistic treatment. How much less of sameness and tameness would there be if this were done, and how much greater would be the artistic force so very desirable! There is great scope here, and until more is done in this department there is some thing wanting here.

The employment of zinc for external cornices and canopies is coming into vogue. Setting aside the question of durability, why is it not possible to treat the material artistically as metal? What is the necessity of making it appear like stone? Even with a design resembling the treatment of stone, it looks far better with its glossy, natural color, as metal, than when smeared and deadened with paint not at all in accordance with its nature.

Austrian International Exhibition.

This exhibition is intended to be opened on the 1st. of May, 1873, under the especial patronage of the Emperor and his brother, the Archduke Charles Louis, and closed on the 31st of October. The Commission consists of his Imperial Highness the Archduke Rainer, president; his Highness the Lord Steward of the Imperial Household, Prince Zu Hohenlohe Schillingsfurst; his Excellency the Imperial Chancellor, Minister of the Imperial House and for Foreign Affairs, Count Von Beust; Prince Zu Liechtenstein, Prince Swartzenberg, Count Festeritz, and Count Potocki, vice presidents; and the Lord High Chamberlain, Count Folliot de Crenneville, and other high courtiers, the Ministers and heads of departments, the Presidents of both Houses of the Reichsrath, the presidents of the chief artistic, commercial, and scientific societies, and a number of gentlemen who have distinguished themselves in the various branches of science, art, and industry.

The entire arrangements have been entrusted to the Austrian Consul General at Paris, Privy Councillor Baron de Schwarz-Senborn, who has been nominated Director General of the exhibition, and who has the advantage of great experience, combined with superior abilities. Local committees are about to be formed in the various provinces of Austria and Hungary, and a special Royal Commission is to be appointed at Pesth. The objects to be exhibited will be classified into twenty-six different groups, as detailed below.

One great feature of the exhibition will be an arrangement for the productions of all countries in groups corresponding with their geographical position, and great pains will be taken to render the Oriental department in every way worthy of the almost inexhaustible resources of the Indian Empire. The position of Vienna is admirably adapted for this, having, besides the waters of the Danube, a direct communication with all the important harbors of the Levant, *viâ* Trieste. The arrangement of the Eastern department will be confided to the Austrian Consul at Constantinople, Dr. de Schwegel, who has already acquired a great reputation for his knowledge of Oriental habits and productions.

A new feature of the exhibition will be an arrangement by which the treasured collections of the various museums of London, Paris, Berlin, Moscow, Lyons, Munich, Stuttgard, etc., will appear in simultaneous position, and it is further intended to represent a history of inventions, a history of prices a history of industry, and a history of natural productions, so that the world's progress in arts, science, industry, and natural products will thus be brought into contrast.

The objects to be exhibited will be classified in the following twenty-six groups: 1. Mining and Metallurgy; 2. Agriculture and Forestry; 3. Chemical Industry; 4. Articles of Food as as Industrial Products; 5. Textile Industry and Clothing; 6. Leather and India Rubber Industry; 7. Metal Industry; 8. Wood Industry; 9. Stone, Earthenware, and Glass Industry; 10. Hardware Industry; 11. Paper Industry; 12. Graphical Arts and Industrial Drawing; 13. Machinery and Means of Transport; 14. Scientific Instruments; 15. Nautical Instruments; 16. Military Accoutrements; 17. Maritime Objects; 18. Architectural and Engineering Objects; 19. Cottage Houses; 20. Peasant Houses; 21. National Domestic Industry; 22. Representation of the Operation of Museums of Art and Industry; 23. Ecclesiastical Art; 24. Objects of Art and Industry of Former Times, exhibited by amateurs and collectors; 25. Plastic Art of the Present Time; 26. Objects of Education, Training and Mental Cultivation.

During the time the exhibition is held, international congresses are contemplated for the discussion of important questions to which either the exhibition itself may give rise or which may be specially suggested as themes suitable for international consideration. More especially it is intended to hold international congresses of learned men and artists, of gentlemen of the scholastic and medical professions, of representatives of museums of art and industry, of teachers of drawing, engineers, architects, representatives of chambers of commerce, of members of banking and insurance companies, of agricultural and forestry societies, as well as of mining and metallurgical companies. Subjects for discussion will be the following: The question of literary property; the improvement of taste; extension and development of the instruction in drawing; the perfection of all modes of transport; the question of obtaining the highest attainable profitable working of machines; cultivation of forest statics; reduction of the prices of articles of food (by increased productions, improvements of marketing affairs, reform in the kitchen, new modes of preserving, etc.); the nourishment and first training of children; the exertions made in our age in regard to therapeutics; the education of women and extension of their sphere of employment, etc.

Filters and Filtering.

Water, wine, spirit, jelly, sirup, tinctures, and a great variety of other fluids, hot and cold, often contain substances which should be separated, in order to render the fluid clear and bright. As regards water filtering, it has become pretty general; but in domestic life there are fluids, such as wine, liquid jelly, sirup, etc., which are required to be made "clear" before they are put on the table. There are three kinds of filters,—sponge for watery liquids, cotton for spirituous fluids, and wool for gelatinous fluids and oils. In every well appointed kitchen, there are tin or porcelain funnels. For filtering watery fluids it is only necessary to insert, in the choke of the funnel, a V-shaped piece of fine sponge. All such liquids, on being put into the funnel, will pass through the sponge, and become quite clear. When this effect ceases, the sponge must be removed, and well cleansed. Vinous fluids are best cleared by filtering through a cone of white blotting paper, shaped by folding a square piece of the paper from corner to corner, then folding the triangle into half its size, and opening the folds; it will fit any funnel, which will act as a support to the paper. Wines, etc., poured into this, will run through perfectly bright. In some cases where the wine is only a little thick from lees, cork, or other mechanically suspended substance, it can be made quite clear by filtering through a wad of white cotton put in the choke of the funnel; and when this answers, it is much quicker than the paper filter. For jelly and oil, wool alone is the proper medidium for filtering. The felted wool jelly bag is pretty well known as the best means of clearing calves' foot jelly, and it also answers for olive and other oil. These bags are however, too expensive to be generally used; hence they are rarely seen in kitchens. A good substitute for the wool bag is a colander, on the inside of which a new flannel lining should be fitted, made of double stuff. A wad of white knitting wool, put in the choke of a funnel, will do to filter any small portion of such fluids. Many a good glass of port wine has been wasted for the want of a penny paper filter.

Iron Trade in Great Britain.

In the iron trade, says the *Ironmonger*, there is still a flush of business, notwithstanding the advance of prices, the manufacturers of the North being hard pressed for deliveries, and scarcely able to take new orders for this season. The Cleveland market is brisk, and prices higher, there are no stocks to be had, and quotations are little more than nominal. In South Staffordshire the trade is greatly interrupted by the uncertainty which prevails respecting the decision, as to prices and wages, at the preliminary meeting which will be shortly held.

The millmen are persisting in their demand for a further rise, and as this has been conceded in North Staffordshire, the probabilities are in favor of higher prices. It is said that some of the largest and more energetic firms have orders on their books which will keep them busy until the end of the year, while others are glad to accept business at a very slight advance on the old rates. Of late the variations in prices have been very marked, but as a rule absolute quotations are not given, and terms are subject to any alterations made by the association. The present uncertainty also tends to encourage speculation, especially in bars and pigs. The export demand is quieter, though orders for Canada, the United States, and the North of Europe, are by no means exhausted. The home requirements consist of merchant iron, angles, rounds, squares, tees, rods, nails, sheets, gas strips, plates, and girder iron, all of which command a brisk inquiry. Pig iron is again firmer in sympathy with the higher prices in the North, and ironstone is still increasing in value.

Surface Blow for Steam Boilers.

This is a new attachment to steam boilers, whereby the light scum on the surface of the water can be blown off.

An inverted cup is suspended, by means of a vertical pipe, from the top of the boiler, so that its lower edge will be a few inches above the water line. A suitable cock is fitted into the pipe. To blow off the surface of the water, the pipe is opened, when the steam under the cup will escape, relieving thereby the water directly beneath from pressure, and causing the same to ascend and follow the steam through the pipe. The light surface scum will thus be entirely ejected, as it flows under the cup to fill the space formerly occupied by the escaped water, and is there also drawn up by the suction. This improvement is the invention of Mr. John Gates, of Portland, Oregon.

Ruge's Lamp Extinguisher.

The careless handling and upsetting of kerosene lamps is the most common cause of accidents from explosion and consequent conflagrations. Mr. William G. Ruge, of Holstein, Mo., has patented an invention intended to prevent such explosions, the improvement being an application, to the lamp burners, of a device which will immediately extinguish the flame on the wick if the lamp is upset, shaken, or struck. To the wick tube a pair of spring jaws, which will close over the wick and extinguish the flame, unless they are held apart by a hook lug and catch, are attached for that purpose. The hook is easily disengaged by a disturbance of the lamp, and will in that case release the jaws and let them extinguish the flame.

THE ST. GOTHARD RAILWAY.—The St. Gothard Railway, with a tunnel about the length of the Mont Cenis, will, it appears, very soon be commenced. The capital necessary for the tunnel is about 60,000,000 francs, and for the lines to join the Italian and the Swiss railways, about 125,000,000 francs. Subsidies to the extent of 85,000,000 francs have been voted by Germany, Italy, and Switzerland, and the remaining 100,000,000 francs will be taken by a syndicate, 65,000,000 francs in bonds, bearing five per cent interest, and 35,000,000 francs in shares. It is estimated that at least seven to eight years will be required for the entire completion of the work.

YOKOHAMA has just seen the first locomotive ever used in Japan.

Improved Panel Raising Machine.

In describing this very simple, compact, and effective machine, we cannot do better than begin with the knives, one of which is shown, in detail, in Fig. 2 of the accompanying engraving. By referring to that figure, the reader will perceive that the cutting edge consists essentially of two distinct parts, although these are joined to form one continuous edge.

The longer portion cuts away the wood down to the common level of the depressed part of the piece upon which the panel is raised, while the shorter portion is formed into an ogee, *cyma recta*, straight bevel, or other form desired to be given to the edge of the raised panel, which is thus molded into any ornamental finish desired, or left perfectly plain.

The knife is slotted in the middle, as shown, so that, by the use of the proper set screws, it is easily and securely adjusted on the cutter head.

This construction of the knives, and the method of adjusting them on vertical arbors, distributes the work along the entire edge, instead of, as heretofore, on such machines, confining it to a narrow portion. The knives are therefore kept longer in order, and require less sharpening.

The peculiar draw cut obtained by the shape of the knives, and the method of attaching them to the cutter heads enable the machine to cut smoothly across the end of the panel; and the general arrangement of parts permits of working warped stuff with as great facility and accuracy as straight material, a feature of great importance, as will be recognised by all familiar with this branch of business.

By the use of different heads and the table adjustment, the width, from the edge of the piece to the raised panel, is regulated from nothing to four and one half inches.

Power is transmitted from the driving shaft to the tight and loose pulleys, A. The speed is multiplied by the pulley, B, and thence the power is led by belts separated by a flange on the pulley, B, to the vertical arbors, C, carrying cutter heads, D, which work on both sides of the piece at once.

The arbors run in adjustable bearings at the bottom and top. At the top they may be regulated to secure the proper thickness to fit any groove in the stiles. This adjustment is accomplished by the screw bolts, E, which move the front arbor to or from the other. The lower boxes of the arbors are held by bolts in slots on the crossbar of the frame which supports the arbors. In these slots, the mandrels may be set at any desired angle. The heads are held by screws, and are therefore adjustable on the arbors. The guide, F, is adjustable, laterally, to and from the inner arbor, and the table is ad justable vertically by the use of the hand screw, G.

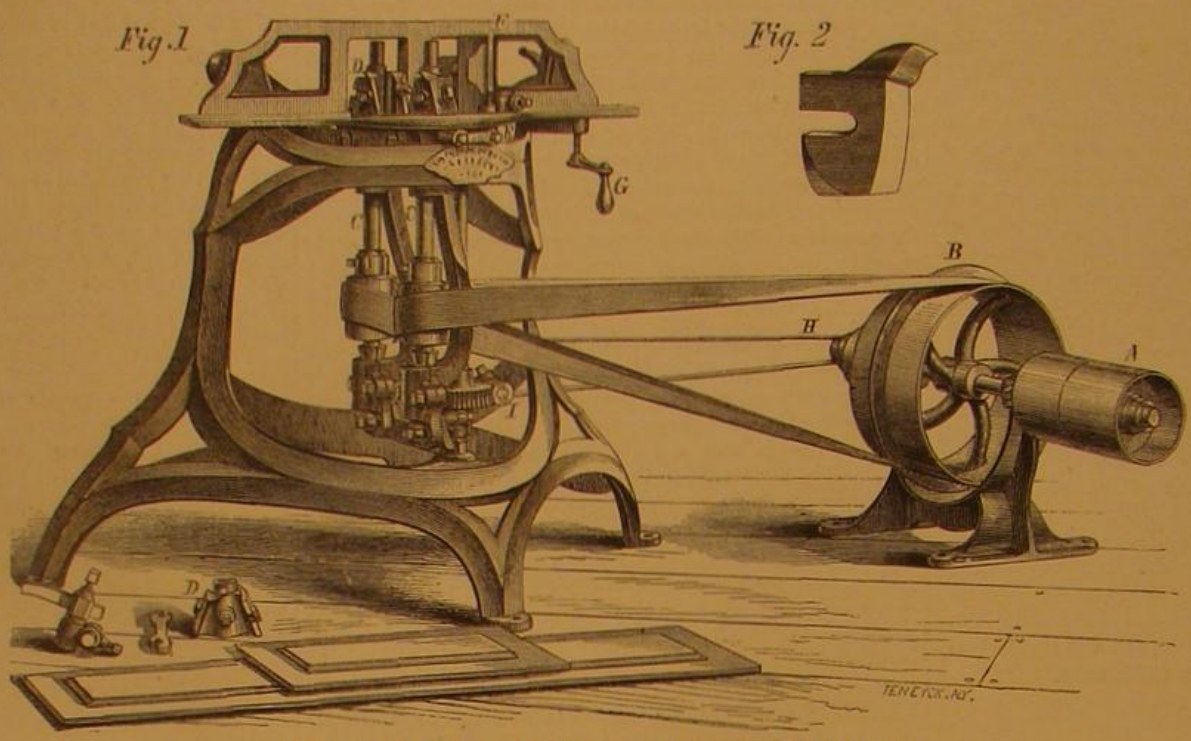
The top, including the table and guide, F, is hinged so that the whole may be turned over to the back of the machine out of the way, when it is desired to change the cutter heads, to sharpen the knives, etc.

Guards, attached to the arbor frame, extend up through the table to the tops of the cutter heads, and are adjustable up and down and to and from the work. Their office is to steadily hold the piece operated upon and prevent chattering.

The belt, H, runs on cone pulleys, and drives a counter shaft carrying the worm, I, which meshes into a worm gear on an inclined shaft having a universal joint, by which the fluted feed roller it carries at the top is made to act obliquely upon the piece, to draw it down and keep it snugly down to the table. The roller is held to its work by the action of a rubber compression spring on its movable bearing.

The raised portion on one side of the piece worked may be made as much wider than the other as desired, as is sometimes required on shutters, etc.

This machine was patented July 11, 1871, by Dwight F. Walker. For further information address Walker Brothers, corner of Second and Cataract streets, Minneapolis, Minn.



D. F. WALKER'S PANEL RAISING MACHINE.

The Rolling of Gunboats.

The British gunboats *Bustard* and *Kite* were recently subjected to experiments in order to test their rolling motion in a sea way, and discover whether it is easier with the eighteen tun gun in its position on the platform level with the fore deck, or when it is lowered into the well beneath; and, although the weather was not sufficiently rough to subject the vessels to a severe test, yet the result showed that they are much steadier when the gun is up in its position than when it is below. The *Bustard*, with her gun on deck, made only eleven rolls per minute, and the greatest roll was from 7° to port (leeward) to 4° to starboard (windward) but with the gun below she made fourteen rolls per minute, the greatest roll being from 9° to port to 13° to starboard, being three rolls per minute more with just twice the amount of heel. A similar result was obtained with the *Kite*.

Natural Rights of Inventors.

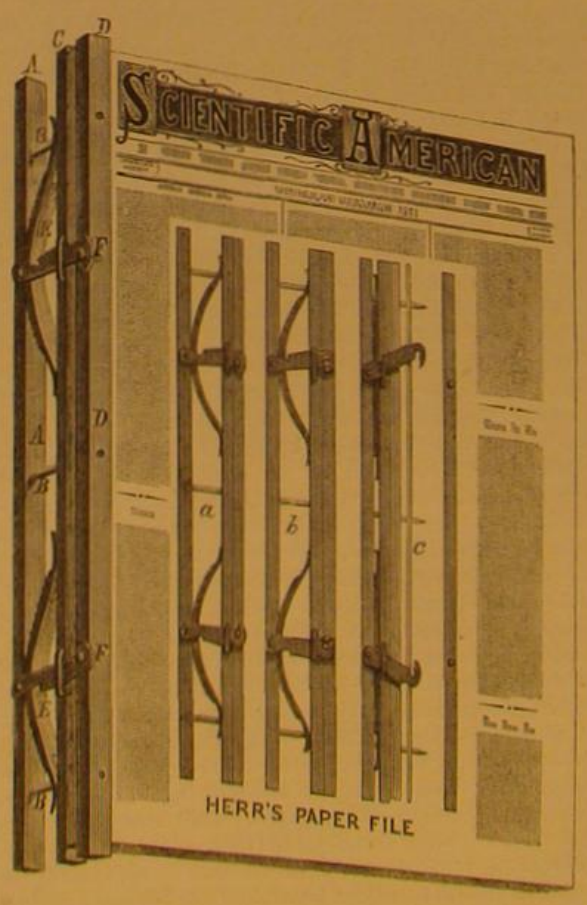
A good deal of high flown sentiment has been scattered touching the natural rights of invention, by those who, taking a high moral ground, seek to argue that it is a "sacred heritage," the violation of which is an outrage not only of equity but of religion. Besides being unpractical, this is, to say the least, ridiculous; none but those, if there be any such, who make abstract inventions unassisted by the previous labors of others, have any business to talk about a "sacred heritage," and for their own interests the less they say about it the better.

But policy and justice point decisively toward awarding to those who labor usefully in any cause the full value of their work, whatever it may be; the observance of this principle forms the very framework of society. Whether, therefore, energy and capital be devoted to the establishment of a common industry, or to the development of a special invention, it is clear that both should, if they are of service, meet with their just return, and that the latter should not sustain the indignity of a reward, but receive the fair payment due to labor.

Viewed from all points, the rights of property in invention are too strong to be shaken by the most earnest efforts of honest or dishonest antagonists, who are doing, however, real service to the cause they oppose, by encouraging free discussion on the subject, and of opening the way to the investigation of the evils and abuses which exist in the constitution and administration of the patent law.—*Engineering*.

HERR'S PAPER FILE.

A handy, durable, and tasty newspaper file is shown in accompanying engraving. It was patented through the Scientific American Patent Agency, Nov. 30, 1869, by B. F. Herr, of Livingston, Ala. It furnishes a very convenient substitute for the regular binding of newspapers, sheets of music, etc., when it is desired to preserve them with but little expense, and for the regular arrangement and preservation of papers, pamphlets, magazines, etc., in publishing houses, reading rooms, and families.



The parts of the file are as follows: A is the back bar of the file, made of wood, as are all the bars. Pointed rods or spikes, B, are fixed firmly to the bar, A, and upon them the inside and outside compression bars, C and D, play, holes being pierced through these bars to admit the spikes. The compression is effected by elliptical springs, E, riveted in the middle to the bar, A, and exerting their expansive force between A and C. The hooks, F, prevent the outer compression bar from being forced off the spikes, and from thus releasing the papers.

The principal engraving shows a file of papers held by the file under consideration. It will be seen that the compression of the bars, C and D, not the spikes, holds the papers, so that they do not easily tear out, as would be the case without such compression.

The subordinate engravings illustrate the file empty and closed, as shown at *a*; the file with the hooks thrown back in the first movement of opening it, as at *b*, in which case the backs of the books rest against the outer angle of the guide staples, as shown; and, lastly, the file compressed and opened for the reception of papers, as at *c*, in which case notches in the backs of the hooks engage the staples, and thus hold the springs compressed till the papers are arranged, and the outer bar is replaced upon the spikes. The hooks do not release the outer bar till the springs are compressed enough to allow the staples to enter the notches as shown at *c*, in which position only can the papers be taken out of the file.

It is claimed for this file, to which the inventor has given the name of "Eclipse," that it will hold more and larger papers in proportion to its size, more securely, conveniently, and with less injury to the papers, than any file hitherto produced. It is especially adapted to papers folded like the Scientific American, *Harpers' Weekly*, *Hearth and Home*, and many other sixteen page papers, which, when filed, and when the leaves are cut, form, so to speak, a book. These files are made of various lengths and sizes, to adapt them to all sorts of papers, and when the bars are made long for large papers, additional springs and hooks are introduced.

Applications for the purchase of territory, or for further information, should be addressed to the Eclipse Paper File Company, Livingston, Ala.

Nickel Plating as a Preservative of Easily Corroded Metals.

A small square bar of steel coated with nickel has been repeatedly immersed in water for hours together without showing any signs of rusting, and John Spiller, F.C.S., states, in the *Photographic News*, that he finds it possible to bury it in flowers of sulphur for several days without tarnishing the luster of the nickel surface. Neither has this latter severe test any effect upon the copper and brass bars upon which the nickel coating has been applied, and these metals may even be immersed in an aqueous solution of nitrate of silver without effecting the reduction of that metal. In one of the angles only, where the coating seemed to be imperfect, was there any indication of silver reduction in the case of the brass tube, the steel bar being perfectly protected over the whole surface against the action of silver and copper solutions. Here, then, is a most valuable property in electro-deposited nickel. A metal of the zinc and iron group is proof against the action of nitrate of silver; the experiment proves it to be so, and we must regard pure nickel as belonging (from this point of view) to the class of noble metals, resisting, like gold and platinum, the attack of sulphur and of highly corrosive metallic solutions.

The nickel facing, when burnished, has a whiter color than polished steel, although not equal to silver itself, its aspect being rather that of rolled platinum. It withstands the action of heat also remarkably well, for the fusion point is very high, and oxidation occurs only at elevated temperatures. For fine balance beams and weights, lens mountings, reflectors, laboratory microscopes, Sykes' hydrometers, still worms, egg beaters, camera fittings, and a variety of apparatus used by the chemist and photographer, the nickel coating will, probably, find extensive application. Oval picture frames of very pretty effect are made of stamped brass coated with nickel. Burnished and matt surfaces of this metal may be used in combination for ornamental purposes.

Genius and Common Sense.

Genius and common sense are best together. Genius alone runs much to rashness, and common sense by itself not seldom hides behind caution. Consequently genius is frequently out at elbows, and common sense just as often remains only comfortable when it might get rich. Genius invents a thing and constructs an expensive model, and secures a patent before ever making a working drawing or fully deciding upon the proper arrangement of the parts. Common sense shivers before the expense of model, machine, and patent, and lets well enough alone, until go-aheadativeness grabs the idea, walks off with it, and leaves common sense out in the cold, neither poorer nor richer than he was before. This is a metaphorical way of stating a solid truth. There is probably not a township in the country in which two inventors might not be found, one a genius daring everything and losing all, the other priding himself on his common sense, running no risks, and making nothing.

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Contents:
(Illustrated articles are marked with an asterisk.)

FIREPROOF BUILDING.

The Chicago fire has proved that so called fireproof buildbuilding may retard the progress of a great fire, but cannot prevent its onward march, when once it has gathered sufficient power in the destruction of wooden buildings. In a city built wholly of brick, stone, and iron, no such fire would have been possible.

A single isolated block of fireproof buildings is no more secure when surrounded by wooden structures than is a so called burglar-proof safe when burglars have ample time and means to open it.

While this does not demonstrate the uselessness of making buildings in cities as nearly fireproof as possible, it shows the necessity of enforcing a better style of building than is allowed in many of the young cities on this continent.

The power of concentrated heat upon stone, bricks, and iron is little appreciated by those who rely upon these materials as security from burning. The writer was in the city of Troy at the great fire of 1862, and had an opportunity of witnessing the effect of fire upon several supposed fireproof buildings, which stood in the direct line of the advancing flames. The heat was blown upon these buildings with almost the intensity of a blast furnace. The wrought iron shutters, which were depended upon to protect the windows, curled up and warped, exposing the glass beneath, which soon broke or melted, or if supported by wooden sashes, was almost instantly dropped from the frames. Then the flames found admission to the buildings, which soon yielded.

It was noticed particularly that cast iron actually seemed to burn, and we have little doubt that in many cases there was actual burning of the metal; the same effect being produced as would be upon the bottoms of cast iron kettles placed over fire and containing hot sand. Nearly every one knows that when cast iron is raised to a red heat, it speedily oxidizes or burns. The extensive use of this material is therefore not the best practice in rendering buildings fireproof.

In the Troy fire, it was seen that even the supposed fireproof safes burned in most cases when they were not protected by masonry. At the great fire at London Bridge, which took place in the summer of 1861, the ready yielding of cast iron columns, beams, and girders was specially noticed, and formed the subject of an article in the *London Review*.

The fact is, that cast iron is no more to be depended on than wood when standing amidst a really great fire. Wrought iron does better, but it too has important defects, among which is its expansibility under heat, which, when it is used in conjunction with masonry, cracks the latter, and thus commences the work of destruction.

In short, our present systems of fireproofing need thorough revision and modification, in the light of recent experience, before they can deserve the confidence of the public.

A GIGANTIC RAILWAY PROJECT.

At present the shortest line of travel for passengers between England and India is by way of Brindisi, Alexandria and Suez, to Kurrachee or Bombay, requiring twenty days for its accomplishment. To reduce the time from England to India, to a little more than five days, is the proposition of Messrs William Low and George Thomas, who, in a communication to Mr. Gladstone, have set forth a scheme, the leading features of which are as follows:

First, to use existing lines of railway and the Mont Cenis Tunnel to Trieste, and thence to construct a railway through Austria, European and Asiatic Turkey, Persia, and Beloochistan, to Kurrachee and to Bombay.

The route proposed is as follows; From Trieste, by Fiume to the eastern shore of the Adriatic Sea, thence southwards to a point nearly opposite Brindisi; thence eastward, across Turkey, north of the Archipelago and the Sea of Marmora, to Constantinople; thence crossing the Bosphorus and turning southward at Scutari, reaching the Mediterranean at Adalia, thence skirting the coast to Alexandretta; thence southeasterly to the west end of the Persian Gulf; thence following the shore of the Gulf and of the Arabian Sea to Kurrachee, and thence to Bombay.

The distance, including the Straits of Dover, is stated to be 5,339 miles. Allowing a speed of 40 miles per hour by land, and 10½ miles per hour by water, the time that would be required for this journey would be 5 days, 16 hours, and 46 minutes. Estimating the rate of travel by land at 30 miles per hour, the time for the journey would be 7 days, 13 hours, and 22 minutes.

There are already 1,170 miles of this line now constructed, and it is estimated that the completion of the remainder would cost about $205,000,000.

Messrs. Low and Thomas propose that the countries, through which the line would pass, shall share in the expense of construction.

Other financial features of their scheme are the formation of an Anglo-Indian Company, that shall construct and maintain the permanent way, and subordinate companies that shall construct and maintain stations, sidings, etc., for local traffic.

The projectors apprehend, very justly, we think, that the raising of the capital and the organization of companies would be the chief difficulty to be surmounted. Allowing a year's time for the preliminary business, they think the road might be completed and running within three years of the present time.

Were there not some precedent in the rapid completion of the Union Pacific Railway in this country, this scheme might be considered visionary and impracticable; but it has been demonstrated that the mere length of railways is a matter of small importance as affecting their speedy completion. The procurement of the necessary agreement on the part of the various governments, the territory of which it is proposed to traverse, is a work of greater magnitude than the building of the road itself; and, should the projectors succeed in accomplishing this, there may be some chance for the success of their project.

The rapid growth of the modern railway system is appreciated by very few, and the magnitude of some of the enterprises, now looked upon as feasible, is something that the last generation little dreamed of. Five thousand miles is a long distance, and two hundred millions of dollars quite a respectable sum of money, yet these things are talked about now-a-days without scarcely producing a sensation in the commercial world.

THE GREAT FIRES IN THE NORTHWEST.

For weeks past the papers have brought us accounts of fires raging in the woods and on the prairies of the Northwest. As such fires are almost of annual occurrence, these reports were received as somewhat sensational narratives of a series of not very extraordinary events; and, in the terrible news of the burning of Chicago, with the excitement ensuing, were almost overlooked.

Day by day, however, has the evidence accumulated that Michigan and Wisconsin are suffering to an unprecedented extent from these fires, that vast amounts of property were consumed, and many human lives destroyed, the whole disaster assuming proportions which far eclipse in extent the Chicago calamity, and which call for the most active sympathy and aid from humanity at large.

The timber which has been destroyed was alone worth more than the entire city of Chicago. It is estimated that not less than thirty thousand square miles of heavily timbered pine lands have been swept over by the flames. Thousands of farms with their stock have been destroyed, villages have been licked up by the hungry flames, and hundreds, perhaps thousands, of human lives lost.

This calamity following the great Chicago catastrophe, and the many minor accidents which have destroyed human life by wholesale, will render the present year memorable in the history of the country, as one of unprecedented disaster. Taking up our files and glancing over their contents, we shrink horror-struck from the fearful catalogue. Many of these destructive events might have been prevented by the exercise of proper care, but human watchfulness cannot control the elements.

For a long time, the region now suffering in the Northwest, has been parched with drouth, and becoming prepared for this terrible visitation. The fires must now have their own way, till natural causes extinguish them. How much farther they will ravage, or when they will terminate, cannot be predicted, although, in the ordinary course of things, the fall rains must, ere long, put an end to them. There yet remains time, however, for extended devastation, and we may expect, during the next fortnight, many additional details of the advance of the fire, the changing of fair and fruitful fields into deserts, and the flight of the houseless, homeless, and hopeless, in wild abandonment of purpose, for some indefinite shelter, perhaps to be overtaken by the pitiless flame on the desolate plains, or to find a grave in the bed of some unfordable stream.

Such has been the fate of many unfortunates, and thousands who have escaped death are now totally destitute at a time when the approaching winter renders their situation terrible indeed.

Appeals are made for contributions of everything that can be directly or indirectly useful in ameliorating the condition of the sufferers. The noble generosity that has been displayed toward Chicago, will not, we are assured, pause in its benevolent work. The appeal from the Northwest will not be made in vain. In fact, it has been already responded to in many parts of the country, and there will be no dearth of contributions as soon as the proper channels, through which to send relief, are indicated.

From the tangled mass of the reports which crowd the daily journals, it is next to impossible to form an idea of the real extent of the loss of life and damage to property, but time will undoubtedly prove this to be the most destructive fire on record.

THE NEW JERSEY ZINC COMPANY.

In our notice of the Wetherill patent trial, October 14th, an injustice was unintentionally done to the above Company, which we hasten to correct. The statement that the aforesaid patent decision was likely to result in an extensive mulcting of the Company, and otherwise to affect its prosperity, is, we are happy to say, without foundation. The operations of the Company are not dependent on the use of the Wetherill patent, or any other one patent. It is true that a large proportion of all the zinc white sold in market is made by the New Jersey Zinc Company, that their article enjoys everywhere the highest reputation, and is always in demand on account of its superior quality. But this excellence is due to the splendid nature of the Company's ores, and the scientific care with which they are treated, by processes peculiarly their own. The mining properties, controlled by the Company, which yield these ores, and upon which, in connection with its large capital, the success of the Company is based, are extensive and valuable. Each year developes more and more their intrinsic worth.

The reported decline of the Company's stock is also a fiction. The stock is not sold in open market at all, but is held, in private hands, by parties who know all about the affairs and resources of the Company, and who are not likely to be influenced to sacrifice their interests by any mere newspaper paragraph. The officers of the Company are men of ability, and have the confidence of the stockholders.

COMETS.

The approach of Encke's comet to the field of our vision will give interest to a few remarks on these remarkable and eccentric bodies. Their extraordinary appearance caused them to be regarded in ancient times with superstitious terror, and as prognostications of war and other great disasters. Their ominous aspect is hightened by their visiting our part of the heavens from all directions, and crossing the usual west to east course of the planets at all possible angles. Moreover, the train of faint light which they leave behind them is a substance so extremely thin that the smallest stars may be seen through it; and it is so slightly ponderable that the proximity of a comet of 200,000,000 miles in length seldom disturbs the equilibrium of any body near which it may happen to pass.

But that it has weight we have evidence, for the velocity of comets diminishes, a fact which also determines that the ether of illimitable space is a resisting medium, sensible to a body of such inappreciable tenuity. However, the matter in a comet is so small in weight that the comet of 1770 was involved, as it were, among Jupiter's satellites for some months, without any disturbance of either to the slightest degree. The comet of the year 1770 is an exception to this rule. In that year it was seen to be moving in the usual elliptical orbit, having a period of 5½ years. But on calculating its time, astronomers found that it had passed very near the planet Jupiter, the attraction of which immense body had disturbed its course to a remarkable degree, and this accounted for its being unrecognized by the scientific world, its period, previous to the perturbation, having been 48 years. It returned to the sun in 1776, but was not visible to us. Again in 1779, it was so attacked by the same planet that its orbit was changed into one of 16 years, with a perihelion, or nearest to the sun, distance of 300,000,000 miles; and it has never since come to our view. The period of revolution of Encke's comet has diminished, by about 3 days, in 80 years, that is, in about 25 revolutions.

The great discovery that led to a comprehension of the nature of the orbits of comets was made by Dr. Halley, that eminent astronomer asserting that the great comet of the year 1682 was identical with those of 1607, 1531, and 1456, and foretelling its reappearance in 1759. It was retarded, however, between one and two years, and reappeared in 1835 Its next visitation will be in the year 1912, or thereabouts. History mentions appearances of this comet as far back as the year 11 B. C.

There is little reason to doubt that the earth passed through the tail of the comet of 1861. Mr. J. R. Hind, the British Astronomer Royal, predicted that the transit would take place on Sunday, June 30, of that year, and Mr. Lowe, another English astronomer, reports that, on the evening of that day, "the sky had a yellow auroral, glare-like look; and the sun, though shining, gave but feeble light. The comet was plainly visible at 7·45 P. M., during sunshine, while on subsequent evenings it was not seen till an hour later. In the parish church, the vicar had the pulpit candles lighted at 7 o'clock, which proves that a sensation of darkness was felt even while the sun was shining. The comet itself had a much more hazy appearance than at any time after that evening."

The comet of Encke, as above stated, has a period of about 3¼ years. It passes nearest to the sun at a distance of 32,000,000 miles, about the radius of the orbit of Mercury. Its greatest distance from the center of the solar system is 387,000,000. It will reach its perihelion in January next, but will be visible through a telescope some months before that time. The appearance of a comet in our heavens is usually accompanied by a high temperature of the weather.

We look for some important discoveries, as to the nature of these mysterious bodies, by means of the spectroscope, the marvellous instrument that is destined to charm

"Her secret from the latest moon."

ELECTRICITY IN MEDICINE.

The use of electricity in medicine is not new, but the recognition of its therapeutic value, by regular physicians, is of modern date. Up to a recent period, electropathists have been considered as little better than quacks, and only confirmed invalids and credulous old women have had the courage to try the effects of a battery upon their pet complaints. This shows how a really good thing can be spoiled by its associations. As the medical schools did not recognize the agent in their instruction, it naturally came to pass that, in the hands of ignorant men, much harm was often done by its application in diseases which required very different treatment. The public were therefore pardonably shy of so destructive an agent. Another difficulty in the way of the introduction of the new practice was a want of knowledge of the proper kind of battery to be employed. The profound researches of Faraday were necessary to the invention of the apparatus now preferred by the profession, and the importance of the contribution, made by this great philosopher, is shown in the name of Faradizing, now given to the peculiar form of electricity employed in medicine. At no period in the history of this science has its possible application to therapeutics been overlooked. If we recall the familiar story of Dr. Galvani, in Bologna, dissecting frogs and exposing some of the muscles to the action of what we now know to be a weak current from a battery composed of iron and copper, we shall see that, at the very outset, animal electricity was made most prominent. Galvani was not much of a physicist, and he explained the phenomenon on the score of a latent force seated in the animal, and simply awakened by the presence of foreign metallic bodies. Animal electricity and animal magnetism soon became words of common usage.

If we had been dependent upon Galvani, we should have made little progress in our knowledge of the real cause of the twitching of the frog's legs; but fortunately for the world there lived, at the adjoining university of Pavia, a philosopher capable of at once seizing upon the true explanation. Professor Volta, the moment he heard of the experiments at Bologna, put his own interpretation upon them, and at once set to work to construct the celebrated "pile," which really lies at the foundation of the present science of Voltaism, and which, in various forms and modifications, has been the favorite apparatus used in medical practice for nearly seventy years. Volta wrote at the time, to the President of the Royal Society of England: "My colleague has made a discovery great in itself, and containing the germ of a vast number of other discoveries."

It is not necessary for us to follow the progress of investigation from the researches of Volta to the present time, as that would lead us entirely astray from the application of the results of these studies to some branch of medical practice.

One of the most striking applications of electro-magnetism was developed during the recent Franco-Germanic war, although we recollect to have seen the apparatus at the Exposition of 1867. It consists of a probe so arranged that as soon as the points touched the bullet, a circuit was completed and a little bell would be rung. It is painful enough under any circumstances to have to feel about in uncertainty in search of the missing ball, and as a bone would easily lead the surgeon astray, some tell-tale like the semaphoric apparatus described above could not be regarded in any other light than as a great blessing. In 1867, the instrument was looked upon as a toy, and contemplated by Frenchmen with a characteristic shrug of the shoulder; but in 1870, its real value was found upon many a battle field.

For purposes of interior cauterization, a platinum wire is rendered white hot by the passage of a current of electricity sufficiently powerful to be obstructed on its way from one pole to the other, and in this way parts of the body can be reached which would be inaccessible by any other form of apparatus. It is an ingenious and unexpected application of experiment originally intended to show the quantity of different forms of a battery, and has enabled physicians to accomplish some important cures.

We have seen it stated that the workmen in the quicksilver mines of Idria, who were poisoned by mercury, had all of the metal removed from their bodies by means of a battery. The patient was placed in a metallic bath of a good conducting liquid, and the metal drawn out of him on the principle of galvano-plastic deposition. It was a true case of electrolysis, but we cannot vouch for the accuracy of the story. The application of electrolysis to the treatment of disease has been made the subject of an admirable article in the *New York Medical Journal*, by Dr. A. D. Rockwell, from which we learn that this form of practice is receiving great attention from the regular medical profession, and that several learned books have been written upon the subject. It is evident from this paper that a knowledge of the electro-chemical properties of compounds will be necessary to a successful practice of electrolysis in the treatment of diseases, as the composition of the diseased tissue to be decomposed, the material of which the poles of the battery are composed, and the strength of the current employed must greatly vary the results. It may sometimes be necessary to employ an electrode composed of a metal that will readily combine with one of the constituents of the body to be destroyed. For example, if iodide of potassium be in the system, the iodine can be either set free by using a platinum pole, or it may be combined with lead by employing that metal instead of platinum; so, too, in the case of a chloride, by substituting for the positive platinum electrode an electrode of copper, the copper first oxidizes and subsequently combines with the chlorine. In both instances the physicians ought to know how far the new compounds of iodide of lead and oxychloride of copper would be likely to affect the patient. Dr. Rockwell is of the opinion that for electrolytic experiments on various substances, platinum is the best electrode, because it is not acted on; and he prefers small needles for most purposes, as they act more rapidly and effectually.

As considerable pain is caused by the introduction of the needles, it frequently becomes necessary to make use of an anæsthetic, and in this way the duration of the application can be continued until a proper result is attained. A wide range of diseases has been subjected to electrolysis and sometimes with favorable results, but the subject is new in the hands of thoroughly educated physicians, and clinical experience is the only sure basis upon which to found a well established practice. A great variety of abnormal growths—*nævi* and papillary enlargements, sebaceous, hydatid, and erectile tumors, goitres, and even cancers, are reported as having been successfully treated by electrolysis, and it is probable that this list will be largely increased by a careful study of the subject.

The celebrated Dr. Liebreich found that the hydrate of chloral was decomposed and chloroform liberated by an alkali; he reasoned that the alkali of the blood ought to accomplish the same result, and enable the anæsthetic properties to tell upon the patient. He tried the experiment, and the result was as he anticipated, and this led to the introduction of the hydrate of chloral as our best hypnotic agent. So too, with many substances of which it is idesired to make a direct application, such as, for example, iodine; by employing a solution of iodide of potassium and decomposing by electrolysis, a local application of pure iodine can be made that would otherwise be impossible. We have no doubt that numerous similar cases could be discovered, if proper investigations were to be made. The subject of the application of electricity to the treatment of disease is manifestly one that ought to attract the attention of the learned men of the medical profession.

FAIR OF THE AMERICAN INSTITUTE.

DISINFECTANTS.

There are not so many disinfectants exhibited this year as usual, the old ones being well enough known, and new ones being scarce. Bromo-chlor-alum is a long name, given to a disinfectant that has been considerably lauded of late, but about which the Chemist to the Board of Health either spoke sparingly or not at all. We have, in the history of chlor-alum, the repetition of the story of many a similar chemical product, which, at one time, is suggested for a particular purpose, and is then forgotten; and, in course of time, is again brought forward as an entirely new body.

About forty years ago, a Frenchman, whose name has escaped us, wrote a short work on disinfectants, which was reviewed in *Silliman's Journal;* in which book, among other things, the author recommends, as an antiseptic, the hydrated chloride of aluminum, now known as chloralum. For some reason, the matter was forgotten until Mr. Gamgee revived it; and a year ago, no household was considered safe without a moderate supply of the chloralum. The experiments with it have not quite come up to the general expectations, although in medicine it has established a favorable reputation. The prefix "bromo" would appear to indicate that some bromine was added to the solution. As bromine has many of the properties of chlorine, and is known to bleach, it is assumed that it could be advantageously employed with the chloride of aluminum. This is an assumption that would require considerable experiment before it could be accepted, and, from the report of the Sanitary Superintendents of the Board of Health, there is reason to doubt the truth of all that is claimed for it. A very little bromine would prove quite offensive, and even unendurable, besides being expensive; and we suspect the word "bromo" is used as a trade mark, and not for any merit it may impart to the article.

Carbolic acid, permanganate of potash, chloride and sulphate of zinc, chloride and sulphate of iron, and chloride of lime, are much used and approved articles, and ought to become familiarly known.

VAPOR STOVES.

These are truly chemical articles, and every chemist knows how dangerous it is to meddle with liquids that give off, at low temperatures, gases that form explosive compounds with the air. A trifling leak will spread liquid fire, over the stove and into the room, which it would be almost impossible to put out; or the gas, liberated when the heat is applied, may become mixed with air in just the right proportions to occasion the worst kind of an explosion. There does not appear to be any safety valve to this engine of destruction; and after the fearful calamity in Chicago, we should suppose the community had had enough of explosive oils, naphtha lamps, vapor stoves, and other inventions of the Evil One. What is the use of framing laws against dangerous kerosene, when the very worst products of petroleum distillation are permitted to be sold, for the use of patent stove dealers, and inventors of new lamps? The Chicago fire has taught us a lesson in this particular, and the question now presents itself with unusual force, how the sale of kerosene and naphtha can be subjected to strict control, and proper penalties be enforced for violations of the law. We doubt if vapor stoves can help the matter, and are hardly prepared to subscribe to their use.

SILVER MIRRORS.

It would delight the eyes of Baron Liebig to see the accomplishment of his favorite idea of the introduction of silver mirrors in the place of the old mercury deposits. He entered, originally from a purely charitable point of view, upon a series of investigations, to see if the dangerous and poisonous quicksilver could not be superseded by some less objectionable metal. He found in some of the small villages of Bavaria that nearly the whole population were engaged in making toy mirrors out of glass and mercury, and that the mortality and disease were positively frightful. He immediately set to work upon salts of silver, and finally succeeded in inventing a process by which a thin film of silver could be deposited at such rates as would enable manufacturers to employ it as a substitute for mercury. The original process has been considerably modified and improved, and the specimens exhibited by Mr. William A. Walker are all that could be demanded in this direction. The silver surface is so much superior to the mercury mirror, that it only needs popular information on the subject to have them universally introduced. While mercury reflects yellow rays and gives us sallow complexions, silver throws back pure white light, and enables us "to see ourselves as others see us."

SCIENTIFIC INTELLIGENCE.

A SIEGE COOK BOOK.

A French woman has published a book on the art of living in a time of siege, which contains a number of recipes not found in the usual works of this character. The Paris *Presse* copies a number of choice specimens. The ass—*l'âne*—by the tenderness of its meat, is admirably adapted for service at the most epicurean feast. Ass meat is, according to the author, "far more tender than beef, and, like mule flesh, deserves to remain in permanent use, as it bears cooking in every style." She says of the cat: "This domestic animal, the ornament and consolation of the attic, and the spoilt fondling of the parlor, is one of the most highly prized and consequently rare dishes of famine times. The meat is white, fine, and tender, only it must, before use, be kept at least forty-eight hours. It can then be served up the same as hare, as a ragout or as a roast. Horse flesh "looks and tastes exactly like beef, and not only can with difficulty be distinguished from it, but is in fact preferable to it. It is better, however, the same as cat meat, to put it in pickle for thirty-six hours." Here follows a list of horse dishes—horse *pot-au-feu*, boiled horse meat, *cheval à la Parisienne, cheval à la mode*, horse ragout, horse hash, horse steak, horse brains, etc. Dog meat, when properly prepared, resembles mutton and even deer. Dog *cotelettes* and dog *filet* are preferred. Finally, the rat is not forgotten, but, in consequence of the danger from the *trichina* worm, cannot be recommended. The object of the author was to enrich our kitchen *répertoire* by a number of dishes learned from cruel necessity; and, even if she fails in this, her book must remain a literary curiosity.

PHOTOGRAPHS AND LETTERS OF CREDIT.

In consequence of the numerous frauds committed by forged checks, some of the Vienna bankers have adopted the custom of sending, with their letter of advice, a photograph of the person in whose favor the credit has been issued, and to stop payment when the person who presents himself at the bank does not resemble the picture. If this practice were to become universal, some of our large banking houses would soon have a portrait gallery of no trifling interest, and the object of preventing fraud could be well attained.

A BONE CRUSHER FOR DOMESTIC USE.

At the last fair of the Smithfield club, Islington, the house of Hancock & Co. exhibited a new and exceedingly useful invention, namely, a machine for crushing and grinding bones by hand, so that a cook could break, crush, or grind bones to any desired size. As a quarter of a pound of bones contains as much gelatin as a pound of meat, it stands to reason that a machine that enables us to recover the whole of this, and, at the same time, reduce the bones to a condition ready for conversion into superphosphate, must prove decidedly successful. The crusher is made of steel and cast iron, and can be screwed to a block or solid table; and it costs in London one pound twelve shillings.

ACTION OF IODINE ON LIGHT.

Andrews has been studying the action of iodine on light, and finds that the beautiful purple color of the vapor of iodine is due to the fact that it permits the red and blue light of the spectrum to pass through, while it absorbs nearly all of the green rays. The transmitted rays will afterwards pass through red copper and blue cobalt glass. If the iodine vapor be sufficiently dense, all of the red rays will be absorbed, and the transmitted light will be blue. These blue rays can be afterwards passed through blue glass, but not through red. A solution of iodine in bisulphide of carbon behaves in a similar way, and appears, according to the concentration of the solution, either purple or blue, when white light is transmitted through it. The alcoholic solution, on the contrary, is red, and does not afford the same phenomena of dichroism. These experiments ought to be further extended to ascertain the relation of heat rays to iodine, and whether there is the same analogy, between the behavior of iodine and its solutions towards heat, that Andrews has observed towards light. Something practical for the use of photographers would be apt to grow out of carefully conducted

researches on this subject. Andrews has also made some curious observations on bromine. If a glass tube, half filled with liquid bromine and the other half with the vapor of bromine, be sealed and heated gently to just above the point of dissociation, the entire contents of the tube become opaque, and it looks as if it were filled with a dark red pitch. The degree at which the light rays are cut off can be observed as heat is applied. Even heated bromine is less transparent to light than cold.

COMBUSTION OF OXYGEN IN HYDROGEN.

Nearly all of our text books say that oxygen gas is a supporter of combustion, but cannot itself be burned, although chemists have been long in the habit of proving the contrary by experiment. A neat way of showing the combustion of oxygen has been devised by Himes; it consists of a glass cylinder from one to one and a half feet long (diameter not stated), open at both ends for the introduction of perforated corks. The upper cork is provided with one opening for hydrogen; the lower cork has two tubes, one for the oxygen and the other to serve as an escape tube. Hydrogen is first turned on, and ignited at the lower opening after all of the air is expelled; the cork with the oxygen tube is then inserted, the gas having been previously turned on. If the current of oxygen be sufficiently gentle, it will burn in the middle of the cylinder; while the excess of hydrogen passes off through the second tube provided for the purpose, where it can be ignited, and its burning will serve to show the march of the apparatus. In course of time, a considerable quantity of water will be produced, which will settle in the bottom of the cylinder. A little experience will enable the demonstrator to perform this instructive experiment without fear of an explosion.

MELTING POINT OF ORGANIC BODIES.

Our books contain the most contradictory statements in reference to the melting point of organic solids, such as the fats, wax, stearine, and the like; and this is due to the difficulty of instituting uniform observations. Julius Lowe has hit upon an expedient for overcoming the difficulty, by the application of a galvanic current. A bath of mercury is provided, into which plunges one pole of the battery, connecting with an alarm bell. A little ball of the substance to be tested is gathered, on the end of a platinum wire serving as the other pole, by repeated immersions in the fused mass, and it is then plunged under the surface of the mercury. An accurate thermometer is also provided. As long as the coating covers the platinum, the electric current is broken, but the moment the film melts so as to bring about a contact with the mercury, the circuit is completed and the bell begins to ring. By the use of a telescope and finely graduated thermometers, accurate determinations of the point of fusion of most organic bodies can be made in this way.

FIREPROOF SAFES — IMPROVEMENTS URGENTLY CALLED FOR.

From all the accounts that we get from Chicago, it appears that the various safe makers will not have much to brag about in respect to the safety qualities of their productions. It is stated that fully one half of the safes failed to preserve their contents during the recent fire, and that the losses are not confined to small safes, but include the larger, first class safes of the best makers. Enormous prices have heretofore been exacted for safes, and those charging most for their goods have been the most blatant in trying to convince the public that their articles were the best. But the Chicago fire has demonstrated that it is not the price charged for a safe, nor the prettiness of its paint, that imparts preservative qualities. It is evident that the present methods of safe making are sadly deficient, and that improvements are greatly needed. We call upon the inventive geniuses of our country to set their wits to work, and devise something new and really reliable in the line of fireproof safes.

IODIZED MILK.—From Hoffman's most admirable report on the "Progress of Pharmacy," we make the subjoined extract, which has a practical value for the physician: "It is well known that milk takes up iodine, disguising its taste, smell, and color, completely; since iodine is an antiseptic, iodized milk keeps for some time. Dr. Hagar calls attention to this fact, and suggests that this, perhaps, is the mildest form of administering iodine. Its therapeutic effect seems to be equal, only, to about one fifth of the iodine. Hagar thinks iodized milk will soon become a favorite form of administering iodine, and suggests the following mode of preparation: One part of iodine dissolved in ten parts of alcohol, admixed with ninety parts of fresh, warm cow's milk.

At a recent auction sale of books an elderly lady ventured timidly to offer "two and a half, just to start them." After "once, twice, gone," from the auctioneer, the lady found herself the owner of forty-two volumes of Patent Office Reports, at a cost of $105.

Declined.

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

INFLUENCE OF THE MOON'S AGE ON TIMBER.—N. M. T.
PSYCHIC FORCE.—C. E. S.—G. L. W.
TESTING BOILERS.—A. P. S.
ANSWERS TO CORRESPONDENTS.—A.J.T.—W.H.P.—.W.W.B.
QUERIES.—B. & S.—D. H. B.—F. K.—J. G. L.

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.

Examples for the Ladies.

Mrs. L. V. Phillips, of Brooklyn, has used her Wheeler & Wilson Machine since October, 1863, dress-making in families, without repairs; earning sometimes $4 to $5 a day.

Answers to Correspondents.

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

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

CLEANING POLISHED BRASS.—The first requisite is to remove all grease. This may be done with a solution of concentrated lye, and fine pumice or rotten stone. A weak solution of muriatic acid and clean scouring dust will then brighten it, after which it may be oiled, with olive or cocoa nut oil. Vinegar and common salt may be used instead of the acid. The red powder, of which G. N. K. speaks, probably contains some preparation of mercury dangerous to health, and injurious to the metal. Raw mashed sour apples will also brighten brass. I know of nothing except acids to remove oxidation, unless it be powder of some mineral and friction. I consider weak vegetable acids preferable on fine work, and vegetable oils better than animal fats.—G. R. R., of Mass.

HEATING SURFACE OF BOILER.—In the SCIENTIFIC AMERICAN, of October 14, 1871, I see a query by C. and H. A., asking for a simple rule by which to ascertain the heating surface of tubular or locomotive boilers. I have an easy rule, and will give it. (As a matter of course, the diameter of the cylinders must be taken into consideration). Multiply the square of the diameter of the cylinder in inches by 5; divide the product by 3. The quotient is the area of the effective heating surface in square feet. The size of the cylinder being taken into consideration, this will give the desired result. For example, we may say a fifteen inch cylinder; as the square is 225, multiply by 5 = 1125 divided by 2 = 562½ square feet.—J. K. W., of Mich.

CLEANING POLISHED BRASS.—G. N. K., can do this by simply scouring with flour of emery and any soft oil. Polish with the emery. It is effective and cheap, and requires very little labor and time. Let him try it, and then if he thinks enough of it to continue, I will take a new hat. Tell him I wear size 7.—J. K. W., of Mich.

BACK PRESSURE IN EXHAUST PIPE.—No. 16, page 267 current volume.—Of course you have back pressure. De Pambour has proved that elbows are the worst contrivances in regard to preventing free exit to steam. If there are twelve of them, there must not only be appreciable, but considerable back pressure. You ask, how much? I suppose that you do not mean that I should blindly guess at it, but give you the means of finding out, as it will depend on the amount of steam pressure you use, the smoothness of the inside of your exhaust pipe, the capacity of your cylinders, velocity of stroke, etc. The only way to find the back pressure, with any reliable accuracy, is to have the indicator applied to your cylinder. This will give you at once the curve of your back pressure, and show exactly how much it is; being, at the same time a piece of advice in regard to whether your exhaust pipe is large enough. —V. D. W., of N. Y.

PROPORTION OF CYLINDER.—No. 20, page 267, current volume.—To find the radius of a cylinder, when the hight and number o gallons are given: Multiply the number of gallons by 231, to reduce them to cubic inches, then divide by the product of the hight with 3·1416 and extract the square root. To find the hight, when radius and number of gallons is given: Reduce the gallons to cubic inches by multiplying by 231; then multiply the square of the radius by 3·1416, and divide the number of cubic inches contained in the measure by the product. To find radius of a circle from the area: Take the area in square inches, and divide by 3·1416, and extract the square root of the quotient. Having the radius in inches, it is of course easy to find the diameter in feet and inches.—V. D. W., of N. Y.

LOCUST TIMBER FOR POSTS.—On page 170, current volume of the SCIENTIFIC AMERICAN, V. A. J. asks for information concerning white locust seed. I will give what I can. First: It is the yellow locust, and not the white, that he should get for post timber. The white will last but little longer than chestnut. I have yellow locust posts standing now that have been in the ground over sixty years. Second: To sprout the seed, I think it should be scalded with water at the boiling point or nearly so. I have observed, where a heap of locust brush was burned, the seeds sprout and shoot up quite thickly soon after, owing perhaps to some of the seeds being roasted just sufficient to burst the shell. Sometimes a hard freezing winter, without much snow, will cause them to germinate. I will try some by scalding and otherwise, and report, either through this column, or by mail, if V. A. J. will send his address to box 78, Lewisburg Pa.—J. A. G.

INFLUENCE OF FRICTION ON STEEL.—In answer to query 12, by J. H. N., October 7, I will say I do not think knitting needles loose their temper during use, but continued use will destroy the texture or crystalline structure of the steel, and retempering cannot restore it. I have observed that knitting needles, remaining in the pot, and that have been drawn six or eight times, have as perfect a spring temper as those but once drawn.—C. P. S. W., of N. H.

CLEANING POLISHED BRASS.—Take eight parts water, and one part muriatic acid; mix them, and put in common water lime, until the mixture is a little thicker than water. Shake up well before using. Pour some on a rag, and put on the brass. Let it stay a minute or two and then rub. It will clean the dirtiest brass more quickly and better than anything else.—H. P. M., of Conn.

SCALE ON BOILERS.—D. T. T.—The scale, of which you send a specimen, is doubtless formed very gradually, and drops off when broken by the expansion and contraction of the boiler. The feed water heater, about which you inquire, is a good one, and will prevent the formation of such scale as you describe.

FIXING PENCIL DRAWINGS ON PAPER.—C. V. B. will find an effective method on page 394, volume XXIV., of the SCIENTIFIC AMERICAN.

HYDRAULIC AND STEAM PRESSURE.—G. R. P. is informed that water, air and steam pressures are all equal in their effects upon boilers, provided that the pressure be steady, and entirely free from jarring motion. In testing boilers hydraulically, the pumps frequently give sudden jerks at each stroke, and this strains boilers to a great extent, weakening them much in a manner that escapes the eye of the person making the test.

BLASTING SUBMARINE ASPHALT ROCK.—C. M. is informed that asphalt rock under water can be easily blasted with dualin, dynamite, or nitro-glycerin. Full explanations of the manner of using the various explosives have been already given in the SCIENTIFIC AMERICAN.

THE "AMERICAN BUILDER."—H. C. C. is informed that this journal was recently published in Chicago, but the office has been destroyed in the great fire. We trust the publishers will be able to resume its publication before long.

SPEED OF LATHES AND PLANERS.—Z. Y. O. had better consult Byrne's "Practical Metal Worker's Assistant," for full information in answer to his two questions.

ACCUMULATION OF AIR IN WATER PIPE.—If J. P. will forward his diagram, we will examine it; and, if deemed of general interest will engrave and publish it.

Queries.

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

1.—RAISING WATER.—We have a spring 145 feet from the house, fall, 20 feet. Can we bring the water to the house with a suction pump? And will a cucumber wood pipe, 1⅜ inch bore (such as is used on cucumber pumps,) answer as a pipe? If not, what will be the best and cheapest pipe? The soil is red shale, and the water is used for drinking.—M. H. P.

2.—FRICTION MATCHES.—What ingredients or articles are used in the manufacture of friction matches? How are they generally used, and what should be the proportional parts of the same?—H. C.

3.—DIMENSIONS OF RIGHT ANGLED TRIANGLE.—I want a rule for finding the perpendicular of a right angled triangle, when the base and the difference between the perpendicular and the hypothenuse only are given. An arithmetical rule is requested.—C. C. B.

4.—VIGNETTING MEDIUM FOR PHOTOGRAPHERS.—Is there any substance, that can be cheaply prepared and may be cut with a knife, which, when of the thickness of one sixteenth to one fourth inch, is nearly or entirely opaque, and becomes transparent upon being shaved down, the transparency being regulated according to the extent of the reduction of thickness, so that it becomes nearly or quite transparent when reduced to the least possible thickness? Such a substance would be of great value to photographers for making vignettings, instead of using glass or tin ones.—T. J. A.

5.—DRAFT IN SAWING.—Can any of the experienced give a proper rule to determine the amount of draft in sawing different kinds of lumber?—E. D. B.

6.—OIL RESISTING METAL.—Is there any metal (or is there any way of doctoring any metal) that has no attraction for oily substances, especially for butter, that is, to which butter will not, and cannot be made to, stick?—W. R. S.

7.—AIR PUMP.—I would like to know how to make an air pump to force air into a cylinder, with a pressure of twenty-five or thirty pounds to the square inch, capable of supplying enough for a one eighth or one sixteenth inch pipe or vent.—N. S.

8.—DRYING ROOM FOR CLOTHES.—Would some of your readers give a description of a drying room for clothes? We have one of these rooms, heated by steam pipes, in our school, but owing to the want of a sufficient draft the moist heat is not drawn out strongly enough, and of course condenses again, which causes the drying process to be very slow, taking more than half a day; while, from what I hear of other drying rooms, half an hour ought to be sufficient. I have consulted some books referring to the subject, but the execution of their designs would involve great labor and expense.—J. J.

Recent American and Foreign Patents.

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

COMPOSITION BOXES.—Thomas Brian Gunning, New York city.—This invention consists in an improved mode of constructing boxes so that the covers will tightly and automatically clasp the bodies thereof and form a joint. The body of the box may be of any desired form, but is preferably made circular. The essential requirements of the invention are—first, that the box shall be made of rubber or other elastic material; second, that the outer face of the body and the inner side of the rim of the cover shall be correspondingly beveled. The advantage of constructing a box of elastic material with bevel edged corner and body is, that it forms a clasp joint, that will hold firmly, and yet can be easily separated.

SHIELD FOR BOOTS AND SHOES.—Orrin Collier, of Sacramento, Cal., assignor to Robert M. Funkhouser, of New York city.—This invention relates to a new and useful device for protecting the bottoms of pantaloons from water and mud; and consists in a detachable shield on the heel of the boot or shoe, made of metal or other suitable material, projecting back and from the heel.

WASHING MACHINE.—Loyal M. Doddridge, of Union City, Ind.—An oblong rectangular box, having vertical ribs centrally placed opposite to each other, has, on the inner part of the long sides, friction rollers, arranged in an upright position near the short sides. Projecting fingers are placed upon a vertical shaft. This shaft is made with a conical shank, which is fast in a hollow socket that serves as its journal. The journal projects up and beyond its bearing, and receives a fast spur wheel upon it. A circular rack is arranged on a vibrating shaft in a frame, and may oscillate the shaft, or it may be rotated by any suitable mechanism. The clothes being placed at either end of the oblong box, and the parts caused to oscillate or rotate, the fingers will seize upon the clothes and carry them over the ribs from one side to the other, pressing and rubbing them thoroughly.

COTTON TIE STRETCHERS.—Samuel Mather, of New Braunfels, Texas.—This is a simple, convenient, and effective instrument for drawing the band around the bale, so that it may be drawn snug and conveniently fastened. It consists of a hand lever, with gripping device, to which a bent link, also with a gripping device, is pivoted, the apparatus being adjustable for different lengths of bands, and very convenient in use.

HAMES FOR HARNESS.—Peter B. Watson, of Belvidere, N. J., assignor to himself and Moses A. Dewitt, of same place.—This invention has for its object to furnish improved harness hames, which shall be so constructed that the hame tug hook may be adjusted to shift the draft pressure upon the horse's shoulders as may be required, and which shall at the same time be simple in construction and easily adjusted. It consists in the construction and combination of various parts, designed to effect the purpose set forth.

CHAIR.—William W. Haupt, Mountain City, Texas.—This invention relates to that class of chairs in which the back, seat, foot rest, and head rest, are all self adjusting, and operated by the natural movements of the occupant, who is enabled to occupy a position erect, horizontal, or at any desired inclination between the two. In this case, there is an improved arrangement of parts, tending to render the chair more easy of operation, and more comfortable for the occupant. The chair is provided with rockers, so that an oscillatory movement may be given to it, whether the position of the occupant be a reclining or [illegible].

CHURN.—Marion G. Decrow, M. D., Newark, Ohio.—This invention relates principally to the rod which connects the dasher with the lever that operates it, said rod being bent to one side, so that butter can be taken out of the churn without removing the rod.

SHADE RACK.—Harvey Lull, of Hoboken, N. J.—This is an improved rack or holding the pulley that receives, holds, and stretches the cord by which the shade is rolled and unrolled. It is simple and inexpensive in construction and effective in operation. The body of the rack is made of sheet metal cut into the proper shape and struck up into the desired form. The side edges of the plate are brought nearly together and are then bent outward, only sufficient space being left between them to receive the dog to which the knob spindle is attached. The extreme edges of the plate are turned outward, and have teeth formed in them, upon which the dog takes hold. The upper end of the dog is bent inward at the same angle as the inclination of the rack teeth. The lower part of the dog is bent inward and upward, to serve as a spring to hold the dog down upon the teeth of the body. The upper end of the dog is bent inward and downward, to receive and hold the end of the spring. The dog is notched at its upper and lower ends, to receive the turned out toothed edges of the body, while the side edges of the dog and spring overlap the side edges of the body. A knob, the spindle of which passes through the pulley that receives the cord, is secured to the dog.

VAPOR BURNER.—Isaac Whitehouse, of New York city, assignor to Charles Royle, of same place.—This invention has for its object to furnish a simple and effective burner for burning the gas generated from gasoline and other suitable light hydrocarbons, and which will give a strong and uniform flame. The piece which is screwed upon the end of the gas pipe, has, at the opposite end, a screw, upon the outer end of which is cast a thumb piece, and which passes into and through a chamber formed in the center of the piece. The point or forward end of the thumb screw is made conical to fit into a conical cavity formed at the enlarged inner end of the small passage that leads from the chamber into the cavity that receives the end of the gas pipe, so that the screw may serve as a valve to regulate and stop the escape of the gas, as required. A passage leads from the chamber into the burner tube. The end of the upper arm, or part of the piece in which the passage is formed, has an annular recess formed in it to receive the lower end of the burner tube, and has a screw thread, cut in the inner surface of the outer wall of said recess, to receive the screw thread cut upon the outer surface of the lower end of the burner tube. In the opposite sides of the lower part of the burner tube, are formed holes to admit air into the chamber, to mingle with the gas as it passes to the burner tip, said holes being made of such a size as to allow the proper amount of air to mingle with the gas. Upon the upper end of the burner tube, is screwed the tip, through a slit, in the upper end of which the gas escapes to be burned. In the tip, above the upper end of the tube, is placed a cap or partition, made of wire gauze or finely perforated sheet metal, the effect of which is to finely divide the escaping stream of mingled gas and air, and cause it to escape thoroughly mingled and uniformly from the tip, thus giving a steady flame. An open ring tube, the open ends of which enter the opposite sides of the upper part of the tube, is cast solid with the burner tube, and is bent a little to one side so as to pass over the tip parallel with and a little in the rear of the slit in the top of the tip. By this arrangement the mingled air and gas will be thoroughly heated before it escapes through the tip, and will thus, it is claimed, be prepared to produce the best effect.

HORSE POWER.—David S. and Josiah D. Heebner, Norritonville, Pa.—This invention relates to links for endless chains for horse power, and it consists in making such links higher at one end than at the other, in order that, while the lower edges of the links stand at an inclination above the rollers, the upper edges may be horizontal, and so afford level footholds for horses

WAGON BOLSTER AND STAKE.—Jacob W. Smith, Dixon, Iowa.—This invention relates to a bolster having adjustable stakes which can be placed as near to or as far from the ends of the bolster as may be desired, and fastened in any position for the purpose of accommodating boxes or sacks of different widths and carrying loads of different magnitudes.

BUCK SAW FRAME.—William Hankin, of Hawley, Pa.—This invention relates to a new means of bracing buck saw frames by L shaped staple braces fitted through the ends of the cross bar, and bearing against the side pieces of the frame. The lower ends of the braces can be carried nearer the saw than any other bracing device, and a better effect is, consequently, produced. The cross bar is at the same time braced above and below, and cannot rack at the shoulders. The entire saw frame, in fact, becomes rigid, and, having the braces in the center, is balanced. The band on the upper part of the frame is unobstructed.

IMPROVED WOODEN PAVEMENT.—A durable and reliable foundation for wooden pavements is an absolute necessity, and at present an item of considerable labor and expense. Mr. Charles K. Deutsch, of New York city, proposes, in an invention just patented by him, to dispense with the use of a separate foundation, or at least make the same of less importance, by making the paving blocks sustain each other. The wooden pavements now in use consist of wooden blocks placed side by side upon a layer of boards, beams, or strips of wood. If at any one point this layer is interrupted, the block or blocks above will be forced down, they being not otherwise sustained. The invention of Mr. Deutsch consists in constructing and connecting the blocks of a wooden pavement to make them interdependent and mutually supporting. Each block has L shaped ends, forming steps and shoulders. The step at one end supports the pendent shoulder at the other end of each block. As the several blocks are put together, the steps will come under the shoulders as shown, whereby one block is made to support the other. In a pavement thus composed all blocks of one row are connected and help to sustain each other. The foundation therefore need not be prepared of wooden layers, as it is claimed a good bed of gravel will be sufficient in most cases. Still, a suitable foundation may be used if desired. The several rows of blocks may be locked together by strips entering grooved sides of the blocks, or by projecting tenons or equivalent means. Cement, gravel, or sand may be filled between the blocks, which completes the structure.

FILTER.—Johann P. A. Vollmar, of Bingen, Germany.—This invention relates to a new filtering apparatus, whereby wine or other liquid can be thoroughly cleared in a short space of time and in a continuous stream. The invention consists in the use of tapering frames, made of sheet metal and surrounded with the filtering fabric in such manner that the liquid passing through the large surfaces of the latter will be collected by the converging braces of the frame and caused to enter the discharge tube. The apparatus is used by putting up sections, as shown, and putting charcoal or other filtering substance around them, filling the funnel therewith to such hight as may be needed for the more or less impure liquid. The liquid is then poured in, and runs off through a suitable spout or pipe. The several upright braces in the filter serve to collect the filtered liquor and guide it to the discharge pipe.

ELEVATORS.—Mr. Patrick Byrne, of Nashville, Tenn., whose improvements in elevators were recently illustrated and described in this journal, has invented still further improvements, in the construction of elevators for warehouses, etc., which he has just patented. A prominent feature of the invention is that the hand rope is so placed that it may be operated from the platform of the elevator. Further improvements are made, which cheapen the cost and simplify the construction.

ATTACHMENT FOR SEWING MACHINE.—The invention of Mr. Abel H. Bartlett, of Spuyten Duyvil, N. Y., relates to improvements in the attachment of various devices for tucking, cording, hemming, and quilting. It consists in the use of a base plate, with arms or plates supported one above another along the front of the base plate, the base plate being provided with a cloth pressing spring, which controls the cloth in passing from the said devices to the needle. The invention further comprises various adjuncts for use in connection with the plates in performing the above named operations. They are of such a nature that no definite idea of their functions can be given in the present notice. The same inventor has patented a device for folding, binding, and hemming, the binding being formed out of the cloth that is bound. These improvements are of a thoroughly practical character, and are neat, compact, and tasteful in design, while convenient to apply.

BREAD CUTTER.—Isaac S. Bunnell, Carbondale, Pa.—This invention relates to a new machine for cutting bread; and consists in a new manner of hanging the knife so that it will be supported at both ends and moved with a slight drawing motion to insure a powerful cut. The knife is pivoted at one end to a straight lever, and at the other end to an elbow lever, so that, when swung down by a person holding it by the handle, it will descend at the handle end slightly faster than at the other end, thus producing a drawing cut. The device is adapted to cutting hay, straw, etc., without change in the arrangement of its working parts.

MEDICAL COMPOUND FOR CURE OF CONSUMPTION.—James E. Larkin, Newark, N. J.—This invention and discovery relates to a medical composition designed for the prevention and cure of consumption; and it consists in a liquid compound, composed of various ingredients in certain proportions, compounded in a particular manner, which, it is claimed, acts directly upon the lungs and bronchial tubes, in a very effective manner, when these parts are affected with incipient disease.

CAKE MIXER.—This is a simple device, operated by a crank, for mixing sponge cake. From the shaft of the crank extend radial arms; at each end, near the bearings, these arms are connected by rods. This arrangement turns in a box or case, the whole resembling the old style of churn with rotary dasher. The materials for the cake are put in at the top, which is provided with a suitable cover. This is the invention of Thomas Holmes, of Williamsburgh, N. Y.

WASHING MACHINE.—William Martin, Orford, Iowa.—A long rectangular tub or case is made considerably deeper at one end than at the other, in which a rack or rubber is pivoted at its upper end, near one end of said case, in front of springs, and provided with a concave face, against which the clothes are rubbed. The springs are designed to allow the rubber or rack to yield back or move to some extent while the clothes are pressed against them, and then move forward again, with the clothes, about the same amount, before the pressure is taken off. The said springs are specially designed to yield easily during the first part of the backward movement, and to offer much greater resistance during the last part, being shaped so that at first the resistance to the rubber is near the front, where it is attached to the case, and during the latter part it is in the front part, much nearer the end bearing against the rubber. The rubber, to be worked forward and backward for actuating the clothes, has a convex corrugated face, and is pivoted to arms, and has a long crotched arm extending round and jointed to a crotched or braced bar pivoted to the end of the case, also jointed together by a link, to a sweep which, being oscillated vertically, imparts a swinging motion to the rubber or beater, which also oscillates it at the same time. This oscillation is intended to impart a slow turning motion to the mass of clothes between the rubber at the same time they are beat up.

MILK CAN.—Thomas M. Bell, New York city.—This invention consists in a new method of cutting out the pieces of which a milk can is formed, in order to economize the material and lessen the cost thereof, and of connecting base and bottom. There is nothing new in the construction of the breast, neck, and cover of the can. Around the outer side of the upper edge of the base or bottom band is formed a rabbet to receive the turned down edge of the bottom and the lower edge of the body. The edge of the bottom is turned upward so as to lie closely along the upper part of the inner surface of the bottom band, and is then turned over the upper edge of said band. This construction of the bottom leaves no seam or joint at the base of the can for the milk to lodge in and sour, and thus enables the can to be more easily kept clean and sweet. The bottom hoop is made solid in one piece, and is struck up into the form of a flange around the edge of a flat disk of sheet metal. The flat central part is then cut out, leaving the hoop of exactly the right size to fit around the bottom of the can, where it may be secured in place in the ordinary manner. The cut out central part of the disk is then used to form the neck of the can, so that there is no waste of metal. The breast hoop is formed solid in one piece by striking up the outer part or edge of a disk of sheet metal into the desired form. The central flat part is then cut out, leaving the hoop in proper form to fit upon and overlap the upper part of the body and the lower part of the breast. The central cut out part of the disk is used for forming the cover so that there is no waste of metal. By this construction the various parts of the can, being formed by dies, will exactly fit their proper places, thus saving a great amount of time and labor in putting the can together.

AUTOMATIC RAILROAD SIGNALS.—Henry S. Evans, West Chester, Pa.—This invention has for its object to furnish an improved apparatus for operating railroad signals by the passing engine or train. Two signal posts are erected at a suitable distance from the track, and at least at such a distance apart that the entire train shall pass one of said posts before its forward end reaches the other post. The posts are placed upon the right hand side of the track, a separate set being used for each track upon a double track road, and for each side of the track upon a single track road. To the upper ends of the posts are pivoted pulleys, with which pulleys are rigidly connected the signals. One signal is a single straight signal or wing, and the other is a double signal, its parts or wings being at right angles with each other, and is designed to be used where there is a crossing. An endless chain or wire, or a combination of chains and wires, passes around the pulleys, and is so connected as not to slip upon them, so that the two signals may always be moved together. To the pulleys are also attached the upper ends of chains, the lower ends of which are attached to the outer ends of levers, which are pivoted at their inner ends to suitable supports beneath the track. Two other levers, extending in opposite directions along the right hand rail of the track, have their outer ends pivoted to suitable supports at the side of the rail. The inner or adjacent ends of these levers are connected to the first set of levers in such a way that a train, in passing, will operate the signals gradually.

BACK BAND HOOK.—Henry Beagle, Jr., Philadelphia, Pa.—This invention has for its object to furnish an improved back band hook which shall be simple in construction and convenient in use, being so constructed as to be easily adjusted upon the back band, and securely held in place when adjusted. The body or plate of the hook has two parallel slits formed in it, dividing it into three parallel bars. The central bar is struck up or pressed outward to project above the planes of the plate. The slits are so formed that the edges of the central bar may be about upon a line with the adjacent or inner edges of the outer bars, so that the back band, when passed through the spaces between the edges of the three bars, may be bent sharply, and may thus be held securely by friction. The hook over which the trace, tug, or chain is passed to be held, is cut out of the solid body of the part of the plate projecting downward from the lower edge of the lower bar of the said plate, and is bent, struck up, or formed into proper shape to receive the trace, and, at the same time, into such a shape that its point may be about in the plane of the plate or body of the hook, so that the said point cannot catch upon the harness of the other horse or upon the reins, and so that the trace cannot become accidentally unhooked. The metal around this hook is cut away, so that the trace can be conveniently slipped over the point of the said hook.

CUTTING APPARATUS FOR HARVESTER.—James T. Polson, Laclede, Mo.—This invention relates to reapers, more particularly to the cutters of reapers; and consists in the peculiar arrangement of a hinged plate by which the said cutters, which are of the rotary kind, may be readily removed. The upper plate of the finger bar is hinged to the upper portions of the guards so that it can be readily swung up to expose the cutters under it, while it is held down by screws when the device is in operation, washers being put around the screws to hold the plates sufficiently far apart. The cutters are fitted upon upright gudgeons, which have their bearings in the lower plates of the finger bar, and are to be revolved when in action. The cutters are of suitable form, having either projecting arms or polygonal cutting edges, or other shape. Between the plates is mounted, upon each gudgeon, a toothed wheel. The several wheels are either connected with each other by intermediate gear wheels, and finally also with a toothed wheel on the driving shaft, so that all cutters will simultaneously and with equal velocity be revolved in the same direction, or the wheels may have beveled teeth and mesh into pinions on a driving shaft which hangs under the finger bar.

PICTURE NAILS.—Thomas C. Richards, New York city.—The object of this invention is to provide the public with a new and improved article of manufacture in the line of picture nails. It consists in the construction and arrangement of the porcelain scalp or head, a nut secured thereto by lead or its equivalent run into a cavity of said head, and having a central screw threaded perforation to receive the head of the spike.

WRENCH.—John Gates, Portland, Oregon.—This invention has for its object to improve the construction of monkey wrenches in their several details, so as to make the same stronger and more reliable without a greater outlay of labor or material than the devices of similar kind now in use. The main bar or shank of the wrench is fitted into the handle, and holds the upper jaw. The screw head fits partly into a notch or recess cut into the main bar, the lower end of the screw resting on an ear of the ferrule. The notch gives full support to the screw head, and holds the same clear of the ferrule. The liability of the wrench becoming loose between the screw head and ferrule is thus obviated.

HOT AIR FURNACE.—Joseph C. Barnes, Albany, N. Y.—This invention relates to improvements in heaters or hot air furnaces. It consists in an annular cold air space surrounding the ash pit, fire pot, and combustion chamber, which is surrounded by another annular space into which the product of combustion is discharged between tubes connecting an upper and a lower section of the cold air space. The whole is surrounded by an outer case, and comprises an arrangement calculated to be very effective in economizing the heat.

GATE.—Samuel Smyth, East Bridgewater, Pa.—This invention consists in hanging gates on horizontal projecting trunnions, and applying sliding weights to the upper ends of the supporting bars or posts which balance the lower part of the gate, but overbalance it when the same is turned up. A very simple and convenient gate is thereby produced, for fences at road crossings, etc.

TOOL HANDLE FASTENER.—James G. Wilbur and Hiram H. Huribut, of Kilbourne City, Wis.—This invention relates to a new and useful improvement in fastening the handles in axes, hammers, and all similar tools or implements; and consists in the employment of a metallic key with its side or one or more of its angles ragged or bearded. The key is fitted to the back portion of the eye, and is of a sufficient width to fill the wedge shaped space left between the handle and the back of the eye. The key is made of iron or any other suitable metal, and its flat side, which comes in contact with the handle, is made ragged or bearded by starting up portions of the metal with a sharp punch or cold chisel. The beards or teeth penetrate the wood of the handle, or create so much friction that the handle cannot be withdrawn unless the key is driven out. This is easily done with a hammer or hammer and punch. The advantages claimed are that the ax, hammer, or other tool or implement, to which the improved key is applied, is securely fastened to the handle by the bearded key, so that there is no danger of its flying off when in use. The handle may be removed without injuring it, if the tool fails, and without injuring the tool if the handle fails, as, by the present mode of fastening, the handle has to be burned out of the ax, which of course destroys the handle, and frequently destroys the temper of the ax.

MECHANICAL MOVEMENT.—William Weaver, of Greenwich, N. Y.—This invention has for its object to furnish an improved mechanical movement for driving scroll sawing machines and other light machinery by hand or other power, where great velocity is required; and it consists in the arrangement of belts, two or more, with pulleys and a driving shaft, with two posts, to and between which the pulleys are pivoted. The driving pulley or drum, is made so as to receive all the belts, and to one of its journals is attached a crank or pulley, by which the power is applied. Belts pass around the driving pulley or drum and around loose pulleys, each belt having its own loose pulley. The opposite sides of the belts are drawn inward and pressed around a shaft, placed betwen the drum and loose pulleys, from which shaft the power is taken to the machinery to be driven, so that the said belts may pass around the opposite sides of said shaft alternately, making the strain upon it equal in opposite directions, thus relieving it from any side strain from said belts. The loose pulleys are made self tightening.

PIPE ELBOW.—Isaac Leas and William H. France, Terre Haute, Ind.—This invention relates to improvements in the manufacture of stove pipe elbows; and it consists in making them of one sheet of metal by cutting out say about four triangular pieces from each side, extending not quite to the center, at suitable distances apart; then rolling or bending the sheet to cut perpendicular into the form of a tube; then bending it so that the sections between the horizontal notches come together and lap; and finally riveting the ends and lapped edges of such sections.

GROUND MARKERS AND FURROWERS.—George W. Martin, William G. Parrish, and James A. Petrie, Elizabeth, N. J.—The object of this invention is to furnish to farmers a simple and convenient implement for marking and furrowing land for planting corn, potatoes, and other seeds, by which the ground may be furrowed in each direction, the intersections of the furrows being at the proper distance from each other for the rows. Different seeds require planting at different distances apart, as well as at different depths in the ground. The plows of this machine being adjustable as to both depth and distance apart, the machine is claimed to be admirably adapted for the purposes intended, and is a most valuable labor saving farm implement.

SHOEMAKERS' JACK.—Franz Weissenborn, Egg Harbor City, N. J.—The post for supporting the last is fitted into the jack in such manner that it may be swung more or less outward or inward, a spring, which is concealed within the jack, holding it inward—that is, vertical to the face of the jack. The rest for supporting the toe of the last is provided with a slotted plate projecting toward the post and fastened to the jack by a bolt that penetrates said plate. The rest is thus adjustable on the jack to admit of longer or shorter lasts. The shoemaker can turn the last to the right or left without taking the hands from the work. The last can be conveniently turned in either direction to bring the boot or shoe in the most convenient position for handling.

WAGON BRAKE.—Henry Sager, Penn Station, Pa.—This brake is a simple block of wood, or other material suitable for the purpose, fitted between the wheels, and so connected with a brake lever by a rod and bell crank that it may be pressed onto or against the wheels with any required force by the driver to retard or stop the motion of the wagon by the friction thus produced. The brakes may be operated simultaneously; or a car or wagon may have but a single brake, should one be sufficient, as it might be when there were no heavy grades. The double brake may be applied below the center or middle of the wheels, and by upward pressure, if desired. A slight movement of the brake lever applies or releases the brake to or from the wheels. Accidents are almost daily occurring in coal mines, resulting in injuries to man or beast, or to the wagons, for the want of some efficient means for controlling the motion of the wagons or cars. By this improvement, it is claimed that the momentum may be checked almost instantly, and the wagon or car controlled by the driver in the easiest and most perfect manner.

COTTON PRESS.—Samuel S. Rembert, Memphis, Tenn.—In this invention, a very unique method of applying the power is employed. There are two followers, upon opposite sides of the bale, both of which receive compression equally, and of a gradually increasing force, as the bale becomes compressed. The speed of the followers diminishes as the power increases. This is accomplished by means of a screw, and a combination of toggle jointed levers placed on one side of the bale, the power being transmitted to the follower on the other side by means of connecting rods and a cross head. The whole arrangement is simple, compact, and evidently powerful.

BREECH LOADING FIRE ARM.—Invented by John D. Wilkinson, Plattsburgh, N.Y.—In general terms, this invention may be said to consist of a revolving disk at the breech of the barrel, on a spindle arranged under the barrel, to revolve and also to slide backward and forward, and extending a suitable distance behind the disk, for being actuated by the hand used for pulling the trigger and cocking the hammer, to revolve the disk for opening and closing the breech and discharging the shell. The simplicity and cheapness of the arrangement are prominent features of the invention, and it is claimed that the gun may be manipulated and fired with great rapidity without taking it from the shoulder. After the trigger is pulled, the hammer may be raised and the spindle turned without moving the hand away, and when the cartridge is applied, the spindle and disk may be turned back by the thumb, as the hand is placed in position for firing.

CORN HUSKER.—This is the invention of Daniel Sager, of New York city, assignor to James A. Robinson, of Brooklyn, N. Y. The ears are stripped from the stalk by revolving pickers, and, rolling down a shaker, meet a blast from a fan blower, which cleans them from dust and dirt, then pass between an endless apron, of peculiar construction, and rollers, whereby the husks are removed and the ear is discharged.

PUMP.—John Roberts, Madison, Ohio.—This is a new method of securing valves in pumps, this valve plate being confined below small knobs on the inside of the cylinder, the plate being held by the friction against the cylinder, and the friction being produced by the expansive force of a spring.

WATER METER.—The invention of Daniel L. Tower, New York city, consists of a shell containing an oscillating valve plate, from which rises a flange which makes a water tight joint with the shell. This flange with the valve is made to work first in one direction and then in another, operating valves which direct the flow alternately upon the two sides of the flange, the motion being communicated by a crank arm to a suitable registering apparatus.

GAUNTLET GLOVES.—Virgil Price, New York city.—The object of this invention is to so arrange detachable gloves and gauntlets that, when worn, they cannot come apart at the wrists, but will be properly held together, to appear as though united. The invention consists chiefly in forming a projecting bead at the upper end of the glove, and a corresponding bead on the lower end of the gauntlet, so that thereby the glove will be prevented from slipping down out of the gauntlet.

BLIND SLAT OPERATOR.—Henry B. Lum, Sandusky, Ohio.—This is a new and improved blind slat operator, which consists in an oscillating cranked rod passing through the window frame and connecting with an arm or crank on one of the slats in such manner that it will not interfere with the opening and closing of the blinds, and will operate the slats in whatever position the blinds may be, whether open or closed, or partly open.

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How Can I Obtain a Patent?

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

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

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Preliminary Examination.

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To Make an Application for a Patent.

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

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APPLICATIONS FOR EXTENSION OF PATENTS.

ICE CREAM FREEZER.—H. B. Masser, Sunbury, Pa., has petitioned for an extension of the above patent. Day of hearing, January 8, 1872.

CUSHIONS FOR BILLIARD TABLES.—Hugh W. Collender, New York city, has petitioned for an extension of the above patent. Day of hearing, December 27, 1871.

Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing

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119,911.—DAMPER.—J. Ash, Sterling, Ill.
119,912.—FRUIT CAN TONGS.—A. T. Atherton, Lowell, Mass.
119,913.—CAR BRAKE.—J. T. Bassett, Galesburg, Ill.
119,914.—HARNESS TRIMMING.—J. Bauer, Newark, N. J.
119,915.—PAPER BAG.—B. S. Binney, Somerville, Mass.
119,916.—SCREWS.—J. M. Carpenter, Pawtucket, R. I.
119,917.—PAPER FILE.—C. Chapman, Chicago, Ill.
119,918.—SCISSORS.—E. Clapp, Boston, Mass.
119,919.—HYDRAULIC MAIN.—C. Collier, Selma, Ala.
119,920.—LANTERN.—M. B. Dyott, Philadelphia, Pa.
119,921.—HEMMER.—H. A. Ellis, Greenbush, N.Y.
119,922.—TRACTION WHEEL.—G. W. Fitts, Oberlin, Ohio.
119,923.—CANAL BOAT.—P. H. Fontaine, Reidsville, N. C.
119,924.—GUN CARRIAGE.—J. G. Foster, Boston, Mass.
119,925.—SPIKE MACHINE.—M. Foster, Cleveland, Ohio.
119,926.—BREAD BOARD, ETC.—B. Fulton, Pulaski, Iowa.
119,927.—TOY.—H. N. Gallagher, Worcester, Mass.
119,928.—SPARK ARRESTER.—B. Garvin, Oshkosh, Wis.
119,929.—EVAPORATOR.—W. F. Gibson, Ryegate, Vt.
119,930.—SEWING MACHINE.—E. L. Howard, Hingham, Mass.
119,931.—FIRE EXTINGUISHER.—E. Jones, Pierrepont, N. Y.
119,932.—BRAKE.—H. B. Lee, Maryville, Mo.
119,933.—WASH BOILER.—E. F. Lewis, Winsted Lake, Minn.
119,934.—COTTON PRESS.—L. Lewis, Vicksburg, Miss.
119,935.—PENCIL CASE.—W. A. Ludden, Flushing, N.Y.
119,936.—FIRE EXTINGUISHER.—J. H. Manning, Chicago, Ill.
119,937.—HARVESTER.L.J.McCormick,W.R.Baker,Chicago,Ill.
119,938.—CLOTHES PIN.—H. Mellish, Walpole, N. H.
119,939.—FIRE ARM.—G. Merrill, East Orange, N. J.
119,940.—FIRE ARM.—G. Merrill, East Orange, N. J.
119,941.—TOBACCO PIPE.—J. M. Mur, New York city.
119,942.—CONDENSER.—J. R. Neil, Brooklyn, N. Y.
119,943.—RECTIFIER.—J. R. Neil, Brooklyn, N. Y.
119,944.—HINGE.—A. A. Oat, Philadelphia, Pa.
119,945.—BLIND HINGE HOOK.—G. Orr, Needham, Mass.
119,946.—CONFECTIONS, ETC.—S. A. Parker,Cambridge, Mass.
119,947.—FILE.—I. N. Patten, Memphis, Tenn.
119,948.—LOCK.—G. H. Peacock, Webster, N. Y.
119,949.—STOVE.—J. S. Perry, A. Dickey, Albany, N.Y.
119,950.—CORN PLANTER. F.A.Ramey,R.Cross,Woodstock,Va.
119,951.—BUGGY TOP.—J. F. Regan, Chicago, Ill.
119,952.—COVER.—D. Smith, Gilsum, E. Smith, Keene, N. H.
119,953.—DISH WASHER.—W. L. Thompson, Stanstead, Can.
119,954.—HORSE POWER.—J. Valentine, Buffalo, N. Y.
119,955.—FURNACE.—J. G. Weldon, Pittsburgh, Pa.
119,956.—SULKY.—J. Winecoff, Berlin, Pa.
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A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXV.—No. 19. (NEW SERIES.) NEW YORK, NOVEMBER 4, 1871. $3 per Annum. (IN ADVANCE.)

ORGAN BLOWING APPARATUS.

It is only recently that motive power has been substituted for manual labor in supplying wind to church organs, many of which are of mammoth size, requiring from two to six stalwart men to keep the bellows full while the organ is playing, the employment of which manual labor is attended with great inconvenience and expense; for whenever the organist wishes to practice, or the choir to have a rehearsal, the blowers must be obtained if possible, and if not, then the playing must be postponed to a more convenient season; for it almost invariably happens that those who perform this service are otherwise employed during week days, and their services can only be had when they can be afforded most cheaply and conveniently.

An instrument of music costing so much as the organ, and which is as susceptible of constant use without injury as a piano, should be in a condition to be used at any time, and without the trouble of obtaining one or more persons to blow the bellows; in fact, no pipe organ, whether for the church, parlor, or public hall, can be considered complete without some automatic action to supply the wind, thus rendering it as convenient to use as the smaller keyboard instruments.

The advent of the cold water engine has opened a new era for this, the grandest and most powerful of all musical instruments, rendering it as accessible and convenient to use as the piano or flute. We give here with a fine illustration of an organ blowing apparatus, designed by G. W. Lascell, and executed by the Cold Water Engine Company, of Watertown, N. Y., for Christ Church, Brooklyn, E.D. (Rev. Dr. Partridge's), on Bedford avenue, near South Ninth street.

The engine is the Coats & Lascell patent, illustrated in the SCIENTIFIC AMERICAN of July 8th, last, so modified in form as to be peculiarly well adapted to the blowing of church and parlor organs, for which it has proved to be all that could be desired. It has received the hearty endorsement of Messrs. Jardine & Sons, builders of the organ, and all interested, who have examined the apparatus and witnessed its performances.

By reference to the engraving it will be seen that, in this engine, the crank has been dispensed with, and a new valve gear substituted for the ordinary eccentric motion, by which it is impossible for the engine to be caught upon the dead centers, or to stop at any point from which it will not readily start again—an important and even indispensable requisite in engines for organ blowing purposes.

The bellows is double acting, with stationary heads, A, and a movable piston, B, the whole covered substantially with leather. As the piston is moved forward or backward, the wind is forced alternately through the pipes, C, to the wind chest, D, at the top of which the trunk, E, is attached, through which the wind is conducted to the organ, as shown in the engraving. A portion of the organ is broken away, revealing a section of the bellows, on the back side of which is a stationary post, F, to which a beam is hinged, which extends across to the front side; and the end resting on a bar, which, with the post in the rear, supports this beam or lever at nearly the highth to which the bellows rises when fully inflated.

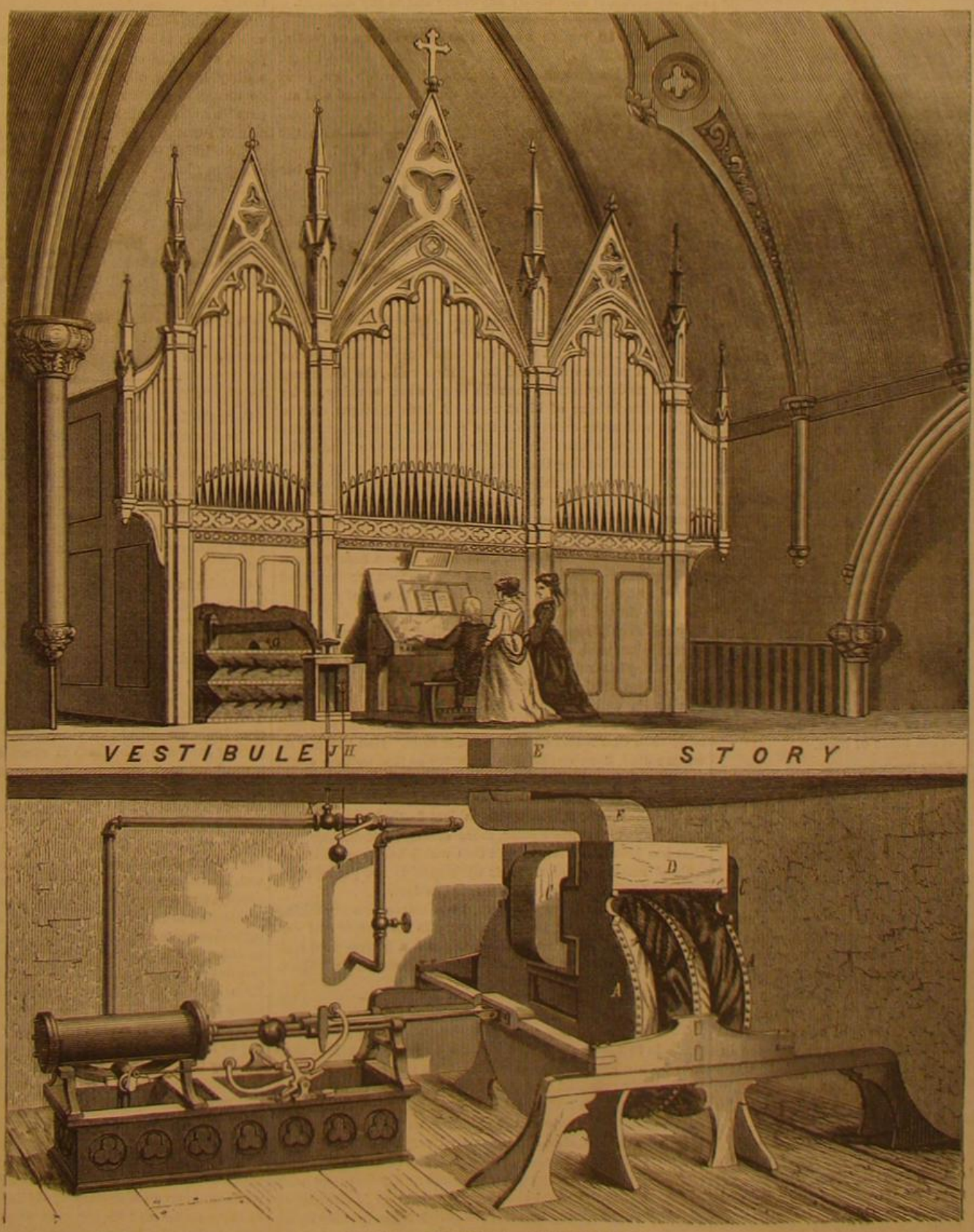
On the center of the top board of the organ bellows is a stationary block, G, which, as the bellows rises, comes in contact with the lever and lifts it. To the front end of this lever the governor valve rod, H, is attached, which is connected with the governor valve in the water pipe, so that, when the bellows is filled to the maximum point, the water is gradually shut off by the rising of the bellows, thus slowing the speed of the engine or stopping it entirely, and *vice versâ*, as the exigency of the case may require; thus the organ bellows is made to supply its own needs automatically, and with such a degree of nicety, in the adaptation of want and supply, as no hand blowing can at all approximate. Besides this, the organist is freed from all fear or anxiety, lest the man at the bellows may be careless or inefficient and mar or cut short his performance. In this, the organist is assured that whether he connects the full organ, or uses but a single stop, or however frequent or sudden may be the changes, the bellows is always full, ready for any emergency, provided always that the blowing apparatus is of sufficient capacity. In this case, as in all others of this manufacture, the capacity is more than ample to meet all the demands upon it.

The feeders of this organ discharged 24 cubic feet of wind to one revolution of the hand crank, while the apparatus now attached discharges 90 cubic feet to one revolution of the engine, and consequently is four times the capacity of the original organ feeders. The engine is, therefore, made to move very slowly, it being constantly held in check by the well-filled bellows of the organ, holding the governor valve of the engine nearly shut, allowing it to move but six revolutions per minute at the highest speed, and one and a half as the lowest; consequently the cost of water consumed is reduced to a nominal sum, the organ blowing expense being brought within 35 cents per Sunday for the prolonged services of the Episcopal and Catholic churches, and less than half that for the others.

Within convenient reach of the organist is the hand wheel, I, attached to the upper end of the rod, J, which extends down to the stop valve, K, and by which he starts the engine at the commencement of the service, and stops it at the close. Thus the organist is the engineer; the engine requiring no attention except a little oiling occasionally.

All parts of this engine that would come in contact with the corrosive action of water are made of brass, which, with the frictionless balanced valve before described, renders this one of the most effective, economical and, for aught we see, durable machines that could well be devised.

These engines are manufactured by the Cold Water Engine Company, of Watertown, N. Y., to whom our readers are referred for further information concerning them.



ORGAN BLOWING APPARATUS

Devices for Raising Sunken Vessels.

Thomas Collier, of New York city, has invented improvements in apparatus for raising sunken vessels.

In the application of his system, the hatches will be stopped or closed by two pieces of strong plank, rabbeted at the edges, and covered on the upper surface by sheets of india rubber or other suitable packing, one of which sheets is adjusted between the parts forming the rabbeted joint, while the other laps over the joint, the plank being inserted through the hatch below the timbers, and clamped up to them and the framing of the hatch, by bolts connected to them by eye-bolts, and passing through the cross pieces temporarily inserted in notches in the sides of the frame.

But in the case of the hatch through which the hose for pumping out the water is passed, the bolts are made longer, and are supported by bridges spanning the hatch, one near each end. The planks for this hatch have short tubes permanently fixed in them, projecting at each side, and screw-threaded for attaching the hose, which will be in two sections, one extending below into the hole, with a nozzle or strainer at the end, and the other upward to the pumping apparatus to be adapted for pumping water out and air in. The two pieces of plank are employed for closing the hatches, because they may be admitted through the hatches,while a single piece wide enough for the purpose could not. Stop-cocks in the short hatch tubes are employed to close them in case, by any accident, the tubes above become ruptured, in which condition the water would flow into the hold. The cocks are rigged with cords and pulleys or other apparatus adapted to work them from the deck of the vessel above. The smoke-pipe, or the hole through the deck therefor in case the pipe is carried away, will be closed by a sheet of india rubber, placed over it, and a closed sack, being placed over the rubber is made fast to the deck by a ring or cleats fastened down over the edge in any way to hold the sheet and sack in place when filled with air forced in through a light flexible hose, leading up to the top, which forces the said sheet and the bottom of the sack down upon the deck and closes the opening water tight, the top of the sack being prevented from rising by cords rigged over it. The sack may have a short tube attached to it for admitting water to sink it to the vessel for adjusting thereon, after which the water may be forced out by the air pumped in, and the said short pipe closed. A hole through the side of the hull will be closed in the same manner, as indicated. In either case, when the opening is wide, bars of wood or iron will be placed across to prevent the packing from being pressed in the hole.

The hatch closing apparatus will be found very serviceable in case of storms at sea, as a protection in case the "booby" or other hatch is carried away, as often happens.

Other small holes may be stopped by a plug, india rubber washers, and an inflating tube, arranged to admit the air above the washer and pass it snugly to the deck, the flange of the plug being nailed down to the deck.

The Physical Features of Insanity.

Dr. T. B. Tuke, a physician of eminence and learning in the science of mental disease, read a document at the recent meeting of the British Association for the Advancement of Science, in which he said:

"It is generally acknowledged that the intellectual powers are manifested through the gray matter of the cerebrum, and as in insanity these faculties were impaired, exaggerated or perverted, I believe that, by examining the brains of the insane, a hope exists of discovering a road for arriving at a solution of the functional difficulty. The time has passed when the term mental disease, insanity, or madness, conveyed, to the minds of physicians, the idea that the mind or its faculties were the entities which were the subject of disease. By a process of reasoning the pathologist has arrived at the conclusion that the abnormal physical manifestations are dependent upon primary or secondary changes in the nerve tissue; that insanity is a *symptom* of disease, not a disease itself, and that the cause of the disease must be looked for in the brain. Six years ago I commenced a systematic microscopic examination of the brains of the insane, and with this most important result, that in every single instance a marked departure from healthy structure was observed.

"I am not prepared to designate the individual part of the brain specially affected in the different forms of insanity; but I may say generally, that the *corpora striata* are the portions most frequently found affected, and that the cerebellum is the organ least frequently subjected to disease. Further, that the white matter is much more liable to evident structural morbid change than the cortical substance in comparatively recent cases; and that where the intellect has been in abeyance for prolonged periods, the structure of the gray matter of the cerebral convolutions is difficult of demonstration, the layers are found indistinct, as the cells are few in number and generally small in size. In the fifty-three cases of chronic insanity which I have examined, I have found distinct structural changes in the brain of each.

The Beehive.

What does it matter in what kind of hive or box the bees are kept? says a correspondent of the *Gardeners' Chronicle*. It does not matter much during the summer months, if the bees be located in a good district for honey collecting. But we have to provide for one or two contingencies, and not a few drawbacks from the extremes of heat and cold—the sun heat melting the new combs in wooden boxes, as happens even in the straw hives, which are the best substitute for the natural habitat of the honey-bee, because the straw absorbs the moisture within the hive in winter, and, with slight protection from the summer heat and winter rains, has carried through many a stock of bees. But there is the drawback of providing stands for the straw hives, as well as covers from the weather; and then how completely is the state of the interior condition of the hive a dead letter to the owner, while transportation for fresh pasturage for the bees is impossible. Then comes the period for smoking and driving, to save the hives of the bees at the honey harvest, if the old plan of the brimstone match has really been set aside. What a hard task has it been to introduce this "humane system," in spite of the able writings of the Rev. W. C. Cotton, with Mr. Robert Golding's straw hives and pamphlet—or any collateral, or safer, or nadir hiving; or even the "bar-frame plan," with all the German and American adaptations of more recent dates. Writings of the late lamented Mr. Woodbury, who did so much in introducing thoroughly the yellow banded bee, commonly called the "Ligurian bee," and which has become quite a profitable business in America and England, although the first agent, Mr. Neighbour, of London, had the *Apis ligustica*, from Mr. Herrmann, of Switzerland, only in 1859, who called this bee *Apis Helvetica*. But to return to the question of hives. No hive yet introduced by hive masters and sellers has been constructed to meet the wants of the bees, but rather the capricious fancies of bee-keepers, where the maker has to tax his skill and ingenuity to meet these wants, while every season apparently requires a new hive or a new book to be foisted on the public, while the true principles have been lost sight of both for economy and the right management of the honey bee. No hive could be so easily converted, either for the usual profitable keeping of bees, or the scientific observation of the same, as the "bar, frames," by those who wish to combine the two; but they generally fail in their object by their own zeal in finding out a "perfect cure" for all the ills that bee management has to contend with, and the beehive seller and constructor is always ready to assist the "new idea"—to put in a hinge or a bar, or some piece of glass that would surely make the hive a marvel of invention! instead of taking a lesson from the simple wants of the bees. We may then sum up the history of the bee hive with a hop, skip, and a jump,—from the Schirach suggestion to Huber, who used the leaf hive, and the improved bar fixed Grecian hives of Golding, made in straw and circular, to the adapted wood and straw hives of Mr. Woodbury, who introduced the system of compound bar and frame, with the adjusted bar of Mr. Golding, having guide combs affixed, to make the bees build in a perfectly straight line; but none have attempted the first views of the "bar frame hive," which followed on the heels of the Grecian hives, not with any view to multiply bee apparatus, bee houses, or sheds, or the necessity of stands, covers, dividers, or glass frames, except for the ladies and timid bee keepers, but with the single object of an easy mode of inspecting each comb, and protecting the inmates of the hive, and transporting the hive and bees bodily anywhere and at any moment.

Difference in Large and Small Diameters of Rolls.

In No. 4 of *Miscellaneous Rolling Mill Information*, issued by Lewis & Rossiter, Second avenue, Pittsburgh, Pa. (sent free on application), the following question is asked and answered:

"Has not the diameter of rolls somewhat to do with the size of billet necessary to fill a groove of given size? To put the question more plainly before you: Will a billet or bar that will fill to a nicety a groove of certain size in rolls of 8 inches diameter, also as exactly fill a groove of same size in rolls of 12 inches or 16 inches diameter?

"Answer: A billet that will exactly fill a groove in 8 inch rolls will over fill the same groove in rolls of 12 or 16 inches diameter, for the reason that the small roll elongates the iron more than the larger rolls; the larger roll spreads the iron more than does the smaller diameter. Templets that are used for turning grooves in guide rolls for ovals, diamonds, and other shapes, show that when the same templets are used for eight inch rolls as are used for 12 inch rolls, the difference must be made by letting the rolls jump when working, or by a difference in size of billet used. A little thought on the subject will make quite plain the principle that governs the matter, which is this: The larger the diameter of rolls the greater is the bearing that they have on the iron being rolled, and instead of large rolls rolling out in length, as does the small rolls, they make the iron more dense, and, as we said, have a greater tendency to spread it.

"We give the following, to more fully convey our meaning. For the sake of contrast, we have chosen nearly about the largest and smallest diameters of rolls that are employed in iron rolling. Let two pieces of iron be taken, of precisely the same size and cut precisely the same length, and, after they are evenly heated, let one be rolled thinner on a 24 or 30 inch plate mill, and the other to same gage on an 8 or 10 inch mill, plain rolls, allowing each to spread all that it will as it passes straight through. The piece drawn out by the small rolls will be found longer than the other, while the piece rolled on the large rolls will be found to have spread more than that rolled on the smaller rolls. Had the pieces, when rolled, been confined in a groove so that neither could have spread, even then the iron rolled on the smaller rolls would have been the longest.

"Another point touching this subject is, that iron rolled on large diameters is more solid, more closely approaching iron that has been hammered, than that which has been rolled on rolls of small diameter. This difference is not perceptible, may be, in all cases, nevertheless it is a fact.

"In conclusion, we answer, yes, the diameter has something to do with the size of billet necessary to fill a groove of certain size. A billet that will exactly fill a groove in 8 inch rolls will fin when entered in a groove of same size in 16 inch rolls."

Non-Smoking Chimneys.

To build a chimney so that it will not smoke, the chief point is to make the throat of the chimney not less than four inches broad and twelve long; then the chimney should be abruptly enlarged to double the size, and so continued for one foot or more; then it may be gradually tapered off as desired. But the inside of the chimney, throughout its whole length to the top, should be plastered very smooth with good mortar, which will harden with age. The area of a chimney should be at least half a square foot, and no flue less than sixty square inches. The best shape for a chimney is circular or many sided, as giving less friction (brick is the best material, as it is a non-conductor), and the higher above the roof the better.

Manufacture of Paraffin Oil in Scotland.

It is to Reichenbach, who is generally regarded as the discoverer of paraffin, that we are indebted for the name by which this oil is now mostly known. Paraffin is formed from *parum affinis* (little allied, or little affinity—in consequence of its power to resist the action of the strongest acids and alkalies). Paraffin, or coal oil, is made from coal or shale, the precise difference between which is not very easy to determine; at all events, upon a subject on which so many doctors differ, we may well be excused if we do not attempt to arbitrate. We may be safe in saying, however, that the district in Scotland, which produces the valuable mineral from which oil is made, stretches nearly the whole distance from Edinburgh to Glasgow. The quantity of crude oil contained in a tun of coal or shale varies considerably. A really good shale says the London *Grocer*, is reckoned to produce from thirty-five to forty gallons of crude oil per tun, thirty-eight gallons being considered a high average, though we were shown several specimens of coal which were said to contain as much as seventy; but the high price which had to be paid for this rendered it unremunerative in the face of the low prices which are at present obtained for the burning oil. The shale has to undergo the operation of being broken into small pieces before it is put into the retorts. In some cases this is performed by a huge machine, called "the crusher." Once between the wheels of this apparatus, the largest blocks are smashed into the required size, with as little regard to the difficulty of the operation as if they were mere lumps of blackened chalk. Some idea of the power of these machines may be found in the fact that one of them, which we saw in the full work at Addiewell, one of the refineries belonging to Young's Paraffin Light Company, was said to crush between its ponderous rollers about 3,000 tuns per week. In some refineries, however, they still prefer to adhere to the to the more primitive style of breaking by hammer, similar to the mode of preparing stones for macadamised roads. The shale, having been broken into the required size, is put into the retorts, some of which are placed horizontally, others vertically.

The retorts are gradually raised to a dull red heat, when vapors begin to come off which are passed through a series of pipes, called the condensers or coolers, where they form into a dirty looking, oily liquid, very impure, and possessing by no means the most pleasant odor. It is, however, rich in paraffin and other ingredients of more or less value, the process of separating which we now proceed to describe. The crude oil is put into a large cistern, and maintained at a temperature 150° to 160° Fah. for some time. This has the effect of separating a considerable quantity of the tarry matters which, on account of greater density, settle to the bottom of the cistern. The lighter oil is then transferred to an iron still furnished with a worm or condenser immersed in water, and kept at a temperature of about 55° Fah. Heat being applied to the still, the oil distils over, and is condensed in a worm, whence it is passed into a tank or agitator for purification, by the action of sulphuric acid, the subsequent process being analagous to that employed in the rectification of petroleum oils.

Cutch and Gambier.

Says the London *Daily Recorder*:

The dye cutch is from a tree, the *acacio catechu*, and is familiarly known as *terra Japonica*. This latter name originated in an ignorant belief that, primarily, cutch was an earth from Japan, but as that *terra Japonica*, turned out to be only a *terra incognita*, the illusion was dispelled by time, but not so the misnomer, which is current to this day. The acacia catechu abounds all along the coasts of Eastern India.

Catechu is a brown astringent substance, easily obtained by the evaporation of its own inspissated decoction. The process is very simple; the outer bark of the tree is carefully removed, when the interior colored portion of the wood developes itself; this is cut up, dissolved by a heated solution, evaporated, solidified cubicaly, and then packed in boxes for export.

The commercial utility of this article is very great. It is a most facile dye, rich in tannin, solvent in water, and with great affinity for cotton, to which it gives a permanent brown. It is not however limited to this color, or to this material, for it yields blacks, greens and drabs to silk and other manufactures. The fact of its applicability to cotton, however, suggests an important consideration to the producer and importer, and that is, that as surely as the manufacture of cotton goods increases, so surely will the consumption of cutch; and, that as soon as statistics register any question as to its supply, so soon must its value enhance.

Gambier is repeatedly confounded with cutch, and wrongly termed catechu, or *terra Japonica*. Gambier is so called, from its being the inspissated juice of the *uncaria gambir*, a native tree of the Malay peninsula. Its chief source of production is from Rhio, a town in the island of Bintang, about thirty miles from Singapore, which port is the principal place of exportation. It is made in a similar way to cutch, and owing to its richness in tannin and economy in price, is mostly used by tanners, though available for many dyeing purposes and akin to cutch, to which, however, it is much inferior in this respect.

Les Mondes, reports some recent experiments made with a saccharine product, extracted, many years ago, from a plant called *Achras sapota*, indigenous to Martinique. The sugar was found, on an elaborate analysis, to consist of 52 per cent of cane sugar and 45 per cent of milk sugar. This result was obtained by boiling in alcohol of 90 per cent, the milk sugar being found in the condition of an undissolved residue.

MODEL IRON WORKS.

[From Engineering.]

The Round Oak Iron Works are, *par excellence*, the best designed of any in South Staffordshire; they are handsome in their style, and substantial in their construction, while not only have they a fine outward appearance, but they are built in a manner best suited to the laying out of the internal machinary. The works are the property of the Earl of Dudley, a descendant of the famous Dud Dudley, who was the first to successfully smelt iron with pit coal. The site of the present works is also not far removed from the spot where Dud Dudley carried out his operations. The Round Oak Iron Works are situated at Brierley Hill, about two miles from Dudley, close to the Great Western Railway, while at their rear is a canal, so that excellent facilities exist for the transport of material to and from the works. Nearly the whole of the land and minerals lying within a circle of five miles round Dudley are the property of the Earl, and it was with the object of utilising on the spot the very rich materials employed in the construction of iron, with which the district abounds, that the present works were constructed. The celebrated "thick coal," ten yards thick, is worked from his lordship's pits, as is also the rich argillaceous iron stone, from which alone the iron is made at these works. The mine is smelted in the blast furnaces, of which there are two extensive plants, and the limestone, used as a flux, is obtained from the pits and caverns on the estate. The iron produced here is, for certain purposes, unsurpassed, and it commands a higher price in the market than any other made in the district. The whole of the materials used in the building and machinery are raised and manufactured, and the buildings, engines, machinery, &c., were erected by his lordship's own workmen. There are four blast furnaces at the New Level, each supplied with hot air stoves, the blast being furnished by a large condensing beam engine. The blast main has a partition running through its centre, so that it can be used for two separate engines at the same time; it is approached by a circular staircase, and a platform runs the whole length, so that men may have ready access to the valves. The tops of the furnaces are level with the main railroad, which brings the coal and coke from the earl's collieries, and delivers them at the furnace mouths. The limestone and ore are drawn from the canal side up an incline to the top of the furnaces by a beam engine, which also draws the cinders from the falls to the top, whence it is taken away, and tipped down the cinder bank. The Round Oak Works are built in a very substantial manner, of red bricks faced with white, and the eaves of the slated roofs are terminated by cast iron spouting of a very handsome pattern. The slated roofs, which cover the entire works, are supported upon ornamental cast iron columns and brackets. The centre portion of the building is occupied by two forges, and on each side of these are the mills; in close proximity to the mills are two extensive warehouses for stocking the finished iron, and these warehouses form the extremities of the front of the works. The boiler houses, three in number, are at the back, while in the centre of the front of the works is a neat little building, used as the timekeeper's office. At the back of this office are two forges, having about fourteen puddling furnaces in each. The machinery in No. 1 forge is worked by a large rope band from a pulley on the flywheel shaft of a horizontal high pressure steam engine, having a 30 in. cylinder and a 3 ft. stroke, placed between the two forges. This machinery consists of a 6½ ton helve, while in No. 2 forge is a 6½ ton helve, worked by gearing from an intermediate shaft. There are two forge trains, one standing in each forge, worked from either end of the intermediate shaft above referred to. In each of these trains there are three pairs of rolls with all their necessary appliances. Steam is supplied to the forge engine by five cylindrical boilers, 30 ft. long by 5 ft. diameter, and one boiler placed upon cast iron columns and girders over a heating furnace, and connected by a flue to the latter. Besides the machinery already named, there is in one forge a very powerful smith's steam saw, which will cut up to 7 in. or 8 in. rounds and squares, and in the other a massive pair of lever shears used for cropping the edges of the plates. To the 16 in. mill there are three heating furnaces, and to the plate mill the same number, with the addition of a large annealing furnace. A 4-ton Kirkstall Forge Company's patent steam hammer stands at one end of the forges.

Howatson's patent heating furnace has lately been tried here with great success. The speciality of Mr. Howatson's plans consists in his modes of supplying hot instead of cold air to the grates of the puddling and heating furnaces, and he asserts that in one year coal and iron to the value of £187 may be saved in a puddling furnace, and over £450 in a 12 in. mill heating furnace, by the adoption of his system. We are not, however, in possession of sufficiently extensive data to to enable us to form an opinion of the accuracy of these estimated savings under a variety of circumstances. The invention is applied to a heating furnace in the following manner: All the ordinary air passages, such as the opening under the grate at the end of the furnace, and the fuel charging place, are covered over; the former with sheet iron, having a sliding door, actuated by a balance weight at the top, which can be lifted to clean the bars; and the latter with a hanging cast-iron door. By this means all air is kept out from the grate end of the furnace, and all air necessary for combustion is supplied from the stack end. At the bottom of the stack there is a square opening, and, above, several perforations in the brickwork; through these the air enters, and passes into flues surrounding the base of the stack, where it becomes heated by contact with the flues. It is then conducted down, round the neck of the furnace, into a series of parallel passages, from whence it enters the opening under the fire bars, and is used at a high temperature for the combustion of the fuel. In order that the gases generated by the fuel shall be thoroughly consumed, and that there be no smoke, a flue is made in the walls of the fire grate, opening by means of perforations both above and below the bars. The perforations under the bars are covered with a sort of valve, which can be regulated so as to supply any quantity of air as required over the top of the fire, and can stop it altogether when there is no smoke. A handle attached to this valve is placed in front of the furnace near where the man stands. The application of the patent to a puddling furnace is slightly different, as the cold air is first supplied under the bed of the furnace, which it cools and preserves, and then passes round the base of the stack, along the back of the furnace, and is then delivered in the heated state under the grate. The smoke consuming apparatus can be applied as in the heating furnace. By an extra arrangement in the puddling furnace, the pig iron is melted in a separate chamber by the waste heat from the furnace. This chamber is built between the puddling chamber and the furnace neck. The charge of pig iron is put into it, and whilst the puddler is manipulating his charge, drawing the balls, and taking them to be shingled, the pig iron is ready to run down into the puddling chamber. With a heating furnace constructed on this plan at the Round Oak Works, the following results have been obtained: In one week of ten turns, when a 12 in. mill furnace had got into regular working order, a saving of 5 tuns 18 cwt. 0 qr. 17 lb. of coal, 1 tun 2 cwt. 1 qr. 3 lb. of iron, and a loss of 2 tuns 8 cwt. 2 qr. 3 lb. of cinder, the decrease in the latter being accounted for by the saving in the iron. It is also stated that the furnace has worked better, the iron being sooner and more uniformly heated, that the labor of the furnace men is diminished, as less fire required, and that there is every appearance that the brick lining will last much longer than is usual with the ordinary apparatus. A puddling furnace has recently been tested at Mr. Thomas Vaughan's Bishop Auckland Iron Works, and there was a saving during the first week it was in operation of 4 cwt. 0 qr. 9 lb. of coal, and 2 qr. of iron per tun of puddled bar made.

The Round Oak new forges, which are situated at a short distance from the other works, have been built about six years, and were erected with the object of making a sufficient supply of puddled bars to keep in advance of the works. The puddling furnaces, 28 in number, are arranged in a semicircle, the engines, forge trains, helves, &c., being placed as nearly as possible about the centre of the semicircle, by which plan all the furnaces are at almost an equal distance from the helves. The forge engines are vertical and placed side by side, having cylinders 27 in. in diameter, with a stroke of 2 ft. 4 in. Steam is supplied from six cylindrical boilers, 35 ft. long by 5 ft. diameter, which are at some distance behind the engines, and clear of the works. To each engine there is a forge train helve, and a pair of shears. The cam rings are driven by pinions on the flywheel shafts, which work into wheels on an intermediate shaft, and are geared to the cam ring shaft. Each helve weighs 6½ tons. The forge trains and two pairs of cutting down shears are driven from the ends of the intermediate shafts, worked by gearing and cranks.

Experiments with Dualin.

Some recent experiments with this new explosive, made on a section of the New York and Boston Railroad, near Tarrytown, N. Y., seem to prove that, while it is somewhat less powerful, it is far safer than nitro-glycerin.

The experiments were conducted by Mr. A. C. Rand, of the Laflin and Rand Powder Co., N. Y., in the presence of many gentlemen interested in the employment of blasting agents.

In order to demonstrate the non-explosive nature of the compound without the aid of a fulminator, a keg packed with the material was elevated by a derrick to a hight of about sixty feet, and then allowed to fall on a rocky surface. The concussion produced no more effect than would have followed had the keg been filled with common earth. As an evidence of its extraordinary utility in submarine work, a broken package was thrown carelessly into a pond of water, and sunk with the aid of a large stone, having first been connected by means of a wire with a powerful electric battery. On being fired it exploded with tremendous force, almost completely lifting the entire body of water into the air, and tearing away the earth for a distance of several feet at the bottom where the package, containing not more than half a pound of the "dualin," had been deposited. A similar quantity, when placed on the surface of an immense bolder, having been first covered with a little earth, was exploded with the fulminating cap by electricity, blowing the rock to atoms. A moderate charge of powder tamped into a hole six inches deep had previously blown out without affecting the solidity of the stone. Other satisfactory experiments were performed.

The effectiveness of the dualin as compared with powder was proved by placing an ounce of the latter in a mortar loaded with a ball weighing over fifty pounds. On the charge being fired, the ball rose lazily in the air to a hight of perhaps not more than twenty-five feet. An ounce of dualin was then carefully weighed and placed in the mortar underneath the ball. The battery having been applied, the iron missile was sent flying toward the clouds, reaching an altitude of at least four hundred feet.

The dualin, which, as our readers are aware, is a preparation of finely comminuted wood and nitro-glycerin (see page 170, Vol. XXII., of the SCIENTIFIC AMERICAN), in appearance resembles pulverized vegetable matter, and is a remarkably light substance. On coming in contact with fire, whether the quantity of dualin be large or small, it burns rapidly, with a fierce flame, evincing no explosive features whatever. A box filled with the compound was thrown into a bonfire, and, on being ignited, passed off in a volume of flame, leaving the receptacle almost intact.

Protection against Fire.

One of the most important elements of our civilization is the power to preserve treasures against destruction by the elements. It is only during the present generation that this power has obtained a recognition in the arts proportionate to its importance. Fireproof buildings, safes, and vaults, for the preservation, not only of momentous public records, but of all considerable accumulations of money, of precious goods, and of documents, are now devised with all the ingenuity of our ablest inventors, and constructed with all the practical skill of our most expert artisans. The result is not only that the libraries and public records of this age will be saved to history, but that the accumulation of wealth from year to year will go on more securely and rapidly. Destructive as was the Chicago fire last week, it would have been doubly so but for the protection afforded to jewels, books of account, money, records, deeds, and the like, stored in safes and vaults.

On the other hand, it is evident that the work which ingenuity and enterprise have to do in protecting property against fire is as yet not half done. The devices which enable our best safes to hold their contents unharmed, for many hours amid a furnace heat, are not applicable to large buildings, and nothing else has been found to take their place. At Chicago whole blocks which had been built at great cost to be "fire proof" gave way to the flames almost as soon as mere wooden sheds. Stone walls "chipped" and fell, iron beams broke or softened and bent, iron shutters were melted off or else blown off, and all the woodwork, or the inflammable goods, within the best of these structures seemed to burst into fire before the heat which the wind directed upon them like the flame of a blast furnace.

The indestructible building which will protect inflammable contents against destruction when a great mass of fire is poured upon it from outside is not yet invented, and is perhaps impossible. But the building which, with its contents, is perfectly safe from fire except when the city around it becomes a furnace, is well known; and if one street were built in this way it would be a complete barrier to the fire; half a city on either side of it might burn, and the ruin might be stopped at this street even against a gale of wind. Had Lake street, or Madison or Monroe, from the river to the lake, been made of buildings like that of the Chicago *Tribune*, the fire of Monday would have ended there, and the northern half of the city would have been saved.

This is a subject which demands attention, not only from landlords and builders, but from all cities. The same kind of security which the bank has in its vaults or the merchant in his safes is to be sought by cities in making, if not each house, at least each section of the city, proof against the spread of fire from any other section. Where land abounds, wide avenues and frequent parks are, for many reasons, the best possible protection. But where land is too scarce and dear for these, as it now is in all New York south of Fifty-ninth street, fire proof streets seem to be the only remedy. A little care in building for ten years to come, and a small addition to its expense, would make it nearly impossible for a fire to cross Broadway; and the same principle might gradually be applied to twenty or more cross streets below Fourteenth, so that no large part of New York could under any circumstances, be burned by one fire. In rebuilding Chicago, it is evident that something like this ought to be done at once.

FIRE SAFES.

There will be lessons to be learned from the Chicago fire concerning the value of safes and vaults, and the true principles of constructing them. The public at large has taken too little interest in this subject; but now that a hundred thousand people have suddenly lost everything except what these contrivances saved to them, the question how and why so much was saved, and how much more might have been saved, becomes interesting to all men. We are as yet without details as to the fate of the several kinds of safes employed there; as to the construction of those which did best, and of those which disappointed the hopes of their owners; but these are matters which must attract attention soon, and on which the public are entitled to be well informed. It is known that the Custom House vault failed entirely to protect its contents. We do not know who built this vault for the Government, nor what officer accepted it. But the fact is a grave one, as showing the incompetency or dishonesty of some man in a high place of trust, and it ought to be investigated at once.

The occurrence of this fire, with the impossibility, in most cases, of saving even the most valuable papers, unless they were already deposited in a fireproof place, is likely to lead the people of other cities to prepare against such an emergency by a more extended use of safes. It becomes the makers of these to study the results of the Chicago fire with care, and to remedy the defects which it may have revealed in any of their work. In particular, they must learn not to sell as "fireproof" any safe whatever which is too small really to protect its contents against a great heat; for it is certainly the small sized safes which have chiefly failed, and it is of the first importance for them to remember that it is the enormous price of their goods which has hitherto prevented the more common use of them; and that, in order to serve the community to the utmost, and thereby to enrich themselves most effectually, their immediate end in view must be to sell the safes at the very lowest price consistent with good workmanship and security—that is to say, at a much lower price than at present.—*New York Evening Post.*

THE London *Athenæum* hears that Mr. Darwin is engaged on a work in which the facial expression of animals will be one of the chief topics discussed.

Improved Thrashing Machine.

The accompanying engraving will give our readers an idea of an improved thrashing machine, in which the thrashing drum is provided, on its outer surface, with separated ribs or thrashers, *a*, extending from end to end of the drum, and so constructed that each rib will present, to the material being thrashed, an obtuse angular front surface, and a receding curved or convex back surface.

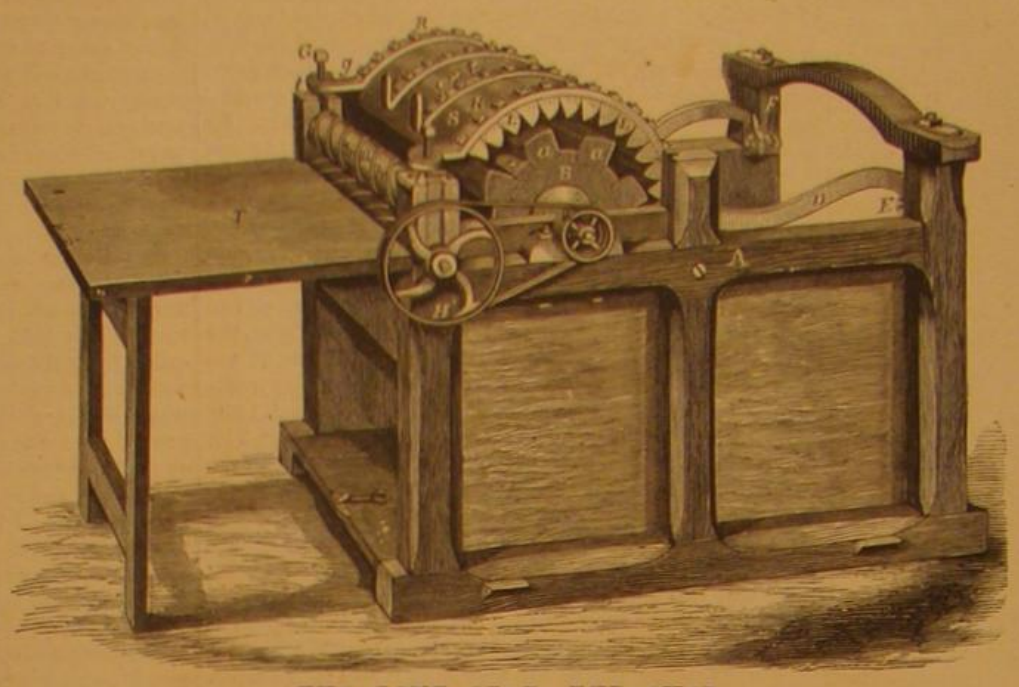
The drum is made light near its center, and heavy at its perimeter, to increase its momentum and steady its motion.

Above the drum is placed a concave cap, C, which is also provided with ribs extending, as on the drum, from end to end, and constructed with flat rectilinear thrashing sides and convex backs, as shown. These are so arranged, relatively to the ribs on the drum, as, it is claimed, to operate to the best advantage in thrashing grain without injury to the straw.

The ribs of this concave are made separately, and bolted to braces upon a sheet metal backing, and, to combine strength with lightness, they are grooved or made concave on the backs, which meet the sheet metal backing.

The feed rollers are made with spiral bands extending over their peripheries, as shown.

The two central bands, or braces, which support the ribs of the concave, have their front ends turned upward, to aid in supporting a detachable chimney or funnel, through which dust and other light particles escape from beneath the front edge of the concave cap.



THE LONE STAR THRASHER.

The material is fed in very uniformly by the feed rollers, which enable a person little skilled to do the feeding in a proper manner.

It is claimed for this machine: That it requires not more than half the power to do the same work that is used by spike thrashers. That it separates the grain, grass seed or flaxseed, thoroughly, without injury to the grain or breaking of the straw. That by the adjustability, up or down, of the concave cap, it may thrash all kinds of grain, clover, millet, and other seeds, beans, peas, etc., in a perfect and rapid manner. So perfectly is it said to spare the straw, that it requires a keen eye to detect the difference between a sheaf of thrashed and unthrashed straw.

This machine, which has been christened the Lone Star Thrasher, was patented September 13, 1870. Circulars containing further information may be obtained of E. E. Roberts & Co., brokers in patent rights, 15 Wall street New York.

Ammonia as a Motive Power for Street Cars.

The use of ammonia as a motive power involves some very nice scientific and mechanical principles. That the general reader may comprehend the peculiar difficulties met with in the attempts to render this substance available for the propulsion of machinery, we will enumerate its leading characteristics.

Ammonia is composed of three parts—by weight—of hydrogen and fourteen parts of nitrogen. These substances do not directly combine to form ammonia; that is, there has yet been discovered no way by which they can be made to combine when placed directly together, but when the hydrogen is presented to nitrogen at the moment of its liberation from water, the oxygen of the latter being abstracted by the oxidation of some other substance, the combination takes place, and ammonia is formed.

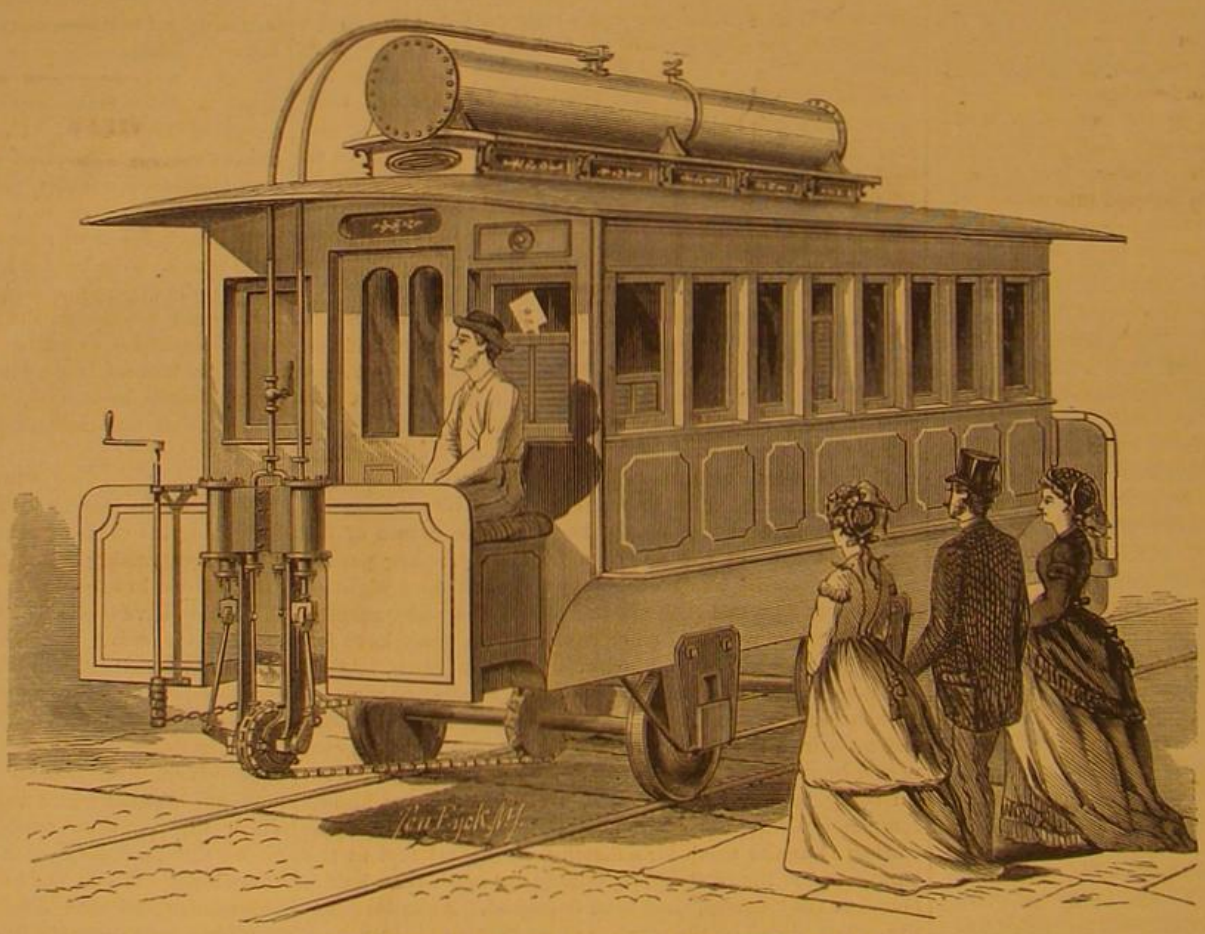
This reaction takes place in the decomposition of various vegetable and animal substances, and in the progress of many industrial operations, of which latter the most notable, in this respect, is the manufacture of illuminating gas. In distillation of coal at the gas works, large quantities of ammonia are produced, combined with sulphur and carbonic acid; and, the resulting carbonate and sulphide of ammonium being treated with sulphuric or hydrochloric acid, sulphate or muriate of ammonium is formed, the commercial name of the latter being muriate of ammonia, or sal ammoniac.

From the two latter salts, ammonia may be freed by heating either of them in contact with a paste made of water and quicklime, sal ammoniac being the salt principally used for the purpose. The ammonia passes off as a gas, is collected in water, for which it has such a strong affinity, that, when the temperature of the water is maintained at 59 degs. Fah., it will absorb 727 times, and at 32 degs., 1,050 times its volume of the gas.

The solution of ammonia in water, containing about 670 volumes of the gas, forms the *aqua ammonia* of commerce, and it is this substance that inventors have sought to utilize in ammonia engines, it possessing peculiar advantages for the purpose, as well as presenting many difficulties, to such an application, which we will point out.

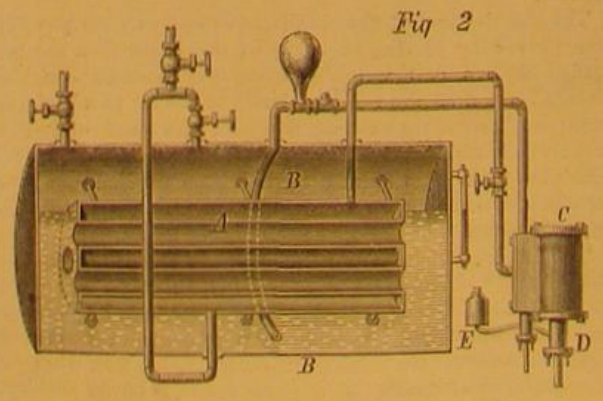
This solution is colorless, and strongly alkaline, is acrid to the taste, and so caustic that it blisters the skin if applied to it. It freezes into a gelatinous mass at 40 degrees below zero of the Fahrenheit scale, and liberates ammoniacal gas rapidly when exposed to the air, the escape being greatly accelerated by heat, so much so that ebullition is produced at 122 degrees Fah. A solution of the strength of 20 degrees Beaumé boils at 140 degrees.

Its capacity for heat is only one fifth that of water, and three pounds of coal will produce four gallons of the liquefied gas, which, heated to 332 degrees Fah., affords a pressure of six and one half atmospheres. To obtain the same pressure from steam requires a temperature of 320 degrees, the relative volumes of the ammoniacal gas and the steam, at this pressure, being 983 for the former and 295 for the latter.



AMMONIA ENGINE FOR STREET CARS.

Fig 2



The same amount of coal that will convert three volumes of water into steam at 212 degrees, will produce four equal volumes of liquefied ammonia.

To those familiar with these facts, it has long been evident that this gas possesses great theoretical advantages over steam as a motive power, but in its use the following difficulties have been met with:

The material is much more expensive than water, and, consequently, it is not permissible to allow it to escape, as waste, after it has performed work; as steam exhausts into the open air, or is condensed by contact with water, and then allowed to waste. More than this, small leaks that, in the use of steam, are of little or no importance, in ammonia engines are sources of great loss, as every atom that escapes is not merely a waste of heat, as in the steam engine, but a waste of a costly material. Besides, when steam escapes, it is harmless and bland, while ammonia is acrid, and acts corrosively on all brass or copper attachments or ornaments. This last property forbids the practical use of any metal but iron and steel in the construction of ammonia engines.

The adoption of this material as a motor, therefore, involves its indefinitely repeated use with such a minimum of waste as will not counterbalance the great economy of fuel, necessary for its production, over that required for steam.

As high pressures are necessary, it has been difficult to prevent leakage, and, in most devices of the kind under consideration, the waste has been so great as to render them useless for practical purposes.

Another difficulty has been the liquefaction of ammoniacal gas in large quantities; but, in the application of ammonia to ice making machines, this part of the problem has been practically solved, a pressure as high as sixteen atmospheres having been maintained in some of them, while, for a motive power, it will not be necessary to exceed ten pounds.

The principle upon which the theoretical utility of ammonia, as a motor, is based, may be thus stated: As the gas is absorbed by water its latent heat becomes sensible, and the temperature of the solution consequently rises. This heat may again be used for the expansion of liquid ammonia into a gas, under great pressure—the pressure thus generated being converted into work behind the piston of an engine. The heat thus transformed into work cannot be recovered and utilized as heat, and, consequently, to maintain the efficiency of the combination, additional increments of heat must be supplied, from external sources, to be again converted into work, and so on.

This is accomplished in a very effective manner by Dr. Emile Lamm, of New Orleans, who has also attacked the practical difficulties of the problem with great success.

We give, herewith, engravings illustrating the application of his ammonia engine to a street car, which, it is asserted, was successfully propelled by it for a distance of seven miles, with an expenditure of only one and sixteen one hundredths cubic feet of ammonia, notwithstanding the somewhat unmechanical and clumsy mode of transmitting the power from the engine to the wheels, rendered necessary by the fact that the engine and the car were not made for each other, and were simply brought together for the purpose of demonstrating the practicability of the method.

Dr. Lamm states that, on the trip mentioned, the gage registered at the start 120 pounds, and was the same at the end of the trip, at no time indicating a variation of more than ten pounds to the square inch; and this has since been confirmed by over 300 trips.

The detailed drawing, Fig. 2, is simply a duplicate of the engine and generator, and is lettered for reference.

Let the reader now bear in mind that, when heat is employed for liquefying ammonia, the latter possesses, through its intense affinity for water, the property of reproducing, at a distance from the furnace and still employed in its condensation, a force equivalent to the heat used in such condensation, the latent heat of the gas appearing anew, as sensible heat, in the water of re-absorption, and being again transferred to the liquefied gas.

In the mode of effecting this circle of interchanges the essence of Dr. Lamm's invention lies. To obtain the full dynamical effect of the expansion of vapors or gases, it is necessary to add as sensible heat the same amount which may be extracted from them as latent heat.

Now, the liquefied ammonia, which parted with its latent heat during condensation by pressure, is placed in the inner

shell, A, through which tubes traverse, the whole being inclosed in an outer shell, B. The fountain communicates with the valve chest of the cylinder, C, in the same way as the steam induction pipe of a steam engine connects the boiler and the cylinder. In the outer shell, B, is placed some of the water or weak solution of ammonia that was left in the boiler of the still, of a suitable temperature to generate the required pressure at starting. This heat exists, then, in the liquefied ammonia as expansive force, and passes out with the gas to the cylinder, where, a portion having been converted into work, the remainder passes, with the exhaust gas, back to the weak solution in the shell, B, where, the latter becoming instantly condensed, the heat is again rendered sensible and passes through the walls of the tubes, to generate expansive force, and so on, the total loss of heat for a given amount of work being the equivalent of the work performed, *plus* that which may have radiated from the shell during the performance of the work; while the loss of the material itself is only that due to whatever leakage has taken place.

This succession of conversions is one of the most beautiful examples of the correlation of forces to be found in any mechanical motor. The theory, upon which the engine is constructed, is sound, while the difficulty of controlling so subtle a gas under high pressure has also been met in an ingenious manner by the use of oil packed stuffing boxes.

One of these is shown at D, Fig. 2. An annular chamber surrounding the piston rod is kept supplied with oil from the chamber, E, through a suitable pipe; this forms a practically impassable barrier to the escape of free ammonia. The oil becomes more or less saponified by the action of the ammonia; but this does not interfere with the usefulness of the packing, or the proper lubrication of the moving parts.

In the Transactions of the American Institute, 1865–6, page 436, the new ammonia engine of M. Tellier, of France, is described. This distinguished chemist invented a means of storing and using mechanical power, by compressing ordinary ammoniacal gas to the liquid state, and applying it for propelling omnibuses and other vehicles, in places where steam power was not admissible. The small vessel containing liquid ammonia (and gaseous ammonia above it) may be compared to an ordinary steam boiler. When the valve is opened, a portion of the gas, having a tension, at 60° Fah., of about 200 pounds per square inch, presses against a piston within a cylinder filled with common air. This movement of the piston transmits power through a crank, and, at the same time, condenses the air before it in the cylinder. At the completion of this stroke, a little water is injected into the cylinder, behind the piston, when the ammonia is instantly absorbed by the water and a vacuum is produced. The pressure behind the piston being thus removed, the compressed air on the other side of it is brought into play; thus the piston comes to its original position and the crank has completed one revolution. After the ammoniacal water has been drawn off, the piston is ready to receive another charge of ammonia. It will be perceived that this apparatus would work more steadily if two cylinders were used. M. Tellier proposes to use three. This arrangement, or any other in which a gas passes from the liquid state at a nearly uniform pressure, has many advantages over that employing atmospheric air as a secondary motor."

This was the ammonia engine alluded to in our editorial of September 23d, in which we stated that a successful trial of it upon an omnibus in Paris had been reported. Dr. Lamm informs us that the trial, though sought, was never made. Even if it were, our readers will see that the engine of M. Tellier is radically different in principle from that of Dr. Lamm, and no more resembles the latter than the steam engine of Savary resembles the modern steam engine.

Dr. Lamm's invention was patented July 19, 1870. Full information regarding it may be obtained from the Ammonia Propelling Company, New Orleans, La.

Ray's Improvement in Wheels for Vehicles.

The object of this invention is to strengthen the fellies or rims of wagon and carriage wheels at the joints, or where the felly segments abut together. The invention consists in the use of a fish plate, curved longitudinally to fit the inside diameter of the felly, and also transversely to fit the inner surface of the felly, of a length sufficient to receive and support the ends of the first spoke or more, on either side of the felly joint.

The plate is made of metal and let into the wood, so that its outer surface is even with and corresponds with the inner surface of the felly, or it may be used without cutting the fellies. The plate extends far enough in either direction from the joint to receive a spoke on each side, holes being formed through it for the tenon of the spoke. Screw bolts pass entirely through the tire and rim, and hold the plate firmly to the felly.

It is well known that the weakest part of the felly of a wheel is at the joint; and various devices have been adopted to strengthen the felly at these points. The fish plate, used as described, confines the ends of the segments, and forms a strong arch, supported by the spokes at the joint, for withstanding the heavy blows dealt upon every portion of the rim of the wheel. It is a cheap, simple, and seemingly effective arrangement. This improvement has just been patented by William F. Ray, of Fort Wayne, Ind.

IRELAND'S VAULTS FOR THE SAFE KEEPING OF VALUABLES.

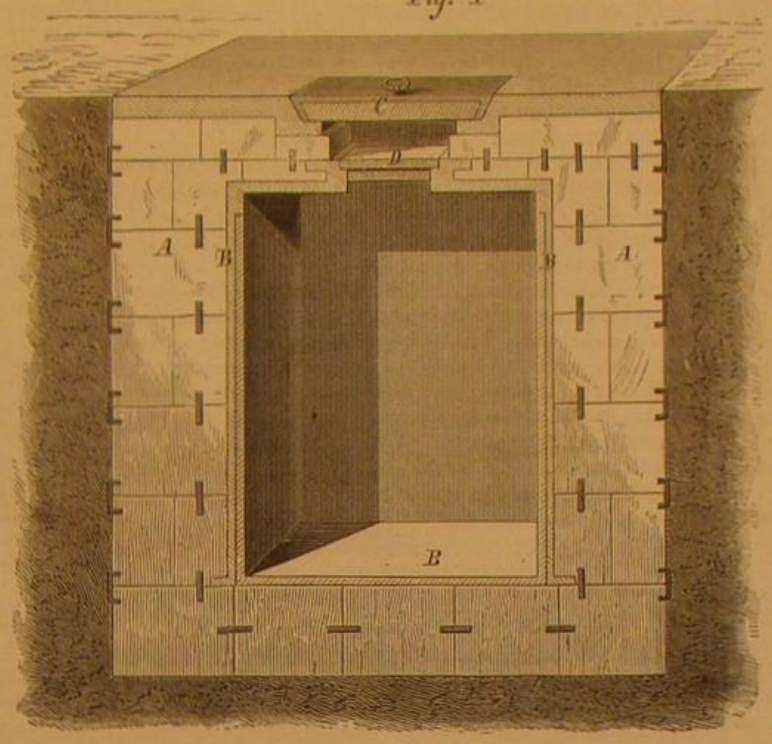
The accompanying engravings illustrate an improved burglar and fireproof vault, for the safe keeping of valuables. Two kinds are shown in our engraving, involving, however, the same principles of construction.

Fig. 1 shows the vault designed for banks, insurance offices, counting rooms, etc., and Fig. 2, a design for use in dwellings, for the safe keeping of plate, jewels, money, documents, etc.

The vault, in both cases, is constructed principally of masonry, and placed below ground, so that, in case of fire, all the heat to which it can be exposed will be by downward radiation, through the thick wall of masonry and through the entrance, which is constructed to defend the interior of the vault against heat, as shown in Fig. 1, in which A represents the stone masonry; and B an iron frame, composed of a top plate and four corner parts or rods, which descend from the top, and are bent outward at right angles, the hooks thus formed engaging with the stone work as shown.

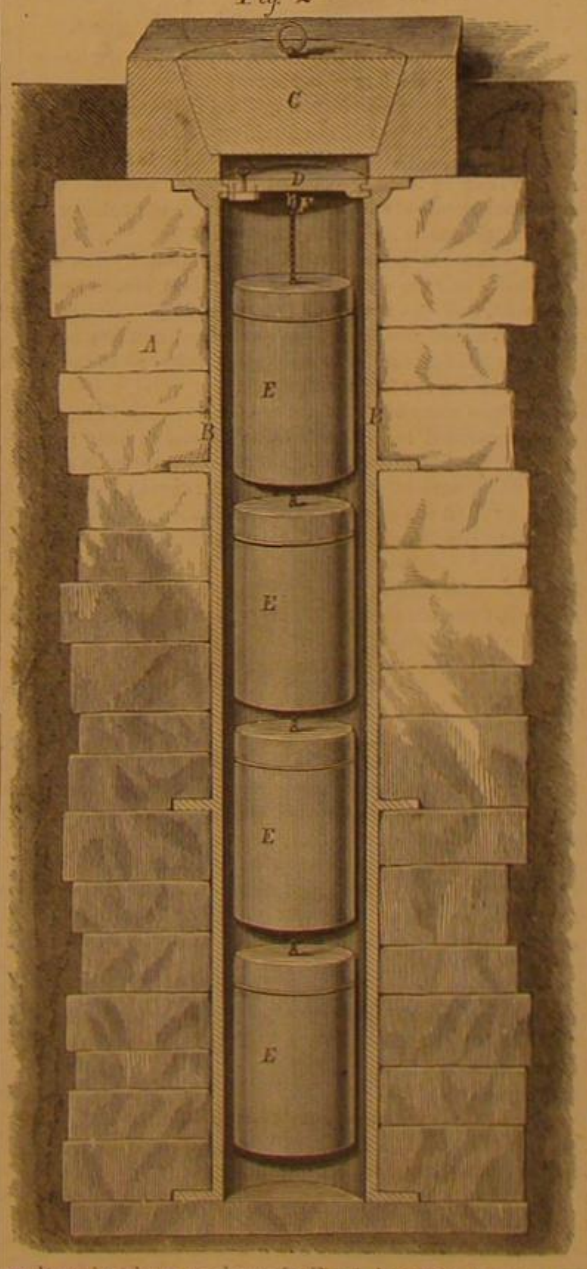
The masonry is bound together by iron straps, as shown, thus making a very solid structure.

Fig. 1



IRELAND'S VAULTS FOR STORING VALUABLES.

Fig. 2



The square vault, Fig. 1, has a cement lining.

The entrance is closed by an external lid, C, and an internal one, D, the air space between the two forming a non-conducting medium, through which heat can only with great difficulty, traverse.

The inner lid is of metal, and is provided with the proper locks and bolts. The external door or lid is made of an iron frame, filled with hydraulic cement.

In Fig. 2, A represents the stone masonry; B is an iron tube, having flanges formed thereon, at proper intervals, which interlock with the masonry, as shown. Within the tube or cylinder, B, are suspended, by a wire rope, chain, or other suitable support, the cylinders or cases, E, for the reception of articles. The chain or rope is suspended from a staple by a hook of fusible metal, F, which, should the heat endanger the articles in the upper case, melts and allows the cases to fall as far as the length of the tube will admit, thus removing the top case from the heated lid, D, and insuring the safety of its contents.

The style of construction, adopted by Mr. Ireland, gives great solidity to the masonry, affording obstruction to the operations of burglars, while it employs comparatively little iron work; and thus can be used with less expense than other vaults. Being completely surrounded with earth, and the iron work not being continuous, heat cannot be conducted to the interior.

We are told that a small safety vault for a dwelling, constructed on this plan, has been subjected to intense heat for four hours and a half, without the first trace of injury to its contents.

The invention was patented May 30, 1871. For further information address Geo. H. Ireland, Somerville, Mass.

Sensible.

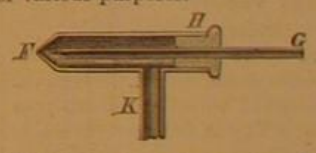
The American Educational Monthly says that the High School of Springfield, Ohio, graduated the young ladies of its last class in calico dresses, as pleasing to the eye of taste as to the hand of economy. This was brought about by the thoughtful suggestion of the superintendent and the hearty acquiescence of the girls themselves, on the only ground on which high schools can be long perpetuated, namely, that being supported by taxation they must be open to all classes in society, and confer their advantages upon the poorest of their pupils, without prescription by fashion or creed, expenses or anything else.

[For the Scientific American.]

STEAM VERSUS DISEASE.

BY JOHN C. DRAPER, PROFESSOR OF CHEMISTRY UNIVERSITY MEDICAL COLLEGE, NEW YORK.

While experimenting with the apparatus of which I gave a description in the last number of the SCIENTIFIC AMERICAN, I have often been surprised by the agreeable coolness, experienced whenever the hand happened to pass through the mixed column of air and steam that issued from the nozzle of the vacuum tube. The reader will remember that when steam, under a high pressure, is thrown from the nozzle of the tube, G, through the larger nozzle, F, a vacuum is formed in the tube of which this nozzle is the termination, and through the lateral tube, K, this vacuum may be applied for various purposes.



If, now, the connection is removed, and air permitted to pass freely through K, a mixture of air and condensed steam is thrown with considerable violence from the opening at F, and this current, brought into contact with the surface of the body, produces an agreeable sensation of coolness, which would, I think, not only be a grateful application in the treatment of all superficial inflammations (as erysipelas), but would, by its soothing action on the nerves, aid in modifying or removing the diseased condition.

In addition to the pleasant sensation imparted by the issuing column of steam and air, I find that it also possesses chemical properties, for it shows the presence of traces of ozone, which has doubtless been produced by the electricity developed by the passage of the current of steam through the nozzles of the apparatus. That ozone may be so formed has been satisfactorily shown in the experiments made, many years ago, with steam electric machines, where the characteristic ozone, or electric odor, as it was called, was produced in a marked degree. This trace of ozone renders it probable that such a steam air current might also be applied with good results to every kind of foul or gangrenous ulceration; and, if proper modifications were made to secure as great a supply of electricity as in the steam electric machine referred to, I see no reason why we may not look forward to the use of ozone, so developed, in the purification of the wards of hospitals, and the disinfection of the holds and decks of fever stricken ships.

THE CHICAGO FIRE.—How it could be that neither buildings, men, nor anything could encounter or withstand the torrent of fire, without utter destruction, is explained by the fact that the fire was accompanied by the fiercest tornado of wind ever known to blow here, and it acted like a perfect blow pipe, driving the brilliant blaze hundreds of feet with so perfect a combustion that it consumed the smoke, and its heat was so great that fireproof buildings sunk before it almost as readily as wood.

Correspondence.

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

A Practical Engineer's Experience with Boilers.

To the Editor of the Scientific American:

The subjects of steam and boiler explosions appear to form a complicated and vexed question. I am one of the few Southerners that served a regular apprenticeship at a mechanic's trade. I have had fifteen year's experience with steam, and I propose to give my opinion in regard to explosions, etc.

I ran a boat in Mobile Bay for about seven years; and changed water from fresh to salt, two or three times in as many hours, and frequent foaming (in the boiler) was the consequence. I found it very necessary to be always on the watch. I have known the gages to show an abundant supply of water one minute, and none the next.

On one occasion I ran in the bay until the water in the boiler became very salt; then changed it in Dog River, where the water was quite fresh. I concluded to pump my boiler quite full before stopping, where we expected to remain several days. I put on a full pump of water nearly half an hour before stopping; and, as I thought, had three full gages; but, on cooling off, and opening the boiler, to my surprise, the water was only about half over the flues. Now I contend that, had the fires been kept up, and the water neglected by the engineer, until the steam and boiler had attained an intense heat (which it would have done in a very short time), then, on the first opening of the throttle or safety valve, it would cause a rising of the water in the boiler; and the water, so raised or thrown into the steam that had become so intensely heated, would have instantly flashed into power, and explosion would not be more certain if the boiler was filled with gunpowder and touched off. This I believe to have been the case with the *Ocean Wave*, at Point Clear wharf, in Mobile Bay, a short time ago.

In such cases as this, the strength of boilers has but little to do with it, except that the stronger the boiler, the worse is the explosion. I see in your paper that the Hartford Steam Boiler Company's inspector comments considerably on the strength and test of boilers, and has treasured up, in his office, a piece of boiler, only $\frac{1}{30}$ of an inch thick. I have run with 75 pounds pressure, when the boiler was so thin that I could and did push my knife blade through it; and often, when it was cracked so badly that it would not hold water, I have rolled up a wad of oakum and white lead, and jammed it into the crack, and went on with a full head of steam. I have never yet had any accident which did the slightest damage.

Hence, you see, Mr. Editor, how ridiculous is the idea of having inspectors arrested, where the fault is that of the engineer. But what can we expect? No high minded, honorable man wishes to be classed with those whom the Government has declared (by its lock safety valve) to be dishonest, and not worthy to be trusted. It would have been better to have offered a handsome premium to those who would keep their engines and boilers in the best condition, with the fewest accidents. The money for such purposes should be deposited, in money or securities, by engineers, on receiving their licenses; and be forfeited at once, without any trial, whenever any serious accident happened to a boiler in their charge. I for one left off steam boating when the lock valve was introduced.

Mobile, Ala. U. A. BARLOW.

Public Steam Supply.

To the Editor of the Scientific American:

Remembering your very favorable reception some time back of my suggestion for a public steam supply, through the streets of our large cities, I thought I would again call your attention to the subject, and especially to the very favorable opportunity now offered for the introduction of such a scheme in the rebuilding of Chicago.

Steam is the great motor of all civilized nations, and its use would be greatly increased if it could be obtained conveniently and at a reasonable expense.

But when each tenant or dwelling has to keep up a separate fire, and run all the risk of a boiler explosion, its use must be comparatively limited.

But, in beginning anew, as must be done in Chicago, what possible reason can there be for going on under the old primitive system, such as would be adopted in the first settlement of a town?

There are plenty of instances where steam is conveyed 1,500 or 2,000 feet with perfect ease and success.

The loss of heat in the transmission to distant points is the first question that arises in the minds of most persons. Upon careful examination, this loss will be found to be exceedingly small in comparison to the ordinary waste in a building. For instance, a two inch pipe would be quite sufficient to supply all the steam for heating and cooking in a large house. The temperature of that pipe, with sixty pounds pressure, would be about 311 degrees With any ordinary protection, the loss of heat from such a pipe for each distance of twenty-five feet front would be less than the usual waste from a single range or stove fire.

There would be every opportunity for the most perfect isolation and protection of such pipes, in carrying them through the street.

One other use to which steam could be applied, I believe, to advantage, would be the extinguishing of fires. A reasonably tight room could be thoroughly saturated with moisture of condensed steam in a very short time, sufficiently to smother any fresh fire. Of course it would be of no use against a large fire in an open space.

I hope the attention of our wide-awake, intelligent and energetic Chicago friends may be called to the idea with sufficient distinctness to give them an opportunity of considering it fairly before they rebuild the city.

New York city. L. W. LEEDS.

How to Concentrate Colorado Gold and Silver Ores.

To the Editor of the Scientific American:

I believe I can in no better way answer the above question than by giving the results of experiments, made by myself, for solving the problem of the best system of treatment for Colorado gold and silver ores.

In the summer of 1870, I visited Colorado, for the sole purpose of demonstrating the practicability of economically concentrating Colorado gold and silver ores. I took with me, for this purpose, one of my dry ore concentrators, weighing about 1,000 pounds, which requires about ½ horse power to work it, and will concentrate Colorado gold ores at the rate of half a tun per hour.

The first difficulty met with was in not being able to get ore properly crushed, as there are no mills in Colorado adapted to crushing ore for the purpose of concentrating it; and I may add that if there are any in the whole country, they are an exception to the rule.

Of course, sizing the crushed ore was also out of the question, except by hand screens; and consequently forty tuns and over was concentrated without any sizing or grading of the particles, the ore being crushed to pass an eight mesh screen. It will be readily understood that the association of such large and fine particles together was not favorable for the best results.

The following are the results obtained from six lots of ore from different mines, first concentrated without sizing:

	Value of Original Ore.	Headings.	Tailings.
Lot No. 1	$27·00	$85·00	$7·25
Lot No. 2	35·20	83·43	13·72
Lot No. 3	25·37	98·93	10·99
Lot No. 4	12·54	79·59	3·62
Lot No. 5	46·66	163·42	9·05
Lot No. 6	18·80	110·13	4·27
	$165·57	$620·50	$48·90

I then tried the experiment of sizing the tailings, to determine how low in value they might be reduced, under proper and favorable circumstances.

	Value of unsized tailings.			Value of sized tailings.
Lot No. 2	$13·72	reduced in	value to	$2·56
Lot No. 3	10·99	"	"	2·25
Lot No. 4	3·62	"	"	2·28
Lot No. 5	9·05	"	"	3·23
Lot No. 6	4·27	"	"	2·07
	$41·65			$12·39

The average value of six lots of ore was $27·00; six lots of headings, $106·41; six lots of tailings, $8·15.

The average value of five lots of unsized tailings was $8·33; average value of five lots of sized tailings, $2·48.

The amount of sulphurets of iron and copper in the several lots varied from 15 to 40 per cent of the total weight. The average would probably be about 20 per cent, the balance, 80 per cent, being quartz and earthy matter.

The experiments demonstrated clearly that, by the dry process, the Colorado ores can be closely and economically concentrated, and that nearly all the valuable portion can be concentrated in one pile, free from quartz and earthy matter, and that the tailings can be so reduced in value as to render them unprofitable for further working.

The ore from many of the mines of Gilpin county, Colorado, can be concentrated to as high a value as, and in some cases higher than, Mr. Lee mentions (in his communication on page 261, current volume of the SCIENTIFIC AMERICAN), namely, $150 per tun; but the average value would not probably be over $125 per tun in gold and silver, no account being taken of the copper.

Mr. Lee is right in looking for success in mining gold and silver ores in Colorado through concentration; and Mr. Church is correct in his assertion that there is nothing to prevent very successful and thorough concentration of Colorado gold and silver ores.

New York city. S. R. KROM.

Sudden Rise of Pressure in a Steam Boiler.

To the Editor of the Scientific American:

Being a constant reader of your valuable paper, I notice a letter in No. 16, dated October 14, headed "A Leaf from a Practical Engineer's Experience;" in which it is said that the steam gage of the boiler arose from eighty to one hundred and forty pounds in four seconds, and that the writer raised the safety valve and kept it open until the mud and foam rose high in the air. Now, Sir, if he had been much of an engineer, would he have allowed his boiler to have become so filthy? I am running a boiler myself, and I find that it never foams when I do my duty in keeping it clean.

New York city. A. MITCHELL.

Dust Rings for Watches.

This is a new dust excluder, to be applied to watches between the top and bottom plates of their works, for the purpose of preventing impurities from entering the works. The under side of the top plate of the works of a watch is beveled at the edge, the beveled portion extending to a shoulder. The dust excluder is made of a metallic spring band, which is laid around the train so as to rest against the beveled portion of the top plate, or against a similar bevel of the bottom plate, or both. The ends of the spring band are either made to overlap, or fastened to a cast arch, which is set between the top and bottom plates, and bulged out to admit the protruding main wheel. This arched casting abuts with its rounded ends against the ends of ears formed on the top plate One end of the band is secured to the cast arch by a screw, and the other end is slotted and fitted over a screw projecting from the arch, the screw being tightened on the narrow part of the slot. When the band is used alone, the screw or connecting pin projects from one end through a slot in the other. The spring power of the band crowds it against the bevel, and serves, therefore, to properly exclude the dust.

The improvement is the invention of George Hunt, of Springfield, Mass.

Condition of Chicago.

It is estimated, upon what may be regarded as good authority, that the fire covered over 2,000 acres in the heart of the city; over twenty thousand buildings were destroyed, and ninety-three thousand persons dispossessed of their homes; ninety thousand buildings are left standing, fifty thousand people have left the city, and two hundred and eighty thousand remain. Five grain elevators were burned, with one million six hundred thousand bushels of grain; eleven elevators remain uninjured, containing five million bushels of grain. One half the entire pork product was burned, with the same proportion of flour. Eighty thousand tons of coal were consumed, and about the same amount is on hand. Fifty million feet of lumber were burned, and two hundred and forty million feet remained unharmed—nearly one quarter enough to rebuild the waste places. The stock of leather was reduced one quarter, the value of that burned being about $95,000. The greater portion of the stocks of groceries, dry goods, and boots and shoes were burned up, with more than one half the ready made clothing, but the quantities destroyed were scarcely equal to three weeks' supply, and are being rapidly replaced. About ten per cent of the currency was burned. A careful average of these larger items with smaller ones shows that the city has suffered a loss of not less than twenty nor more than twenty-five per cent on her total assets, real and personal. The terrible personal experiences published in the Eastern papers are stated, almost without exception, to be fabrications. The banks are all in full operation.

Reduction of Nitrate of Silver by means of Charcoal.

A very simple method of reducing nitrate of silver, analagous to that some years ago mentioned by the late Mr. Hadow, is given by Mr. C. F. Chandler. If crystallized or fused nitrate of silver be placed upon glowing charcoal, combustion forthwith takes place, the silver remaining behind in a metallic form, while nitrous oxide and carbonic acid are freely given off. The nitrate of silver is fused by the heat developed by the reaction, and is imbibed through the pores of the charcoal; as every atom of consumed carbon is replaced by an atom of metallic silver, the original form and structure of the charcoal are preserved intact in pure silver.

By proceeding in this manner, it is possible to produce silver structures of any desired size, possessing in every way the original form of the wood. A crystal of nitrate of silver is in the first place put upon a piece of charcoal, and a blow pipe flame is then applied in the vicinity, in order to start the reaction in the first instance; and, as soon as combustion commences, crystal after crystal may be added as these, one after another, become consumed. The silver salt is liquefied, and penetrates into the charcoal, where it becomes reduced. Pieces of silver may in this way be prepared of one or two ounces in weight, which exhibit all the markings and rings of the original wood to a most perfect and beautiful degree

Inhaler and Vaporizer for Administering Anæsthetics and Medicated Vapors.

Ethelbert E. Duncanson, of Chicago, Ill, has invented a new and improved anæsthetizer, vaporizer, and inhaler, which will greatly assist in the proper adminstration of medicinal gases and vapors.

The inhaler consists of a truncated cone, made of metal or other material, with the outline of the base fitted to be applied to the face of the patient so as to cover the mouth and nose, the edge being turned and protected, by a cushion of chamois leather or other substance, so as not to injure the face on application. It is divided near the center by a horizontal diaphragm, so as to form two compartments connected by a valvular opening, the upper being fitted with a basin, shield and sponge; the sponge to be moistened, saturated, or wet with chloroform, ether, or other anæsthetic, or medicated liquid, the vapor being drawn by inhalation through the opening left around the lower margin of the shield, the shield itself protecting the patient from any moisture in the sponge by shedding that excess or droppage into the space below. The vapor passes into the lower chamber through a passage having a valve, connected to the diaphragm and opening inward toward the face of the patient, and then enters the lungs by inhalation. The expiration from the lungs, passing into the lower chamber, is conveyed by a lateral valve, to an open air valve, closing at the time, thus saving waste of the agent employed, and preventing it from being saturated with noxious gases passing from the lungs, the out-breathing not passing through the sponge, but by the aforesaid valve in the side of the lower chamber, thus forming it is claimed, the simplest and most scientific instrument yet in existence for anæsthetizing and inhaling purposes.

A slide is placed on the side of the lower chamber opposite the valve for the admission of atmospheric air, by raising or lowering which the density of the vapor can be graduated to any desired strength, thus hastening or shortening the rapidity of action at the administrator's pleasure, or as the necessity of the patient may require. A movable cover is placed on the top for the easy saturation, removal, or cleansing of the sponge and basin. The top has an opening in the center, for admission of air or insertion of the flexible pipe attached

to the vaporizer or the tube or valve used for inhaling purposes.

This vaporizer consists of a simple vessel, of any material, with a close fitting cover and small tube in the center of the cover for attachment or connection between the inhaler and the vaporizer; the attachment consisting of an india rubber or other tube passing from the pipe on the vaporizer to the apertures in the cover of the inhaler.

The bottom of the vaporizer being fixed above a lamp or on any other heating surface, the medicine, water, or any other agent to be administered in the form of a vapor or steam having been previously placed inside, the sponge is removed from the inhaler; and the connection by means of the tube between the vaporizer and inhaler, being established the vapor or steam passes abundantly and efficiently to the nose, mouth, throat, or lungs, either or all, as may be required.

It is claimed that this improved instrument furnishes a cheap, convenient, and efficient apparatus, which greatly economizes the material used and administers it in such a way that the vapor cannot become charged with the impurities discharged from the lungs.

IMPROVEMENT IN EARTH CLOSETS.

A very simple and excellent improvement has been lately patented in this country by Mons. Goux, of Paris, France, which promises to give a new impetus to the earth closet system, and widely extend its employment.

The earth closet, as commonly made, consists of a tub or holding vessel, to receive the excreta, and another vessel or holder containing dry earth; there is also a lever and valve arrangement, so connected with the earth chamber that when the lever is operated a small quantity of earth is thrown down upon the excreta, which is thus deodorized. This plan although valuable, is, in practical use, attended with some little trouble, as the chambers must be frequently looked after, the contents of one, when full, removed, and the other chamber filled when empty.

The improvement of Goux consists in lining the interior wall of the tub or excreta holder with earth, or any other suitable deodorizing absorbent; and thus prepared it is ready for use, requiring no further attention until it becomes filled, when its contents are removed to the manure heap, and a fresh earth lining substituted. The earth lining absorbs the noxious effluvia and liquids, and the closet thus made is odorless. There is no machinery about it. It is admirably fitted for family use, and it presents this striking advantage, that its products form a manure of the highest value, which may be collected and transported without nuisance to any body. The product is, in fact, odorless, although it is a rich fertilizer.

This form of earth closet has been extensively introduced in London, where a company has been formed and a large and profitable business inaugurated. The company employs a large number of drays and men, who go around to regular customers, removing the filled tubs and substituting fresh ones, a work of only a minute in each case, with nothing disagreeable about it. The fertilizer thus produced and collected brings the highest prices, and the demand is much greater than the supply. In this country the invention is now being introduced, and may be seen in operation at the establishment of A. L. Osborn, 424 Canal street, New York.

Sheet Metal Knobs for Tea-pots.

Sheet metal knobs for teapots aro at present usually made in two pieces of eqnal size and shape, each piece being first cut and then struck into proper form, the two then being united by lap joint and solder. The manufacture of such knobs involves five distinct operations, the last of which is difficult and tedious. The appearance finished knob is never perfect, as the joint is always more or less visible. This inveetion consists in forming the knob from one single star-shaped piece of metal by bending the arms of the same and striking up the center, so that the edges of the arms will come in contact with each other.

By the means described a knob is made by but three manipulations, to wit, those of cutting, striking up, and final bending of arms. If the arms are to be curved transversely to make the knob of conical instead of pyramidal form they can be so made by striking them in the desired manner at the beginning of the operation. The improvement has been patented James Britton, of Williamsburg, New York.

Shall we send our Children away from Home to be Educated?

The *College Courant* published at New Haven says on the above subject: The notion is quite prevalent that it is a good thing for children to go away from home while acquiring their education, so that they may see the world and learn how other folks live. There is doubtless much to be learned in seeing the world, and we would, by no means, deprecate the enlargement of mind which comes by travel; but the natural place for children is home, and their best society that of their parents and brothers and sisters. The teacher of a boarding school has the double office of teacher and parent, and, however well he may fill the former, it is impossible for him to fill the latter to the perfection which the parent can, and often does attain. The child almost knows instinctively that the love of a parent is disinterested, that his advice is without any selfish motive, and that his command must be obeyed; he therefore trusts his parent with a confidence, and obeys him with a good will, which he is not ready to yield to a stranger. It is the duty, therefore, of parents to keep their sons and daughters together at home till their minds are well disciplined by study, their principles well established, and their habits formed, and then they can safely see the world, and profit by the lessons it teaches. The high schools enables us thus to do. The young men and women graduating from our high schools find the same incentive to action in society that they found in the school, and do not leave behind them the forces which thus far have impelled them. There is no such violent change as must occur when one graduates from a school exclusively devoted to one sex.

The Pennsylvania Steel Company.

The Pennsylvania Steel Company, one of the most important industrial establishments in the country, has its works on the Susquehanna, about three miles below Harrisburgh. Its Bessemer department was started in June, 1866, and the annual product of Bessemer steel is about 18,000 tons. The building now consists of a melting building 81 by 52, and 39 feet high, with a hipped roof and lantern 18 by 44 feet. Adjoining and divided by a thick wall is the converting room, 114 feet long by 100 feet wide and 25 feet high in the clear, for a pair of five tun converters. Connected is the engine room, containing a pair of engines of 500 horse power for driving enormous air condensing pumps for the air-blast. Specimens of all the iron are carefully tested before it is allowed to go into the furnace. A visitor to the works describes the operations as follows:—

The iron is first melted in blast or cupola furnaces, of which there are five, located in the second story of the melting building—one of which is reserved for melting the Franklinite iron separately. While the iron is in process of melting, the workmen kindle a fire of hard coal inside the converters—it being necessary to prepare them for business in that way. Three fourths of a tun of coal is thus consumed each time a converter is used after being cooled off. The converter is of iron, made in parts and bolted together; it is lined with fire brick and a mortar of pounded quartz; it is egg-shaped with an opening at the top, like the neck of a crooked squash cut short. It is suspended on trunnions, with ratchet apparatus propelled by hydraulic power for turning it at will on its side or bottom upwards. It has a false bottom, and through the inner bottom are ten holes about five inches in diameter. Over these holes are placed what are called *tuyeres*, made of fire-brick clay and hollow; the nozzles are pierced with a number of small holes to allow the influx of air. These tuyeres are about thirteen inches long; all around them to their tops is rammed moistened earth, well mixed with pounded quartz. This double bottom, after being prepared, is bolted to its place on the converter. Connected with the space between the upper and lower bottom of the converter is a large iron pipe leading from the air cylinder of the force pumps. Ten tuns of the melted metal are first drawn from the furnaces into a huge ladle in the room adjoining the converting room. Five tuns being a charge, there is enough to supply the two converters at once. All being ready, the enormous charge is, poured from the ladle, through an iron trough lined with a mortar of crushed quartz, into the converter, then horizontal. Instantly the blast of air is let on, and the converter slowly resumes its upright position, while a tempest of fiery cinders pours from its crooked neck. When horizontal this neck serves as a tunnel to receive the metal; when upright, it deflects the stream of fiery cinders into the wide-mouthed chimney. And now the molten iron, already heated to 3,000°, is urged by the furious blast to an unknown temperature.

The 500 horse power engines drive 6,000 cubic inches of compressed air per minute through the surging mass. The carbon in the air unites with oxygen, and, as combustion proceeds, the boiling mass grows hotter and hotter; impurities rise to the top and pass off in liquid slag, or in streaks of red and yellow gas, and finally in thick, full, white, roaring dazzling flame.

The foreman knows by the flame each instant change. In fifteen to twenty minutes the flame is thinner with a bluish tint, and then the hidden hydraulic power turns the huge converter slowly down until it is again horizontal. A quantity—I think about 7 per cent—of melted Franklinite iron containing carbon and manganese is poured in, and again the boiling and surging is renewed; but only for a brief half minute or less, and then all is quiet. The melted pig iron has lost about 17 per cent of its weight, and has become a homogeneous mass of liquid steel that pours out into the ladle, under its roof of slag, smooth, shining, and almost transparent.

Each filled ladle now takes half the charge into the converter; and from the ladle it is drawn into iron molds set on the outer limits of a depressed semi-circurlar area which surrounds one side of the converters. The molds are set with the large end down on an iron floor covered with loam. When cooled, the mold is raised by an immense hydraulic crane, and the enclosed ingot is jarred out by repeated blows of a sledge hammer. The ingot is then weighed and transported on a truck running on a tramway to the rail mill or rolling mill.

At every stage the iron is weighed, before it is melted, after it is melted, and after it is converted into steel. The steel rails are also weighed and tested. The ingots weigh about 1,600 pounds each.

In the rolling mill the usual process of heating the ingots, of hammering and drawing out through rolls is gone through with. In these works there is ample floor space and hight. There are eight frames arranged in pairs, with room for more, at one end and in one wing, with the boilers over them and sheet iron chimneys outside the building. In the center of the space between the furnaces and the rolls' there is ample room for piling ingots, and a hydraulic crane for unloading them from the converting room cars and loading them on the furnace buggies. So ample are the arrangements of the rolling mill that it can roll twice as fast as the Bessemer works can turn out the steel, and that part of the establishment is about to be duplicated. The ingots, heated from the furnace, are placed under a twelve tun steam hammer, and after being drawn out to twice their length, are cut in two, and are then passed through the rolls which draw them into proper length and shape. Passing from the rolls to a carraige, each rail is cut into lengths of 30 feet by swiftly revolving circular saws. They are straightened partially while hot, and completely when cold, under a straightening press.

Growth of the Petroleum Trade.

According to the annual report of the New York Chamber of Commerce, just issued, the exports of petroleum in 1870 were 37 per cent greater than those of the previous year, and nearly all this increase, or 33 per cent, is accounted for by the shipment from the port of New York. The total export from the United States in 1870 was 141,208,155 gallons, against 1,500,000 in 1860, and 99,281,000 gallons in 1868, showing an increase of nearly 42,000,000 gallons in two years. The first sale noticed for export was in May, 1861, when 100,000 gallons were sent to foreign markets. Antwerp, which has since led all other ports in the importation of petroleum, took in that year 5,671 gallons, increasing the amount in the following year more than 800,000 gallons. Great Britain took 579,000 in 1861—and in 1862 increased her importation to 3,238,000 gallons.

The continued growth of this trade for ten years—from 1,500,000 gallons in 1860 to 141,000,000 in 1870—is a wonderful exhibit, not only on account of the rapid development of the oil interest, but also because the yearly increase has been steady. The daily average product of the Pennsylvania oil district in December, 1867, was 10,400 gallons; in the same month of 1870, it was 15,214 gallons—a fact which shows the inexhaustibility of the wells in that region. In regard to the home consumption, it is estimated that it is equal to one half the quantity exported—making in round numbers an aggregate consumption of 11,000,000 gallous annually. This enormous amount, reckoning the price at an average of twenty cents per gallon, represents a value of more than $42,000,000 for a single year—certainly a remarkable return for a product unknown to commerce ten years ago.

Lint.

Next to cotton, the vegetable fiber most extensively used for textile fabrics is flax, the Latin name of which is *linum*,—hence come the names of linen and lint. The fibers of cotton and flax, viewed under a microscope, will be found to be different; the fiber of cotton is angular, or bladed, while that of flax (linen) is perfectly round and smooth. It is this difference in their natural formation that constitute the superiority of linen over cotton as a material for dressing wounds, or as a fabric for clothing the body. Lint is the unwoven fiber of linen. By wear, and much washing, which it necessarily undergoes, linen becomes softer than when new; it undergoes a partial decay, and the much prized linen eventually becomes "rag." In this state it is fit only to be converted into paper or lint. Lint is, in fact, the woolly fiber of old linen, "thrown" or slightly "felted" together (as manufacturers term it) into the material form so named. The flax plant yields not only linen by means of its fiber, but it also, by expression, gives a valuable oil from its seeds, known in commerce as linseed oil. The residue, after the oil is expressed, is called linseed cake, and excellent food for cattle. Each product of the flax plant, both in peace and in war, has its value either as linen, linseed, or lint.

AN extensive sugar planter, of Louisiana, who has over fifty Chinamen employed, informs us that while this class of laborers are physically incapacitated to perform as much work as the negroes, (man for man), still they are, upon the whole, quite as serviceable and more reliable than any other available class of laborers now in the South, white or black; and inasmuch as there is a great deficiency of farm labor in the cotton and sugar producing States, he informs us that the capitalists of the South are taking steps to insure a large importation of Chinamen in the coming fall and winter, for the purposes alluded to.

JOHN CHINAMAN AS A PLANTATION HAND.—Says the *Illustrated Agriculturist*, (St. Louis); a planter at Irish Bend, Parish of St. Mary, has had twenty-six Chinamen at work for him the past eight months, on his sugar plantation; and he infinitely, and for every reason, prefers them to negroes. They take good care of their teams, never beating or abusing them. They get $13 for twenty-six days work, and ordinary rations. This would indicate John as the coming laborer in the Southwest.

IT is intended to hold a grand exhibition of architectural models, plans, appliances, work and materials, at Berlin, in the course of next year. The funds have been subscribed, and the Emperor of Germany will appoint a commission, to carry out the scheme, immediately on his return to the capital.

THE POLAR EXPEDITIONS.—A letter has been received from a gentleman on board the *Polaris*, reporting the safe arrival of the ship at Upernavick, and her departure thence on September 5, steering due north. All well. From Gotha, Germany, we hear of the German expedition, and its reported success in reaching the open Polar sea. The sea is reported to be "free from ice, and swarming with whales."

EDUCATION enters the mind through the gates of the senses. It is commenced very early, many children requiring to be taught even to nurse. Remembering that James Watt commenced the study of Greek at the age of seventy, it would be difficult to fix a period at which it terminates. As a general rule more lessons are learned outside than inside of our school houses.

THE CHAMPION SPRING BED.

The sum total of human experience on the subject shows that the bed question is one of great importance to everybody, and that upon the wisdom of one's choice of bedding material depends much of comfort, health, and even the prolongation of life. A badly composed bed is too often but the breeding place of contagion and disease.

Good feathers and curled hair, in abundant quantities, make good beds, but their organic substance renders them unhealthy, and the best medical authorities discourage their use. A capital substitute for them has been found in the elastic properties of metal, and the subject of our illustration is the very latest improvement in this line—the Champion Spring Bed—which rivals in its softness the old-fashioned down and hair, embodying, likewise, all the other good qualities that experience has shown to be desirable.

This bed is composed of eighty-eight beautiful steel springs, comprising over eight hundred coils, drawn and tempered with accuracy, yielding and pliable like watch springs, the helices united by leathern bands, and the whole so arranged that pressure, applied upon any one portion of the surface of the bed, is equally distributed and sustained by all of the springs. This imparts to the bed an even elasticity and general softness, which is a peculiar characteristic, preventing that sinking down of the bed in one spot, and that down-hill feeling of the surface, or sloping towards the place where the greatest weight rests—defects that are common to most of the ordinary spring beds.

Another striking advantage of this bed is its remarkable flexibility. As shown in our engraving, it may be rolled up like a blanket, forming a convenient package for transportation; and it may be lifted, turned, and carried about the household with the utmost facility.

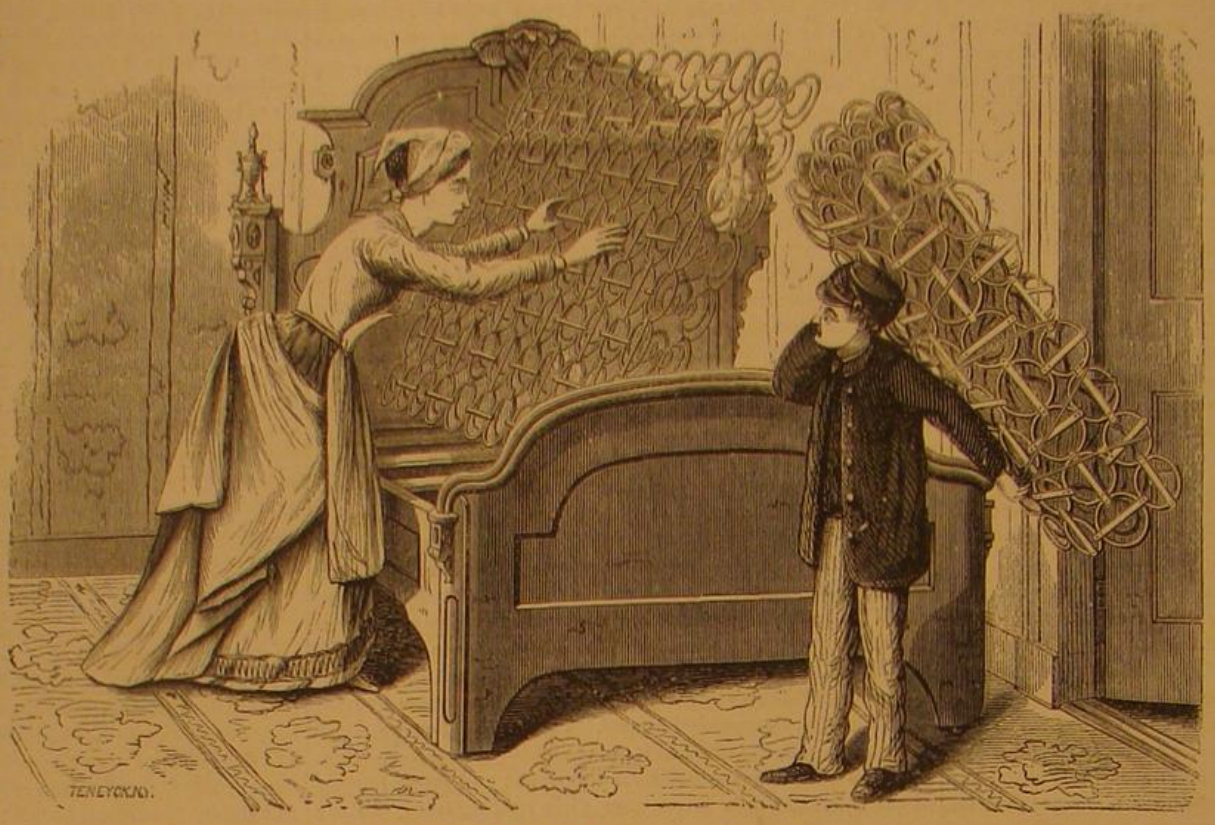
Its extreme lightness is a distinctive and important quality, the total weight of a first class double bed being only 25 lbs. A child may carry it; any woman may lift it with one hand. Housekeepers will appreciate this quality, for they can remove and place the bed, wherever they require, as easily as if it were a bolster.

Another excellent feature is its perfect security against corrosion, the springs being inlaid with a firm waterproof fire enamel, which renders the bed serviceable in every climate, hot or cold, dry or damp.

Both sides of this bed are alike, it can be used either side up, has no attached frame of wood or slats, but is soft, yielding, and flexible in every part. In summer time it forms a cool and luxurious couch; no under bed being required, a blanket thrown over its surface is sufficient. In cold weather, a mattress of only half the usual thickness is needed.

This bed is noiseless and durable. It is also economical in price, the full sized double beds of this pattern being retailed at $12—the smaller sizes for less. Rolled up for transport, as shown in our engraving, it forms a light, compact bundle of steel springs, which may be sent to any part of the world without risk of damage. Such are some of the merits of this invention, as claimed by the makers, and they appear to be well founded.

Patented Sept. 19, 1871, by Wm. B. Judson. Manufactured by F. C. Beach & Co., 260 Broadway, New York, from whom further information can be obtained.



THE CHAMPION SPRING BED.

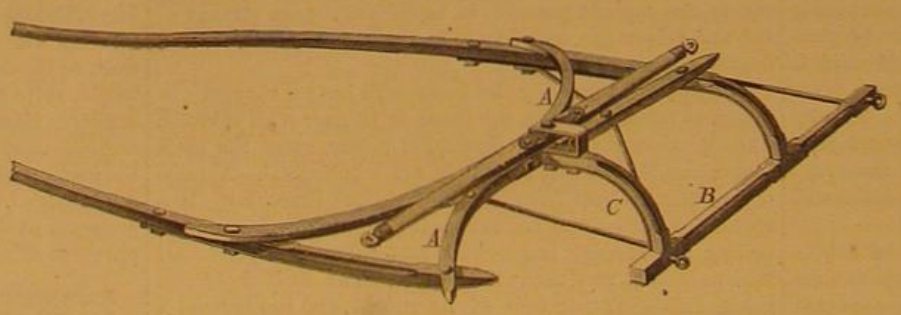
Silk Reeling in California.

At the recent fair in San Francisco, a small space in one of the galleries of the pavilion was devoted to silk, and this was occupied by a reel, the office of which was to unwind the fibers from the cocoons. This was of much interest, and while at work was the center of an admiring group of spectators. The operation was conducted by a California lass, who took real pride in her occupation and showed great skill. The cocoons, which look like large peanuts, are put into a vessel of boiling water which stands in a small furnace, the furnace itself being set below or rather in front of a small table, on a level with the operator as she sat in a low chair. The action of the hot water in a few minutes loosened the gum, that, in the natural condition, cements the fibers to the cocoon. This done, the girl, taking a brush in one hand, stirred the cocoons about with it until the requisite number of fibers were detached at their ends, and clinging to the brush. From this they were quickly brought together to form a thread, passed through a fixed guide or staple at the opposite edge of the table, from this through a staple on a reciprocating bar, and thence to the reel, which was revolved by the hand of a small boy. A second thread was formed in like manner, and in the same way connected with the reel.

As the reel revolved, the fibers were drawn or unwound from the cocoons, which danced about in the boiling water, united in the two threads, and conducted to the reel upon which they were distributed by the vibratory movement of the bar previously mentioned. The two threads, in passing to the reel, were made to cross each other at an angle of about thirty degrees. This was the distinguishing characteristic of the new invention, and the advantage claimed for it is that the two threads, in rubbing each other as they pass to the reel, cause the gum to stick more closely together and consequently secure a smoother and firmer thread. After certain lengths of the two threads were wound upon the reel, its motion was stopped, the threads were severed from it, and the two skeins of raw silk, bright yellow or lighter colored, according to the original tinge of the cocoons, were slipped from its ends. The peculiar skill required from the attendant is shown in keeping the threads of silk continuous as the fibers wind off and leave the cocoons, it being necessary to add the fiber from a new cocoon at the instant the fiber from the previous one is exhausted. The fibers are of course too fine to be seen at the distance of more than a very few inches, and while the operator was attending to her work, it seemed as if her fingers were flying in the weaving of an invisible web.

BOCK'S IMPROVED ONE HORSE SLEIGH SHAFT.

In the old way of constructing the shafts of a one horse sleigh, the left runner extended out beyond the left shaft, so that in passing other sleighs, or in crowded positions, it was liable to get caught and broken



ONE HORSE SLEIGH SHAFT.

In the invention, herewith represented by our engraving, a method of construction has been adopted that not only obviates any such difficulty as that described, but gives a peculiarly graceful style and appearance to the shafts.

Our artist has so well delineated this improvement that any one conversant with sleighs will understand it.

The invention consists in the combination of the shafts with the double crossbar, A, the draft bar, B, and the short curved bar, C, made in such a way as to carry the left thill out laterally beyond the corresponding runner, as above described.

This improvement, though simple, is practical, and we think, will meet general approval.

Patented through the Scientific American Patent Agency, Sept. 5, 1871, by C. & D. Bock. For further information address the patentees, Drum P. O., Luzerne Co., Pa., or Bent, Goodnow & Co., 490 Washington street, Boston, Mass.

To Preserve Flowers.

A new mode of preserving flowers, fruit, and botanical specimens generally, has been suggested by Dr. Piesse, which we think will be appreciated by those who wish to preserve specimens gathered by departed friends, or to retain the form of flowers for botanical teaching. The process consists in simply dipping the flowers into melted paraffin, and withdrawing them quickly, when a thin coat of the paraffin instantly sets, and incloses hermetically the plant so treated. In order to be successful, the flowers should be freshly gathered, perfectly dry, and free from dew or moisture of rain. The paraffin should not be hotter than just sufficient to liquefy it; and the flowers should be dipped into it separately, holding them by the stalks, and moving them about in order to get rid of bubbles of air, which are likely to become imprisoned within the corollæ of the flowers. Those parts of plants or flowers which are not required to be preserved should be removed with scissors prior to steeping them in the paraffin.

COOGAN'S MACHINE FOR BOARDING, PEBBLING, AND GLOSSING LEATHER.

The process of boarding leather is at present carried on by vibrating, by hand or machinery, a convex plate, on the doubled leather, which is placed on a flat table. This vibrating plate operates slowly, and the process is consequently expensive. Mr. Owen Coogan, of Pittsfield, Mass., in an invention just patented, proposes to use, instead of the convex plate and table, two cylinders or rollers, hung parallel to each other in a frame, and geared in such manner that they will revolve in the same direction. One of the rollers hangs in vertically adjustable bearings, so that its own weight, or machinery connected with it, may be used to press it against the other roller. The leather to be boarded is doubled, placed between the two rollers, and rotary motion then imparted to the latter. The two layers of leather are thereby drawn in opposite directions. The leather is thus constantly folded and refolded, and consequently softened, and, on the inner side at the same time, grained or boarded in the desired manner. The rollers are smooth or roughened and made of any suitable material.

For applying a design to the ace of the leather—"pebbling" it, as it is termed—he applies to the machine a pebbling roller, which is placed between the first mentioned rollers, so that the leather passes around it. The surface of this roller is roughened by indentations, or provided with a suitable design, so that such design will be impressed in the face of the leather while the latter is pressed against the pebbling roller. In order to permit the easy application of various designs, he makes the pebbling roller of a central pin or shaft, and fits short tubes upon it, the tubes carrying the design on their circumference and constituting thus the outside of the pebbling roller.

For glossing the surface of blackened leather, a smooth or glossing roller is used in place of the pebbling roller. The pebbling and glossing rollers are removable from the machine, so that the latter may be used for boarding only. The axis of one of the boarding rollers has at its end a worm, which meshes into the teeth of a worm wheel. This worm wheel has a projecting pin, which, after a certain amount of rotation, strikes against a lever connected with a clutch lever, whereby the driving belt is carried so as to automatically reverse the motion of the rollers. Thus the leather, after having been doubled and moved one way, is subjected to the same process under reversed motion. The pin, set into the worm wheel so as to permit full action on the entire length of the leather, is adjusted in position according to the length of the leather to be boarded. For this purpose the wheel has several apertures or sockets for the reception of the pin.

We regard this as an important addition to leather dressing machinery, and see no reason why it should not prove itself valuable in practice.

Labor.

"Labor," says the Rev. Newman Hall, "as a mighty magician, walks forth into a region uninhabited and waste; he looks earnestly on the scene, so quiet in its desolation; then waving his wonder-working wand, those dreary valleys smile with golden harvests—those barren mountain slopes are clothed with foliage—the furnace blazes—the anvil rings—the busy wheels whirl round—the town appears—the mart of commerce, the hall of science, the temple of religion, rear high their lofty fronts—a forest of masts, gay with varied pennons, rises from the harbor—the quays are crowded with commercial spoils, the peaceful spoils which enrich both him who receives and him who yields—representatives of far off regions make it their resort—science enlists the elements of earth and heaven in its service—art, awaking, clothes its strength with beauty—literature, new born, redoubles and perpetuates its praise—civilization smiles—liberty is glad—humanity rejoices—piety exults, for the voice of industry and gladness is heard on every hand; and who contemplating such results, will deny that there is dignity in labor?"

GOOD MANNERS are not learned from arbitrary teaching so much as acquired from habit. They grow upon us by use. A coarse, rough nature at home begets a habit of roughness which cannot be laid aside among strangers.

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Contents:

(Illustrated articles are marked with an asterisk.)

THE DEPENDENCE OF FUTURE MECHANICAL PROGRESS UPON THE DISCOVERY OF NEW MATERIALS.

We would not, in the above heading, imply that without the discovery of new materials the triumphant march of improvement will be stayed, but we hazard nothing in asserting that such discoveries at this period would greatly accelerate mechanical progress.

We have within a few years witnessed a new impulse to the arts imparted by the discovery of nickel plating, which places in the hands of inventors a comparatively cheap material, suitable for many useful purposes.

By new materials, we mean not only those substances hitherto totally unused, but such modifications of known substances as render them practically new and capable of hitherto unknown applications.

For both the discovery of new substances and modifications of the old ones, the world must principally look to chemistry and metallurgy. The former almost daily acquaints the world with some new combination; but, for the most part, these discoveries are made in organic chemistry, and prove of little practical value to the arts. Once in a while, however, there appears an announcement of some investigation, the results of which completely revolutionize an entire industry; or, if not of so radical importance as this, still produce immense changes in various arts. As one out of many illustrations of this, we may adduce the discovery of the coloring matters contained in coal tar, which has so greatly added to the resources of the dyer's art.

The aim of metallurgists at the present time seems more directed to cheapening the methods of extracting metals from their ores, and rendering them more complete and effective than they have yet been; and there seems to be a pause in the study of the alloys. Yet, in these remarkable compounds of metals with each other, there seems to us an almost illimitable field, containing the highest promise to the patient worker. The man who could discover a new alloy as widely useful as brass, and who could secure the fruits of the discovery to himself, would have found a source of wealth richer than any gold or silver mine in this country.

What is needed is the systematic study of alloys, the putting of metals together in a great many possible proportions, with a constant record of results, and specimens of each preserved in cabinets, with minute observations of their physical and chemical properties. As this would take much time and involve great expense, it could hardly come within the means of a single individual; but if a suitable laboratory could be endowed, and provided with suitable apparatus, and properly qualified men could be induced to give up their lives to such an investigation, we feel assured the knowledge which might be gained would as fully repay its cost as that obtained in any other field of research.

It is also probable that the vegetable and animal kingdoms still hold rich stores of material, capable of extended use in the arts. It is not many years since it was known that useful paper could be made of wood and straw.

The milky juice of the "silk weed" or "milk weed," as it is called in common language, but known to botanists as the *asclepias cornuti*, is capable of abundant supply, if it can be shown to be of industrial value. It dries into a very viscid substance, as every boy who has soiled his hands with it knows. How nearly is it allied in property to the juice of the india rubber tree? Is it not capable of combining with sulphur, like rubber, to form a species of vulcanite? Who has answered these questions, and scores of others that might be propounded in regard to other plants?

If some of our inventors would now turn their attention to the utilization of new materials in the vegetable world, we think many valuable things might be discovered.

But we have said enough for our purpose, which has been to direct attention to the vast supplies of hitherto unworked materials lying idle in the great storehouse of Nature. Can any one believe that, among all these, remains nothing that can be brought successfully into the service of mankind? We have only to look back a few years to find a negative answer in the general introduction of petroleum products that were unknown to the last generation, to the development of the vulcanized rubber industry, to the employment of anæsthetics in surgery, to the adoption of new articles of food and drink, and to many other contributions to the comfort and luxury of mankind, that were, at the time of their discovery, no more within the limits of possibility than others not yet made are at this moment.

FIREPROOF BUILDING.

It may be safely said that there exists no solid material, available for building, sufficiently refractory to withstand heat, as intense as may be produced by artificial means, or generated in large fires like that which has recently visited Chicago. It is true that there are many substances which resist heat for a long time. Fire clay, plumbago, asbestos, platinum, etc., are capable of enduring very high temperatures, without perceptible damage or change, for considerable periods. Safes, made of these and other materials we could name, would scarcely burn up, though exposed even in the fiercest fires for hours or even days. It is, therefore, not difficult to make a safe that the heat of burning buildings will not destroy; but to make one that will not transmit heat to its contents, after long exposure, is quite another matter. Even the worst conductors do conduct heat somewhat, and though this conduction may be slow, it will, if long continued, be ultimately sure to char the destructible things in any safe that relies solely upon non-conductors—so called—as a protection for its contents. This has been proved in all the great fires that are on record, since the general introduction of safes.

The same remarks apply to fireproof buildings. No doubt a building could be made of a material, or of materials, that will not burn under any combination of circumstances; but walls will heat, and combustible organic substances will become converted into charcoal in dry ovens, for such every really fireproof building is when its exterior walls are the sole protection of its stored wares.

Could we make walls of a substance that will only attain a moderate temperature, no matter to what degree of heat it might be exposed, and which would not melt down or volatilize, we should have found the precise thing of which to make the walls of fireproof safes and buildings. A building made of ice would preserve its contents from fire till the walls were melted. But we cannot use ice for building.

What ranks next to ice as a protector, and is available in large quantity, is water. If a building could be made in such a way that each pillar, block, lintel, and sill—each separate part of the structure—could be instantly, on an emergency, converted into a steam boiler, evaporating water at atmospheric pressure, such a structure would withstand any heat that could be brought against it, and preserve most of its contents so long as the supply of water for evaporation was maintained. More than this, the exact amount of water necessary to preserve it for a given time, under a heat that would keep the water boiling, could be accurately computed. The temperature of no part of the structure could rise much above 212°, at which few materials in common use, and stored in dwellings and warehouses, would be much injured.

As a matter of interesting computation, let us estimate the amount of water necessary to protect a building one hundred feet long, thirty feet wide, and seventy feet high, having the ordinary flat roof. The superfices of such a building exposed to fire, would be equal to the effective heating surface of a 1,927 horse power boiler, or one that will evaporate 1,927 cubic feet per hour; so that, admitting all sides to be equally exposed, that amount of water would keep building and contents down to a temperature of 212° Fah.

Practically, however, only the ends and tops of a building in the center of a block would need such protection, unless the buildings next it should take fire, so that, in most cases, only about 665 cubic feet of water per hour would be necessary, supposing the heat on the ends and top to be intense enough to keep all the water boiling.

It would be clearly impossible to burn a city made up of such buildings; and no fire could have a long duration, unless some inextinguishable substance like coal oil, alcohol, etc., should ignite; in which case, unless such a building as we have described should explode, its interior would become a boiler furnace instead of an oven, and its walls would stand, to a great extent unimpaired, after its contents were consumed.

We do not pretend to assert that precisely such a system as we have indicated, is practicable, but do not doubt that the use of the vapor of water to prevent the possibility of fire would prove far more economical than the present use of that fluid as an extinguisher. We believe the direct application of steam as a conveyer of heat rather than as a motor for engines, which are only employed to throw, in a wasteful deluge, a volume of water upon buildings for the same purpose, would be shown the more scientific and effective method.

If the hint is worth anything, we leave it for inventors to put it into practical form. The problem is to make a structure that fire cannot destroy; and to the use of water as the cheapest, most available material, in combination with those which have proved themselves, when used alone, unreliable, we must look for its solution.

THE LEISURE TIME OF BOYS.

Every father of a family knows that there is a time in the life of his sons that gives him much trouble and some anxiety. We allude to the period of boyhood, when exuberance of spirits and thoughtlessness are at their hight, and when the studies imposed by school discipline are entirely insufficient to find adequate employment for their too active minds and bodies. And it is not possible, or even desirable, to increase the already considerable application of all well bred boys to the study of books and the acquirement of learning. It is not to be wished that a youth of twelve should grow up to be a conceited would-be pedant of twenty, and a bookworm of thirty, years of age. Thus the task of finding fitting occupation for the leisure hours of a boy is no inconsiderable one, as few pursuits into which a boy would plunge with eagerness are suited for putting in the way of so much impulsiveness and want of consideration as most boys possess. The question, then, of how to amuse our boys, is one of paramount importance and difficulty.

We would suggest, to the many parents who have been perplexed with this difficulty, to give their lads every possible opportunity of acquiring a mechanical trade. The industry and ingenuity of a boy of average ability may easily be made to furnish him with a never failing source of amusement of the best order. The boy who can produce or make something already begins to feel that he is somebody in the world, that achievement of a result is not a reward reserved for grown people only. And the education of mind, eye, and hand, which the use of tools and mechanical appliances furnishes, is of a great and real value, beyond the good resulting from the occupation of leisure time. Having nothing to do is as great a snare to the young as it is to the full grown; and no greater benefit can be conferred on youths than to teach them to convert time now wasted, and often worse than wasted, into a pleasant means of recreation and mental improvement.

We say, therefore, to all parents, provide your boys with mechanical apparatus and tools. There is no greater pleasure to most boys than the handling of a tool; and many great men and ingenious inventors look back with gratitude and delight to the day when they were first allowed to use the lathe, the saw, and the plane.

The expense of a visit or two to a theatre will furnish a family of boys with an occupation into which they will all enter with alacrity, and which will instruct them in two most important branches of education, namely, quickness of eye and docility of hand. And, further, it will develope any latent genius they may have for the mechanical and constructive arts, which are, now more than ever, the most important means to the progress of mankind. The boy, whose time and mind are now occupied with marbles and kites, may be a Watt, a Morse, or a Bessemer in *embryo;* and it is certainly an easy matter to turn his thoughts and musings into a channel which shall give full scope to his faculties; for, to any lad, the use of mechanical tools is the most fascinating of all occupations. And for boys whose spare hours are spent in more objectionable ways than the innocent games of childhood, it is of tenfold importance that all fathers should recognize the existence of a simple and attractive substitute.

And if the boy has not in him the germ of a great benefactor to his race, and if his tastes and morals are unexceptionable, the training of the intellect in some handicraft will have great and salutary influence on his character. As logic and mathematics have a value beyond accuracy in argument and the correct solution of problems, in that they teach men the habit of using their reflecting powers systematically, so carpentry, turning, and other arts are of high importance, even if the boxes and silk spools produced are of little value. These occupations teach boys to think, to proceed from initial causes to results, and not only to understand the nature and duty of the mechanical powers, but to observe their effects; and to acquire knowledge by actual experiment, which is the best way of learning anything. All the theories culled out of books leave an impress on the mind and memory, which is slight compared to that of the practical experience of the true mechanic.

Our advice is, to all who have the great responsibility of the charge of boys, give them a lathe, or a set of carpenter's, or even blacksmith's tools. Give their minds a turn towards the solid and useful side of life. You will soon see the result in increased activity of their thinking capabilities, and the direction of their ideas towards practical results; and, still more obviously, in the avoidance of idle mischief and nonsense (to omit all reference to absolute wickedness and moral degradation), which are, to too great an extent, the pastime of the generation which is to succeed us. The future of the world is already sown, and is springing up in our children; is it not worth while to bestow a little thought on the cultivation of a growth so important to society, and so easily influenced for good or for evil?

VALIDITY OF PATENTS ISSUED UNDER THE NEW LAW.

Some anxiety has been caused to patentees by a statement, now circulating among the papers, to the effect that all patents issued between July 8, 1870 (the date of the new patent law), and July 4, 1871, are invalid by reason of a discrepancy existing, during that period, between the working of the patents issued and the wording of the new law. The difference referred to is this: Under the old law, a patent was granted to the applicant, "his executors, administrators, or assigns," but in the present law the reading is "his heirs or assigns,"

It seems that, during the interval above named, the old blank forms were used while the new ones were being prepared and engraved, the above difference in wording not being considered of any essential importance, and certainly in no manner exposing the validity of the grant. It would have been a simple matter to have changed the wording of the old forms with pen and ink, if it had been legally required, or even desirable. We understand that the chief reason for adopting a new blank form was to reduce the size. Why a change was made in the wording of this paragraph in the law itself is not apparent. Persons, therefore, who may have seen the sensational item alluded to, and have had their fears much excited thereby, can safely compose themselves on the subject. Even in case the Office had committed an error, as stated, affecting in any measure the soundness of any patent, Congress would not fail to protect the rights of the party interested.

SOMETHING ABOUT FACES.

It is a trite remark that, among all the multitude of people who inhabit this globe, no two can be found that exactly resemble each other. Even in cases of twins, where a strong similarity exists, there is always to be found some point of difference by which those most intimately acquainted with them are enabled to distinguish one from the other. And it may be further observed, that those most alike in early youth lose their resemblance, to a greater or less degree, as age advances. No face leaves this world at mature years without having undergone changes that astonish even the most intimate when comparisons are rendered possible. In this age of photographs, almost any one is able to make such comparisons, and to note how the various circumstances and trials of life carve their impress upon the features. Very few have, however, fully estimated the infinite variety and number of indirect, direct, near and remote influences that have operated through ages to work out the form and feature of every face upon earth.

A skillful physiognomist may often determine character approximately by the countenances of men; but, as a sheet of paper, printed and reprinted, must at last become a confused jumble of indistinguishable characters, so are most people's faces too much interlined and crosslined, by the confused imprint of circumstances and events, to be intelligible even to the most practiced reader of faces.

There are, indeed, some traits of character, and some passions that ordinarily stamp themselves upon faces more conspicuously than others. Of these may be mentioned cruelty, settled melancholy, and jolly good nature. As a rule, these traits are easily distinguished by a look at faces; but it is not infrequent that good faces conceal bad hearts, and sanctimonious appearances cover secret vices.

A man who was tried for and convicted of murder, and who confessed his crime before his execution, was admitted, while on trial, to be as fine looking and prepossessing in appearance as any man on the bench, in the bar, or in the jury box, yet that court room contained some men whose lives and record have been in the highest degree honorable, and whose personal appearance could scarcely be excelled by any equal number of men anywhere.

It is notorious that circumstances of easy living, the absence of business cares and worries, will do much toward smoothing away the marks of crime; while the faces of criminals that have lived in circumstances of physical hardship gather a rough brutality from which we instinctively shrink.

As the circumstances which give character to the human face at birth have been infinitely various, and have acted through long periods of time, it is not a matter of surprise that the results are so varied, but rather that they should be even as uniform as they are. Were it not that throughout nature there prevails the great law of compensation, and also the great law of reversion (admirably set forth by Darwin), there could be no two living things even approximately alike. There would be neither *genera* nor species, even if the wide difference in structure and habits thus arising should not lead to the mutual destruction of all.

As circumstances shape our birth, so they shape our lives and mold our characters. Yet, with all the thought and effort toward social improvement that marks the age, the effort of society seems to be directed to making character adapt itself to circumstances rather than to form character by controlling the circumstances through which character is developed. Thus we have failed to recognize the fact that physiological law is stronger than social law. We do not yet admit the fact that, if our habits and customs are such as to develop the animal in us at the expense of the mental and spiritual, we shall have animals to control by civil law; or if we do see this, we do not see that civil law must prove utterly inadequate to control animals, that obey only their depraved instincts.

Society, in assuming to govern not only the depraved, but the healthy, instincts of our animal nature, assumes too much when it attempts to force violations of physiological law. As well might it legislate that weights shall fall upward; they will fall downward in spite of enactments; and so will the catastrophes and crimes that have lately shocked our community continue to happen so long as the circumstances that lead to them are permitted to exist. If we feed our children upon heating diet, and place them where they are forced, like plants under glass, into premature bodily development, let us blame ourselves only, that their immature minds and wills are too weak to contend with the strength of their passions which we have taken such pains to cultivate; and if, in the temptations that beset them, they overstep the bounds of social propriety, let us not be surprised that, in their efforts to escape the disgrace society attaches to such lapses, they, some of them, resort to dangerous practices, and find a final escape in death.

DEATH OF SIR RODERICK IMPEY MURCHISON.

The death of this distinguished man is announced by telegraph to have taken place on October 22, in England, at the advanced age of seventy-nine years. It has rarely fallen to the lot of any man to contribute so largely to the advancement of science as this deceased scholar. His career was a peculiar one. In early life he was an officer in the British army, and, as such, served under Wellington in Spain. He left the army, in order to marry and settle down to quiet literary pursuits; and, in accordance with the advice of his friend, Sir Humphrey Davy, as well as the influence of his accomplished wife, and following a natural predilection, he took to scientific studies, more particularly to geology and physical geography.

One of the earliest fruits of this study was the publication, in 1834, of a work "On the Geology of the Neighborhood of Cheltenham," which was afterwards augmented by Buckman and Strickland, and republished in 1845. "The Geology of the Counties of Salop, Hereford, Radnor, etc.," appeared in 1835; and, in 1839, was published "The Silurian System, founded on geological researches in the County of Salop." By this time Murchison had become a thorough scholar, and an indefatigable investigator; and, like many previous scientists, had taken up a hobby, which he pushed with admirable zeal, and in elegant language. The ancient name of Wales was Siluria, and this served to give character to the new system of the oldest rocks. The Silurian system has become one of the recognized names in geological science, and for this we are indebted to Sir Roderick.

From the date of his first publication, in 1834, down to the time of his death, Sir Roderick Murchison was a constant contributor to the proceedings and transactions of learned societies, and the author of several popular books. The genial character of the man and his high social position at once pointed him out for the position of presiding officer over the learned societies of London, and he was for many years President of the Royal Geographical and Geological Societies; and in this double capacity he was able to aid in the organization of some of the most important exploring expeditions that have ever been fitted out in England. To his persuasion and energy, the world is indebted for much that we have learned of obscure portions of the earth.

The death of such a man will create a profound impression in the whole scientific world, for there is no part of the globe where his name has not been carried by the indefatigable explorers fitted out and sent through his influence. A thorough gentleman, a conscientious scholar, an active publisher, an elegant writer, and an eloquent speaker, he will be greatly missed from English circles, and will be mourned by lovers of scientific truth everywhere.

Death of Mr. Charles Babbage.

We have received from England the news of the death of Mr. Charles Babbage. This gentlemen gained considerable celebrity by inventing a calculating machine, which excited great public curiosity for a time, but was found to be valueless for general use. It was subsequently improved, and is now in use in England for indicating logarithms in one of the statistical departments of the Government service. The deceased was for many years the holder of the mathematical professorship at Cambridge University, a position long held by Sir Isaac Newton. Mr. Babbage's writings on the economy of manufactures and cognate subjects are numerous and valuable. He was, in the year 1832, a candidate for Parliament, but was defeated at the election. He died in his seventy-ninth year.

FAIR OF THE AMERICAN INSTITUTE.---ADDITIONAL OBJECTS OF INTEREST.

Many objects of interest have been added to this exhibition since our last visit, some of which we will notice in the present article, and which, together with what we have already noticed, render this year's fair one of the best ever held by the American Institute.

GLASS AND STONE CUTTING BY SAND BLAST.

The new process of cutting hard substances by the sand blast has, on account of its novelty and unique character and the great rapidity and exactness with which the work is performed, attracted crowds of admiring observers, so much so that it was quite difficult to get near enough to see the operation of the apparatus. When, however, we succeeded in approaching it, we were lucky enough to be in time to witness a test experiment, being the drilling of a ¾ inch hole through a solid emery wheel; this was done at the rate of a quarter of an inch per minute. Specimens of glass cutting in beautiful lace patterns, and of lettering in marble in either *intaglio* or relief, elicited unanimous commendation. Few that saw the operation of the machine failed to see that the process is destined to a high place in the useful arts. As we purpose giving an engraving of this machine, we reserve further particulars for a future article.

NAIL CUTTING.

Mr. Henry Scheurle, 64 Avenue B, New York city, has added to the attractions of the fair a nail cutting machine that cuts, from cold bar iron, 400 nails per minute. The machine is small and very compact, and its gluttonous way of satisfying its appetite for iron amuses all who see it.

GEOMETRICAL LATHE.

Mr. A. Schaefer, of 82 Forsyth street, New York city, exhibits a geometrical lathe. This wonder of mechanical art, seen for the first time by the majority of visitors to the fair, is a center of attraction to which many are drawn, and the delicacy and richness of the tracery wrought by it are marvelous to the uninitiated.

Mr. G. L. Kelty, 722 and 724 Broadway, New York, has laid the public under obligations by exhibiting the various processes in the manufacture of upholstery trimmings. The beautiful wares, growing under the practiced and skillful fingers of the trained female operatives, are very curious, and make a very instructive and interesting exhibit. The machines employed have a somewhat primitive appearance, and there is more than one operation now performed by hand that appears susceptible of being done wholly by automatic machines.

BRICK MAKING.

Mr. J. Nottingham Smith, 225 South Third street, Jersey City, N. J., claims with much reason that it is useless to press bricks when molding them, for, consisting of intimately mixed clay and water, they, at that stage of the process, form a practically unyielding mass. When, however, they have partially dried, they are susceptible of being further compacted, and he has therefore invented, and exhibits at the fair, a machine designed for this purpose, which is worthy the attention of brickmakers. The theory seems plausible, and the machine is evidently the production of a thoughtful mechanic. It is guaranteed to press one thousand bricks per hour.

AIR COMPRESSING ENGINE.

This is the exhibit of J. B. Waring, consulting engineer of the Norwalk Iron Works, 133 Center street, New York city. It is a very handsomely finished and effective machine, evidencing in its design a full comprehension of the niceties of engineering required in a first class air compressor. The air cylinder is kept cool by a water jacket. The trouble experienced in some compressers, from congelation of moisture on the chilled pipes, seems, by certain peculiarities of mechanism, to have been obviated in this machine. It supplies power to two rock drilling machines in another part of the building, of one of which we have now an engraving in process of preparation, and in describing which we find it necessary to again allude to this air compresser.

THE CAMPBELL COMBINATION PRINTING PRESS.

We have already noticed briefly this beautiful machine, and we now return to it, because its liberal exhibitor, having announced that it will be sold at the close of the fair, and the proceeds donated to the Chicago Relief Fund, we are anxious to aid in its sale for a good price by some further exposition of its merits. Said a bystander at our last visit: "That machine feels and thinks," and surely the extreme delicacy of its operation is such as to make it easy to imagine a brain and nervous system concealed in its beautiful proportions. If it has not these, it has the nearest approach to them human art has ever been able to achieve, a galvanic battery, which so acts upon the adjustment of the machinery that it is impossible to print out of register. Said its inventor to us: "When I first began to construct presses, it was impossible to print in register. I first rendered it possible, and now I have made it impossible to print out of register." As a proof of the truth of this last assertion we have now on our table a sheet, one side of which received two impressions, the form being inked the second time and the sheet fed in precisely as at first. No one in comparing it to a similar sheet printed only once could tell it had been printed twice, except that, having received double the usual quantity of ink, it is somewhat darker in general tone. There is no indistinctness of outline, and yet this sheet has upon it engravings of a character that would show the slightest discrepancy in the registering.

Unless the sheet is properly presented to the grippers, the press refuses to print it. If it is a quarter of an inch from the guide, it is thrown out perfectly blank and uninjured; if it is farther away from the guide than this, it may be rumpled, but will not be soiled. If the sheet is not printed, the press places it on the regular pile, with its edge sufficiently projecting to be easily seen and drawn out, so that it shall not be sent to the bindery. In printing the second side, unless the registering points are entirely through the paper, the sheet cannot be printed, as, these points then failing to make the battery circuit complete, a stop motion, to all the parts not necessary to throw out the sheet unprinted, acts to effect this result. Ink is only taken by the forms when the press prints; when a sheet is printed, the press runs on but takes no more ink till the next sheet is printed; and although the roller may have run many times over the form, there is to the ordinary observer no perceptible difference between the sheets printed. This results from the fact that in inking there are two distinct and complete operations, at each end of the form, that distribute the ink in, so to speak, two superimposed wedges, the thin end of one lying on the thick end of the other, and thus making the layer of ink uniform throughout. No part of the form can be over inked. This, with the new and peculiar mode of adjusting the form rollers, makes four rollers equal in efficiency to twenty of the old style, as is shown daily in the actual working of this press. All this automatic accuracy in working is accomplished through the agency of the sheet itself. It must cover, when laid, three small holes in the sheet guides, which, when so covered, establish a perfect communication between a small gravity air pump and two diaphragm bolts. These moving pieces accomplish all the varied results, and they are so simple and easy to comprehend when seen that they surprise even the best mechanics who have, after long search for something complicated, found in them the secret of the delicate working of the press. If any one wishes to see a mechanical poem, and to converse with a man who has reduced printing

almost to a fine art, let him look at this press, and get it explained by its courteous exhibitor, Mr. A. Campbell, who is generally present. Mr. Thomas H. Senior, *Sun* Building, New York city, is the general agent.

GRINDING MACHINES.

Mr. W. S. Jarboe, 93 Liberty street, New York city, agent of the Union Stone Company, Boston, exhibits an Universal Grinding machine, which is a very useful appliance in doing many kinds of work. The work is placed on a bench or truck, and the emery wheel is swung at will to conform to the straight or uneven surface. It is especially adapted for heavy work that cannot be easily handled. He also exhibits a hand machine for universal grinding of castings, etc. which have uneven surfaces, which is an ingenious and effective tool.

Another interesting exhibit is a machine for grinding paper or other long knives requiring to have a truly straight edge, the knives traversing by the emery wheel, and the grinding being performed in the most accurate manner. In all these machines, emery wheels made by the Sorel process are used.

STEEL CASTING TO PATTERN.

A case of various articles of steel, cast to pattern, is shown by the Union Steel and Iron Works, of Rhinebeck, N. Y. It is claimed that the process by which they are made is entirely novel in its character, and that by it all articles now forged from steel may be successfully made. The articles thus cast may be hardened or tempered to suit the work they are designed to perform; and the steel, being malleable when taken from the molds, may be, it is claimed, worked and tempered the same as tool steel. The specimens shown seem to indicate that these claims are not exaggerated. Should they become established in practice, this little case will be entitled to rank among the most important expositions of the present fair.

POTTERY.

The Jersey City Pottery Works show the process of manufacturing pottery. This evolution of forms of beauty from crude clay, by the agency of the time honored and primitive potter's wheel, has attractions second only to those of glass blowing, which forms a center of delight in another part of the building. The managers of the fair are wise in encouraging displays of this kind, which do far more to educate the people than the mere exhibition of products.

ANOTHER NOVELTY IN SEWING MACHINES.

The Lathrop Combination Sewing Machine Company, of New York, exhibit a decided novelty in sewing machines, which is almost as radical in its character as is the celebrated Lyall positive motion loom in weaving. This machine sews directly from two spools, making either the lock stitch, the simple chain stitch, or a beautiful French embroidery stitch compounded of the two. The looper is so constructed that one of the spools, sustained in a carrier which takes the place of the shuttle on ordinary shuttle machines, passes through the loop to make the lock stitch. The machine is most ingenious, and appears to work admirably. We hope soon to present engravings illustrating it, together with a minute description.

The Bickford Family Knitting Machine, several of which have been running at the fair since its commencement, deserves commendatory notice. It has no competitors at the fair, but notwithstanding the absence of opposition to add zest to its struggle for public favor, it attracts much favorable comment. It has, like Saxe's fisherman, a "very taking way," that seems to captivate the fair sex at sight, and it is really wonderful to witness the variety and beauty of the work it performs, as well as the speed with which the operation proceeds. It has made a decidedly good impression, and is one of the first class attractions of the fair. It is exhibited by Mr. Dana Bickford, vice-president and general agent, 689 Broadway, New York. The reader will find a detailed description of it, with illustrations, on page 367, Vol. XXIV. of the SCIENTIFIC AMERICAN.

EXTENSION DESIRED.

We echo a generally expressed desire that the date for closing the fair shall be postponed. The attendance still remains large, and, as it must be remunerative, we trust the wish for an extension will be regarded by the managers.

[Special Correspondence of the Scientific American.]

LARGE NUMBER OF PATENTS EXTENDED.

Washington, D. C.

Among the extensions recently granted are the following:

To Stanley A. Jewett, for improvement in melodeons, reissued in 1864. The invention consists in graduating the sizes of the air chambers, above and below each reed, upon a geometric scale, by which an uniformity of volume of sound is produced; also, in producing a perfect *mute*, and in producing a swell and *diminuendo* by operating the swell valve by the bellows, without the intervention of a pedal, yet under the control of the performer.

To J. D. West, for an improved pump.

To G. J. Mix, for an improved iron spoon. The bowl and handle are made in separate pieces, cut and fashioned by a die, and then riveted. The invention consists in forming the rivet and handle out of one piece of metal, by which the manufacture is much facilitated and a better article produced.

To Samuel Darling, for a metallic square. The blade is tempered at the edges to prevent wear, and soft in the middle to prevent springing, and so united to the beam by soldering that there is no danger of its changing its position; a valuable invention by which a very durable and accurate instrument is produced. Formerly the tongue of the square was warped by being tempered throughout its whole extent, and had to be straightened before being fit for use, and the blade, being secured to the beam by rivets, was constantly liable to be untrue or to be displaced through the wear of the rivets.

To Lauriston Towne, for machine for making ornamental chains. The links are cut from a strip of sheet metal, and then transferred to the bending and clinching mechanism, which locks them together, and thus builds up the chain. Prior to this invention, chains of this character were all made by hand, at an average price of fifty cents per foot, but on this machine they are manufactured for three cents per foot. The exclusive use of this machine in this country is controlled by Sackett, Davis & Co., of Providence, R. I., and since the patent was granted, they have made nearly 2,000,000 feet of chain, causing a saving to the public, on the above ratio of three to fifty, of about $839,000. Four machines are leased to parties in Hanau, Germany. So valuable a machine is necessarily exposed to infringements, and, in this case, no less than ten different parties have pirated the invention and worked it secretly, until discovered and compelled by the Courts to cease the manufacture.

To A. B. Lotta, for a steam generator. This is the third extension granted to the applicant for devices connected with tubular coil boilers, which are specially useful in steam fire engines, where steam is required on short notice. The patent just extended was for a combination of a force pump receiving water from the jacket, and returning it to the coil, and a strainer box through which the surplus water, discharged from the coil, passes on its way to the jacket. In ordinary boilers, the salts, formed by heat and evaporation, settle at the bottom, and are blown off; but in case of rapid circulation, as in the tubular boilers, this becomes impracticable, hence the need and advantage of Lotta's strainer box. Mr. E. G. Maguire, who was chief engineer of the fire department of Cincinnati for many years, estimates that each of Lotta's patents is worth not less than $20,000 to that city city alone. The application in the above case is made by Finley Lotta, administrator of A. B. Lotta, deceased.

John Butler, for a gas generator. The gas is for lighting purposes, and is produced from resin. The invention consists in covering the bottom of the retort with a fusible metal, such as lead, which, becoming fluid, prevents a crust from forming on the bottom of the retort, and effecting a saving of fifty per cent. An ingenious and valuable invention. The rebellion having cut off the supply of resin, applicant has failed to reap a reasonable reward during the term of his patent.

William Plumer, for a rock drilling and cutting machine. It consists of an arrangement of devices, for cutting out pillars and blocks of stone, circular pillars of any diameter, and blocks either square, rectangular, or irregular shaped, the cutter working on all sides of the piece. A valuable invention, and some of its features have been incorporated in nearly all of the later stone cutting machines, but, by reason of sickness and service in the late war, applicant has failed to cover even the expenses of his invention.

To E. B. Bigelow, for wire weaving looms. Owing to the inflexibility of wire, the ordinary fly shuttle is too uncertain and weak in its action for this class of weaving, and is not adapted to straighten the wire as it comes from the reel or bobbin; and, prior to this invention, wire cloth was made by hand. Mr. Bigelow's shuttle is moved positively throughout its whole passage, and is provided with a wire straightener. The drag required to straighten the wire would draw in the selvedge wires, and contract the cloth, but this is guarded against by an ingenious mechanism. Pointed upright bars are moved horizontally towards and from the selvedge, also vertically up and down, by which they are alternately thrust between the filling wire and the selvedge, so that the filling wire passes around them, and draws on them instead of on the selvedge. The loom is also provided with a peculiar stop motion and also a double beat up of the lay. The Clinton Wire Cloth Company was organized to develop this invention, and has produced 11,444,059 square feet of cloth at an average cost of from three and a half to four cents per square foot less than hand made goods, making a saving to the public of $400,652·05 A portion, however, of this saving should be credited to other inventions used in the manufacture.

The application of George W. Hildreth, of Lockport, N. Y., for an extension of his patent for a gang plow, has been refused. This patent was reissued last December. The leading features of the invention are these: crank supports, for adjusting the hight of the frame from the ground; supporting wheels, so adjusted as to run upon different planes, one to run in the furrow and the others upon the sod; the axle made adjustable laterally; in brief, the axle has a triple motion, upward, downward, and lateral, and it also vibrates on the center bolt. This plow is well known on the Pacific coast, and has been manufactured by Baker & Hamilton, of San Francisco. It is claimed that it will plow from two to four acres a day more than a common plow. The applicant appears to have been unfortunate in reaping no profits from his invention. He says: "I am getting towards three score years and ten, and have had a hard up-hill business for years; and this gang plow business has contributed largely to my misfortunes." The extension was strongly opposed, and remonstrants claim that applicant has not used due diligence in introducing his alleged invention into general use, and that in his reissue he claims more than is his invention. A suit for infringement of this patent has lately been brought against Treadwell & Co., the damages being fixed at $50,000.

It will be noticed that the Patent Office is disposed to be liberal towards all applicants for extension, and that in most cases of real merit, extensions are allowed without any close scrutiny of the profits that may have already accrued. Even the present limit of a patent to seventeen years is considered by many as too short, and it is not impossible that Congress will either extend this period, or allow the Office to grant extensions to patents issued since March 2, 1861. In a late issue of your paper, I see that ex-Commissioner Charles Mason expresses the opinion that Congress, by special act, will extend many of the seventeen year patents, and that twenty-one years is not too long a period for their general continuance.

Among the recent visitors at the Patent Office (and no bureau or department is more inviting to strangers) we find the names of Mr. William and Mr. Alfred Carpmael, the sons of the distinguished patent lawyer of England, Hon. William Carpmael, the author of a standard collection of law reports of English patent cases. These gentlemen have made a thorough examination of our patent system, and of much of the office routine, and they have expressed themselves highly pleased. In England, at present, the subject of patents is undergoing considerable discussion in view of proposed changes, some favoring an entire abolition of this form of government protection, while others favor the adoption of the American law and our general official management.

NEW BOOKS AND PUBLICATIONS.

THE AMERICAN CHEMIST—Edited by Professors C. F. & W. H. Chandler of Columbia College, 49th street, corner 4th avenue, New York—to whom subscriptions should be sent—now rivals in interest and value the London *Chemical News*. Each number contains a large amount of information that no progressive chemist can afford to be without. The Professors Chandler are editing this journal with singular ability and judgment, and it has taken its place in the front rank of contemporaneous scientific publications.

THE ATLANTIC MONTHLY FOR NOVEMBER comes to hand richly freighted. The number is one of the best issued by its publishers, James R. Osgood & Co., Boston, during the present year. The article "Bedlams of Stamboul" is alone worth the price of the number. The leading article, "Tennyson and Theocritus," in which the styles of the ancient poet and the English Poet Laureate are compared, will be of great interest to students of *belles lettres*. The usual lighter literature and reviews are provided.

THE COMMERCIAL LAWS OF THE UNITED STATES. A Summary of the Laws relating to Arrest—Assignments—Attachments—Collections—Commercial Paper—Corporations—Depositions—Dower—Deeds—Damages on Bills—Execution—Exemption—Factors and Consignees—False Pretences—Homesteads—Imprisonment for Debt—Interest—Usury—Liens—Statutes of Limitation—Receivers—Redemption—Stay Laws—Partnership—The Rights of Married Women, etc. New York: Published at the Office of the "Banker's Magazine and Statistical Register," 23 Murray street. Sold by Baker, Voorhis & Co. Price, Three Dollars.

The exhaustive summary of contents of this book, embraced in the above title, relieves us from the necessity of characterizing its contents, except by way of commendation, of which it is highly worthy. It would be worth many times its price, annually, in the counting room of almost any business house in the country.

EXPERIMENTAL MECHANICS. A Course of Lectures, delivered at the Royal College of Science for Ireland, by Robert Stawell Bell, A.M., Professor of Applied Mathematics and Mechanism in the Royal College of Science for Ireland (Science and Art Department). With Illustrations. London, and 38 Bleecker Street, New York: Macmillan & Co.

This is a magnificently printed, illustrated, and bound octavo volume comprising twenty lectures (some of them revised and rewritten), delivered at the above named institution of learning, to artisans and others unable to attend the ordinary classes. As specimen lectures in which science is popularized, they are models. While, of course, they do not take the place of a full treatise on mechanical science, they form an outline easily comprehended by ordinary readers, and really embracing the fundamental principles of the subject. If a mechanic has once mastered these, there is little danger of his being led astray into absurdities in his practice. The style of these lectures is such as to at once attract and sustain the attention of the reader, and no father could make a more valuable investment for the price (six dollars) than to place the volume in his family library.

A TREATISE ON THE RESISTANCE OF MATERIALS, AND AN APPENDIX ON THE PRESERVATION OF TIMBER. By De Volson Wood, Professor of Civil Engineering in the University of Michigan. New York: John Wiley & Son, 15 Astor Place.

This is a thorough investigation of the resistance and strength of materials in the various forms and under the different circumstances in which they are applied in civil and mechanical engineering. It has been prepared by an author of distinguished ability in his field of labor, and is rich in tables and formulæ for reference. In this place it would be impossible to give anything like a suitable review of the work, and we shall therefore supplement this notice by some extracts which will give our readers a taste of its quality. The volume is a handsome octavo of over 300 pages, with an appendix, but, we regret to say, while giving a full table of contents, is devoid of an index. This, while it matters little in a work used solely as a text book, limits the usefulness of the treatise as a work of reference.

ANCESTRAL TABLETS. A Collection of Diagrams for Pedigrees, so arranged that Eight Generations of the Ancestors of any person may be recorded in a connected and simple form. By William H. Whitmore, A.M., Member of the New England Historic-Genealogical Society. Second Edition. Boston: William Parsons Lunt, 102 Washington Street.

This is, undoubtedly, the most complete, direct, and easily understood system of genealogical diagrams ever devised. Those who are interested in tracing back their ancestry, or in the recording of pedigrees, will find it very useful. We cannot spare space to describe the ingenious method adopted but recommend our readers to examine the system for themselves.

CATALOGUE OF PRACTICAL AND SCIENTIFIC BOOKS. Published by Henry Carey Baird, Industrial Publisher, 406 Walnut St., Philadelphia. Sent free on application.

This enterprising publisher is constantly extending his catalogue, which now embraces works on almost every known industrial subject. The mechanic, engineer, chemist, farmer, and teacher, may each find, in its enumeration, works which constitute the most valuable aids to each avocation. Full descriptive tables of contents of the works are given, so that there is no difficulty in selecting the precise work needed. It is worth the trouble to send for this catalogue, if only to see what an amount of talent has been enlisted by Mr. Baird to supply industrial information to the workers of the United States.

SCRIBNER'S MONTHLY FOR NOVEMBER is a beautiful number, finely illustrated, and containing much useful as well as entertaining reading. This deservedly popular monthly is achieving, we are glad to learn, a brilliant success, and it has undoubtedly a brilliant future in American literature. The Hell Gate Improvements form the subject of a very instructive and interesting article, profusely illustrated, which appears, to our mechanical mind, the gem of the number.

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.

Examples for the Ladies.

Mr. James Stewart, of Yonkers, N. Y., reports that a Wheeler & Wilson Machine, No. 38, under his charge, has been hat-binding by steam for nearly 17 years, and will now do as much work as any machine, new or old, of any make. From September, 1868, to 1869, it bound 187,088 hats, and the operator earned $654.17. The previous year she earned $507.48.

Answers to Correspondents.

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

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

PROPORTIONS OF TELESCOPE.—Let E. T. N. query No. 15, Sept. 30,) procure for the object lens, one of about ½ an inch focal distance, another for the amplifying lens, 2½ inches focal length and 1¼ inch diameter, and a third glass, 1 inch focal distance, to be placed next the eye. The distances at which these glasses should be placed from each other are as follows: The object glass should be placed at the end of a small tube, next the object, and the aperture or hole that lets in the light should not exceed one tenth of an inch in diameter. At a distance of about 7 inches from this glass, the amplifying should be placed; and the glass next the eye should be placed about 1¾ inch from the amplifying lens; such a microscope, reckoning the combined eye glasses to magnify 6 times, and the object glass 14 times, will produce a magnifying power of 84 times in linear dimensions, and in surface 7,056 times. The stage and its supports may be made of wood, and the tubes of paper or very thin pasteboard.—J. R. B., of Md.

PASTING GLAZED PAPER.—In answer to query No. 5, Oct. 21, if F. S. will mix a little honey in the paste, his object will be accomplished. W. R. J., of Pa.

CLEANSING THE HAIR.—Query No. 14, Oct. 21.—Barbers use carbonate of potash, known as salts of tartar, in water, to shampoo with. It is better to use a tablespoonful or two of common spirits of hartshorn, in a basin of water; then thoroughly wash the scalp and hair until they are clean; then wash with clean water, wipe dry, and apply a little oil or pomade.—W. R. J., of Pa.

FRENCH POLISH.—Let W. B. W. take one ounce of shellac, a quarter of an ounce of gum arabic, and a quarter of an ounce of gum copal; bruise them well, and sift through a piece of muslin; then put them, along with a pint of spirits of wine, into a closely corked vessel; place it in a very warm situation, and shake frequently every day till the gums are dissolved. Then strain through muslin, and keep well corked for use.—D. D., of Ohio.

DIMENSIONS OF CYLINDER.—W. G. N., query 20, Oct. 21, should multiply 231 (the number of cubic inches in a gallon) by the number of gallons, and divide the product by the hight in inches. This gives the area of the cylinder. To find the diameter, divide the area by ·7854, and extract the square root of the quotient. In reply to his second query: Find the area of cylinder by squaring the diameter, and multiplying by ·7854, by which divide the number of cubic inches in the number of gallons, and the quotient will be the hight in inches. To his third question: Divide the area by ·7854, and extract the square root of the quotient. If the answer is in feet and decimal parts of a foot, multiply by twelve for the inches. If the answer is in inches, divide by 12 for feet.—A. B. P., of N. J.

CLEANING POLISHED BRASS.—If G. W. K. will get some tripoli, such as comes in lumps: powder it up fine, and use with oil and a cloth or chamois skin, and then use some more of the powder dry, with another piece of chamois skin, he will be able to make his brasses shine. If the brass be very badly tarnished, he had better use a solution of oxalic acid first, and immediately wash clean with water; then use the tripoli, with water or oil, whichever is the most convenient. The oxalic acid will immediately remove all stain and discoloration, and the tripoli will polish the brass. Most of the lacquers have shellac for a base, consequently heat would ruin them, although there is a kind that will stand heat, that does not contain shellac, but I have forgotten how it is made.—J. F., of Ga.

STEAM HEATING PIPES.—To R. G.—I have been using a heater for three years, and never met with the trouble you speak of. I carry low pressure (two pounds); if you have greater pressure, I would advise you to place a stop cock in your return pipe; then when you shut off the steam with one cock, you can shut off the return with the other cock.—J. A., of Md.

CLEANING POLISHED BRASS.—In answer to G. N. K., query 17, Oct. 14, I will say that I have found lime juice the best thing for cleaning polished brass. Rub the brass with cotton waste, dipped in lime juice, and polish or finish with whiting. This cleans the blackest brass or copper, with scarcely any labor. G. N. R. can try this, and is welcome to the recipe.—L. G. B., of S. A.

CLEANING BRASS.—If G. N. K. will take equal quantities of good vinegar and fine salt, he can clean his brass work easily; but this mixture will not polish it.—S. R. G., of N. J.

Queries.

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

1.—ALUMINUM FROM CLAY.—I wish to know how aluminum is obtained from clay. Will some one let me know the process of manufacturing it, and how much can be obtained from a tun of clay?—J. L. R.

2.—FIREPROOF PAPER.—Can newspapers, intended to be used in walls to protect against cold, be cheaply rendered fireproof?—C. G. A.

3.—FIREPROOF CLOTH.—Can common cotton cloth be made fireproof by any substance that will withstand rain? A double tent of common sheeting, like two tents, one outside the other, is an excellent shelter for a party traveling in cold weather, even when snow is on the ground and ice in the rivers. It is very light, yet keeps out cold, wind, and rain better than duck, besides being cheaper. The sole disadvantage is its liability to catch fire from sparks from the camp fire. Such a misfortune has recently befallen me, and to have one's house thus burned over his head on a frosty night is no joke.—C. G. A.

4.—SPONGY PLATINUM.—How can I make the platinum sponge for Doebereiner's process? And is it possible to restore platinum sponge which has lost its catalytic property?—T. M.

5.—TRANSPARENT CEMENT.—In your last issue I read: "It is a shameful thing to be weary of inquiry, when what we search for is excellent." I have been experimenting lately in making a transparent cement. I have been very successful; only one difficulty is in the way. Will you tell me how I can prevent white sugar from turning into white powder again after it has been melted in water? I want it to dry clear, and prevent it from again becoming granulous, when mixed with gums and other protean bodies.—C. E. E.

6.—SOLUBLE GLASS.—On page 105, Vol. XXV., SCIENTIFIC AMERICAN, I read Professor Bottger's method of preparing cement by mixing different materials with soluble glass. I have tried to obtain soluble glass in San Francisco, but cannot get it. I am told silicate of soda is the same material, and have bought a small quantity to try. It is a hard, dry, jelly-like, colored substance; and, if made irregular on the face, it in course of time fills up and becomes level and smooth on the surface. I have dissolved it in hot water and used the liquid, but it has no more effect than water upon any substance with which it is mixed. When dissolved in water it is just as thin as water. I understand soluble glass should be of the consistency of sirup. It would be an advantage to have it of that thickness, as it would make the material with which it is mixed adhere better. Any information will be thankfully received.—W. J.

W. J., for a reply to his other query, can consult our advertising columns.

7.—ENAMEL FOR IRON.—I am experimenting, trying to make a hard, white enamel for iron, similar to the black plate used for ambrotypes. I shall be glad to have any suggestions as to articles or books from which knowledge on the subject can be obtained. The enamel should not only be hard, but insoluble in ether and alcohol when dry. I have succeeded with a plate made with varnish compounded with zinc white, but it is not sufficiently hard. The black plate is simply or principally asphaltum varnish. It becomes very hard, and still remains pliable. I want a substance soluble in turpentine.—J. S. Y.

8.—PORCELAIN LINED VESSELS.—Can tin vessels be lined with porcelain? What are the processes of fusing porcelain upon tin, and is the art patented?—C. L. S.

9.—DESTRUCTION OF TREES.—Will A. K., of N. Y., page 186, current volume, please tell me how to prepare the concentrated solution of sulphate of iron for killing trees?—J. B. S.

10.—SCALE IN BOILERS.—I wish to know how to prevent the carbonate of lime from forming scale in my boiler.—E. L. F.

11.—INDIA RUBBER BELT UNDER WATER.—Can a gum belt be successfully used in working under water? And, if so, can any and what preparation be applied to preserve the belt?—O. J. H.

Declined.

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

BOILER EXPLOSIONS.—P.

MATHEMATICAL NOTATIONS.—B. J. B.

MOTION.—G. W. H.

PHOSPHORESCENCE OF THE SEA.—A. P.

PROCURING RAIN.—H. J. S.

ANSWERS TO CORRESPONDENTS.—G. K.—J. P.—R. P. S.

QUERIES.—A. P.—C. C. & Co.—C. T. H.—J. B. B.—J. C. W.—T. I. M.

Recent American and Foreign Patents.

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

PIANOFORTE.—Azariah H. Hastings, of New York city.—These improvements, in the construction of the plates and tuning mechanism of upright and other pianofortes, consist in a new manner of forming the upper or back edge of the metal plate, and in a new construction of and fastening for the travelers that hold the upper or back ends of the strings. The metal plate of a pianoforte has in its upper edge oblique grooves. Through these grooves are fitted the screws for holding the ends of the piano strings. The screws for the strings of each key are arranged in one groove, so that there are two or three screws in every groove. By the oblique direction of the grooves, the screws, though collected for the several notes, are, nevertheless, alternated transversely, to provide more room for the keys to work in and permit the use of larger screws. Each screw fits with its lower end into a nut or traveler, which is a prismatic rod, with a neck near, and a head at, the lower end. A funnel shaped cavity is formed in the lower end of the traveler, and an oblique slot cut through one side of the rod to meet such cavity. This slot forms a hook-bearing for the string. The upper end of the string is fitted through an aperture of the traveler, then wound around the neck, and finally put through the slot into the aforesaid cavity of the traveler. In this manner it is securely held, and will be in line with the adjusting or tuning screw, so as to be pulled straight and not twisted. The two or more layers of travelers are placed under flat guide straps, which prevent them from turning and hold them steady on the plate. These guide straps are preferably made of wood. The invention is, in every respect, as applicable to horizontal as to upright pianos.

ELEVATOR BRAKE.—Theodore Thorn, of St. Clair, Pa.—This is an improvement in a safety brake for elevators or platforms used for raising coal or other articles from mines or perpendicularly. It consists in a beveled cage or platform frame and in wedge shape brake blocks and jointed brake bars operating in vertical rabbeted timbers, in such a way that, should the hoisting chain or rope break, the loaded cage would instantly wedge, between the brake blocks, bars acting as knuckle joints to force the brake blocks with their ragged faces against the guide timbers. In use there would be more or less play between the timbers and the brake blocks and between the brake blocks and the cage; but, in case of a break, the cage would act instantly upon knuckle joints and be arrested.

PAN SCRAPER.—Gottlieb Scherer, of South Boston, Mass.—This invention has for its object to furnish an improved pan scraper or metallic dishcloth for scraping and cleaning pans, kettles, etc. It is formed of iron rings interlocked with each other to form a network or cloth. At one end of the scraper is formed one or more loops, also made of iron rings, for convenience in hanging up the scraper when not in use. When it is desired to make a heavier scraper, one half of the rings may be made double—that is to say, formed of two coils of wire. The scraper thus constructed is rubbed over the surface of a pan in the same manner as an ordinary dishcloth, and does its work quickly and thoroughly, leaving the surface clean and smooth.

CULTIVATOR.—John S. Nolen, of Paulsborough, N. J.—This invention relates to an improved implement or machine for agricultural purposes, particularly designed for the use of gardeners. It is so constructed in its several parts as to adapt it to be used at a harrow or mere pulverizer of the soil, and also as a cultivator, which shall lift the vines and throw the earth around the roots or stocks of the plants. Oblong and eight sided shovels, adapted to be reversed or changed in position so as to adapt the implement for use as a harrow or cultivator, are employed, both the form of the shovels and the method of constructing the machine being covered by the patent.

FLOUR BOLT.—Thomas G. Morgan, Murfreesborough, Tenn.—The ribs of the reel have cam rims attached midway between the arms. The roller knockers are arranged to fall upon the cams and impart to them a slight downward motion, by springing the ribs so that their recoil will detach the meal from the cloth and the ribs in the most effectual manner. The roller knockers are mounted in the ends of levers pivoted to the frame, and having adjustable weights to vary the force of the blows. By pins provided in the ribs for securing the cloth, tacking is avoided, except on the rib where the two edges of the cloth meet. Nuts on the arms enable the ribs to be adjusted out or in, radially, for regulating the tension on the cloth. Clamping strips are placed on the ribs above the cloth to confine it, said ribs being held by nuts screwing down on the arms and having holes for the pins. The ribs are made oval on the inside to facilitate the rolling of the meal down the cloth, which, being kept free by this arrangement of the knockers, will bolt it properly without speckling as much as when the meal is carried up by the ribs and let fall, and the cloth will not be worn as much a when so let fall.

DERRICK.—William M. Howland and George L. Howland, of Topsham, Me.—This invention relates to improvements in derricks, and consists in a combination, with a chain wheel which engages the links of the chain so as to draw it without winding around said wheel, of a chain keeper or guide adapted to prevent the chain from twisting at the under side of the chain when returning to the wheel in letting down the chain after being raised up. The invention also consists in novel arrangements of apparatus for connecting the shores or braces of the derrick to flat railroad cars. It also consists in a novel arrangement of reversing gear for letting out the chain after raising a load, and also in a novel arrangement of a pair of shore braces and a connecting bar, whereby they are connected together and to the derrick, and may be disconnected and folded together for transportation.

CASTERS FOR SEWING MACHINES.—Warren D. Hatch, of Antrim, N. H., assignor to himself, Shepard Russell, of Boston, and Henry O. Goodrich, of Worcester, Mass.—This invention has for its object to furnish an improved caster attachment for sewing machine tables, dentists' chairs, etc., which shall be so constructed and arranged that the weight of the table, chair, or other article, may be thrown upon the casters or upon the feet of the article, according as it is desired to move the article or have it stand immovable; and it consists in long and short adjusting levers of the casters by means of a toggle lever hinged to the upper part of the frame.

HORSE HOLDER FOR SLEIGH.—Henry A. Sprague, of Charlotte, Me.—This invention has for its object to furnish a simple and convenient device for attachment to a sleigh runner, which shall be so constructed that, should the horse start, the sleigh will move forward while the holder remains stationary, thus tightening the reins and stopping the horse. In using the device, it is placed upon the upper end or bend of the runner. The reins are then placed upon an arm or hook, and the device is allowed to slide down said bend. When the horse attempts to start, a calk is drawn beneath the runner, and forced into the snow or ice and held stationary while allowing the runner to move forward or backward through it freely, so that when the sleigh is drawn forward it tightens the reins, and slackens them when the sleigh is backed.

CARRIAGE SPRING ATTACHMENT.—Orris E. Bennett, of Cannonsville, N. Y.—A short bar is secured to the cross springs with clips. To this bar, about midway between its ends and center, are riveted or otherwise securely attached two eyebolts, the eyes of which are interlocked with the eyes of two other eyebolts, which, in the case of the back spring, are passed through and secured to the spring bar. The eyebolts in the case of the front spring are secured to the head block or platform. The device thus forms a hinged connection between the cross springs and the parts of the carriage body with which they are connected, so that the side springs may be straightened out by the pressure of the load without twisting or breaking the springs or their fastenings.

STEAM BOILER.—E. H. Rümmele, of Glenbeulah, Wis.—This invention consists in an improvement on steam boilers, in the use of which, it is claimed, the heat is well utilized, even that of the cinders that fall through the grate being made available for the production of steam. The boiler can be easily cleaned, and is not liable to get out of order, and is not liable to accidents on account of clogged passages.

HORSE POWER.—James W. Knox, of Winona, Miss.—This invention relates to improvements in horse powers; and it consists in a simple and economical arrangement of the sweep or hitching bars for connecting, so as to apply the power directly to the rim of an overhead power wheel. It is well known that something is gained in power, and that the shaft and arms of the wheel are relieved of considerable strain, by attaching the sweep or drawbar directly to the rim of the wheel, which has been heretofore done; but, as a better, more simple, and economical means of so connecting to the rim than any heretofore employed, this inventor proposes to form the sweep of branching descending metallic arms, the hooked end having a brace, connected to one of the arms near the crotch and extending upward and toward the center of the wheel to one of its arms, while the branches are connected to the rim, one in advance, and the other behind the vertical plane of the hook. Each branch of the sweep, thus composed of these arms, is bolted to the wheel by a single bolt tapped into it. This is claimed to be a much stronger and more durable sweep for this kind of connection than any now in use, while the arrangement is such that it can be very economically constructed.

PIANO STOOL.—Charles A. Schindler, of West Hoboken, N. J.—This invention has for its object to improve the construction of piano stools, to make them stronger and more durable, and at the same time improve their appearance. The top of the stool has attached the upper ends of three or more legs; to its center is attached the upper end of the pedestal. The seat of the stool has attached, to the center of the lower side, a screw, which passes through the center of the top and into the pedestal, which is made hollow to receive it. A metallic band is fitted upon the lower end of the pedestal, and is secured in place by a screw or spike, made with an ornamental head, and screwed or driven into the lower end of the pedestal. Upon this band are cast three or more brace arms, as many as there are legs, which are made of such a length as to reach the legs, to which their outer ends are secured by screws. The brace arms are designed to be made with the same style of ornamentation as the other parts of the stool, and strengthen the legs, making the stool more firm and substantial while greatly improving its appearance.

HORSE HAY FORK.—John C. Lampman, of Baltimore, Md.—This invention has for its object to furnish an improved horse hay fork, strong, durable, simple in construction, and effective in operation, and which shall be so constructed that it may be conveniently repaired, should any of its parts be accidentally broken. The rear end of the central tine is bent and extended upward to serve as the shank or standard of the fork. The side tines have their rear ends bent inward, and are welded or otherwise securely attached to the central tine at or near its bend, the connection being further strengthened by the band that forms the eye, to which the hoisting rope is attached. Upon the upper end of the shank is formed a notch or shoulder, to receive a loop or link attached to the hoisting rope. The trip lever is pivoted to the upper end of the standard, and is curved to serve as a cam to push the link out of the notch, to discharge the load from the fork. The trip rope passes over a guide pulley, pivoted to the shank or standard, so that it may always act in the proper direction upon the trip lever, whatever may be the position from which it is operated.

PRESS FOR STAMPING PANS, DISHES, ETC.—John B. Jones, of Williamsburgh, N. Y.—The die is operated by suitable mechanism, and connected with a piston, working within a reciprocating frame, whose lower face constitutes the pressure plate for holding the sheet metal down upon the counter die. The counter die consists of an outer and an inner portion. The outer portion of the counter die is securely affixed to the frame, and is of annular or other form of about half the depth of the pan or dish to be shaped. The inner portion of the counter die is as large in diameter as the opening in the stationary part of the counter die, and is fitted through the same. A piston, fitting a cylindrical chamber, is affixed to the bottom of the counter die, and is sustained by water or other liquid material, or mechanism. Liquid, when used, is let into the chamber by a pipe, from a reservoir. When the central part of the counter die is lowered, its slanting sides meet those of the outer portion to form a continuation of the same. The die, in descending, bends the metal at once over the edge of the stationary part of the counter die and over the edge of the movable part, as at the beginning of each operation the counter die is elevated so that its upper edge is about in line with the top of the outer part of the counter die. The margin of the plate is kept from crimping by a reciprocating pressure plate. The die gradually descends, and at the same time the inner part of the counter die descends with about half the velocity of the upper movable die. The bottom and upper portion of the pan are thus formed at the same time. The metal is first bent over the edge of the inner part of the counter die, and as the latter gradually descends the lower part of the pan is formed. The metal is subsequently bent over the edge or corner of the outer part of the counter die, and this gradually and not suddenly drawn into the required shape. The movable part of the counter die is elevated by means of a lever, which is actuated by suitable connection with the operating mechanism. The lowering of the inner part of the counter die is regulated by the displacement of the water, controlled by suitable mechanism.

BALANCED SLIDE VALVE.—John Rigby and Joseph Holt, Marquette, Mich.—This invention relates to improvements in the method of balancing slide valves for steam engines. It consists in connecting the valve with a slide which is given an uniform and simultaneous sliding motion with the valve, the steam being admitted between them; and it consists also in a device for raising the valve and slide from their seats, when the engine is not in motion, by the fall of a weighted lever, sustained when the engine is in motion by the pressure of steam on the piston in a small cylinder within the steam chest.

ROTARY ENGINE.—John Stott, Burlington, Iowa.—This is a combination of a piston, toothed ring, hub, and pinion, also a steam gate swinging on its center within a steam chest, in combination with a weighted arm, thereby dividing the pressure of steam and lessening the friction on the piston. The invention is of a nature, not easily explained in a mere verbal description, by which an engine may be caused either to rotate or reciprocate. The device is ingenious, and forms an important attempt at advance in this department of engineering.

HELICAL WIRE BRUSH.—Francis F. Field, Stapleton, N. Y.—This is an improved wire brush for cleaning boiler flues and other uses, the contiguous wires being arranged at right angles with each other at their centers. A tube receives the ends of the binding wires at the base of the brush, and has a screw thread cut upon its outer end for the attachment of the rod by which it is operated. Four binding wires are used, the ends of which are secured in the tube. The brush wires are arranged between the four binding wires (at right angles with each other at their centers), so that each brush wire may project to an equal distance upon the opposite sides of the binding wires, a side view of the brush thus showing a spiral row of brush wires between each coil of the binding wires. If desired, the brush wires may be made small or thin, and two of them used together, the pairs being arranged alternately at right angles with each other, as described. When the brush wires have been arranged, the binding wires are coiled, and their ends secured in the ordinary manner.

CHANDELIER CENTER.—Joseph Kintz, West Meriden, Conn., assignor to himself and P. J. Clark, of same place.—This invention consists in having the chandelier arms connected to the center piece by a shank or tenon, going through the rim or wall of said center piece and receiving a nut, key, or other fastening, the shoulders of said arms having projections fitting in sockets in the outer face of the wall or rim, to prevent turning. The inventor is thus enabled to use the most simple mode of connecting the arms, and by it to hold them securely against turning, which has heretofore prevented the use of such connections.

CHANDELIER CENTER.—John Meah, Meriden, Conn., assignor to Meriden Malleable Iron Company, of same place.—This invention consists in having a vertical socket for each arm of a chandelier on the inner side of the cylindrical part of the center piece, from which the arms radiate, and a pintle on the part of the arm extending to the inside of said ring fitting in the socket, in which it is locked by the cap of the center piece. The ring is of cast metal, forming the cylindrical part of the center piece, with deep notches in its upper edge for the arms to extend into the interior. Vertical sockets are formed on the inside of this ring, one under each notch, and each arm is provided with a pintle on the under side to fit into the socket for it, as shown, for holding the arms with greater security than they can be held by any arrangement now in use.

SAP BUCKET COVER.—A cover for sap buckets is formed of a square piece of board or metal, with one edge rounded out, forming the arc of a circle to nearly correspond with the diameter of the tree. On the other three edges of the cover there is a flange projecting down three inches (more or less), so as to completely cover the top of the bucket and exclude leaves, snow, rain, and all foreign substances. On top of the cover, near the circle, are two screw eyes, which engage with the hooks driven into the tree for supporting that edge of the cover. On the opposite edge is another screw eye, to which a cord is attached, which is tied with a hook in the tree to support the cover in an inclined position. Without some kind of protection, sap buckets are liable to receive whatever may be flying in the atmosphere or drop from the trees, and the sap is thereby frequently rendered nearly useless. With this improved cover the bucket is perfectly protected, and the sap caught therein is preserved pure and fit for use, without reference to the state of the weather, or what may be falling or flying in the air.

FLANGED COLLAR FOR BROOM.—Henry A. Lee, New York city.—This invention pertains to an improvement in metal caps for covering the butts of the corn attached to the broom handle by wire in the ordinary manner; and it consists mainly in forming the cap with corrugations, which enable it to compress or bind the corn somewhat, but to perform the more important functions of holding the lower wire in place.

WATER RAM.—Christopher Hodgkins, Marlborough, N.H.—This invention has for its object to increase the efficiency of hydraulic rams by making them continuous in operation; and consists chiefly in the application to one ram of two force or conducting pipes whose force valves are connected so that the closing of one will cause the opening of the other, and *vice versa*. The invention also consists in a new form of force valves, and manner of applying and making them adjustable. This ram will always start itself whenever water is let on, owing to the absolute obedience of the valves to pressure, which requires less accumulated force for closing said valves than the lowering appliances hitherto necessary. Another advantage claimed is that it cannot be stopped by dirt, since one side will close and wash the dirt out from the other side; and that a change of temperature will not affect it, while ordinary valves must have their weight changed in cold and warm weather.

ENDLESS TRAVELING SIDEWALK.—Alfred Speer, Passaic, N. J.—Mr. Alfred Speer, of Passaic, N.J., has invented an endless traveling sidewalk, as described below: A permanent walk is suspended from the buildings bordering the streets in any suitable way, in which it is proposed to run the endless traveling walk of platform cars, connected together and mounted on rails elevated on posts in any suitable way, so that the top of the platform will be level with the walk. These cars are to be propelled at a suitable rate of speed continuously by stationary engines, or any other means. Awnings are employed to shelter the passengers. To facilitate the getting on and off, small cars will be mounted with the wheels of one side on a rail on the permanent way, and those of the other side on a rail on the movable walk, and each set provided with an independent brake, so that a person, on the stationary walk and wishing to get on the movable one, taking the brake handle for the wheels running on the rail on the stationary walk and forcing the brake down on the wheels, can readily stop the car, as the wheels upon the movable track will simply turn on their axles without moving the car forward. He may then step on the foot board of the car, and, releasing the brake he first set in action and setting the other in action with the wheels on the movable platform, will cause the car to move with the platform, after which he may get off the car, release the last mentioned brakes, and leave the car to the next person wishing to get on or off. For the latter operation the car will be caused, by the brake of the wheels on the traveling walk, to move with the platform until the passenger gets on the foot board. Then it will be stopped as at first, and he will step off upon the permanent way. Any suitable number of these transferring cars will be arranged along the whole route, so as to be at all times at the service of passengers. Many persons may get on and off at the same time, according to the capacity of the transfer cars. These cars may have seats above the foot boards, for persons who are aged or infirm to rest on while they are stopping or starting.

BOTTLE OPENER.—Charles B. Trimble, New York city.—This invention consists in a metallic stirrup or casting attached to the counter, or placed in any convenient position, so constructed that by a slight pressure the yoke is forced from the cork of the bottle, when the gas immediately forces the cork from the neck. When the bottle is filled, and the cork is driven into the neck, the yoke is turned up over it, which securely holds it against the pressure of the gas in the bottle. The pressure of the gas is frequently so great that the end of the yoke is embedded in the end of the cork, rendering it extremely difficult to remove it by simply pressing it with the end of the thumb and fingers. By grasping the bottle and pressing the bars formed on the yoke against lugs formed on the stirrup, the yoke is readily forced off the cork. When this is done, the nose of the bottle will pass between the lugs, and the cork will fly under the counter. By this simple device the cork is removed without straining the thumb or fingers. Much time is saved, and no one is annoyed by the flying cork.

LUBRICATOR.—Erick Ehlin, San Francisco, Cal.—From the oil reservoir descends a tube, which passes through the stopper and is placed in a hole in the cap of the journal box. There is a metallic plate or disk on the inner end of the tube, and also on the outside of the stopper, for keeping the latter in position, although they may be dispensed with. The inner end of the tube is a conical valve seat, fitted with a cone or valve, tapered so as to engage with the valve seat, and provided with a stem which extends down into the tube and upon the lower end of which there may be a screw thread. A spiral wire coil, of about the diameter of the interior of the tube, is attached to the stem, and extends below the lower end of the tube so as to rest upon the journal. The elasticity (laterally) of the spiral wire coil will hold it to the stem sufficiently tight in any position, whether the stem is provided with a screw thread or not. The cone or valve is adjusted by slipping the wire coil up or down on the stem, so as to allow a greater or less quantity of oil to descend through the tube and reach the journal. The jarring of the machinery will cause a slight but constant motion in the wire coil and cone or valve, which serves to feed down the oil uniformly on to the journal and prevent any clogging. The tube may be screwed into the box cap, or it may be connected in any other manner, so as to be supported (with the reservoir) in an upright position.

PROPULSION OF CANAL BOATS.—Owen Coogan, Pittsfield, Mass.—This invention relates to a new mechanism for propelling canal boats, river boats and wheeled vehicles; and consists chiefly in the employment of a propelling rope, which is stretched over the water course or road, and can be wound around a drum on the vehicle, so that the latter, when rotary motion is imparted to said drum, will be propelled by friction with the rope. The invention consists, also, in a means for suspending said rope above the vehicles so that the contact with the drum can be uninterruptedly sustained, and in improvements of the mechanism connected with the drum on the vehicle.

VALVE MOVEMENT.—This is an improved device for operating the valves of steam engines. The valves are operated by flexible metallic plates, or diaphragms, placed on the inside and at the ends of the steam chest connected with the valve stem, and operated by steam in a way that cannot be well described in this notice, the admission of steam to the diaphragms being controlled by an oscillating valve actuated by a crank, the crank being oscillated by a connecting rod from the piston rod. The invention has been patented by Frederick Glassen and William Gilfillan, of Paterson, N. J.

BALANCED SLIDE VALVE.—Charles B. Hutchinson, Concord, N. H.—We would be glad to give our readers an idea of the details of this unique invention. It is, however, of a nature that precludes a mere verbal explanation. The balancing devices may or may not reciprocate with the valve, and either cylinder and piston, or a spring, may be used to effect the balancing, the whole being intended to obviate certain defects in the operation of balanced slide valves, and to effect the desired balance in a superior manner.

STUDS OR BUTTONS.—The invention of William E. Dutemple, of Providence R. I., assignor to himself and J. M. Hopkins, of the same place, provides studs or buttons with a post having wings arranged thereon at right angles, one wing being capable of being turned half way round, when it stands superimposed on the other wing. In this way the wings are easily inserted into the button hole, and then the turned wing, being restored to its original position, engages with a stop that holds it from turning back again, thus holding the stud very securely.

SLEIGH.—Rice Webb, Star Prairie, Wis.—This is a combination of various parts now used in sleigh building into a new, light, tasteful and strong design for cutters or sleighs, one which, we judge, will be much cheaper than the present, while it will be more durable, the raves, runners, knees, and braces being made of wrought bar iron, bent into the required form. Either end of either of the runners is capable, through a peculiarity of construction, of rising to pass any unevenness in the road, while the other runs smoothly, thus making, it is claimed, the sleigh or cutter of much lighter draft than those having rigid runners.

DITCHING MACHINE.—This is the invention of Oscar F. Hale, of Irvington, Iowa. It is a combination of various strong and seemingly effective devices for the purpose specified, which is, to deposit the excavated dirt of open ditches in a ridge at a distance from the edge of the ditch, and place the sod upon the ditch side of the ridge between it and the ditch, to prevent the washing back of the excavated earth.

120,146.—SCOOP.—N. S. Barnum, Bridgefield, Conn.
120,147.—ROLLER SKATE.—J. L. Boone, San Francisco, Cal.
120,148.—CHAIN LINK.—H. Boyd, East Bridgewater, Mass.
120,149.—BOLT CUTTER.—J. R. Brown, Cambridgeport, Mass.
120,150.—HUB.—J. Y. Burwell, Worthington, Pa.
120,151.—COAL GAS.—D. Davison, New York city.
120,152.—PAPER.—D. D. Foley, J. J. Johnson, Washington, D.C.
120,153.—ROOFING MACHINE.—C. L. Fowler, Baltimore, Md.
120,154.—MATTRESS.—H. Gardner, R. Lowe, J. & J. Wood, J Pickering, Manchester, Eng.
120,155.—NAIL MACHINE.—L. Goddu, Boston, Mass.
120,156.—HOOK.—A. J. Goodrich, Wolcottville, Conn.
120,157.—SAW FRAME.—W. Hankin, Williamsburgh, N. Y.
120,158.—STEP LADDER.—W. Huey, Galena, Md.
120,159.—WHEELBARROW.—W. McKibbin, San Francisco, Cal.
120,160.—HAY FORK.—P. J. Moose, J. Kuhn, Dansville, N. Y.
120,161.—TURN TABLE, ETC.—W. K. Muir, Hamilton, Can.
120,162.—PUNCH.—R. J. Mullen, Providence, R. I.
120,163.—HAT VENTILATOR.—E. G. Nichols, Beaufort, S. C.
120,164.—BRUSH.—J. Pickering, Philadelphia, Pa.
120,165.—FURNACE.—W. Quann, Philadelphia, Pa.
120,166.—SOLDERING IRON.—J. C. Reynolds, Taunton, Mass.
120,167.—THRASHING MACHINE, ETC.—H. Ries, Norwalk, O.
120,168.—CURTAIN FIXTURE.—A. Roelofs, Philadelphia, Pa.
120,169.—STONE DRESSER.—T. Ross, Rutland, Vt.
120,170.—EDGING BOARDS.—J. K. Sanborn, Sandy Hill, N. Y
120,171.—BURIAL CASKET.—J. Scott, Philadelphia, Pa.
120,172.—LAMP.—G. W. Thompson, New York city.
120,173.—RUFFLING DEVICE.—E. J. Toof, Fort Madison, Iowa.
120,174.—RENOVATOR.—J. Wellfare, F. Champagne, Aurora, Ill.
120,175.—WASHER.—S. Williams, H. McNeill, Philadelphia, Pa.

120,176.—REST.—E. Withall, Rochester, N. Y.
120,177.—LOCK.—S. N. Brooks, Bernardston, Mass.
120,178.—FENCE.—P. C. Yost, Carthage, Ill.
120,179.—ORDNANCE.—H. Arden, Brooklyn, N. Y.
120,180.—LOCOMOTIVE.—W. D. Arnett, Denver City, Col.Ter.
129,181.—MILLSTONE PICK.—S. A. Bell, Newtown, Ohio.
120,182.—ROCK CUTTER.—M. C. Bullock, Rutland, Vt.
120,183.—ROTARY ENGINE.—W. Case, Troy, Ill.
120,184.—HEATER.—E. C. Clay, Malden, Mass.
120,185.—ELECTRIC CLOCK.—W. M. Davis, Cincinnati, Ohio.
120,186.—CLEARING OIL WELL.—J. Dickey, Oil City, Pa.
120,187.—BUCKLE.—E. F. Driggs, Brooklyn, N. Y.
120,188.—GRATE BAR.—A. W. Foster, Jr., Pittsburgh, Pa.
120,189.—HOD ELEVATOR.—E. H. Garrigues, St. Louis, Mo.
120,190.—NAIL MACHINE.—J. C. Gould, Oxford, N. J.
120,191.—LOTION.—J. Greene, Providence, R. I.
120,192.—FASTENING.—J. J. Greenough, Syracuse, N. Y.
120,193.—PAVEMENT.—W. J. Harris, Elizabeth, N. J.
120,194.—ALARM PUMP.—E. Haskell, Dover, N. H.
120,195.—HARROW.—E. W. Herendeen, Geneva, N. Y.
120,196.—PRIMER.—A. C. Hobbs, J. Orcutt, Bridgeport, Conn.
120,197.—TRAP.—T. W. Houchin, Morrisania, N. Y.
120,198.—BRAN DUSTER, ETC.—J. H. Jones, Yellow Springs, O.
120,199.—CAR COUPLING.—J. H. Kenworthey, West Point, Ind.
120,200.—TREADLE.—E. W. Keyes, Charlestown, C. K. Bradford, Boston, Mass.
120,201.—STEAM GAGE.—G. Lightbody, New York city.
120,202.—BRICK KILN.—T. Lindsley, New York city.
120,203.—PUNCHING MACHINE.—R. Livingston, Albany, N.Y.
120,204.—HARROW.—J. Mathison, Fremont, Neb.
120,205.—HARVESTER.—E. R. McCall, Simcoe, Canada.
120,206.—FIRE LIGHTER.—J. McCallum, J. Hartzell, Alliance, O.
120,207.—SPINDLE.—T. E. McDonald, Trenton, N. J.
120,208.—SUN SHIELD.—H. D. McGovern, Brooklyn, N. Y.
120,209.—ROVING FRAME.—E. P. Morgan, Saco, J. H. McMullan, Biddeford, Me.
120,210.—WOODEN PIPE.—A. Muller, Brooklyn, N. Y.
120,211.—FIRE ESCAPE, ETC.—W. H. Nobles, St. Paul, Minn.
120,212.—PLANE.—R. Phillips, Boston, Mass.
120,213.—LUBRICATOR, ETC.—T. Roddick, Stranraer, J. Lockhead, Glasgow, N. B.
120,214.—LAMP BURNER.—S. Ross, Washington, D. C.
120,215.—RESTORING INDIGO.—F. A. Sawyer, Boston, Mass.
120,216.—WELL.—H. Smith, Southington, Conn.
120,217.—STOVE.—G. T. Spaulding, Broadhead, Wis.
120,218.—WASH BOILER.—G. F. Stone, Baltimore, Md.
120,219.—CLOTH SHEARER.—J. A. Thurston, Providence, R.I.
120,220.—LOG ROLLER.—J. Torrent, Muskegon, Mich.
120,221.—STEAM ENGINE.—S. Van Emon, Covington, Ky.
120,222.—PITMAN.—S. Van Emon, Covington, Ky.
120,223.—COPING.—C. Willcox, New Haven, Conn.
120,224.—PICTURE CASE.—I. F. Woodward, McMinnville, Tenn.
120,225.—PRINTING PRESS.—J. B. Adt, Baltimore, Md.
120,226.—GAS LIGHTER.A.N.Allen, R.H.Dewey, Pittsfield, Mass.
120,227.—PAPER FILE.—H. J. Asthalter, Pittsburgh, Pa.
120,228.—GIRDER.—Z. S. Ayres, New York city.
120,229.—STOVE.—R. Backus, Albany, N. Y.
120,230.—SEED DROPPER.—J. C. Barlow, Quincy, Ill.
120,231.—ROTARY ENGINE.—J. W. Barriger, Omaha, Neb.
120,232.—HORSE POWER.—S. Basket, Crittenden Co., Ark.
120,233.—HEATER, ETC.—E. A. Beardsley, Binghampton, N. Y.
120,234.—DESK.—S. L. Bligh, Pit Hole city, Pa.
120,235.—BOILERS, ETC.—G. W. Bollman, Pittsburgh, Pa.
120,236.—PAVEMENT.—S. B. Brittan, Newark, N. J.
120,237.—PAVING BLOCK.—S. W. Brooks, Brownsville, Tex.
120,238.—CHECK REIN.—B. L. Budd, Fairfield, Conn.
120,239.—CHECK REIN.—B. L. Budd, Fairfield, Conn.
120,240.—CIGAR CLAMP.—N. A. Buhle, New York city.
120,241.—SEED PLANTER.—E. E. Chesney, Bushnell, Ill.
120,242.—DRYER.—S. L. Cheyney, Springfield, Ohio.
120,243.—SAW SET.—E. Y. Clark, New York city.
120,244.—STOVE.—J. H Codding, Taunton, Mass.
120,245.—PRINTING FRAME.—J. G. Coffin, Portsmouth, Ohio.
120,246.—BARK MILL.—O. Coogan, Pittsfield, Mass.
120,247.—LOCK.—G. Crompton, Jersey City, N. J.
120,248.—PLOW.—T. Cuming, Jr. Brookhaven, Miss.
120,249.—HARVESTER, ETC.—E. Culp, Hilliard, Ohio.
120,250.—MAT.—H. W. Curtis, Phila., Pa.
120,251.—LIGHTNING ROD.—D. W. Demorest, Newark, N. J.
120,252.—INDIA RUBBER SHOE.—L. Elliott, Jr., New Haven, Ct.
120,253.—DRYING FRUITS, ETC.—H. Endemann, New York city.
120,254.—FURNACE, ETC.—D. Eynon, St. Louis, Mo.
120,255.—SPINNING MACHINE.—L. W. Felt, Keene, N. H.
120,256.—SPINNING MACHINE.—L. W. Felt, Keene, N. H.
120,257.—FURNACE.—R. R. Finch, Peekskill, N. Y.
120,258.—HAND GRINDER.—H. C. Fisk, Wellsville, N. Y.
120,259.—EMPTYING CARBOYS.—W. Gee, New York city.
120,260.—ALBUM.—G. W. Hawes, New York city.
120,261.—BURGLAR ALARM.—L. Giebrich, Ottumwa, Iowa.
120,262.—TELEGRAPH.—W. Gillett, Allegheny City, Pa.
120,263.—TANK.—G. W. Glass, Pittsburgh, Pa.
120,264.—VESSEL.—J. S. Godfrey, Leslie, Mich.
120,265.—PULP ENGINE.—S. L. Gould, Skowhegan, Me.
120,266.—DIE.—J. J. Grant, Greenfield, Mass.
120,267.—WINDOW SASH.—J. Groves, New York city.
120,268.—PAVEMENT.—H. A. Gunther, New York city.
120,269.—VALVE.—A. M. Haley, Sioux City, Iowa.
120,270.—LOUNGE, ETC.—J. C. Hall, Cincinnati, Ohio.
120,271.—BED BOTTOM.—J. W. Hampton, Mt. Pleasant, Iowa.
120,272.—RELEASING HORSES.—J. Harrison, New York city.
120,273.—ELEVATOR.—T. Harter, Ilion, N. Y.
120,274.—CULTIVATOR.—J. W. Hatcher, Bethesda, Tenn.
120,275.—LIFTING JACK.—H. C. Havemeyer, New York city.
120,276.—WATER CLOSET.—D.L.Hawkins, Poughkeepsie, N.Y.
120,277.—SHUTTLE.—J. C. Hervey, Newport, Ky.
120,278.—BLAST.—W. Hollenbaugh, New Germantown, Pa.
120,279.—ROCK DRILL.—S. Ingersoll, New York city.
120,280.—GAS REGULATOR.—J. Keeling, New York city.
120,281.—SHUTTER WORKER.—L. B. Kenney, Charlotte, Mich.
120,282.—BRIDGE.—L. Kirkup, Brooklyn, N. Y.
120,283.—SOFA BED.—G. Knell, Philadelphia, Pa.
120,284.—TOY GUN.—J. Lair, J. F. Rawzell, Indianapolis, Ind.
120,285.—GRAIN SEPARATOR.—W.H.Lawrence, Baltimore, Md.
120,286.—WASHING MACHINE.—G. Leach, Union, N. Y.
120,287.—COFFEE MILL.—A. Lepage, Woodhaven, N. Y.
120,288.—TRANSMITTER.—G. Little, Rutherford Park, N. J.
120,289.—TELEGRAPH.—G. Little, Rutherford Park, N. J.
120,290.—TELEGRAPH.—G. Little, Rutherford Park, N. J.
120,291.—CIRCUIT CLOSER.—G. Little, Rutherford Park, N. J.
120,292.—STOP VALVE.—F. D. Livingston, Norwich, Conn.
120,293.—FAN.—M. Lochner, Newark, N. J.
120,294.—WATER COOLER, ETC.—R. Long, Pittsburgh, Pa.
120,295.—RAILWAY RAIL.—J. Maitland, Newburgh, Ohio.
120,296.—IRONING TABLE.—J. H. Mallory, La Porte, Ind.
120,297.—BALING PRESS.—T. E. Marable, Petersburgh, Va.
120,298.—STEAM ENGINE, ETC.—R.M.Marchant, London, Eng.
120,299.—SMOKE CONSUMER, ETC.—G. Marlow, Chicago, Ill.
120,300.—WASH BASIN.—C. C. Marsh, New York city.
120,301.—SIDING GAGE.—J. Mason, Buffalo, N. Y.
120,302.—GAS MACHINE.—H. S. Maxim, Brooklyn, N. Y.
120,303.—AXLE SKEIN.—L. Mayhew, Rock City Falls, N. Y.
120,304.—WRENCH.—T. D. McBride, Philadelphia, Pa.
120,305.—WOOD BENDING.—H. McDonald, Shortsville, N. Y.
120,306.—WOOD BENDING.—H. McDonald, Shortsville, N. Y.
120,307.—KILN.—J. Q. Merriam, A. J. Dietrick, Fort Scott, Kan.
120,308.—FENCE POST.—W. A. Middleton, Harrisburg, Pa.
120,309.—CARD CASE.—I. M. Miller, Huntsville, Ala.
120,310.—WASHING MACHINE.—T. W. Miller, Montezuma, Ind.
120,311.—STOP COCK.—H. Muller, Vienna, Austria.
120,312.—SEAT.—H. Nagle, Carlisle, Pa.
124,313.—ALARM.—R. W. Newbery, New York city.
120,314.—STRAW CUTTER.—J. K. O'Neil, Kingston, N. Y.
120,315.—BED BOTTOM.—O. S. Osgood, Mount Pleasant, Iowa.
120,316.—BRAKE.—J. Paradis, Brooklyn, N. Y.
120,317.—FAN.—C. R. Patterson, Pittston, Pa.
120,318.—FURNACE.—E. Peckham, Antwerp, N. Y.
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120,320.—BRISTLES.—A. P. Peyroux, New Orleans, La.
120,321.—BENDING WOOD.—J. Phillips, Chicago, Ill.
120,322.—GATE.—W. H. Phillips, Staunton, Ind.
120,323.—CARTRIDGE.—G. R. Pierce, Grand Rapids, Mich.
120,324.—ATTACHMENT.—J. C. Reed, Boston, Mass.
120,325.—AIR ENGINE.—A. K. Rider, New York city.
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120,328.—BLOWER.—T. Rogers, Fredericktown, Ohio.
120,329.—GAS FITTING.—G. Rosenthal, Pittsburgh, Pa.
120,330.—HAIR CLOTH.—W. Rossnagel, Newark, N. J.
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120,332.—STREET CROSSING.—J. Schley, Savannah, Ga.
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120,358.—GRATE.—R. J. Wood, Hancock, Mich.
120,359.—MEAT CHOPPER.—N. T. Worthley Brunswick, Me.
120,360.—STEAM VALVE, ETC.—H. Wright, Warren, Ohio.

REISSUES.

4,604.—TUBE WELL.—S. L. Bignall, Chicago, Ill.—Patent No. 92,569, dated July 13, 1869.
4,605.—HOSE COUPLING.—J. C. Cooke, Bridgeport, Conn.—Patent No. 22,166, dated November 30, 1858; reissue No. 4,344, dated April 18, 1871.
4,606.—ALCOHOL.—J. H. Deacon, Lumberton, N. J.—Patent No. 86,284, dated January 26, 1869; reissue No. 3,831, dated February 15, 1870.
4,607.—VENTILATING, ETC.—T. Krausch. New York city.—Patent No. 108,707, dated October 25, 1870.
4,608.—CRUCIBLE.—A. Pickering, Boston, C. R. Vickery, C. R. Atwood, and the Phœnix Manufacturing Company, Taunton, Mass.—Patent No. 49,141, dated August 1, 1865.
4,609.—FURNACE.—H. Ross, J. H. Clemens, Pittsburgh, Pa.—Patent No. 118,279, dated August 22, 1871.
4,610.—CULTIVATOR.—W. S. Weir, Jr., Monmouth, Ill.—Patent No. 37,351, dated December 23, 1862.
4,611.—CASE, ETC.—S. Whitaker, Macon.—Patent No. 113,827 dated April 18, 1871.

DESIGNS.

5,320.—LAMP SHADE.—C. Binzer, New York city.
5,321.—FENDER.—G. Buchanan, Washington, Pa.
5,322.—BILLIARD TABLE.—W. H. Griffith, New York city.
5,323.—SHAWL FABRIC.—J. Hodgson, Philadelphia, Pa.
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505.—SHEET IRON.—A. Wood & Co., Philadelphia, Pa.

EXTENSIONS.

PUMP.—J. D. West, of East Orange, N. J.—Letters Patent No. 18,309, dated September 29, 1857.
METALLIC SQUARE.—S. Darling, of Providence, R. I.—Letters Patent No. 18,327, dated October 6, 1857; reissue No. 2,869, dated February 18, 1868.
ROCK CHANNELING MACHINE.—W. Plumer, of Boston, Mass.—Letters Patent No. 18,352, dated October 6, 1857; reissue No. 3,368, dated April 13, 1869.—Division A.
ROCK CHANNELING MACHINE.—W. Plumer, of Boston, Mass.—Letters Patent No. 18,352, dated October 6, 1857; reissue No. 3,399, dated April 13, 1869.—Division B.
LOOM FOR WIRE CLOTH.—E. B. Bigelow, of Boston, Mass.—Letters Patent No. 18,339, dated October 6, 1857.

APPLICATIONS FOR EXTENSION OF PATENTS.

HARVESTER.—Ezra Emmert, Franklin Grove, Ill., has petitioned for an extension of the above patent. Day of hearing, January 3, 1872.

METALLIC TIE FOR COTTON BALES.—Frederic Cook, Washington, La., has petitioned for an extension of the above patent. Day of hearing, February 14, 1872.

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The tenth volume of Wood's Household Magazine begins with Jan. '72. Its regular contributors include Horace Greeley, Gail Hamilton, Thomas K. Beecher, Dr. Dio Lewis, Theodore Tilton, Dr. W. W. Hall, James Parton, etc. Harriet Beecher Stowe, Brick Pomeroy, John G. Saxe, Petroleum V. Nasby, etc., write for it occasionally.

A LETTER FROM MRS. HENRY WARD BEECHER.

While overhauling our papers, after the recent removal to our new quarters, we came across the following letter which so appropriately expresses the general sentiments of those who read our Magazine, that we have concluded to publish it:

BROOKLYN, Feb. 11, 1871.

S. S. WOOD:—

Dear Sir,—In '69, while I was editing "The Mother at Home," I was much interested in a few copies of your "Household Magazine," which found their way into my house, whether to me or my husband, I do not know, nor does it matter. I was so much pleased that I wrote, asking for an exchange, but receiving no answer, I let the matter drop. I write now, enclosing two dollars, with the request that, if you can furnish me the whole set of 1870, you will do so, and also put me down as a subscriber for 1871. If you have not a set of 1870, please, for the extra dollar, put my daughter down for 1871, directing to Rev. Mrs. Samuel Scoville, Norwich, Chenango Co., N.Y.

I think one copy comes to the office of the "Christian Union," edited by my husband, but I prefer to have one copy sent to the house for my own use.

Direct last year's numbers, if you have them, and this year's edition, if you please, to Mrs. Henry Ward Beecher, 124 Columbia Street, Brooklyn, N.Y., and oblige yours respectfully,

MRS. HENRY WARD BEECHER.

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Or, Wood's Magazine, and the Phrenological Journal, (price $3), *new subscribers only*, and either the Agriculturist, Merry's Museum, or the Herald of Health for $3, which is but the price of the Journal.

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SCIENTIFIC AMERICAN

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

Vol. XXV.--No. 20. [NEW SERIES.] NEW YORK, NOVEMBER 11, 1871. $3 per Annum. [IN ADVANCE.]

Electro-Pneumatic Protector.

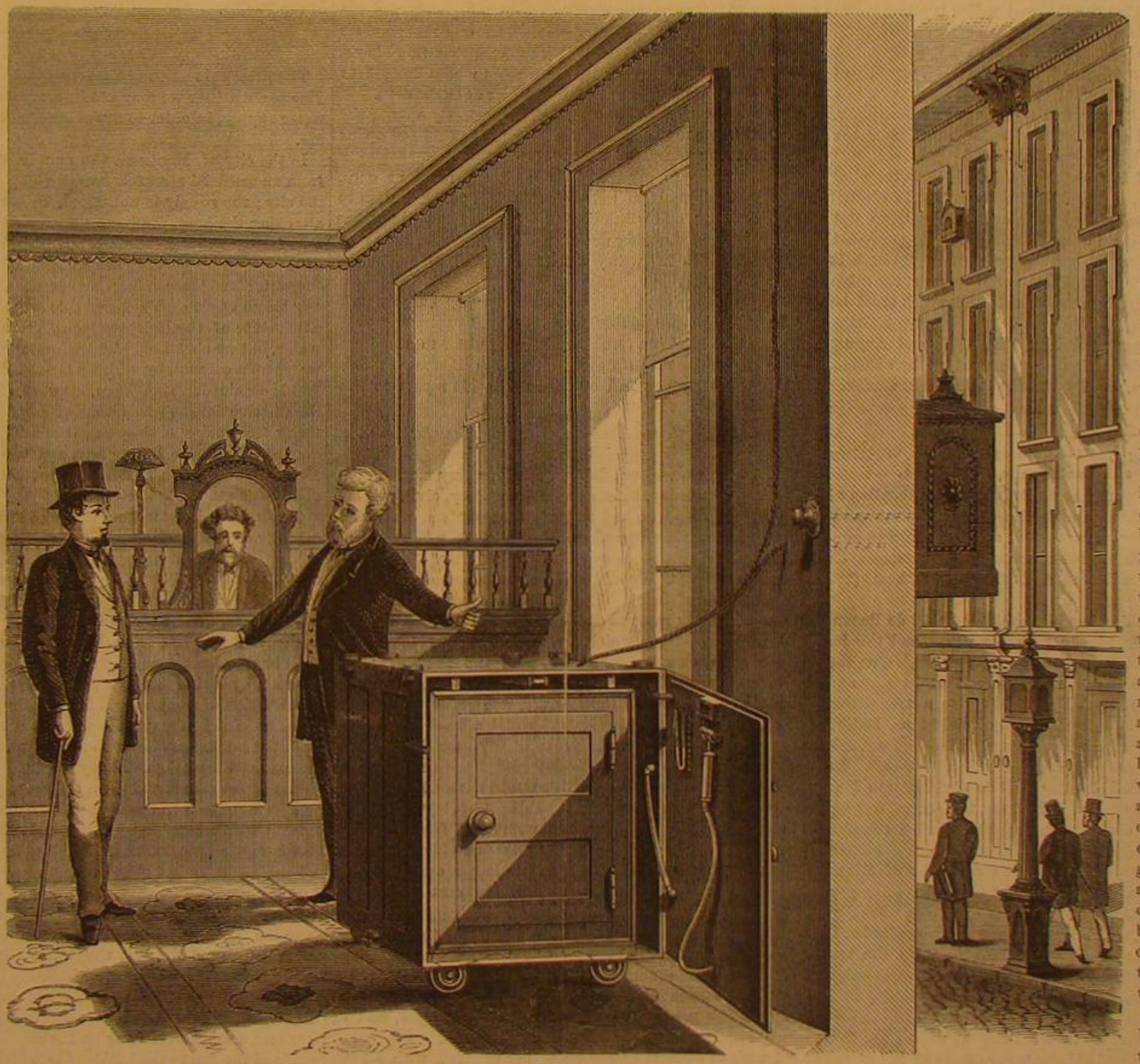
We illustrate, in the accompanying engraving, a very unique invention, which, so far as we can at present see, appears to afford absolute protection to safes or vaults to which it is applied; and it does this without necessitating great strength in the walls of such safes or vaults, and the consequent expense attending their construction.

It has been shown that burglars have been able to keep pace with the inventions, that have sought to defeat them by sheer strength of brute material, except where a large expense is incurred to so pile plate upon plate, and to temper and harden, till the time necessary to penetrate these combined obstacles is greater than that through which safes or vaults are generally left, unprotected by the proximity of honest people.

So confident are the inventors that the method of protection about to be described is absolutely certain to sound such an alarm, in case of attack, as would at once summon assistance, that they invite the closest investigation, and challenge the severest trial of their claims, especially by scientific electricians, as the gist of the invention consists in a most ingenious application of electricity to sound an alarm when the safe is tampered with, in the slightest degree, with a view to enter it.

The general principle of its action may be stated thus:

The protector, when closed, completes a battery circuit, which is broken by either opening the door or penetrating the walls to a depth equal to that of a single plate of tin. The breaking of the circuit releases the armatures of electromagnets, which, in their movement away from the magnets that previously held them, unlock a train of clockwork placed in a position inaccessible to burglars, and in itself burglar proof, so far as iron and steel casing can make it. This clockwork, once set in motion, sounds an alarm for at least one hour, and can only be stopped by a person who knows the combination upon which it is set, this being in principle like the standard combination locks now generally used on bankers' safes and vaults.



DUNCAN & ROWELL'S ELECTRO-PNEUMATIC PROTECTOR FOR SAFES AND VAULTS.

The clockwork magnets are connected with that portion of the apparatus that surrounds the safe, by a peculiarly constructed cable, the junctions being arranged in a manner to be hereinafter described.

Around the safe to be protected is placed a double walled sheet metal case, the space between the walls being filled with corrugated wood to give the case rigidity. The door of the case is made in the same manner; but its interior space is connected with the air space of the rest of the case by means of a flexible rubber tube.

In the center of the top of the protector case, and on its inner wall, is a collapsible disk, which, when uncollapsed, springs toward the inclosed safe, and breaks all the circuits by moving against the end of an insulated pin, as hereinafter described.

The disk is collapsed by exhausting the air, from the connected air spaces in the protector case, through the agency of a small air pump, connected by a flexible tube with the air space in the door. This pump is shown, suspended on suitable supports on the inside of the door where it is hung when not in use, in our engraving. A mercury gage is also shown on the door, which indicates at all times whether the exhaustion is complete or not.

On the inside of the door, in any convenient position, is permanently attached a wedge of copper. This wedge is shown at the middle of the top of the door in our engraving. When the door is closed, this wedge is forced in between the ends of two strips of copper, establishing an electric circuit between the protector case and the alarm apparatus, which is shown in our engraving, attached to the front of the building in which the safe is placed.

The ends of the copper strips, opposite the wedge on the door, are connected, one with the wires of a galvanic battery, and the other with the wires comprising the wires of the cable, which connects the protector case and the alarm. The upper copper strip, nearest the collapsing disk, is made of two pieces, the end of one piece lapping on to the other directly opposite the central part of the disk. The two pieces are so sprung together that they will remain in contact when left undisturbed.

Now the moment the outer shell of the protector case is tapped, the collapsible disk, being relieved from the external pressure of the air, springs into its original position, and, coming in contact with the insulated pin (above referred to, and which is affixed to the inner movable piece of the upper copper strip leading from the wedge in the door to the disk), separates the ends of the pieces and breaks the circuit.

The cable is composed of six wires perfectly insulated from each other. Three of said six wires are firmly twisted together to form the core or center of said cable; and the other three are braided firmly together and wound around said core, and form the outside of the cable. Any attempt to untwist the outside wires necessarily involves the twisting of the inside ones still harder, and, if any considerable force is exerted, will rupture one or more of the inside wires, and of course break the electric circuit.

There are three pairs of electromagnets used in the alarm mechanism, and three distinct electric circuits flow through the cable. To the first magnet the current passes through one of the outside wires, and returns through one of the central wires. To the second magnet, it passes through a central wire and returns through an outside one. To the third magnet, the other outside wire conducts the current, which returns through the remaining central wire. The severing of any one of the wires of the cable will relieve the armature on one of the magnets and instantly spring the alarm as effectually as if the whole six wires of the cable were cut.

As a closed circuit is employed, it is necessary to separate the negative from the positive wires of the cable, and to connect the three negative wires of the cable to the negative pole of the battery, and the positive wires of the cable to the positive pole. There are two outside wires and one central wire that belong together, and which must be connected to one pole of the battery, and one outside wire and two central wires that work together and must be connected with the other pole of the battery. If any person should attempt to attach a second battery to any part of the cable for the purpose of keeping the magnets charged, it would first be necessary to separate the positive from the negative wires in the cable, get at the central wires and test them, and also test the outside wires, to ascertain which are negative and which are positive, before attaching the second battery and before venturing to sever any one of the wires of which the cable is composed. Now to get at these wires so as to test them is deemed an impossibility, as the method of twisting is such that no wire can be traced.

From this it will be seen that the electric current, generated in the battery, passes through the battery wire to one of the strips of copper: then—when the door is shut and the air space exhausted—through the wedge of copper on the door to the other copper strip, and through that to the lap joint above described, and, passing that joint, enters the cable and flows through the helices of the magnets. It is obvious that if the door be opened the electric current must be broken by the withdrawal of the copper wedge, and the alarm instantly sounded. So, also, if the copper strips are separated at their lapped joint, as they certainly must be by the pressure of the disk whenever air is let into any of the air spaces of the case, the elecrical circuit will be instantly broken and the alarm sounded.

It is claimed that the cost of battery power will not exceed three cents per day. The battery requires attention only once a week, such adjustment occupying less than five minutes' time, and it is intended to ultimately use a battery that will run for a year or more without any attention. The battery can be placed in any position where most convenient. There are no fumes or odors arising from it, and it is harmless and inoffensive. It can be kept in order by a servant, a galvanometer indicating whether it has received proper care.

To use the "Protector" requires no knowledge of electricity. It is only necessary to learn to operate a combination lock attached to the alarm box. This alarm consists of two double bells, struck two thousand times per minute, and a large gong bell, struck once in twenty seconds. When started it will

run for an hour or more. The alarm is placed in a strong iron or steel box, and set into or bolted upon the outside wall of the building, over the sidewalk, in plain view and hearing of the police and others in the street. The box, from its construction, strength, and position, is believed to be burglar proof. It cannot be reached without a ladder, nor worked upon without lights. Any one attempting to get at the alarm would be discovered.

The alarm box can be placed outside, on either story of the building, or in any room of the building, or at any point, however distant away from the building. Two or more alarms can be used when deemed necessary. One is shown in our engraving, supported on an iron post, placed at the outer edge of the sidewalk.

The alarm is easily and securely controlled by the knob of the combination lock inside of the room, and does not require over one minute per day to shut it off and on. The alarm once started cannot be stopped by any one, except the person knowing the combination of the lock. Any attempt to remove it from its position would break the circuit and set it going, when it would run in any position, and could not be stopped by any one ignorant of the combination upon which it was set.

For private residences the protector affords perfect security for all the more valuable property in the house. A good fireproof safe protected in this way is all that is required for a private house. The instant the burglar opens the door of the case, the alarm begins ringing, and notice is given inside and outside that burglars have effected an entrance. If burglars are heard in the house, and they have not approached the safe, the alarm can at once be set in motion, which will either drive them away, or call in the police. The safe, in a private residence, can be placed in any part of the building, and the alarm placed outside the sleeping room, over the sidewalk, or in any other convenient place.

The impossibility of tapping the cable, which is the vital point of the invention, is vouched for by scientific electricians, who have experimented long and arduously to test whether this could be done or not. No one has yet succeeded is establishing a current with a second battery through it without starting the alarm, and those who examine the cable will see that, to do this, insurmountable difficulties must be met with.

The invention was patented Nov. 15th, 1870, and August 1st, 1871. Further information may be obtained by addressing Hon. A. H. Cragin, Post building (Room 13), Hanover street, corner Beaver street, New York city.

An Italian Diving Bell---The Inventor Writing Letters at the bottom of the Sea.

The *Tolpa marina*, or marine mole, is a recent invention of Signor Toselli, of Naples, by which he descends into the sea with plenty of air and plenty of room, and is enabled to continue, for four hours, his minute scientific observations on surrounding submarine life at a depth of 31 fathoms (186 feet) under water.

This wonderful machine has been built at Sestri de Ponente, near Geneva, after Signor Toselli's plans, and the inventor made his first experiment in the Bay of Naples, on the 26th of August, in the presence of the local authorities and several officers of the Royal Navy. We give a translation of a description of the apparatus as printed in an Italian periodical, *L'Italia Nuova*: "It is 4 yards 8 inches long, cylindrical in form, and made entirely of iron and bronze. Its diameter is about 1 yard 4 inches. It is divided into four superposed compartments or diaphragms, the central one being reserved for the divers. The upper chamber contains the compressed air necessary for respiration during immersion. The lower chamber acts like the air bladder of fishes, as it increases or diminishes the weight of the machine proportionably to the quantity of water it displaces. Finally, the last compartment, which is at the end of the cylinder, is filled with the necessary quantity of lead to keep the machine in a vertical position, like an aerometer. Several holes, fitted with bronze round the surface, admit of various contrivances, without which it would be incomprehensible how a man, hermetically shut up in what may be called an iron castle, could catch external objects, secure them by the means of ropes, and collect them."

The same paper, in its following number (August 28) adds: "We have received letters from Naples, which confirm the reported success of Signor Toselli's first descent into the Bay of Naples, by means of his diving apparatus, at a depth of 35 fathoms—namely under a pressure of six atmospheres. . . . The weather could not have been lovelier, nor the sea more calm. As soon as the crowd of distinguished invited witnesses had arrived at Baja—the chosen place for the experiment—they were met by Admiral de Viry and his staff.

"The experiment began about noon. After soundings had been taken, the machine, then empty, was sunk into the sea, and left for some time at the depth of 30 fathoms, to try if it would bear that pressure without being smashed; as soon however, as it was again seen floating upon the surface of the water without having received the slightest injury, the bystanders ceased to entertain doubts of Signor Toselli's safety, whilst he, perfectly calm, got into his marine mole, and descended slowly to the bottom of the sea. The lowering of the machine through 30 fathoms of water took three and one half minutes. When, after awhile, it was seen floating again, and when the lid opened, and Signor Toselli came out smiling and serene, cheering burst out on every side.

"During his sojourn at the bottom of the sea Signor Toselli wrote the following report of his experiment to the well-known director of the Royal Observatory of the Vesuvium, Signor Palmieri, who was a witness of the experiment, and expressed himself highly satisfied with it:

"Sir: The sensations I experience at this moment are so strange and numerous, that, should I wait to write them down, I am sure they would slip from my memory.

"First of all I must tell you that the water here does not look like itself any longer, but seems really to be a motionless mass of transparent glass, quite luminous enough to allow of reading and writing.

"The bottom of the sea seemed at first to hurry towards me; then I saw it stop, and after a while glide away from me. I was quite astonished at this, and almost feared lest my eyes should be diseased; but by observing that the movements of the manometer kept in direct communication with the sea, I felt reassured, having at once surmised the cause of the apparent movement. When I fancied the bottom of the sea was running towards me, it was a proof that I was sinking with a certain speed; when the bottom seemed to have stopped moving, it was myself in fact who did not move; and when the bottom sunk rapidly as if running away from me, I was then ascending towards the surface.

"It is very amusing to see so many fishes swimming to and fro on all sides, and to be able to enjoy a curious spectacle without experiencing the slightest inconvenience.

"Such silence prevails here that it would seem terrible to some people; but I consider it, on the contrary, a peculiar sort of pleasure to breathe in such a medium.

"The barometer marks 81 centimeters of pressure, the igrometer in my cell indicates 26 degrees, and the one outside only 15. The manometer communicating with the sea shows the depth to be 31 fathoms. The other manometer still marks two atmospheres, which tells me that there is yet air enough in the chamber to allow me to stop here four hours longer, without running any danger of suffocation.

"All the contrivances of my machine perfectly answer the purpose I had in view, except the lid, which shuts and opens too slowly.

"I can venture to say that I have hit the mark at once. This makes me feel an indescribable joy, which I wish to share with you, and with all those honored and illustrious persons, who, by favoring me with their presence, have generously offered to my weary mind the best of all remunerations. Yours, &c.

"G. B. TOSELLI.

"From the bottom of the Bay of Naples."

Signor Toselli also wrote the following letter to the directors of the engine manufactory at Sestri di Ponente, which, we think, is almost as full of interest as his report to Professor Palmieri:

"*Messrs. Westermann Brothers, Engine Manufacturers, at Sestri*:

"I inform you, without delay, that I put my marine mole to the test yesterday, before several military, civil, and scientific authorities who had told me that the sea was much deeper at Baja than anywhere else in that neighborhood. They kindly deceived me out of anxiety for my life, for on reaching the bottom I could read on the manometer that the depth, instead of being 55, as I had wished, was only 31 fathoms. At any rate the depth to which I have descended is far below the depth which divers have as yet reached with their usual apparatus. The time, from the moment I signalled telegraphically for my departure from the bottom of the sea, to my arrival at the surface, was three minutes, as some bystanders said three minutes and a half, which constitutes a great difference in favor of my machine, if compared with what a common diver would have been able to achieve with his apparatus, which would have employed not less than 70 minutes to pierce the same thick layer of water. It is well known that the greatest number of fatal accidents occurring to divers are to be ascribed to the sudden transition from a very high pressure to a much lower one, and that they can only avoid this by ascending slowly at the rate of forty inches per minute, and not more.

"The pressure inside my marine mole being exactly the same near the surface of the sea as at a depth of 55 fathoms, I could dart with impunity from the bottom to the surface, like a fish, without experiencing any pain in my lungs. This is one of the greatest advantages of my invention, and of which I had not even thought or hoped before.

"I wish to share the pleasure of my triumph with all the clever mechanics of your establishment, who have built my machine with so much care. By acting thus towards them, I do nothing else than my duty, because I know how few people do justice to the great merit of those, who, with their tools and their exhausting labor, succeed in giving a *de facto* existence to the products of intelligence."

A New Gold Field.

The St. Paul *Press* says that great excitement now prevails at Winnipeg, Canada, over recent gold discoveries at Lake Shabondawan. Many specimens of gold dust, nuggets, and gold bearing quartz had been brought to Fort Garry, and, so confident were the people in general that a new Eldorado of unsurpassed richness had been discovered, hundreds at once repaired to the scene of the discoveries; and the latest information from that region has not only fully confirmed all previous reports, but exaggerated them to the extent of placing them among the richest mineral deposits in the world, outranking even California and Australia.

The government of the Dominion of Canada is engaged in establishing a road through the country between Fort William, on Thunder Bay, and the settlement on the Red River Valley, but all work on this thoroughfare has been entirely suspended, the workmen, to the number of several hundreds, having dropped their shovels, picks, and axes, and emigrated in a body to the gold fields, where they were each washing out with their hands four dollars and upwards. News of their remarkable success in finding gold in paying quantities had infected the sober citizens of Winnipeg, and the prospects seemed to be that even the fears of a Fenian raid from Pembina would be forgotten in the general desire to revel among the golden sands of the Shabondawan.

There would seem to be some foundation for these reports, for the locality mentioned is in the midst of one of the richest argentiferous regions on the continent. The early explorers of a route through the British possessions discovered gold and silver in this vicinity, and later investigations have shown that vast deposits of minerals are to be found along both shores of the great lake. Lake Shabondawan lies about forty miles due west from Fort William, and at least 400 miles from Fort Garry. This lake is only about ten miles in length and but two or three in width, and forms one of many small bodies of water in that section. It is bounded on the south and west by a mountainous and broken country, through which flow several small and rapid streams.

Lake Shabondawan is but a short distance from Silver Islet in Lake Superior, said to be the richest silver mine in the world, and not over 150 miles distant from the copper mines of Ontonagon. There are, therefore, reasonable grounds for believing that these discoveries may prove to be as valuable as they are reported, and that the extensive prospecting of experienced gold hunters, which is sure to follow, may yet develope mineral resources north of Lake Superior as vast as those which have attracted hundreds of thousands of people to the western slopes of America and the islands of the Pacific.

Water for Fires.

The present is a fitting time to consider, says the Chicago *Tribune*, whether we may not improve our present system of water supply, in order to make it more efficacious in case of fire.

In the city of Montreal, the supply of water is obtained from an artificial reservoir two or three hundred feet above the city; the supply is unlimited, and any householder, by attaching the hose, can have a stream of water, which, by its own force, can be thrown 123 feet high against the resistance of the air. This obviates the necessity of steam fire apparatus, the water itself ascending higher than it can be forced by any steam engine. To secure this same result is the principal feature of the Holly system. We have an abundance of water, but no elevation. The great steam pumps force the water up a column, by which a head of less than one hundred feet is obtained. This force, however, is not maintained in the distribution, and half a mile distant it does not rise above thirty feet, and diminishes until at a distance of two miles it does not rise above twelve feet, and often not over six feet. This arises from the impossibility of the pumps keeping the distribution mains full at all times.

The inflow of water from the lake is far in excess of the capacity of any existing machinery. From the wells of the tunnel, there might be supplemental tunnels to various points of the city. Other tunnels might be constructed into the lake. The city might be divided into fifty or more convenient fire districts, and in each of these districts there might be such wells, supplied from the lake, incapable of exhaustion. This having been done, there might be erected over each well a pump, by which this water could be given a force equal to an elevation of one hundred feet. This would place the public in a much better condition, as against fire, than it is now with the steam engines. The main items then needed would be hose and fire plugs. Every building could have its own hose and fire plugs, and upon the first appearance of fire, the roof, or any room in the highest building, could be instantly flooded with water. At present, an ordinary fire, occurring in the upper story of any large building, has time to obtain a fierce headway before the engines reach the place; and, before the hose can be laid and dragged up ladders, and the water forced to that hight by the engines, it is impossible to save the building. In the case of the Drake-Farwell Block fire, thirteen months ago, the water could not be forced to to the roof, and building after building burned from the roof downward. The engines could not force the water to that hight. Had there been a head of water ascending seventy-five feet, one man standing on the roof with hose could have confined the fire to the building in which it originated, and the loss on even the latter might have been prevented. In Montreal, there can be no extensive fire resulting from an insufficient supply of water or insufficient force. Each man, with sufficient hose, can exercise as much power as can be used by a steam engine in Chicago. As this water can be thrown from the roofs of the highest building as far upward as it can be thrown by a steam engine from the ground level, no machinery or steam power is required in order to make the water effectual against fire. The wells for the supply of water for fire purposes could easily be obtained from the river. The piping for that purpose can be easily laid, and of a much cheaper material than that used for the general distribution. This same water could be used for manufacturing purposes, for livery stables, and for a variety of purposes, thereby reducing the demand upon the present water works. It would be comparatively inexpensive. The machinery once erected, the cost of working it would be but trifling. The cost of piping could not be one fifth of the cost of the ordinary water mains. This pipe could be laid at once in every street in the city, and the annual cost of maintaining the whole would not equal one third that of the requisite number of steam engines under our present system. We might erect water towers in each fire district and obtain additional head, but either plan is feasible to supply the great natural want of Chicago, a supply of water from an elevation. That want must be supplied. Our present system cannot do it, and now is the time to consider and adopt some plan by which the end can be obtained.

Toys as Teachers.

The primary use of toys to children, says a writer in *Chambers' Journal*, is to keep them occupied. A mother thinks what her infant, even when only a few months old, requires to amuse him, and she selects a bright colored bird, or a rattle, or something which it can feel, shake, and look at. An elder child complains of having nothing to do; and a toy or game is found, or a book of pictures or little stories with which he may amuse himself. The great aim of all those who understand the bringing up of children is to keep them constantly engaged, and at the same time, though encouraging them to play as long as possible with one toy, yet to change and vary their occupations and amusements as soon as they show signs of mental fatigue or weariness. This constant employment is not only desirable for children, but is really essential for them; they must be doing something, and, as has been well remarked, even mischief is but misapplied energy. Toys are the natural instruments on which this energy and activity should be expended. It is the province of the toy dealer to find objects for the exercise of their minds and fingers, just as much as for the baker to supply them with bread, or the shoemaker with shoes.

Children are essentially active in every sense; and toys can not properly be called toys at all if they are merely capable of being looked at, and do no more than amuse the eye for a few moments. This fact will often account for the peculiar way in which children take fancies to their toys. Of course the glitter of a new thing, whatever it may be, lasts for some time; but it will be remarked how they generally return to some old plaything, long since bereft of its beauty, because they can *do something with it*. A broken doll, even with no legs and arms, may be dressed and handled as a baby; a horse without legs may be dragged about the floor, and so on; whereas, a new picture book is soon put aside, after the novelty of the illustrations is forgotten; and a very elaborate mechanical toy, too delicate even to be handled, is not much cared for after it has been exhibited a few times and has ceased to be a novelty.

While carefully avoiding the mistake of making play a lesson, some few toys, if well selected, may impart a vast amount of instruction, and that without the child having to undergo any undue mental strain. It would, of course, be undesirable to give a little boy five or six years old a direct lesson on the principles of the bridge and the use of the keystone. Give him, however, a box of bricks capable of making a bridge with the centering, and show him how to put it together; he will puzzle over it for days, try every sort of arrangement, and unwittingly become gradually and practically acquainted with some important mechanical laws. Again, a little model of a steam engine made to work by gas or spirit, which may be bought for a few shillings, is a most attractive toy. Children will watch it for hours. They see the water poured in; they remark that it is made to boil, and soon has to be replenished; they notice the action of the valves, the piston, the crank, and all the parts. When they come to study the theoretical laws of steam and machines, half the difficulty of their first lessons vanishes. If, during his play, the child is so fortunate as to have a really educated nurse or mother, herself acquainted with the outlines of such general knowledge, the child's play may be made, by simple toys, far more educational and interesting than any set lesson, and the result of the instruction far more fixed on his mind than the simplest theoretical idea could ever be by any number of repetitions and learnings by heart.

What is true concerning the box of bricks and the model engine, is also true of a number of other toys; that is, they depend for their action on certain laws, with which, by a little skill, children may be made practically familiar without any undue taxing of their minds, and during the time they are engaged in play. Of these may be mentioned, the kite, magnetic fish; hydrostatic toys, with water-wells, fountains, etc.; pneumatic toys, such as pop-guns, etc.; tops of all sorts, the kaleidoscope, the magic wheel, etc. All these involve scientific laws, which a child may understand familiarly, with no more difficulty, if properly put before him, than he usually finds in learning to read.

Cookery, as a regular subject of instruction in girls' schools, has hitherto been looked upon as one of those things which, though no doubt desirable, is, unfortunately, impossible. Toys, however, seem to prove that this is a mistake. Judging from the collection of cooking stoves which Mr. Cremer has brought together in his International collection of toys in the Exhibition this year, it is clear that "pretending to cook" is largely played at by children of all countries. These stoves, though in miniature, are made large enough, and are so fitted for gas, as to be capable of dressing a small dinner. It would seem that, by a regular course of instruction in practical play cooking, a most agreeable and permanently useful *game* might be introduced in all schools, to the immense advantage of all classes.

The dressing of dolls may be made a most pleasant mode of teaching a little girl to work. All girls are fond of dressing their own toy babies, though they soon weary of hemming dusters. By making dolls' clothes exact miniatures of children's garments, so that they will take on and off, agreeable occupation in needlework will be found for a little girl. The child will easily be made to take a pride in having all her doll's wardrobe as neat and well worked as she can; and good habits of care, neatness, and order may thus be inculcated. In this way, as has already been pointed out, play, useful instruction, and training may be combined through the agency of toys. In watching a little girl play with her doll, an insight may often be obtained into the mode in which the child herself is being brought up. When young we all imitate more or less the habits and manners of our elders; and in whichever way a child is seen using her doll, whether it be roughly, kindly, or gently, or by making a great fuss over its appearance, such as thinking chiefly of the fashion of its dress and ornaments, so may the characteristic features of the treatment that the child herself receives at home be frequently inferred.

The cost of toys cannot be taken as a guide to their usefulness or value. To a certain extent, as in all other articles, it is true that good playthings cannot be had for nothing, but the most expensive playthings are by no means necessarily the best. Nothing is more desirable than to encourage children as much as possible to make some of their own toys; when they do this it affords them immense pleasure and amusement. It should also be borne in mind that the fewer playthings a child has in use at the same time the better. Too many at once encourage restlessness and a continual want of change and variety, and prevent habits of attention and contentment being developed.

Heating and Preparing Stone for Pavements, etc., by the direct application of Steam.

Mr. Campbell Allen, of Albany, New York, has made use of the direct application of steam to heating and drying broken stone or gravel for laying pavements, sidewalks, roadways, or for roofing or other purposes.

The stone or gravel to be heated is placed in a steam tight retort of strength and construction suitable to withstand the steam pressure attending the degree of heat needed in the process. The door or head through which the retort has been charged being securely and tightly closed, steam of the requisite heat and pressure is let in through a pipe directly among the stone or gravel to be dried and heated. The steam expels the air through a cock at the bottom of the retort, which cock is left open for the purpose until the air and a portion of the condensed water has escaped. This escape-cock then being closed, and the action of the steam continuing, the mass in the retort soon becomes heated to the temperature, or nearly to it, of the boiler from which the steam is derived. When this point has been reached, communication with the boiler is cut off, a cock in the retort is opened, and the steam from the latter allowed to escape. The heat in the mass of material will, if sufficient, convert at atmospheric pressure all the condensed water therein immediately into steam, leaving the mass dry and hot. The mass in the retort must be raised sufficiently above 212° that the temperature above that point is sufficient to convert all the condensed water in the mass into steam; otherwise the mass would be discharged at 212°, but leaving the stone wet. But the amount of heat contained in the condensed water thus converted into steam is very considerable, and, to save this, the steam is conveyed into another retort charged with material like the first. The steam rushing in among the material in the second retort imparts its heat thereto, and is condensed thereby, thus saving the heat.

The direct application of steam to the broken stone or gravel to be heated is chosen because of its capacity when applied under pressure to circulate quickly throughout all the spaces and crevices, and convey the heat so as to apply it to the whole mass at once, with but little of the loss which is incurred, by the escape of the heat from the surface while penetrating to the interior, when applied as in the common way to the exterior of the vessel containing the gravel.

Another object attained by using steam for heating the gravel is the facility with which the heat (or that part of it remaining in one vessel after the work is accomplished), greater than that required for the gravel when used, may be transferred to another vessel containing gravel to be heated, and in exhausting from the retort, in which it is confined with the heated gravel, to another containing cold gravel or stone to be heated, thus converting all the water in the first retort into steam instantly, which, escaping, will leave the gravel or stone, hot and dry, fit for use.

This invention, for which letters patent have been recently secured through the Scientific American Patent Agency, has been practically used with great success during the past summer in heating broken stone for concrete paving, and has shown itself to be much more economical than any method of heating stone hitherto employed, only about one tenth the fuel being required, to heat the stone in this way, that was consumed by the old method.

Himmer's Improvement in Electric Batteries.

The improved battery which forms the subject of the present notice is the invention of Vitalis Himmer, of the city of New York, and it is claimed that the arrangement employed permits the power to be regulated at will, and that a supply of its source of power can be attached to it to keep it operative, for a length of time practically limited only by the supply of the material. The battery cup is made of glass or other suitable material. A small vessel of truncated conical form is placed upon the bottom of the battery cup. A vessel of suitable size and shape is filled with sulphate of copper and water, and provided with a neck, through which a small tube is fitted, this tube being preferably held in a cork, in which it may be shifted up and down and still held secure. This vessel is inverted, and placed upon the battery cup, so that its tube enters the truncated conical pot, placed in the battery cup, to a greater or less depth. The copper element of the battery is placed in this pot. The zinc element of the battery is placed within the upper part of the battery cup, and held there by its own spring pressure.

The outside battery cup described being filled with salt water, the vessel holding the sulphate of copper and water is inverted over the cup, its tube entering the pot. The upper end of the tube is preferably closed; and small perforations are cut near the top through it, so that they will not be liable to become clogged by pieces of sulphate of copper. The water in the inverted vessel will gradually dissolve the sulphate of copper, the solution flowing into the pot containing the copper element, where, on account of balanced pressure, it will rise no higher than the lower end of the tube. That amount of surface of copper which is in actual contact with the above named solution will be active in the battery, but not the remainder. The depth, to which the tube is immersed, and the consequent hight of the sulphate of copper solution, determine, therefore, the strength of the battery. The zinc will, by the contact with the water, always be ready for action, the spent zinc dropping to the bottom of large battery cup, but not into the pot containing the copper element.

When the battery is active, the solution in the latter will be gradually absorbed and a new supply constantly given down in such ratio as is necessary to provide the active effectiveness of the battery. When the battery is not used there will be no displacement of solutions. The cup containing the sulphate of copper and water may be secured upon the battery cup in such manner as to secure it air tight, in which case evaporation is absolutely prevented. A battery of this kind can, it is claimed, be kept in effective operation continuously for years, without requiring the least addition or replacement of parts, provided the copper and zinc are of sufficient size, and the supply vessel large enough to hold the requisite amount of the sulphate of copper.

In a recent notice of this battery at the Fair of the American Institute, we expressed some doubt as to the practicability of adjusting the tube leading from the supply vessel in such a way as to regulate the force of the latter. The inventor personally assures us, however, that this difficulty does not exist, and that he has run a battery of this kind eighteen months without any change of parts or addition of material, the electromotive power being employed for driving a clock, and acting continuously and uniformly throughout that period.

An Enterprising Photographer.

An ingenious photographer has lately come to grief in Paris in this wise: Business being slack—personal vanity not having revived sufficiently, since the Commune, to call for his aid and the sun's—he looked up his collection of negatives, and, selecting those of the least well favored of his lady clients, he took off impressions of the same, and sold them as portraits of the *pétroleuses*, or women arrested for firing houses with petroleum. A collector of these curiosities was astonished one day to find the counterfeit presentment of his respected mother-in law among those of these fair incendiaries. Some men might not have found fault with this disposition of that particular relative, which seems to be the *bête noire* of English and French husbands. This son-in-law, however, did not belong to that category; and forthwith looked up the offender, and had him arrested and punished. In mitigation of sentence, he pleaded that he was by no means the only sinner of his class, the same industry being profitably pursued by others of his profession.

Elasticity of Wood.

The following are some of the results of the recent experiments of Messrs. Chevandier and Wertheim on the resistance of wood. These experimenters have drawn the following principal conclusions:

The density of wood appears to vary very little with age.

The coefficient of elasticity diminishes, on the contrary, beyond a certain age; it depends, likewise, upon the dryness and the exposure of the soil, in which the trees have grown, to the sun; thus the trees grown in the northern, north eastern and north western exposures, and in dry soils, have always so much the higher coefficient as these two conditions are united; whereas the trees grown in muddy soils present lower coefficients.

Age and exposure influence cohesion.

The coefficient of elasticity is affected by the soil in which the tree grows.

Trees cut in full sap, and those cut before the sap, have not presented any sensible differences in relation to elasticity.

The thickness of the woody layers of the wood appear to have some influence on the value of the coefficient of elasticity only for fir, which is greater as the layers were thinner.

In wood there is not, properly speaking, any limit of elasticity for the woods experimented upon by Messrs. Chevandier and Wertheim; but in order to make the results of their experiments agree with those of their predecessors, the authors have given, for the value of the limit of elasticity, the load under which it produces only a very small permanent elongation.—*Treatise on the Resistance of Materials.*

DO NOT be above your business, no matter what that calling may be, but strive to be the best in that line. He who turns up his nose at his work quarrels with his bread and butter. He is a poor smith who quarrels with his own sparks; there is no shame about any honest calling; don't be afraid of soiling your hands; there is plenty of soap to be had. All trades are good to traders. Above all things avoid laziness. There is plenty to do in this world for every pair of hands placed upon it, and we must so work that the world will be richer because of our having lived in it.

WHO IS OLD?—A wise man will never rust out. As long as he can move and breathe he will be doing for himself, his neighbor, or for posterity. Who is old? Not the man of energy, not the day laborer in science, art or benevolence; but he only who suffers his energies to waste away, and the springs of life to become motionless; on whose hands the hours drag heavily, and to whom all things wear the garb of gloom.

YOU may find your best friend or your worst enemy in yourself.

FOSTER'S THILL COUPLING.

Our engravings illustrate a new thill coupling, which is free from rattle, is stout and durable, neat in appearance, and enables the thills to be coupled or uncoupled with the greatest facility.

Fig. 1 is a perspective view, Fig. 2 a detail, and Fig. 3 a section, showing a tubular rubber compression spring, by which the coupling is rendered noiseless.

A, Figs. 1, 2, and 3, is the strap of the coupling, which is attached to the axle by means of a clip, B, as shown in Fig. 1.

Fig. 1

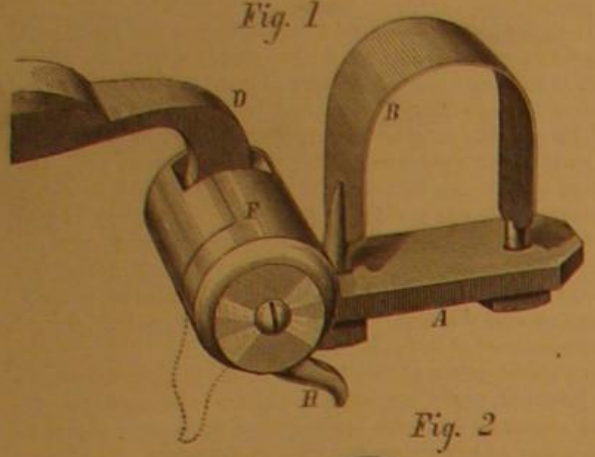
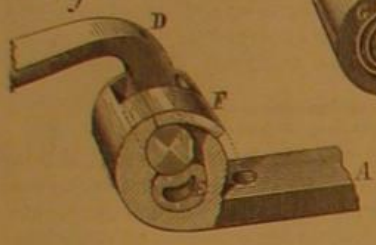


Fig. 2

Fig. 3



On the front end of A is formed the body of this part of the coupling, of the form shown at C, Fig. 2. This body is a hollow cylinder, slotted in the upper side, as shown, to admit the thill iron, D, Figs. 1 and 3.

The part of the thill iron which enters the hollow of the cylinder, C, is bent at right angles to the shank, and is itself cylindrical in form, as shown in dotted outline in Fig. 3.

The outline of the hollow, in C, is not a circle, but is of the shape shown in the section, Fig. 3, nearly that which would be produced by the intersection of two cylinders. In the lower portion of this cavity is placed a piece of rubber tubing, E, Fig. 3.

Pivoted to C is the cap, F, which, by means of a coiled spring, G, Fig. 2, is made to cover the cylindrical end of the thill iron, as shown in Figs. 1 and 3. A thumb piece, H, enables this to be turned back to permit the insertion of the thill iron; and, when it is released, it closes again, as shown in Figs. 1 and 3.

The whole seems admirably adapted to subserve the desired end, namely, a quickly adjusted, durable, and silent coupling.

Patented, August 29, 1871, by Wm. G. Foster, whom address, for further information, Dansville, N. Y.

VENTILATING GRAIN VESSEL AND GRAIN CAR.

The purpose of the first of these inventions is to improve upon the common construction of the hulls of grain vessels, so that the grain may be more thoroughly aerated and more perfectly preserved.

Perforated air conducting pipes are arranged along the bottom of the hold of the vessel from bow to stern, or throughout the length of the grain holding space, preferably one on each side of the keelson; but they may be arranged in any approved way. They have a connection at one end, with a funnel mouthed hood; or with any other suitable natural or artificial means, for causing the air to flow in through the pipes and escape through the perforations into the grain or other perishable cargo. The other end has an escape pipe provided with a stopper, to be opened or not, for permitting the air, or a part of it, to escape thereat, or for inspection of the pipes, or to note the action of the air. Another system of perforated pipes is arranged under the deck and connected with the hood or other supply source, and is also provided with a discharge, at the end opposite where the air is received.

The hood is arranged on a pivot to turn to the wind, and the discharge may have a hood arranged to cause a vacuum and produce suction, to accelerate the currents. In this case covering plates are used for the lower tubes, to be swung over the pipes upon the top of the keelson to protect them when other freight, which might injure them, is being carried instead of grain, as on return passages. The air introduced through the pipes, rising up through the cargo to cool it, is delivered through openings in the deck, or is taken up by the system of pipes under the deck, and conveyed away by them; or these pipes may be used alone in some cases where the grain is comparatively dry, and the air, acting on the surface only, will be sufficient to preserve the grain.

By this, or an equivalent apparatus, a current of air may be kept constantly flowing through the bulk of grain or other perishable cargo while in the vessel, maintaining a low temperature, and conveying away the vapors generated by the tendency of all such substances, when confined in large bodies, to fermentation, and the grain or other substance will not only be preserved from damage by fermentation, but will be improved in condition at the same time. This mode of applying the atmospheric air and removing the confined air is also beneficial in a high degree to vessels carrying other freight for preserving the vessel and maintaining a healthful condition in the hold.

The inventor claims any other analogous arrangement of air pipes that may be used with like results.

He has also made an application of the same principle to grain cars, and those used for the transportation of fruit and vegetables, which will greatly aid in the proper transportation of such articles in good condition.

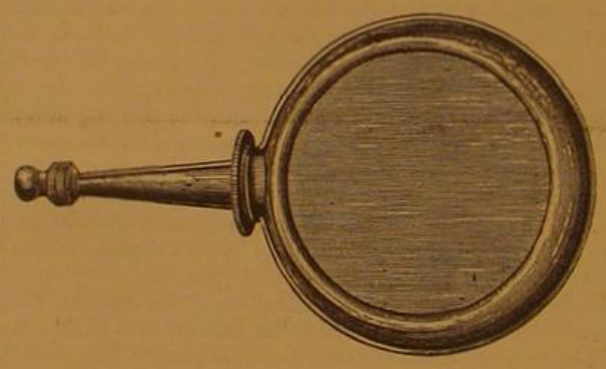
At the present time the great quantity of grain, shipped from the interior of the country to the seaboard and across seas, is carried in bulk in close cars, or in boats or vessels, and is almost always injured more or less by the exclusion of air, which is so necessary for its preservation. Owing to the vast quantities shipped, the bulkiness of the article, expense of storing room, and facilities for drying, cleaning, and preserving the grain, and also owing to the limited means of shipment and the haste with which it is necessary, for various reasons, to get the grain to market, it is much neglected in respect of its condition as to dryness after once having been started on the way to market; and vast quantities are shipped in a damp condition, in consequence of which, when arrived in the market, a large proportion has greatly depreciated in quality and value, so that, besides the actual loss in money value which falls ultimately mainly on the producer, the consumer is subjected to the necessity of using inferior or injured food. The inventor of the system of ventilation described claims not only to obviate these evils, but to cause the grain and other articles to be actually improved while in transit, and that, too, by taking advantage of the natural facilities offered by the moving vessel or car, without additional expense, except, perhaps, an unimportant trifle in the first cost of cars, and also without additional attendance.

These inventions have been patented, through the SCIENTIFIC AMERICAN AGENCY, by William S. Sampson, of New York city, assignor to himself, Ruth Ann Van Bunschoten, and Harriet Van Bunschoten, of same place.

IMPROVED POCKET OILER.

The improved pocket oiler, shown in the accompanyin gengraving, is a very neat and handy implement, for use in connection with sewing machines and other small machinery, and as neat in use as it is in appearance.

The body of the oiler is flat, rounded off at the edge, and the nozzle is provided with a small neat screw cap, which effectually prevents any efflux of oil, when not in use.



The engraving so fully illustrates the device that no further description is needed. It was patented July 20, 1869, through the Scientific American Patent Agency. Further information may be obtained from Charles Goodenough, 41 Dey street, New York city.

Clogston's Gate for Marble Saw Gang.

A new way of coupling together the sides and cross pieces of a gang saw gate, by means of an intermediate coupling piece, fast to the cross bars sliding loosely in the tubular sides, has been invented by Lucius B. Clogston, of West Rutland, Vermont.

Tubular and channeled iron have been heretofore used to combine lightness and strength, and are well known to the public; but Mr. Clogston combines with them a third instrumentality which enables the two to embody a new principle or mode of operation.

The cross bars of the gate are preferably formed of channel iron; and the side pieces are preferably made tubular throughout their whole length. Coupling plugs, riveted to the cross bars, play loosely in the ends of the tubes.

A series of saws is placed between and parallel to the side pieces at a suitable distance apart and strained to any desired tension while cold. As they are used, the heat of friction causes them to expand and become elongated.

If the cross bars are rigidly fastened at a fixed distance apart, one of two things must occur; they must be either strained very loosely at first, so as not to work well, and remain so until they reach some indefinite temperature and expansion; or they must be strained tight enough to work well in the first instance and successively keyed up, as they work loose by expansion, according to the judgment of the operator, until the requisite tension is obtained. Neither of these gives the desired accuracy or desired economy of labor. By making the coupling plugs self adjustable in the side tubes, they can be strained to the proper degree of tension in the beginning and thus be made automatically to adjust themselves to the elongation of the saws by expansion.

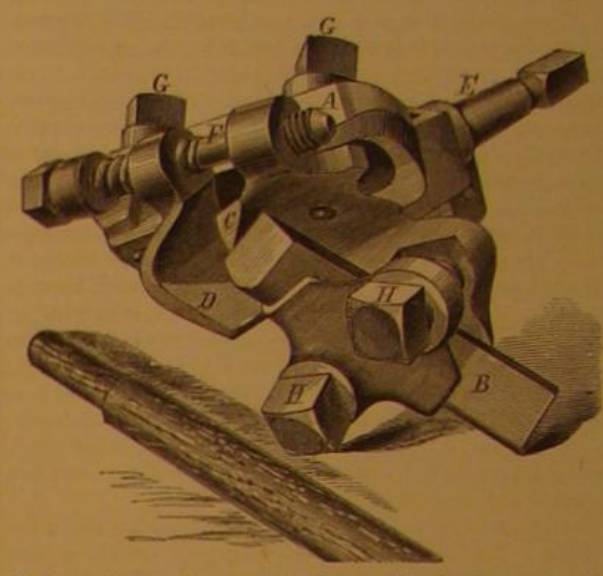
HE who has struck his colors to the power of an evil habit, has surrendered himself to the power of an enemy bound by no articles of faith, and from whom he can expect only the vilest treatment.

SMITH'S IMPROVED HOLLOW AUGER.

The tool illustrated in the accompanying engraving has the merit of being very cheaply constructed, while it is, at the same time, adjustable for various diameters and lengths of tenons (for spokes, etc.), the one tool thus taking the place of several which are required in the performance of certain kinds of work.

Referring to the engraving, A is the part which supports the working parts of the device, namely, the cutter bit, B, its clamping plates, the jaw, C, the jaw, D, and adjustable shank shaft, E, the right and left threaded screw, F, and the set screws, G and H.

The point of the spoke to be tenoned is inserted between the jaws, C and D. The instrument then being turned by the aid of a bitstock, the tenoning proceeds until the inner end of the shank, E, meets the end of the spoke, thus gaging the length of the tenon.



By loosening a set screw (not shown), the shank may be adjusted so as to make longer or shorter tenons, as desired. The set screw referred to does not, however, hold the shank from turning in its socket, this being accomplished by a groove and feather. The set screw merely presents the longitudinal movement of the shank.

The jaws, C D, are adjustable, for the diameter of the tenon, by the right and left threaded screw, F, which moves them, simultaneously and equally, to or from the central axis of the tool. They move in slots formed in the part, A, and are held when adjusted by the set screws, G.

The jaw, C, carries the cutter bit, which has an L shaped edge, and is held by a clamping plate and the set screws, H.

The principal parts of the tool, except the bit shank and screws, are of malleable cast iron, and the implement can be manufactured at small cost, and sold cheaply.

It was patented July 17, 1866, through the Scientific American Patent Agency, by J. Heston Smith, whom address at Lambertville, N. J.

Schindler's Photographic Posing Chairs.

Mr. Charles A. Schindler, of West Hoboken, New Jersey has designed an improved chair for photographers' use in posing their subjects, which he has just patented. The back of the chair has the lower parts of the side bars slotted to receive a flange formed upon the rear ends of arms, the forward ends of which are attached to the rear parts of the sides of the seat frame. The outer sides of the side bars of the back are covered by plates, which cover the rear ends of the arms and the slots. The lower ends of the slotted parts of the side bars of the back are connected and held in their proper relative position by two parallel cross bars. A hand screw, is passed through and swivelled to the outer of these cross bars, and screws into the inner cross bar, so that, by turning the screw in one direction, the parts of the side bars of the back will be made to clamp the flanges of the arms, which extend back from the seat, and thus secure the back at any desired elevation.

The rear legs of the chair are so arranged and formed that the lower ends of the side bars of the back may descend along and fit upon the rear sides of the legs, to support the lower end of the back, however it may be adjusted. As heretofore made the rear legs these chairs have projected laterally and rearwardly, and the lower end of the back has descended between them, the lower end when lowered being entirely unsupported.

The arms of the chair are each made with and supported by a single standard, the lower end of which is inserted in a keeper, attached to the side of the seat frame. This construction allows one or both the arms to be detached when desired.

THE DARIEN SHIP CANAL.—Some particulars of Commander Selfridge's exploration of the Isthmus of Panama have been communicated to the public, although the report has not yet been published. The route recommended is along the course of the river Atrato, and thence to Cupica Bay, on the Pacific Ocean. The work is calculated to cost over $100,000,000, the obstacles to rapid engineering progress being formidable. One of these difficulties is the construction of a tunnel, four miles in length, seventy feet wide, and *one hundred and seventy high*. The account does not tell us the nature of the soil through which this excavation is to be made. The canal will require twenty-two locks, nine rising from the Atlantic coast to the highest point, and thirteen descending thence to the Pacific.

PSYCHIC FORCE.--FURTHER EXPERIMENTS BY DR. CROOKES.---REPLY TO HIS OPPONENTS.

"I am attacked by two opposite sects—the scientists and the know-nothings. Both laugh at me, calling me the 'frog's dancing master.' Yet I know that I have discovered one of the greatest forces in nature."

With these pithy words of Galvani, extorted by the ridicule to which that great discoverer was subjected on the announcement of the wonderful discovery of the movements of dead frogs' legs, caused by the contact of metals with the lumbar nerves, and which was the origin of that department of electric science called, in honor of its discoverer, galvanism, Dr. Crookes, in the last number of the *Quarterly Journal of Science*, commences an elaborate article to sustain the authenticity of his alleged discovery of "psychic force," and an account of further experiments which he puts forth as removing all the objections raised against his previous experiments, which were published in a former issue of the same periodical, and reproduced with engravings in the SCIENTIFIC AMERICAN of August 12, 1871.

We do not propose in this article to repeat the replies of Dr. Crookes to certain, in his opinion, captious objectors. He very properly declines to notice any who question his veracity. To some of those who, on other grounds, have taken exceptions to the conclusiveness of his experiments, he replies in a very spirited manner, and in several cases proves these objectors to be themselves in fault.

Thus, to Mr. Coleman Sellers' singular objection, based upon his assumed weight of the mahogany board, calculated from its size and the specific gravity of mahogany as given in tables, he replies that the board in question weighs only six pounds, instead of thirteen and one half pounds, as calculated by Mr. Sellers. Dr. Crookes says: "Four separate balances in my own house tell me so, and my greengrocer confirms the fact."

To Professor Stokes' objection, based upon a geometrical demonstration of the power that might be gained in a peculiar way of applying the pressure of the hands to the apparatus described in our former article, Dr. Crookes replies by a similar demonstration, showing that in the application of the pressure, as described by Professor Stokes, Mr. Home would have been obliged to exert a pressure of seventy-four and one half pounds, with the tips of his fingers, to have produced the result stated, which exertion he regards as simply impossible under the circumstances.

Professor Balfour Stewart, who thought Dr. Crookes might have been electro-biologized by Mr. Home, will hardly say the recording instruments were biologized, and he is referred to the curves traced by these instruments as proof of actual motion in the apparatus.

Dr. Crookes also applies some verbal caustic to the tender skin of Professor Stokes, relative to the refusal of the latter gentleman to witness the experiments for himself, when he not only had ample opportunity, but was earnestly urged to do so; but we will not go into these personal matters. We prefer to introduce the experiments at once to our readers, reserving such comments as we may see fit to make for our editorial colums. In describing these experiments, we shall only in part quote *verbatim* from Dr. Crookes' paper, condensing such portions as will not weaken the force of the points he makes, in order to accommodate the discussion to our limited space.

He says:

On trying these experiments for the first time, I thought that actual contact between Mr. Home's hands and the suspended body, whose weight was to be altered, was essential to the exhibition of the force; but I found afterwards that this was not a necessary condition, and I therefore arranged my apparatus in the following manner, illustrated in the engravings:

A B is a mahogany board, thirty-six inches long by nine and a half inches wide and one inch thick. It is suspended at the end, B, by a spring balance, C, furnished with an automatic register, D. The balance is suspended from a very firm tripod support, E. To the moving index, O, of the spring balance, a fine steel point is soldered, projecting horizontally outwards. In front of the balance, and firmly fastened to it, is a grooved frame carrying a flat box, similar to the dark box of a photographic camera. This box is made to travel by clockwork horizontally in front of the moving index, and it contains a sheet of plate glass which has been smoked over a flame. The projecting steel point impresses a mark on the smoked surface. If the balance is at rest, and the clock is set going, the result is a perfectly straight horizontal line. If the clock is stopped, and weights are placed on the end, B, of the board, the result is a vertical line, whose length depends on the weight applied. If, while the clock draws the plate along, the weight of the board (or the tension on the balance) varies, the result is a curved line, from which the tension in grains, at any moment during the continuance of the experiments, can be calculated.

The instrument was capable of registering a diminution of the force of gravitation as well as an increase; registrations of such a diminution were frequently obtained. To avoid complication, however, I will only here refer to results in which an increase of gravitation was experienced.

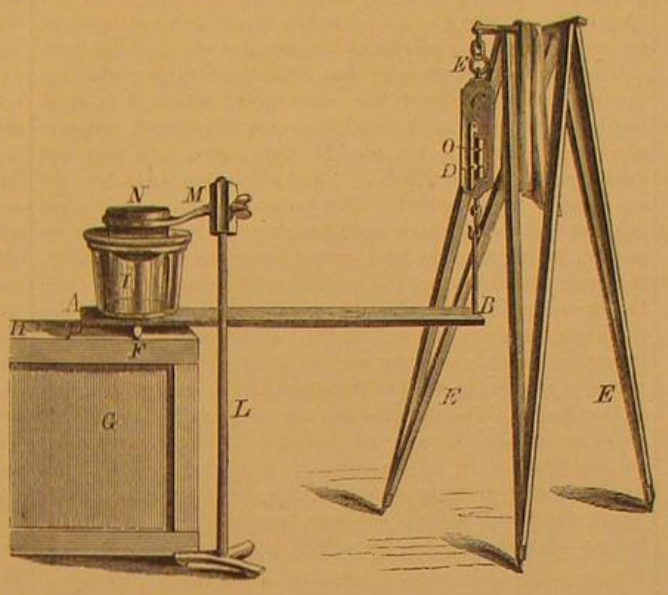
The end, B, of the board being supported by the spring balance, the end, A, is supported on a wooden strip, F, screwed across its lower side, and cut to a knife edge. This fulcrum rests on a firm and heavy wooden stand, G H. On the board, exactly over the fulcrum, is placed a large glass vessel with water, I. L is a massive iron stand, furnished with an arm and a ring, M N, in which rests a hemispherical copper vessel, perforated with several holes at the bottom.

The iron stand is two inches from the board, A B, and the arm and copper vessel, M N, are so adjusted that the latter dips into the water one and a half inches, being five and a half inches from the bottom of I, and two inches from its circumference. Shaking or striking the arm, M, or the vessel, N, produces no appreciable mechanical effect on the board, A B, capable of affecting the balance. Dipping the hand to the fullest extent into the water in N does not produce the least appreciable action on the balance.

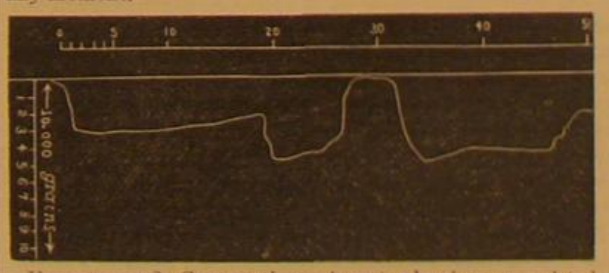
As the mechanical transmission of power is by this means entirely cut off between the copper vessel and the board, A B, the power of muscular control is thereby completely eliminated.

For convenience, I will divide the experiments into groups 1, 2, 3, etc., and I have selected one special instance in each to describe in detail. Nothing, however, is mentioned that has not been repeated more than once, and in some cases verified, in Mr. Home's absence, with another person possessing similar powers.

There was always ample light in the room where the experiments were conducted (my own dining room) to see all that took place.



Experiment 1. The apparatus having been properly adjusted before Mr. Home entered the room, he was brought in, and asked to place his fingers in the water in the copper vessel, N. He stood up and dipped the tips of the fingers of his right hand in the water, his other hand and his feet being held. When he said he felt a power, force, or influence proceeding from his hand, I set the clock going, and almost immediately the end, B, of the board was seen to descend slowly and remain down for about ten seconds; it then descended a little further, and afterwards rose to its normal hight. It then descended again, rose suddenly, gradually sunk for seventeen seconds, and finally rose to its normal hight, where it remained until the experiment was concluded. The lowest point marked on the glass was equivalent to a direct pull of about 5,000 grains. The accompanying figure (2) is a copy of the curve traced on the glass. The horizontal scale of seconds shows the time occupied in the movements, the experiment lasting one minute. The vertical scale shows the tension in grains exerted on the balance at any moment.



Experiment 2. Contact through water having proved to be as effectual as actual mechanical contact, I wished to see if the power or force could affect the weight, either through other portions of the apparatus or through the air. The glass vessel and iron stand, etc., were therefore removed as an unnecessary complication, and Mr. Home's hands were placed on the stand of the apparatus at P. A gentleman present put his hand on Mr. Home's hands, and his foot on both Mr. Home's feet, and I also watched him closely all the time. At the proper moment the clock was again set going; the board descended and rose in an irregular manner, the result being a curved tracing on the glass (of which a copy is given, but which we do not reproduce).

Experiment 3. Mr. Home was now placed one foot from the board, A B, on one side of it. His hands and feet were firmly grasped by a bystander, and another tracing was taken on the moving glass plate, indicating abrupt deflections, more or less sustained.

Experiment 4—(tried on an occasion when the power was stronger than on the previous occasions). Mr. Home was now placed three feet from the apparatus, his hands and feet being tightly held. The clock was set going, when he gave the word, and the end, B, of the board soon descended, and again rose in an irregular manner, making a peculiar and striking diagram on the moving glass plate.

A series of experiments were also performed with the following apparatus: A light lever was delicately balanced. At one end it carried a vertical needle point touching a parchment disk stretched on a hoop, much like the ordinary tambourine. At the other end of the lever, which was the end of the long arm, a tracing point marked upon smoked glass moved by clock work. When the hand of a medium was brought over the parchment, at a little distance from the lever, the latter was so agitated as not only to make distinct taps on the parchment, but to form, at the same time, curves on the glass at the opposite end of the lever. In one case the medium was a lady, a non-professional, who had no knowledge of the apparatus previous to being ushered into its presence. The experiments indicate nothing beyond what was shown in those which preceded them. They were, however considered more delicate. In a letter to Professor Stokes, published in another part of the paper, Dr. Crookes states that, with a mirror and a reflected ray of light, will show deflections, due to fractions of grains of pressure. With this apparatus, he thinks he will be able to prove that all persons possess the psychic force in some perceptible degree.

These experiments, says Dr. Crookes, *confirm beyond doubt* the conclusions at which I arrived in my former paper, namely, the existence of a force associated, in some manner not yet explained, with the human organization, by which force increased weight is capable of being imparted to solid bodies without physical contact. In the case of Mr. Home, the development of this force varies enormously, not only from week to week, but from hour to hour; on some occasions the force is inappreciable by my tests for an hour or more, and then suddenly reappears in great strength. It is capable of acting at a distance from Mr. Home (not unfrequently as far as two or three feet), but is always strongest close to him.

Being firmly convinced that there could be no manifestation of one form of force without the corresponding expenditure of some other form of force, I for a long time searched in vain for evidence of any force or power being used up in the production of these results.

Now, however, having seen more of Mr. Home, I think I perceive what this psychic force uses up for its development. In employing the terms *vital force*, or *nervous energy*, I am aware that I am employing words which convey very different significations to many investigators, but after witnessing the painful state of nervous and bodily prostration in which some of these experiments have left Mr. Home—after seeing him lying in an almost fainting condition on the floor, pale and speechless—I could scarcely doubt that the evolution of psychic force is accompanied by a corresponding drain on vital force.

I have ventured to give this new force the name of *Psychic Force*, because of its manifest relationship to certain psychological conditions, and because I was most desirous to avoid the foregone conclusions implied in the title under which it has hitherto been claimed as belonging to a province beyond the range of experiment and argument. But having found that it is within the province of *purely scientific research*, it is entitled to be known by a scientific name, and I do not think a more appropriate one could have been selected.

To witness exhibitions of this force, it is not necessary to have access to known psychics. The force itself is probably possessed by all human beings, although the individuals endowed with an extraordinary amount of it are doubtless few. Within the last six months I have met, in private families, five or six persons possessing a sufficiently vigorous development to make me feel confident that similar results might be produced through their means to those here recorded, provided the experimentalist worked with more delicate apparatus, capable of indicating a fraction of a grain instead of recording pounds and ounces only.

As far as my other occupations will permit, I propose to continue the experiments in various forms, and I will report, from time to time, their results. In the meanwhile, I trust that others will be induced to pursue the investigation in its scientific form. It should, however, be understood that, equally with all other scientific experiments, these researches must be conducted in strict compliance with the conditions under which the force is developed. As it is an indispensable condition of experiments with frictional electricity that the atmosphere should be free from excess of moisture, and that no conducting medium should touch the instrument while the force is being generated, so certain conditions are found to be essential to the production and operation of the psychic force, and unless these precautions be observed, the experiments will fail. I am emphatic on this point, because unreasonable objections have sometimes been made, to the psychic force, that it is not developed under adverse conditions (dictated by the experimentalist,) who, nevertheless, objects to conditions being imposed on himself in the exhibition of any of his own scientific results. But I may add, that the conditions required are very few, very reasonable, and in no way obstruct the most perfect observation and the application of the most rigid and accurate tests.

TO VIOLIN PLAYERS.—Mr. J. R. Little, of Monmouth, Ill., writes to say that his suggested use of chalk, by performers troubled with perspiration on the hands, was misunderstood by us. He states that "slipping of the fingers is in some instances an absolute necessity, and anything interfering with that motion is objectionable." We do not understand that the *sliding* of the stop fingers should be prevented, nor would our readers gather such an opinion from the paragraph. We alluded only to the difficulty some players find in keeping a steady stop on the strings when the hands are perspiring; and to prevent the fingers from slipping involuntarily, the use of chalk was recommended.

THERE is nothing like beginning life with settled economical principles. Extravagance is a habit easily contracted, and goes on increasing in volume as a snowball does when rolling down hill.

Correspondence.

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

The Psychic Force.

To the Editor of the Scientific American:

The reply of B. D., of Jersey City, to my communication (page 243), is the best proof I could possibly desire of the truth of my statement, that there exists, among people, a "universal predilection for believing what is liked best, without investigating what is strictly true, and a general disgust of being told that they err in judgment."

I further said: "When you tell them that they err in judging about the so called spiritual manifestations (and I ought to have added, the so called psychic force theory), and that they are totally mistaken in ascribing them to the mysterious agencies, the belief which they so dearly cherish, you will find that there are very few who will ever forgive you."

That B. D. is not one of the few, is evident from his temper, displayed in using, in my regard, the words, "false position," "foolish," "unscientific," "credulous faith," etc. I wish he had followed my example, and abstained from personal imputations, and above all from offensive adjectives, which prove nothing, and only reflect on him who uses them. He commences with the gross misstatement that I "plead guilty of entire ignorance of the experiments which were made by Professor Crookes and his two colaborers," and that I "admit that I cannot explain them."

First misstatement: Mr. Crookes has given a detailed account of the experiments, and illustrated them with elaborate figures, in order to give his readers a full knowledge of them, and of the reasons which induced him to accept the hypothesis of what he calls a new force, "Psychic." Every one who has read, as carefully as I have done, this description, cannot be said to be entirely ignorant of the experiments, and I surely did not "plead guilty of this ignorance."

Second misstatement: The experiments were not made at all by Professor Crookes, nor by his colaborers, but by D. D. Home, an acknowledged English spiritualistic medium. Mr. Crookes only says that he prepared some of the apparatus, but this is not experimenting. If Mr. Crookes had himself done the whole thing, in place of Home, only then would B. D. be right in speaking of "the experiments by Professor Crookes, and his two colaborers." According to Crookes' own account, he was, with his two friends only a witness to Home's performance.

Third misstatement: That "I admit that I cannot explain them." Now I think that B. D. places himself here in a false position, when it is considered that I have distinctly stated that I have made similar experiments, and have seen some apparently much more mysterious and wonderful, all of which were only claimed to be produced by the ordinary means, or so called jugglery; therefore, I say that, in order to explain what Mr. Crookes has seen, it is not at all necessary to invent a new force. As the very same things are done by jugglery, Home must, in order to satisfy people of common sense, perform more dignified feats, in which there can be no jugglery whatever, in place of the childish tricks described by Crookes; and to do this he signally fails.

All what I admitted was, that in order to find out what the special trick of the juggler is, in any similar performance, it is necessary to be present; this is for the simple reason that the resources of physical science are almost infinite. Expert jugglers often perform the same trick by different means, in order to mislead, most thoroughly, such spectators as are at the point of divining the truth. Every trick, therefore, has its own explanations, which vary with the manner in which it is performed.

In the second paragraph, B. D. informs me that Professor Crookes is the editor of the *Quarterly Journal of Science*, published in London. This looks as if all that B. D. knows of Professor Crookes is from the account of these experiments taken from that journal by the SCIENTIFIC AMERICAN. The editorship of the *Quarterly Journal of Science*, since January, 1871, is only one of the minor merits of this eminent chemist. Let me tell B. D. that I am better acquainted with Mr. Crookes' labors than he appears to be. Professor Crookes is also editor of the *Chemical News*, one of the best scientific weeklies, also published in London; he is the celebrated discoverer of the new metal thallium; he has also made many other very important discoveries, and published most valuable contributions to science. Therefore I have been for many years his constant admirer, and was greatly mortified to see the appearance of such a weakness in his mind, as to be at the point of becoming a believer in the psychic force theory. It was with the same feeling of mortification that I met, in the year 1853, the great American investigator, Professor Hare, of Philadelphia, whose discoveries and experiments in electricity I had, twenty years before, carefully studied while in Europe, where I had his experiments repeated; this great man, in the latter part of his life, when his mind became weak, turned a confirmed spiritualist.

B. D. will not allow this, I suppose, as an argument in favor of spiritualism; well, even so I object to consider the weakness of mind of Professor Crookes as an argument in favor of the "Psychic force theory."

In the third paragraph B. D. thinks he finds proof of my "want of knowledge of the position of this matter . . . by the strange way in which I mingle the psychic force theory and spiritualism together." This may appear so to him, who believes in the one and not in the other, as is proved by his expression that I may apply my "reprobation to spiritualism, and few people will object." He proves here his own "want of knowledge of the position of this matter," because spiritualists claim that there are more than a million spiritualists in the United States alone, while I can introduce him in more than one flourishing spiritual society, in New York city. Let me assure B. D., that, years ago, I studied the so called psychological phenomena, and that if I should describe what I have witnessed, I could fill Professor Crookes' whole *Quarterly Journal of Science*, and his *Chemical News* besides, with the illustrated accounts, among which increased pressure on levers, without apparent contact, table tipping, table moving, piano playing by invisible players, floating guitars and accordions, etc., etc. All this is exclusive of the strictly spiritual circles in which I have assisted, and where only communications were assumed to be received from departed souls, by the intervention of so called mediums, one of which Mr. Home claims to be.

Now I deny, with B. D., this claim of Home, and assert, with him, that such a claim is an imposition. Then I go a step further, and assert that the claim of possessing a peculiar force (psychic, or whatever name, is indifferent) is also an imposition. Mr. Crookes and B. D., allow this claim, but when they find the errors of their ways, I do not doubt but they will be candid enough to confess that they were deceived by an ingenious application of the positive physical sciences.

These sciences, especially that branch of them constituting modern biology, answer the main point, which B. D. says, in his fourth paragraph, that I have not considered, namely, the question: "Is it not possible that power can emanate from a man's will or mind, over and above the mere dynamical force of his muscles?" This question is the usual argument of the defenders of such deceivers as Home. It is repeated, in other words, by a second correspondent (page 276); it simply proceeds from the ancient misconception that force is something immaterial, separable from matter, that it has its origin purely in the will of the mind, and that therefore it may be possible that the will, or spirit, alone can move extraneous matter, as well as it appears to move any member of our bodies. The doctrine of the conservation and transmutation of forces, in combination with the clearer ideas taught by modern physiology, has exploded the idea that there is a new unexplored field in this direction. But as this communication is already too long, I am obliged to devote, to the consideration of this important question, a separate article.

In the closing sentence, B. D. makes a very unjust, unfair, and unmerited accusation against me, namely, that I should have "a most credulous faith in the inventive genius of a charlatan." After what I have seen of so called jugglers, and considering what I am able to do myself in this line, there is no credulity, and even no faith about it; it is all positive knowledge. I know what can be accomplished, especially before spectators like B. D., who, when witnessing such experiments, are prejudiced by a foregone conclusion, about the existence of a so called psychic force, and, in this way, obscure entirely the little amount of acuteness in perception their senses may perhaps otherwise possess.

In conclusion I appeal to the future, confidently expecting that, at an early day, we will see published by an expert in this line, who has opportunity to do it, a full exposure of the "inventive genius of the charlatan," David D. Home, pretended spiritualist, medium, psychologist, etc.

P. H. VANDER WEYDE, M.D.

New York city.

Treatment of Gold Ores.

To the Editor of the Scientific American:

The numerous discussions, in recent numbers of your valuable paper, on the imperfect manner in which quicksilver amalgamation performs the gold extraction of Colorado ores (and, for that matter, of California and other gold ores in general), and the desire to discover means, by which the amalgamation may be improved, are but another illustration of the observation, frequently noticed in your pages of late, that the human mind is apt to follow a well worn track, from which few only deviate. Amalgamation and concentration of the ores has been practiced with gold ores for centuries, and it is erroneously taken for granted that these two modes should form the basis of operations, which ingenuity is taxed to improve. It has been shown that amalgamation, by the indifferent affinity of quicksilver to gold, secures on an average, only a little over, if at all, one half of the gold contained in the ore. It is also proved that in the process of concentration the fine particles of gold, flattened out exceedingly thin in the act of crushing the ores, are carried off in a large proportion as float gold by the stream of water used in concentration, as well as in battery amalgamation, and in a proportion sometimes approaching nearly that secured by amalgamation; for a float loss of $10 to $15 per tun in ores yielding but $16 to $25 per tun is by no means rare. This demonstrates, as it has done many years ago to this writer, a California gold miner of 1849, that we have to look for other means to avoid these losses.

Of all substances known, zinc, in a melted state, has the greatest affinity for gold (and silver); instant contact suffices to dissolve even heavy particles of gold by forming an alloy. Zinc does not combine directly with sulphur, but gold particles, covered with gold sulphuret and inert to the action of quicksilver, yield instantly to the zinc, as anybody can easily convince himself. The ore pulverized dry, and the dry (or dried) ore or tailings passed gradually through a bath of melted zinc, yields up, on an average, 80 to 90 per cent of its auriferous contents, without loss of any float gold. All the *débris*, even the iron sulphurets of the ore, is specifically lighter than the zinc; and the ore, introduced at the bottom of a deep and narrow trough of melted zinc, rises to the surface to be removed, leaving in its passage the gold behind as an alloy, which can be tested at any time, and the amount of gold in it determined with accuracy. When sufficiently rich, the precious metals are separated from the zinc by retorting, or the known modes of dissolving the zinc by acids. No water is required in the zinc process above explained, except for the use of the engine, to reduce the ores, and that much is found even in the barren Colorado desert without difficulty. This point is well worthy of consideration, for nine out of ten rich gold mines are now lying idle, entirely or part of the time, for want of water required for the usual battery amalgamation works, while the sagebrush and mesquite of the desert yields ample fuel to raise steam and to keep the zinc up to the required temperature—just above the melting point; and the value of the flour gold saved is alone sufficient to cover the whole cost of extraction by zinc.

New York city. R. D'HEUREUSE.

Fireproof Safes.

To the Editor of the Scientific American:

The great fire in New York, in 1835, demonstrated that perfect immunity from fire for records and valuables was to be attained only beneath the surface of the ground. Firms, which in that disaster had their books and papers in vaults, came out from it actually richer than before, the increased value of the soil more than compensating for the loss sustained. Soon after this an ingenious friend of mine constructed a very simple iron safe, suspended by an ordinary rope and counterbalanced as window sashes usually are. This hung over a shaft descending below the floor of the cellar, and, with its door constructed to close always of itself, remained, throughout the time wanted for use, easily accessible. Should a fire occur by day, the rope would burn before the contents could be injured, and the box drop to its vault below. To raise and lower it morning and evening would be a very slight task, if it were properly balanced. The safe was guided by projections fitting in grooves, and on its top were three or more loose iron plates, each larger, by several inches around the margin, than the one below it. The top plate first engaged the projecting rim of the vault and closed it. The next, some four inches lower, rested on and closed another rim projecting upwards, and so on till the safe rested, leaving thus between each plate a space of several inches, with an iron bar passing through the holes in the plates to which the rope is attached. Whatever molten matter might run down, it could not reach beyond the first or second plate. This, I apprehend, is the only principle on which a perfectly fireproof safe can be constructed. As to burglars, what masonry and iron can effect is most easily brought into play in forming the case. In securing the safe then, vertical bars and locks are as easily and effectively applied as in any other form. Modification of these plates as permanent hinged lids on the box below, or otherwise, would perhaps be an improvement. J. J. W.

Philadelphia, Pa.

Indestructible Cities.

To the Editor of the Scientific American:

Can not we Americans invent a city that will not burn? These conflagrating Chicagos, combustible New Yorks and pyrotechnic Portlands are too trying for humanity to endure. Of course Chicago will arise, phœnix-like, from her ashes, and, of course, be consumed again, and with her the wealth and power that might make the earth an Eden, if properly spread over it. And why may not cities spread, while there is "all out doors" around them waiting to be beautified? Now that walled towns have passed away, and the need of crowding human beings into fortified cities for mutual protection from outside barbarians no longer exists—what wisdom, or even common sense, is there in adding house to house, thus making safety impossible, health a miracle, and happiness a myth? Why, with only our present imperfect means of transit, what multitudes of our citizens find their bed rooms from twenty to forty miles from their counting rooms! If our business men can do this, why may not their business follow suit? Could not cotton be sold on the north side of Harlem river, as well as on the south? Were Stewart to build a new "iron dry goods box" next square to his Fifth Avenue palace, would not the fashionable world follow? And if that wily Irishman has had the foresight to insulate his block by a street on every side, why may not poorer men do the same or better? If a Trinity church yard can be sandwiched into Broadway's most crowded part, thus avoiding the possibility of a fire spreading to or from it, why may not every business man have at least a few yards of green grass between him and destruction? That would be an oasis worth looking at, and an insurance that was sure. As things now are, city life is hardly worth the living. What we must insist on are beautiful, safe and wholesome places for human beings to pass their days in, to the end that, with wealth, health may be possible, and happiness not a mere mirage to be looked for only in or beyond the skies. Chicago has taught us two things: that a city can be built in a day, speaking figuratively, and be destroyed in a night, quite literally. Now let her take a "new departure" from ancient errors, and show the world how to create a city that will stand the test of both fire and time. To do this, let every block be insulated from every other; or, better yet, let no more than two business places be joined, and let there be as much space between every two as they both occupy. Let this open space be put down to grass or trees, or built in with green-houses, in which all sorts of exotic fruits could be made to grow. The side walls of the buildings, so coupled, could be pierced with all necessary windows for light and air, balconies (of iron) run along their many upper stories, and closed in with glass when desired. The roof should be entirely of glass set in iron sash, mansard style, thus converting what is usually a dreary dark garret into "a thing of beauty and a joy" to every one who enters its world of sunshine. Then let the upper

"lofts," unused as they generally are for business purposes, be converted into suites of floors, as dwelling places for the thousands of working people, or those employed in the stores below, who are now crowded into wretched far-away dwellings or more wretched tenements. With steam "elevators," these airy homes could be reached in less time than one could cross a street! With blocks so constructed, not more than one need ever be burned at any one fire; and, perhaps, with water introduced in every story on the plan lately shown in the SCIENTIFIC AMERICAN (Hall and Brother's, I think) not even one need ever be entirely destroyed. And with proper "fire escapes," easily provided from the many balconies, not a life need be lost.

But, "this will cost money," is objected. To which I reply: So does insurance (that may never be sure!) So do broken hopes (that can never be mended!) So do wrecked fortunes (that can never be restored!) So do all good things, health, happiness and security,—the crowning excellence of all. In this way, business and salubrity can go hand in hand to make city life what it should be. Our homes could then keep pace with our warehouses, and our comforts with our commerce.

Do you say that this is impossible? Then I say, with Ruskin, "It is indispensable!" J. IVES PEASE.

Stockbridge, Mass.

Testing Boilers Again.

To the Editor of the Scientific American:

In your issue of 21st instant, I find an article headed "Testing Boilers by Hydrostatic Pressure," signed Joseph A. Miller," in which he admits the possibility of testing boilers with a head of water greater than the pressure required. As he claims to feel thankful for the information I gave him on that subject in my letter of September 30th, in reply to his inquiry of the 2d of same month, I will further state for his benefit that it has been done hundreds of times, and will again be done with less injurious results than when done by a pump (notwithstanding his doubts) for the simple reason that the pressure is a steadily increasing one, and easily regulated; whereas, in the other case, the shock or pulsation produced by each stroke of the pump is more severe, upon the same principle that boilers do not sustain the same injury when the engine is at rest as when in operation, cutting off at any given point with equal pressure. This is a well established fact with all practical engineers.

Mr. Miller, after admitting the possibility of such results, endeavors to make a little capital (or administer another kick to a party whom he considers to be going down hill) by accusing me of showing contempt for witnesses before coroners' inquests (using his own words), amongst whom are some of the best and truest men in the country. From practical positive knowledge I fully indorse his description of the character of most of the parties described as witnesses. But I am equally fully aware that there are others who embrace every opportunity offered to rush before juries for the sole purpose of perverting the truth, making statements at variance with facts, and advertising themselves and those who employ them, regardless of whom it may injure.

In this communication, I will state that I have no objection or dislike to any investigation of my conduct when made by honorable men who know of what they speak. Nor have I any fear of Mr. Miller's insinuations injuring me with gentlemen who know me, very many of whom are readers of your valuable paper.

He alludes to my size as being too large to enter manholes, and doubts my habit of wearing overalls. To show that he has no personal knowledge of what he says, I will state that I began to wear the one and enter the other in the year 1833, and have been in the habit of doing both to the present time; facts which may be proven. I am doubtful if his most intimate friends would accuse or credit him with such habits, judging from the knowledge he displays in the mode of testing boilers.

Then ensue other little kicks to the man supposed by him to be going down hill, in the shape of an appeal to humanity and the obligation of oaths, etc. In reply, I can only state that I as deeply regret the loss of life as any man living, and have as much veneration for an oath, and am also willing to be judged by a higher power than man.

He next proceeds to explain the non-elasticity of water and the tendency of containing vessels to assume the shape that will hold the most, also the strain on braces, etc. It seems to me that he was not writing for the edification of the intelligent readers of your paper.

Mr. Miller concludes his article by saying that unless I treat him as a gentleman, he will have nothing more to do with me. If a party, who will allow himself to take advantage of other's misfortunes, and make insinuations entirely devoid of truth, can flatter himself that he is a gentleman, I have yet to learn the true meaning of the term.

I am now done with Mr. Miller, unless his assertions should take a shape that would require notice in a different direction than a newspaper correspondence.

JOHN K. MATHEWS.

New York city.

COAL IN ALASKA.—We hear of the formation of a company for working some beds of coal recently discovered in Alaska. The report states that the coal is of good quality, both bituminous and anthracite. The deposits are found near the coast of the main land, and also on many of the islands. The company states that coal from Alaska can be sold in San Francisco for from $5·50 to $6·00 per tun. We hope it is so. The value of the discovery in such a locality as Alaska can hardly be overrated.

[For the Scientific American.]

ON MUSICAL TELEGRAPH COMPANIES.

BY P. H. VANDER WEYDE, M.D.

I have received a circular and prospectus of a "Musical Telegraph Company," formed recently in Rochester, N. Y., which proposes to connect a number of pianos, by means of electrical attachments, so that they may be all "controlled by one or more performers, or automatically by one or more musicometers." All the instruments are to be placed in one large hall, and "so arranged that notes reach the ear from different points, thus giving fullness and volume to the music;" while, finally, it is said, "It will afford the highest style of accompaniment to the human voice, in particular to that of the female."

The first step will be to construct electrical attachments for ten pianos, and to give, with these instruments, "the highest order of entertainments in different parts of the United States and other countries. The cost of these instruments will be about $20,000." Further, it is said: "Out of the proceeds of these proposed entertainments we will be able to construct, at a cost of half a million, our Grand Electro-musical Hall, which is the ultimate object of our efforts."

Being anxious to know more about this application of electromagnetism to musical performances (as I have given some attention to this subject myself), I ordered the lecture advertised by the president of the company, Mr. Hachenberg, to be sent by mail, but receiving information that it is not published yet, I am obliged to judge about the invention by the light so far received, and do this more readily as the main points are very distinctly stated.

I do not doubt that all cultivated musicians will agree with me that placing ten pianos around in a hall, and causing them to go mechanically all at the same time and in the same way, offers not the least advantage, and that a performance of this kind does by no means merit to be called a "musical entertainment of the highest order." For my part I infinitely prefer one single good grand piano with half a dozen or more or less other instruments, playing one of those classical compositions called quartets, quintets, septets, octets, etc., which the immortal masters have bequeathed to us. In such performances we have the advantage of the different character, color, or *timbre* (as the French call it), of the different instruments, the great charm of the individuality in the style of each separate performer, all of which brings out distinctly the connected thread of the separate melodies, often clashing together, as it were, but forming a whole with which the ear is delighted, and enabled to appreciate easily the multitude of melodies or *polyphony*, as it is technically called.

As the highest style of musical compositions are those of the class referred to, in which each performer executes melodious passages, different one from the other, the hearing a number of ten equal instruments all playing the same tune is, according to my taste, a most excruciating trial for any audience, and to call it "the highest style of accompaniment, in particular for the female," is indeed the highest style of absurdity. Still more so when it is stated that they also will be played automatically by "musicometers," which I understand to be mechanical contrivances containing the music stored up in them, as gasometers contain the provision of gas, the one letting off the music when turned on, the other the gas. Most likely the word is only a new name for a revolving drum, like that of a barrel organ.

Besides all this, experience has sufficiently proved that when two able performers play a classical composition for four hands on one good piano, everything is obtained which can be had out of this instrument, and that there is no advantage whatever gained in the effect by the addition of one or more other pianos. In regard to strength I say that one good grand piano is fully strong enough when four hands perform on it. What now must I think about the judgment in musical matters possessed by Mr. Hachenberg, when I read also in his programme: "One performer can play simultaneously two sets of instruments, the left hand controlling one set, and the right hand the other, and, in a duet, two players can play two sets of instruments." Any player can test the advantage of this proposition practically, by placing two pianos (upright ones are the best for this purpose) so close together at an angle that he can easily reach the two keyboards, and play on both at the same time; he finds then, musically illustrated, that two halves never make more than one whole. Connecting them electrically with different sets of instruments would make some difference in the effect, as the bass part may then be heard at one side of the room, and the treble part opposite, but this difference would not amount to much after all.

It may be interesting to trace the growth of the idea of applying the galvanic currents to keyed instruments; it was of course suggested by the fact that the House, Hudges, and a few other telegraphs use keyboards. The first description of such an instrument, we find in the London *Scientific Review* for 1866; it was noticed in the SCIENTIFIC AMERICAN for April 28, 1866, page 285. An organ worked on this principle was on exhibition at the Fair of the American Institute, New York, in September, 1869; it was made at the organ building establishment of Messrs. Hall, Labach & Co., who later applied it practically in St. Thomas's Church, New York, where the organist plays two organs, one directly and one with a separate keyboard, also in front of him, electrically connected with the other organ at the opposite side of the church. The pressure on any key, making contact, sends the current along the corresponding wire, which charges an electromagnet, by the attraction of which the valve of the proper tone opens, in the wind chest of the organ, while in the case of the piano it lifts the hammer.

The main expense is that there must be as many wires as there are keys, but they may be isolated and combined like a telegraph cable. There also must be as many small electromagnets. The battery may be either near the player or near the instrument or in any point of the circuit, while the keyboard of the player may be a plain keyboard without giving sound, acting electrically on one or more instruments at any distance.

As now the distance on which the current instantaneously acts may be very large, it is not necessary at all to place the ten pianos of Mr. Hachenberg in the same room. I should rather propose to place them in ten different concert halls of a large city and its suburbs; for instance, let the main performer, say Franz Lizst, play on a Steinway grand in the Academy of Music, New York, and let there be an electric connection between this piano and some others in the city, also one in Brooklyn, in Jersey City, Newark, Trenton, and even Philadelphia. What is to hinder to lay the musical cable to Boston, Baltimore, and Washington, so that all these cities would be musically connected, and the performance of a great player in one city be enjoyed simultaneously in all the others? I think that this would be a much more promising plan, pecuniarily, than placing all ten pianos in one room, as then ten times as many people could hear, and pay for, the performance of a single artist.

This my idea, however, appears to be not new, as the London *Athenæum* already has suggested that the organs of the various churches in London be connected, in this way, with the keyboards in St. Paul's, so as to give them all the benefit of the excellent organ playing there. It strikes me, however, that while I found that the clergymen in St. Paul's hurry through their duties there with an astonishing rapidity, it would be difficult for many others of a more sedate temperament, who officiate in the other churches, to prevent being continually interrupted by the music, before they had time to come to the respective ends of their first and second lessons.

I think, therefore, such a plan rather impracticable, and likely to meet with serious and well founded opposition. It would be a much better plan to have in a large city, say New York, Philadelphia, or Boston, a company formed to furnish music to those who desire it. This company could have, at its headquarters, pianos played upon by a set of good performers, engaged for the purpose; to each piano could be attached a cable of wires connecting it with the pianos at the houses of those who desire to be supplied with music, in the same way as they are already connected by means of pipes, with the gas works or reservoirs, in order to be supplied with gas or water. If any one wants music, he only has to turn it on, the key being a simple arrangement to make metallic contact with the cable, and then the piano starts at once and plays the music which is being performed at the musical depot or headquarters. This special arrangement of being able to turn the music on and off, *ad libitum*, like gas or water, is an essential condition in my plan, as it would be very undesirable to be obliged to have to listen to all the music the headquarters could furnish; it would be almost as bad as to be obliged to use all the water or gas that would be supplied, in case we had no stopcocks to keep it shut till wanted. Another advantage of this musical shutting off arrangement is that we may stop the piano at any time without insulting the player, which will be appreciated by all who have been obliged to listen to music, out of mere politeness, while they rather would talk.

But as there are many kinds of music, while there is but one kind of water or gas, it is necessary to have a choice in order to have the music appropriate to circumstances. A polka at a funeral, or "Old Hundred" at a dancing party, would be somewhat out of place, and therefore I propose that there should be, at the musical depot, several sets of players, one set for sacred music, one for dancing music, one for classical music, one for operatic selections, etc. Each set has a separate room with an instrument, and plays in succession continually, according to a programme previously selected, printed, and published in the newspapers. The inhabitants of the musically blessed town have then only to look at their watches to see what music they may get, and if the time for the desired piece has arrived, turn it on; or, if they are not particular about the piece, they may choose any time between different styles, and may be influenced by serious or lively performances, according to their desires. Or, for the sake of simplicity and economy, different styles could be performed on a single piano at different set hours, say a collection of sacred music for the morning hours, at that time that family prayers are most likely going on dancing music at night, when the young folks are keeping parties, etc.

In regard to the expense of being furnished in this way with any amount of music, I dare say that it would be a trifle, compared by that spent by the head of a family of daughters, when they take, year after year, music lessons. Besides we must take in consideration the enormous saving of time to the young ladies in not being obliged to study an art in which most of them never attain any proficiency, and forget all about it afterward. What a field opens itself here for the promotion of woman's rights! How many could then devote themselves to politics, which is a much more profitable business than drumming on the piano! And the most glorious result of all would be that the electromagnetic musical telegraph company would be the most active agent to accomplish the emancipation of the female sex, now oppressed by being obliged to lose so much time in studying music in addition to other absolutely necessary accomplishments.

New York city.

Corn Sheller and Vegetable and Meat Slicer.

We have been much pleased by an examination of this simple machine. We say simple—a machine that consists of only four moving working parts, and that will accomplish what this will, is certainly entitled to that appellation.

It consists of the toothed disk, A, turned by the winch, B, the concave, C (held up to its work by the spring, D), and the meat or vegetable hopper, E, with the pivoted and movable side, F.

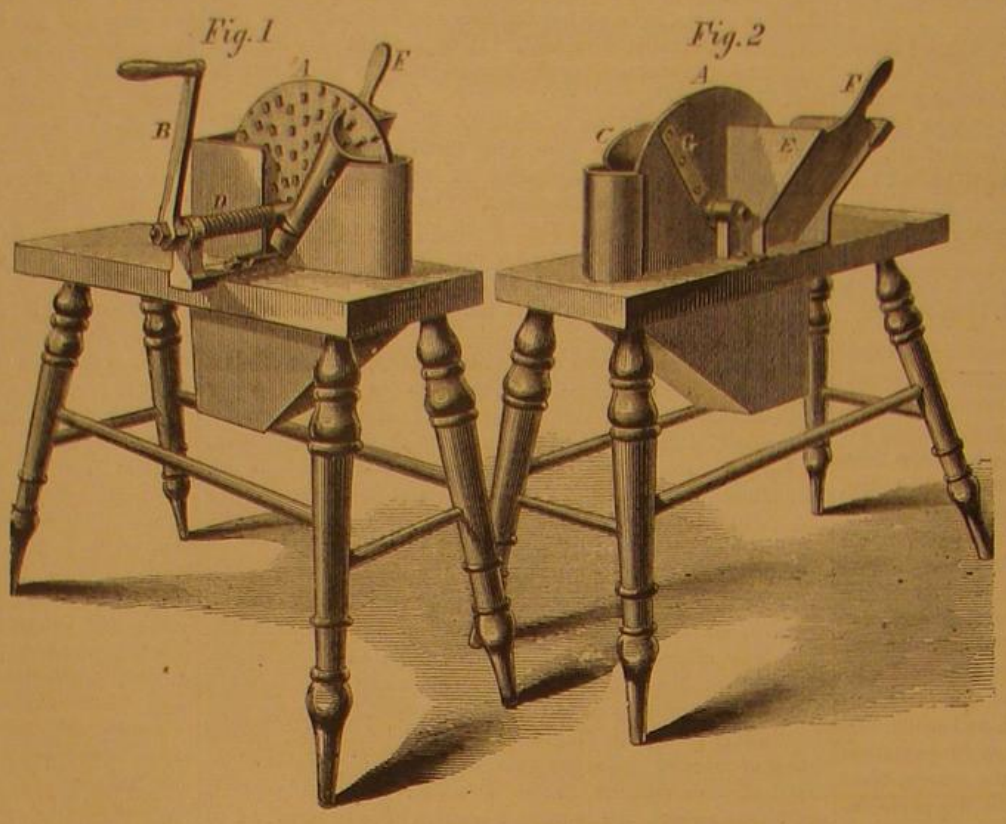
Corn is shelled by putting the ears into the concave, C, and turning the winch. The teeth on the disk, A, meet with and shell off the kernels, as the ear drops, by its own weight, down through a chute provided for it; and the corn may be caught below in a basket.

In the disk are formed slots to which are adapted knives, G, on the side opposite the teeth, as shown in Fig. 2. These are the meat or vegetable cutters. The substance to be sliced is placed in the hopper, E, and pressed up against the knives by the handle in the pivoted side, F, of the hopper.

This may be done by one hand, while the other turns the crank, the operation proceeding with facility, the operator sitting on the bench.

Machines of this kind are made with he hopper, E, extending the whole width of the disk, so as to admit two heads of cabbage, if desired.

This simple and useful machine was patented May 3, 1870, by Jeremiah P. Smith, whom address for further information, Schuylkill Haven, Pa.



SMITH'S COMBINED CORN SHELLER AND VEGETABLE AND MEAT CUTTER.

Sleeplessness.

The best anodyne is a liberal amount of muscular activity out of doors every day. Persons who sit around the fire and lounge on the sofa, or read or sew a great part of the day, need not expect sound sleep; only the laboring man can taste it in all its sweetness.

Many fail to sleep at night because they will persist in sleeping in the day time. It is just as impossible to healthfully force more sleep on the system than the proportion of exercise requires, as to force the stomach to digest more food than the body requires. Rather than court sleep by industrious activities, many persons resort to medicine, and every new drug which is heralded as a promoter of sleep becomes at once immensely popular, even though it is known to possess dangerous qualities.

Chloral hydrate has had a great run, and even young men are known to be purchasing it at the drug stores, to be used in promoting sleep; it should never be taken unless advised by the family physician, for the medical journals are constantly publishing cases where serious harm and even fatal results attend its habitual use.—*Journal of Health.*

Improved Builders' Scaffold.

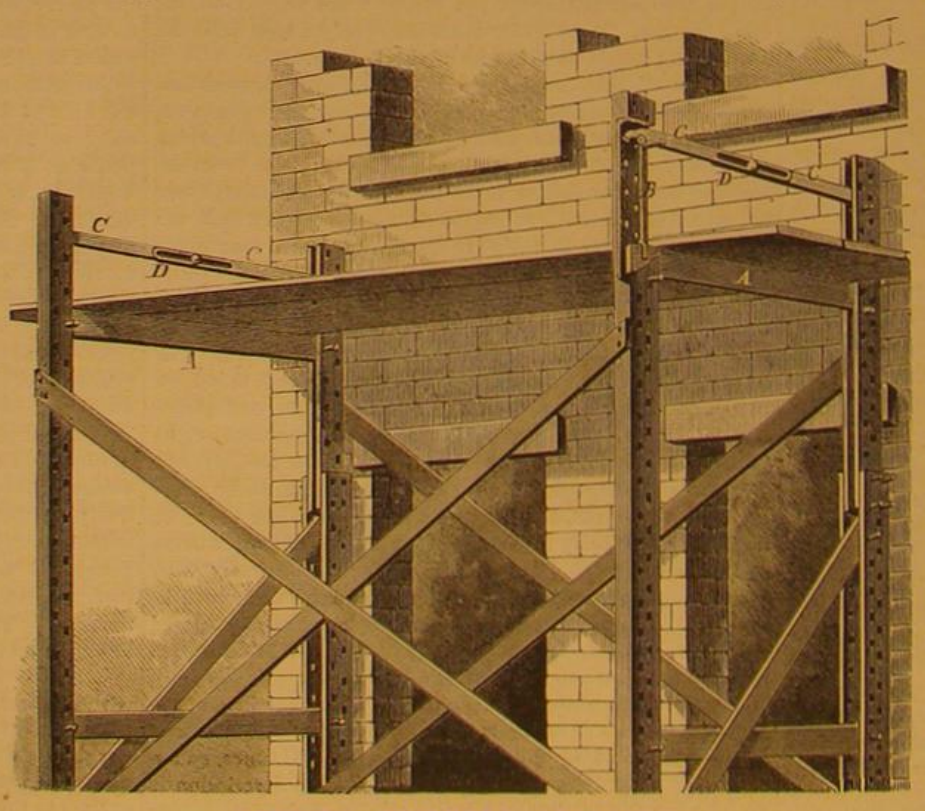
This is a very simple and cheap modification of the support of builders' scaffolding, whereby the workmen may elevate or lower themselves, together with the platform and its burden of tools and materials, without dismounting from the platform.

The supports of the scaffold are provided with holes, as shown, into which wood or metal pins are thrust. These pins support the crossbars, A. These crossbars are connected with links, B, one of which is shown in the engraving, a portion of the frame of the scaffold being broken away to show the position of the link relatively to the frame. These links are pivoted to the ends of the jointed levers, C, the joints, D, of the levers being slotted, so that they may be depressed or raised in the center without becoming disconnected. The outer ends of these levers rest upon movable pins placed inside the links.

The workman, stepping to the end of the platform, may depress the middle joint, D, which will, through the links, B, raise the end of the platform. Another workman then adjusts the pins to hold the platform thus raised, and the same operation is repeated at the other end.

In this way, the platform may be elevated to any extent desired; or, by reversing the movement, it may be lowered. The practical character of the invention will be apparent to carpenters, masons, and house painters.

This improvement was patented through the Scientific American Patent Agency, August 29, 1871. Address, for further information, Redick & Kunkle, Butler, Ohio.



REDICK'S BUILDERS' SCAFFOLD.

Cottrell's Improvement in Printing Presses.

The invention of Mr. Calvert B. Cottrell, of Westerly, Rhode Island, relates to improvements in that class of presses in which the reciprocating table is arrested by an air spring. The air spring apparatus is arranged for automatically increasing the quantity of air acted upon as the speed of the machine increases and greater pressure is required to arrest the table, and for diminishing the quantity as the machine slows, so that the movements of the table will be equal, whether running fast or slow, and the action of the machine will be more uniform in other respects.

Those familiar with this class of presses are aware that the motion of the heavy table is arrested by the action of a piston which enters a cylinder, and, compressing the inclosed air, is thus gradually brought to rest.

The varying the quantity of air, acted upon according to the speed of the table, is accomplished in Mr. Cottrell's improvement by allowing a considerable quantity of air behind the piston to escape when running slowly, thus making the pistons act upon a smaller quantity, which, being properly regulated according to the speed of the table, admits of always having the table stop at the same point. To this end, he makes tubular connections, from the air cylinder to a drum cylinder, for a check valve, to be opened more or less to let the air escape. For varying the speed of the valve, he employs a speed governor or regulator, such as is commonly employed upon steam engines for actuating throttle valves, gearing the said governor with some part of the machine, so that its speed will be governed by the speed of the machine, and arranging it with the check valve so that, as the speed increases and the balls rise or swing away from the axis, the valve will be closed. He also connects a pressure gage with the air cylinder, or any other suitable part, to indicate the compression of the air and show the variations thereof due to different speeds, and to facilitate the adjustment of the governor for varying the openings of the valve for any given speed.

The governor always opens the check valve on the stopping of the machine, so that the air will be allowed to escape from the pistons when starting, thus avoiding the necessity of compressing the air when the driving belt has but little adhesion to the pulley or when the table is moved by hand, as is sometimes required.

A HUNDRED years of wrong do not make an hour of right.

How it Burned.

There have been not less than nine hundred causes assigned for the Chicago conflagration by people who, residing many miles away and knowing nothing about the circumstances, may be supposed to be as "unprejudiced" as Johnson's ideal critic on the subject which they treat. A majority of the opinions attribute the calamity directly to the "wrath of God;" some assigning one cause and others the opposite for the aforesaid wrath. A Toledo opinion lays it all to petroleum, and locates the oil in the pores of our building stone. The foundation for this theory consists in a statement made in a late number of *Silliman's Journal*, that many houses in this city are built of an oil bearing limestone found hereabouts. The sudden combustion of all buildings in the track of the fire furnishes the rest of the evidence. We don't know how the advocates of this theory will reason when they learn that the Second Presbyterian Church, the only edifice built of the "oil bearing" stone, is the best preserved ruin in its neighborhood, much better for instance than the Field & Leiter store, of Westchester marble. Perhaps they will have to fall back upon *Silliman* to explain that phenomenon, or else upon the wrath of God in general, leaving petroleum walls, pine pavements, the Fire Commissioners, and the O'Leary cow all out of the account. The fact is, it is difficult to see how the fire, having got the start that it did at De Roven street and again at "Conley's Patch," could have burned any less than it did. The roofs and sidings of acres of wooden buildings were dry as touchwood in the first place, and were then rendered trebly inflammable by the furnace heat with which the wind surrounded them. This wind—the hardest known here in many seasons—not only wafted brands upon all roofs and under all cornices, and awnings, and sign boards, through all windows, shivered by the heat, but acted as powerfully as the most powerful blowpipe in furnishing oxygen to feed the flame. If any person wishes to see why Chicago burned, he has only to construct a small model of a store or house—made of and filled with such materials as are usually put into stores and houses, place the same in the blast furnace of an iron mill, and see how it will come out when the blast is over.—*Chicago Tribune.*

Ryder's Improved Candle.

In this invention a new manner of arranging wicks in candles is employed, with the object of enlarging the flame and utilizing to the fullest extent the combustible material. The invention consists in so applying two or more braided wicks to one candle that, without the aid of other devices or substances, their burning ends will turn away from each other.

In braided flat wicks, the opposite faces differ from each other by having the strands on one converge downwardly while on the opposite side they converge toward the upper end. When one end of such a wick is ignited, it will be bent to that side on which the strands converge upwardly toward the flame. This bending is effected by the position of the strands, for when burnt, they meet on top, and their upper ends, being liberated, will bend under the influence of the heat, while on the other side, where the strands converge downwardly, they are always held at and braced by the lower junctions. The heat tends to twist and curve the burning wick, whose strands, when it becomes disintegrated on one side, will, on just that side, bend in a direction where they are unopposed, and draw the entire burning portion of the wick to the same side.

Thus, when a candle carrying two wicks is so constructed that those sides of the wicks where the strands converge upwardly are on the outer sides, the burning ends of such wicks will both be bent or curved outwardly. The flame is thereby enlarged, and the consumption of oxygen consequently increased, so that the quality of light is also improved.

This is the recently patented invention of Mr. Henry Ryder, of Bristol, Mass. The candles thus made do not require snuffing, and on this as well, as other accounts, are particularly adapted for use in railway cars, omnibuses, etc.

AN AUSTRALIAN contemporary draws a picture of a New Zealander, 2,000 years hence, coming to Victoria and extracting gold from the tailing of the deserted gold fields. And yet this is no caricature or exaggeration, for a similar thing is now taking place in Greece. The silver mines of Laurium were abandoned as exhausted 300 years, B. C.; but a company is now working the *scoria*, rejected as worthless twenty-one centuries ago, and has created a community of 4,000 persons whose livelihood is drawn from this occupation.

A PRUSSIAN engineer has, it is said, invented a machine which will manufacture ice without chemicals, merely by compression and expulsion of air. A machine makes two tuns of ice per day, and the capacity can be increased to twenty tuns.

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Contents:

(Illustrated articles are marked with an asterisk.)

SUITABLE BUILDING MATERIAL FOR CITIES.

Recent events have turned the attention of thoughtful people to a consideration of the question of building material for large towns. It no longer appears proper to permit indiscriminate constructions, where the safety of a whole community may be endangered. We have, in large cities, superintendents of buildings, but they generally confine their attentions to the question of security against falling, and not to the character of the building material, excepting in so far as wooden structures may be prohibited in certain districts. There would now appear to be cogent reasons why commissioners should be appointed to secure greater precautions than the mere question of wood and iron. A mixed commission, composed of builders, architects, underwriters, firemen, and scientific experts, could be appointed to study the whole subject and report thereon to the government. This commission could very properly decide upon the survey of streets, and the width, the kind of pavement and flagging to be used. They could lay down water pipes and establish hydrants at suitable distances, and see to proper arrangements for extinguishing any fires that might arise; but the most important duty to be assigned to them would be the control of building material in certain sections of the city.

By insisting upon the construction of a row of buildings, up and down and across town, as nearly fireproof as it is possible to make them, a wall, impervious to fire and constituting a barrier impassable to any ordinary conflagration, would arrest the flames and save whole sections of the city. A street, built up entirely of fireproof buildings, would be a novelty; but in the light of recent events, it would appear to offer great protection, and it may be worth while to designate what streets shall be of this character, and then insist upon a compliance with the prescribed style of building. Having adopted some such plan as this, the commission would have to study the kind of building material best adapted to city structures, combining security and durability with reasonable economy. This opens up the whole question of the comparative value, for building purposes, of wood, iron, and stone. They tried wood in Chicago, without having treated any of the material with the numerous agents that have been recommended to render it incombustible; and the sad consequences of this neglect ought to serve as a warning to all other cities. If the wood had been saturated with soluble glass, ior soaked first in phosphate of soda and afterwards in chlorde of barium, it could not have been set on fire. The latter mixture may be too expensive for use on a large scale; but silicate of soda, or soluble glass, can be obtained in sufficiently large quantities, and at such reasonable rates, as to admit of the preparation of the shingles, clapboards, and all exposed portions of frame buildings. Any such precaution as this has the double advantage of protecting against fire, and securing against decay; and, in the long run, would be found to be the greatest economy.

If people will insist upon constructing frame buildings in large towns, they ought to be compelled to render them essentially fireproof by the above chemical mixture. So many experiments have been tried with soluble glass that the security it affords against fire and decay may be considered as fully determined. Wood thus prepared will char and smolder, but will not burst into flame; and hence there could be no scattering of cinders or blowing about of firebrands.

Where frame buildings are tolerated, the fire marshal might justly insist upon a chemical preparation of the wood—an operation that could easily enough be done, if it were imperatively required. The scientific experts on the commissions would be apt to report in accordance with the principles laid down above, and by degrees the dealers in lumber would learn how to furnish a building material nearly as durable as iron.

In reference to the use of iron for houses, the facts, that it is employed to a large extent, and that we are constantly acquiring greater skill in its manipulation and management, are sufficient proof of its practicability. In Chicago, however, this material proved unavailing, for the reason that the wooden structures made a fire hotter far than a blast furnace constructed to melt pig iron. No iron could stand such a heat, and it melted down like wax. This was not the fault of the iron, but caused by the neglect to prepare the wood against such an emergency; and no one will be likely to condemn iron structures on account of their failure in Chicago.

A third building material is stone, and this may be divided into the native and artificial. There are a good many varieties of stone suitable for building purposes; but the cost of quarrying, transportation, and working, is so great in this country as almost to shut this material out of competition. This objection does not apply to artificial stone. The lime and sand required to make artificial stone can be found nearly everywhere. They can be mixed by simple machinery, and require no labor to cut them into shape; but the plastic material can be run into any kind of a mold, where it dries in a few hours, and one layer after another can be carried up in marvelously short time.

For rapidity of construction, for durability, for security against fire, for warmth, and ventilation, for dryness and health, for economy, for architectural effects, there is nothing like artificial stone; and we look upon this material as the most suitable for cities and as probably destined to supersede all other. It only needs the popular dissemination of information on the subject to occasion a demand for artificial stone; and as soon as such a demand is created, this material can be furnished in any quantity in all parts of the country; and we shall have it for our cellars and our ice houses, our sewers, cisterns, wells, water pipes, paths, roads, schools, churches, dwelling houses, and stores, in a way that will make us wonder how we ever performed the slow and tedious labor of hewing out stones or laying up brick, when we could have formed a whole house at one casting—as Krupp pours the melted steel into molds, and produces a cannon of any size.

In a country where labor is as dear as it is with us, where wood is becoming scarce, where iron is needed for other purposes than houses, where the native rock is difficult to work, the suitable building material would appear to be artificial stone.

DR. CROOKES AND PSYCHIC FORCE.

Dr. Crookes is a bold man, or he never would have braved the storm of ridicule he has invoked by the assertion that the manifestations, which have hitherto been ascribed to spirits or to legerdemain, are simply the result of a natural hitherto unrecognised force residing in the human organism. He is also a candid man, as is shown by the way he discusses this question with those whose insinuations must be irritating in the extreme. That he is an earnest man, none who know him through his previous labors will deny. To admit these characteristics is to admit that their possessor is entitled to a certain degree of respect, even if ability, which alone can make them valuable in scientific research, should be lacking.

But the past record of Dr. Crookes proves him no intellectual pigmy. He has been a power in the scientific world. These facts entitle every assertion he makes to the belief that we willingly accord to the asseverations of men whose veracity stands proved by years of honest record.

We therefore accept the statements, made by this investigator relative to certain results obtained in his experiments with Mr. Home and others, published in another part of this paper, as correctly describing the deflection of the mahogany board, the increased tension of the spring balance, the tracing of curves upon smoked glass, and the taps upon the parchment disk.

Some force actuated the apparatus that thus moved. Was it a force that resides in the human organism, or was it some other force or forces already known to scientists? Dr. Crookes thinks he has shown it to be what he calls "psychic force;" but we submit, that while, upon his own showing, there is some ground for inference that the persons present, called "psychics," had some connection with the effects produced, the nature of this connection is not proved by anything yet said or done, or written, by Dr. Crookes. It is merely inferred that out of the bodies of these persons proceeds a curious and inexplicable influence that fitfully acts with, or opposes, gravity, at the will of the "psychic."

Dr. Crookes seems to be surprised that his experiments are not now accepted as conclusive proof of such a force. But it would be far more surprising that they should be so accepted. All known forces act uniformly upon the establishment of known conditions. When first discovered, it was by the establishment of such conditions that their existence was demonstrated. When it has been desired to use them, the same set of circumstances, under which they first became known to man, invokes them at once.

Not so with the psychic force. Dr. Crookes arranges his apparatus, brings in his psychic, and yet often fails to obtain results. Unlike Galvani, whom he quotes, he cannot always make his frog kick. If it be objected that certain unknown conditions, in the bodies of psychics, must spontaneously, or at least independently of any external agency, be set up, in addition to the proper adjustment of apparatus, then we say that the existence of psychic force remains undemonstrated; for force only manifests itself in a specific recognizable form under certain regular conditions of its action. When we see a body moving away from the earth we know that some other force than gravity has for the time control of it, because gravity, like other forces, acts according to fixed laws, and, unopposed by adverse conditions, draws bodies towards the earth's centre. There is nothing fitful, capricious or intermittent about the action of any force by itself.

Variations appear only under conditions which always accompany apparent changes.

Thus, suppose that some one had, for the first time, felt a shock upon touching an electric eel, and, repeating his experiments, should find the shocks, after a time, discontinued. Having first attributed the sensation to the force emanating from the eel, he would now doubt that this animal was the source of the influence, and would look for other causes. Not till he found that the shocks uniformly ceased upon the exhaustion of the fish, would he satisfy himself that the force really resided in it. Variations in the manifestations of a force must, therefore, be traced to uniform conditions, as they are really a part of the characteristics which enable us to place the force in its proper category.

Dr. Crookes takes the ground that this is no argument against the existence of psychic force. He not only—to use his own language—fails to furnish "any dynamic equivalent of psychic force, or any formulæ for the varying intensity of Mr. Home's power," but he fails to account for the sometimes total cessation of its action under circumstances apparently precisely like those under which it acts with maximum vigor.

Some more definite relations between the effects and their cause must be established before psychism will take its place in the list of physical sciences.

AMERICAN FORESTS.

What with the immense drafts made upon the store of valuable timber possessed by this country, and the terribly destructive fires that almost annually visit some portion of our wooded regions, we are fast reducing our supply, and raising the value of industrial woods in the market.

Still we seem to regard the end as something remote, and to imagine that something will turn up ere our timber shall become exhausted. We speak of the exhaustion of the English coal fields, which, at present rates of consumption, will have been reached about *Anno Domini* 2,971, as something to be dreaded, but at present rates, we may fix a much nearer date for the total denudation of our valuable forests, the annual drain upon which now far exceeds the natural growth, and is constantly increasing.

We have more than once endeavored to awaken a realization of this fact in the public mind, which, however, contents itself with present plenty, and puts away the thought of anticipated evil.

The industries employing wood, as the basis of their operations, are of a magnitude scarcely second to any on this continent. We have perfected machinery, for working timber, that is marvelous in the speed and delicacy of its operation, yet the time will come, unless our forests are preserved, when the majority of these industries will have passed away.

Now, there are vast tracts of country where scarcely anything except timber can be properly cultivated, and, by proper attention on the part of the General Government, the oftimes worthless, or comparatively worthless, timber now growing upon them, might easily be replaced by that of great value in the arts. There is no more reason why we should not cultivate oak, or hickory, or pine, than corn or wheat.

The trouble has been that we have looked upon the timber supply as practically inexhaustible, and so have overlooked a means of perpetuating and increasing this element of our national wealth.

In Europe, where the importance of a liberal supply of timber has been long felt, active measures have been taken on the part of various governments to protect existing forests and encourage the cultivation of timber. It is estimated that there yet remain in France 2,700,000 acres of State forest, the revenue of which, previous to the recent war, was $8,700,000. Bavaria has about 2,000,000 acres of forest; Prussia, as it existed before the war, had upwards of 5,000,000 acres. In each of these countries, schools of forestry, under State control, are supported, in which men are trained in the scientific and economical management of the State timber lands.

The attention of England has been turned to the preservation of the sal and teak forests in India. Of the latter, it was found that, within eight years from the time the forests of the native princes were thrown open to the public, teak timber, suitable for government use, was becoming scarce in Madras and Bombay. The opening of these forests was in 1822. The sal forests are more extensive. Those belonging to the British Government cover 3,500 square miles; but it is estimated, by good authority, that a rest of at least fifty years would be requisite to make good the inroads upon this supply.

Surely our timber is as worthy the attention of the Government as our mineral wealth, and it is high time that some means, like those adopted in Europe, be employed to save and develop it. The origin of the fires that do so much havoc ought to be investigated; and, if possible, means of prevention adopted.

As one means of protection against fire, we suggest that artificial breaks in the continuity of forests would, if they could be made practicable, aid somewhat in preventing the progress of a conflagration, especially if the cleared spaces were brought under cultivation. In extraordinarily dry weather, a fire might probably cross three or four miles of cultivated

land, but in most seasons this could hardly occur. If, in placing the public lands in market, alternate sections, of sufficient width, were first sold, the intervening ones being reserved, the tendency would be to ultimately break up the forest regions in just the way indicated.

As to those reckless persons who, careless of results, fire burning wads, throw stumps of cigars or knock the fire out of their tobacco pipes, into dry leaves, regardless of the extent of damage to which their carelessness may lead, it is probably difficult to reach them by law, but something might be done toward awakening in them a sense of moral responsibility by properly circulated printed warnings, and appeals to their humanity. Such a course would tend to render the thoughtless thoughtful, and would lessen risks.

It is to be hoped that the attention of Congress will be called to the importance of this subject at its next session; and that at least some experimental attempts will be made to lessen the enormous waste which now goes on entirely unchecked by any effort to prevent it.

GENERAL REFLECTIONS SUGGESTED BY THE FAIR OF THE AMERICAN INSTITUTE.

It would be strange if such a display of mechanical, chemical, and general industrial improvement, as is now on exhibition at the Fair of the American Institute, should fail to suggest many valuable hints to the thoughtful mind.

There are thousands who go to such places merely for amusement, and for such there is generally plenty of food for mirth in the eccentricities of exhibitors and spectators, and the amusing incidents that are sure to take place in any large gathering of people.

There are others whose minds are ever on the alert to gather some crumbs of instruction from every thing with which they come in contact. Such will see, in many things displayed this year, that mechanical invention, asserted by some pessimists to be on the decline, is really in the full pride of its strength; that it still retains its eager scent for novelties, and that, the combinations of crude elements into new forms of beauty and usefulness being infinite, there can be no such thing as an end to invention.

One of the most striking of the features of this year's display, is the advance made in cutting and working hard materials. The diamond rock drilling and stone sawing, and, the greatest triumph of all, the process of cutting stone, glass, and even more refractory materials, by the simple agency of a sand blast, have placed resources, at the command of the engineer, the architect, and the decorator, that open an entirely new field of industry, into which an army of workers will be shortly introduced.

No one can pass through this collection without observing numerous new applications of electricity in the arts. If this force fails to give us a motor, of sufficient power and economy to propel machinery, it furnishes one of the very best means of controlling other forces, almost imparting intelligence and feeling to the performance of automatic machinery, and acting with a delicacy approaching the sense of touch. It is evident that the uses of electricity are destined to become far more widely extended than at present, and it may be that even that grandest of human achievements, the electric telegraph, may find its peer in other applications of this subtile yet docile force, that, like light and heat, pervades the universe.

The various displays of ornamental art show, strikingly, the increase of desire for luxurious living, and the endless craving of the human heart for something more and better than it already possesses. This craving has kept the demand, for everything that human ingenuity can produce, fully up to the supply, and will so continue it, no matter how many and various may be the productions which loom, forge, the sculptor's chisel and the painter's brush, throw upon the market. "The eye is never satisfied with seeing," said Solomon, and so long as inventors produce novelties, just so long will they find them absorbed into the multitude of things which taste and the means to gratify it collect in modern homes.

In the steam engineering display are to be found ample evidences of two important tendencies of the time, namely, to the increased use of sectional and safety boilers, and the employment of all attainable safeguards against neglect of boiler tenders. People have been, by numerous destructive accidents, thoroughly aroused to the importance of caution in the use of steam, and desire to enforce careful attendance by the use of tell-tale appliances, that bring carelessness into light; and the general feeling, among those who use light steam power, seems to be that safety is preferable to economy, if both cannot be secured together. For light powers, also, simple forms of engines, having few parts and complications, are preferred to those of more complicated forms, even though the latter may give more economical results.

In household and domestic appliances and utensils, there is a constant accession of new inventions; and judging from the favor many of these simple yet useful things seem to obtain, there must be always purchasers for any meritorious novelty in this line. There is a great variety of these articles at the present fair, and the interest taken in them shows that, after all, the homely things of practical utility are even more attractive to the average mind than works of art.

Of the latter, there are enough exhibited to show that, in the arts of design, the country is making rapid strides, and may hope to rival older countries in this field, as it has surpassed them in others.

Not to extend these rambling thoughts to a tedious length, we will conclude by remarking that the educational influence and power of such exhibitions, upon the public mind, can scarcely be overrated. In them are combined, in the most attractive manner, both instruction and amusement, without any objectionable features. For these reasons, they should be well encouraged. Every parent who desires to instil healthy tastes and principles into the minds of youth has an interest in their support.

USE OF SODIUM FOR BLASTING.

The employment of sodium for blasting rocks has been frequently proposed, and numerous experiments have been tried. The subject is again revived, and we have some of the figures upon which its use is founded. To decompose 9 parts, by weight, of water, 23 parts, by weight, of sodium, are required; and the product is 31 parts of soda and 1 part of hydrogen. If we employ 46 grammes of sodium, this will evolve, with 18 grammes of water, 2 grammes of hydrogen, which occupies a space equal to 22,471·9 cubic centimeters. If the sodium be sealed up in a glass ball of the capacity of 50 cubic centimeters (46 grammes sodium occupy 44·7 cubic centimeters), the hydrogen gas will exert an explosive force against the walls equal to 450 atmospheres. In the practical application, it is proposed to take two glass bulbs connected by a thin tube. In the upper bulb is placed the metallic sodium; in the neck between is formed a soluble salt, and in the lower bulb is drawn some water, when required for use. By filling the lower bulb with water, and inverting it, the salt will gradually dissolve and give the water access to the sodium, and the explosion follows.

The bulbs can be safely transported, as the water is put in like a charge of powder, and the length of time required for the melting away of the intervening salt can be calculated.

For submarine blasting, for employment in crevices, for hollow trees, and other purposes in which gunpowder is not easily available, a fuse of metallic sodium can be highly recommended.

PROPULSION OF STREET CARS.

The writer well recollects how, in his youth, together with other mischievous boys, he used to hang an old red flannel shirt on the fence of a pasture in which was inclosed a bull. Then hiding in an adjacent thicket, it was considered glorious fun to watch the irritated animal, as he would paw, and bellow, and finally charge at the shirt, usually going through the fence; when, before he could recover himself, the shirt was withdrawn from his sight, through the agency of a piece of strong twine, and the enraged animal would recover his temper in his supreme astonishment at his supposed complete destruction of the irritating object.

The public, like this bull, often rushes pell mell at any proposed innovation, without stopping to consider whether there is any good ground for its opposition. It is always ready with objections against anything new, whether it has reason on its side or not.

Inventors have been busy working out ways and means to propel street cars without the aid of horses. Few of them have stopped to consider, that, when they have solved their problem, they will have another to solve, namely, how to allay the foolish fear that such cars, running by steam or other power than that furnished by animals, will frighten horses.

When carriages were first introduced, they were strenuously objected to, and it was even attempted to suppress them by law. When Stephenson was endeavoring to convince the public of the practicability of steam railways, a member of parliament objected that cows would get in the way of the locomotives and be killed; yet we have now plenty of carriages and locomotives, and the world appears to have benefitted by them.

An inventor, who has been a long time experimenting on the practicability of propelling street cars by steam, remarked to us the other day that, were he to put up a brass Yankee clock on the front of one of these vehicles, and demonstrate that he could thus draw cars at the proper speed, the public would object to their use.

Now, not one man in a hundred, in any large city, owns a horse, and not one horse in a hundred is of such bad disposition that he could not readily be broken to tolerate, in the most dispassionate manner, the passage of a street car that ran without horses. So that this objection, sifted down, amounts to the assumption of the privileges of one person in ten thousand as paramount to the interests of all the rest.

There are no doubt many ways in which the application of steam could be made to street cars, which would meet the objections to smoke and ashes discharged in the street, and the puffing of the exhaust. In fact, we know of more than one invention in which these drawbacks have been obviated. Such objections can not lie against the ammonia engine of Dr. Lamm, illustrated and described in our last issue.

There are, however, some requirements in engines for this purpose that many inventors have overlooked. One of these is the ability to mount grades without carrying a surplus of steam on levels. To do the latter, is to waste fuel; and to raise steam quick enough, on the approach to short grades, if not impossible, is, to say the least, not the most scientific and mechanical way of accomplishing the desired object.

The better way is to use the minimum power, required for ordinary grades, for surmounting heavy grades, the latter being ascended slowly enough to permit this.

There are several ways in which this has already been done; the more important of which are, the use of gearing to slow down the motion of the car, while the engine makes the same number of strokes per minute; and the use of a compound engine, the large cylinder of which is worked at high pressure while ascending grades. Either of these plans accomplishes the end sought, but neither seem to provide for that nice adaptation of power to the character of the work to be performed, in a way to satisfy the ideal of nicety in the operation of an engine, as attained by the link motion on locomotives.

There is a wide field for invention in providing the means for drawing cars on city and suburban trainways, and, if we mistake not, the time is nearly ripe for their introduction. We know of several important companies that are anxious to get rid of their bondage to horse-flesh, and some of them are even now experimenting to find the invention that will emancipate them from an expensive and unsatisfactory system.

IMPROVEMENT IN PAVEMENTS—ARTIFICIAL STONE FLAGGING FOR SIDEWALKS.

Our readers will recollect an article on artificial stone, published on page 336, Vol. XXII of the SCIENTIFIC AMERICAN, in which special reference was made to an artificial stone, manufactured by Mr. Herman A. Gunther, now of the firm of H. A. Gunther & Co., 460 Broome St., New York. The basis of this stone is Portland cement and sand, which is treated in a peculiar manner by a chemical solution which greatly increases its hardness and durability. Coloring matters are added by which very exact imitations of the blue and brown stones, so popular for building purposes in this country, are produced in a very rapid and cheap manner.

Mr. Gunther has recently patented, through the Scientific American Patent Agency, an improvement in the use of this kind of stone for flagging side walks, by which stones may be manufactured *in situ*, in squares or diamonds, and still be capable of being taken up without injury, and relaid whenever desired.

The blocks being formed by the aid of suitable molding strips, which separate the stones by about three sixteenths of an inch, the interstices are filled with a peculiar elastic waterproof composition which allows the artificial flags to contract from cold or expand with heat, obviating all danger of cracking from this cause, and, at the same time, preventing the percolation of water to the substratum, thereby preventing subsequent upheaval by frost.

A large piece of sidewalk has been thus flagged, at the corner of Lexington Avenue and Fifty-seventh street, in this city, which we recently visited and examined, and we must say that it would be difficult to conceive a handsomer piece of work, of its kind.

The flags are an artificial blue stone, of great density and hardness, presenting a perfectly level surface, very much superior to the undressed natural flag-stones in common use, while they can be laid at about one fourth the cost. The flags are four inches thick, and we see no reason why they should not prove as durable as the natural stone, since we are aware of experiments extending through three years, with stone of this kind, which have tested its power to resist, to the utmost, atmospheric influences, and which it has endured perfectly.

We regard the improvement as one of much importance, as the difference in first cost will allow the artificial stone to be relaid several times, at less expense than the first cost of the natural stones.

THE HEALTH OF BARON LIEBIG.

From a private letter received in this city, we learn that Professor Liebig is by no means restored to his former state of physical and mental activity. He spent the early part of the summer at the baths of Kissingen, and was much benefitted by the treatment; later in the season, he went to meet a few choice friends, among them his life long colleague, Professor Woehler, at Reichenhall, where one of his sons is a physician; and here, in the invigorating mountain air, his bodily infirmities disappeared; but he complains of dizziness and suffering whenever he attempts the least mental exertion. We fear that the illustrious chemist will hardly be able to enrich our literature with many more of the brilliant writings which have rendered the science, to which he has devoted his best years of his life, so useful and so popular.

Liebig may be justly called the founder of modern chemistry. It was he who first organized laboratory instruction, and rendered it possible for pupils to pursue an experimental science in an experimental way. This has been his chief service, but another almost equally important contribution to the cause of learning has been the popularization of science accomplished by his writings.

Howe's Tobacco Dressing Machine.

This is a machine invented by Mr. James H. Howe, of Utica, N. Y., for loosening and separating the strings of fine cut tobacco, which adhere together, after being cut, on account of the packing of the leaves previous to cutting, and of the adhesive substance used for sweetening the tobacco.

The invention consists in a hopper with a flexible bottom, in which the cut tobacco is placed, two or more pairs of rotary beaters acting against the flexible bottoms by revolving under it, in a manner to thoroughly separate and loosen the strings from each other, and to work the adhering bunches into soft fleecy masses.

The tobacco, when cut from the thick mass of leaves packed together, adheres in thin ribbons or shavings made up of strings, connected side by side, and is commonly separated and loosened by a rapidly up and down shaking machine, which is expensive to keep in repair owing to the great wear and tear occasioned by the rapid movements necessary, and the sudden stopping and starting. Such machines are also objectionable on account of the great amount of power required to operate them.

In Mr. Howe's machine these objections are avoided. The motion being slow and the moving parts operating continually in one direction, require but little power, and the wear will be slight, while the work is claimed to be accomplished in the most satisfactory manner.

OUR CHICAGO EXCHANGES.

Chicago exchanges? Yes! they are creeping out of the cinders, like singed cats, much better than they look. Glad to see some of their old faces again. We recognize them, though their visages bear marks of their recent terrible ordeal. Courage! "Time makes all things even."

First here is the *Railroad Gazette*, a most excellent weekly journal, devoted to Transportation, Engineering, and Railroad News, looking quite fresh and not at all frightened. It was formerly published at 63 and 65 Canal street. The whole establishment was cleaned out by the fire, but its enterprising proprietor, Mr. A. N. Kellogg, states that the paper will, until further notice, be issued by the acting publisher, Mr. W. H. Boardman, at No. 72 Broadway, New York. The trade will address orders to the Western News Company, corner of Jefferson and West Randolph streets, Chicago, as heretofore.

Then comes along the *Chicago Railway Review*, another live journal devoted to Railways, Navigation, Manufactures and Finance, somewhat smaller than of yore, but not a whit less spirited. The reduction in size is announced as only temporary, and the editor, Mr. D. C. Brooks, thus apologises for defects: "Typographical errors were, we fear, the exceptions which proved error to be the rule, last week. The Editor, in addition to his usual duties, had to act in the capacity of publisher, assistant foreman, mailer, carrier, collector—not to say "devil;" and it is not to be wondered at that something, or the want of it, played the d—l with the types."

The present address of the *Review* is Chicago, 1603 Prairie avenue, or at St. Louis, Barnum's Hotel, or 215 Pine street.

Mr. Charles D. Lakey, editor and proprietor of our valued contemporary, the American *Builder*, writes to say that he is, among most other publishers, a sufferer by the fire in Chicago, his office being destroyed. He desires us to announce that the *Builder* will be continued, and its publication will recommence as soon as practicable. "The good will of the public towards my magazine remains unchanged. Fortunately, my house was not in the path of the flame." The public will join us in expressing great regret for Mr. Lakey's loss, and in a hope that his excellent publication will soon be again circulating through the length and breadth of the land.

The *Land Owner*, which was one of the most beautifully printed of the Chicago papers, and which was undoubtedly the most widely circulated land paper in the world, is—writes the publisher, J. M. Wing & Co., 58 Canal street—in press, and its publication will be continued as heretofore.

Our editorial friends, who have suffered by this great fire, will receive our most hearty expressions of sympathy, and their speedy resumption justifies the hope that they have yet a long and prosperous career before them.

RECENT PATENT DECISIONS.

In the matter of the application of E. S. Renwick for letters patent for improved suspender ends. Appeal from Examiners-in-Chief, August 8, 1871.

LEGGETT, Commissioner:

The applicant claims that he has invented a new article of manufacture, named by him "Veneered Leather Suspender-Trimmings." His process of manufacture consists in pasting shammy leather upon the surface of roan leather, and from sheets thus prepared cutting the trimmings out with the dies in common use for such purposes, and then stitching with a sewing machine.

This process of "veneering leather" is not new, and could hardly be called an inveation if it was. The process of pasting different pieces or kinds of leather together, and then stitching, has long been known among manufacturers of all kinds of leather articles. Suspender trimmings, manufactured by this old and well known process, certainly cannot become a new article of manufacture in such a sense as to be patentable. But, waiving this point, it seems to me that the references made by the primary examiner were complete answers to the application.

The decision of the Board of Appeals is affirmed.

MILLIGAN AND HIGGINS' PATENT.

In the matter of the application of Milligan & Higgins for letters patent for calcimine powders.

LEGGETT, Commissioner:

Calcimine, as generally used, is a compound of water, glue and a white pigment, such as whiting, Paris white, or zinc white (oxide of zinc), and has heretofore been prepared by painters by soaking the glue, dissolving it in water, and adding the white pigment, with or without some coloring material. As, however, different lots of glue vary in strength, and the strength is unknown to the user without experiment, a loss of time, and perhaps material, in its preparation occurs.

The applicants say:

Another difficulty in the preparation of calcimine arises from the fact that different proportionate quantities of glue for the same quantity of other material are required, according to the nature of the work for which the calcimine is to be used. Thus, for example, if the calcimine is to be used upon a wall that has never been calcimined nor sized, a larger quantity of glue is required than in the preparation of calcimine for a wall that has been calcimined.

Applicants further say:

The object of our invention is to enable calcimine to be prepared for use with rapidity, without experimental trials on the part of the user, and with certainty as to the quality of the prepared article, whether it is to be fixed for an old wall or a new one. To this end our invention consists of a package containing the requisite quantity of the materials required for preparing a certain quantity of calcimine for use, with the glue in a separate paper (placed by preference inside of the package), in quantity sufficient to render the calcimine suitable for a new wall, and in such a condition that it is readily soluble in water

Applicants further claim:

The prepared calcimine powder, having the glue separated from the coloring material, substantially as heretofore set forth, the same being a new article of manufacture.

I have thus quoted from the applicants' specification and claim, from the fact that the attorney for applicants has ably and persistently insisted that their invention is new and worthy of patents. I am of the opinion that the reference to Johnson's patent is well taken, and the applicants are fully anticipated. The Board of Examiners-in-Chief upon this case say:

The object of applicant's invention is to provide the material, for calcimine painting, dry, pulverized, and put up in convenient packages for the trade. All that is necessary to be done to prepare the powder for use is simply to add the proper quantity of water. Johnson does the same thing, the only difference being that in his packages the glue and pigments are mixed, and those of applicants the glue is put in a separate paper, but inclosed in the same package. This does not appear to be a material difference, and we must therefore affirm the decision of the principal examiner.

Applicants' mode of putting up their preparation has a single advantage over that of Johnson. It will admit of being compounded in various proportions to suit different cases. But Johnson does not limit himself to any exact proportion. As between the two there certainly is not a patentable difference.

The decision of the Board of Appeals is affirmed.

The Gatling Gun.

When describing and illustrating the Gatling battery gun some months since, we mentioned that Sir William Armstrong & Co. had received instructions from the Government to manufacture a limited number of these important adjuncts of our army and navy, for experimental purposes. It is, however, only recently that the production of these weapons has been proceeded with, on account of the delays which have occurred in determining the diameter of the bore, the nature of the rifling, and the description of cartridge to be used. These points have, however, at length been settled, and the guns at present ordered will be rifled upon the Henry principle, the calibre of the bore being ·45, so that the ordinary service rifle cartridges can be used upon an emergency. Solid drawn cartridges, however, are to form the ammunition of the gun, as it has been found that the Boxer cartridge is liable to have the base torn from the body of the case by the extractor, the metal case being left in the chamber. Thirty-six of these guns have been ordered, a portion being for the War Office and a portion for the Admiralty. When completed they will be distributed in various branches of the army and navy for experimental practice. Should they be found to answer the requirements of the service, their manufacture will be further proceeded with, and any modification suggested by practice will be introduced. It is probable that in some of these machine guns a larger calibre will be adopted by the Government. For certain purposes, such as for use in casemated forts or garrison batteries, the heavier guns would probably prove the most useful. All the weapons are being constructed with the most recent improvements.—*Engineering.*

Leaves.

The *People's Journal* gives the following practical advice to agriculturists: In a short time the frosts, aided by rains and winds, will have scattered a bountiful supply of leaves over the woodland. These leaves can be made to do an excellent service on the farm. They should be carefully raked together in heaps, and drawn to the homestead, where a shed or some place can be found in which they may be stored away. They may be hauled in a hay rack by weaving in some cornstalks between the stakes, close enough to prevent them fall ing through. A large barn-basket is a convenient thing to load them with, and it will be surprising how many loads may be gathered from an acre of woodland. They make a very excellent bed for hogs, being to some extent the bed provided for them by nature. For sows with young pigs, they are the best bed that can be procured, as there is no danger, when they are used, of the young pigs getting entangled in the bedding and crushed. As a source of manure they are valuable; they rot easily, and have good fertilizing qualities. Elm and oak leaves contain a large proportion of potash, and leaf mold, or the decomposed leaves, makes a valuable addition to the soil of flower gardens, or for potting plants. Where manure is scarce—and where is it not?—leaves should be the first resource whereby an increase may be made.

A Family's Ration.

The Relief and Aid Society of Chicago have adopted the following as the standard daily ration for a family of five persons, the amount to be varied according to the income of of the family from labor or other sources:

Bacon or pork	2 pounds,
Or beef	3 pounds.
Beans	1 pint.
Potatoes	2 quarts.
Bread	3 pounds,
Or flour	2 pounds.
Tea	1 ounce,
Or coffee	2½ ounces.
Sugar	4 ounces.
Rice	4 ounces.
Soap	4 ounces.
Soft coal	¼ tun per month.

THE fire in Chicago had the curious effect of spoiling the "outsides" of nearly two hundred weekly newspapers which are published, hundreds of miles from that city, in Illinois, Iowa, Wisconsin, and Minnesota. One of the leading printers of Chicago did a large business in printing these "outsides" in duplicate and sending them to different places, where the local publishers printed the news on the other side. The farmers who depended upon these sheets for their weekly supply of news must have been puzzled to know how the Chicago fire could have deprived them of their village newspaper while the home office remained intact.

THE Babylonians, having no physicians with whom to consult in case of sickness, adopted a novel plan to obtain relief under such circumstances. They had the infirm brought into the Forum, and those who passed by were asked their opinion as to the nature of the disease. They demanded of each one if he ever had the same distemper, if he knew any one who had had it, and, if so, how he was cured.

WE give in another column an interesting account of a new diving bell, invented in Italy, by Sig. Toselli. Since the realization of their political unity, the Italians have made rapid strides in all the arts of peace and progress. Schools have been established, and institutions opened for popular education in scientific knowledge. Italy has a liberal patent law, and the number of patents granted for new improvements augments every year. The Italians are a generous, ingenious, and progressive race. The population of the kingdom is now twenty-six millions.

KINDLE UP THE FIRES.—Half the diseases that afflict humanity at this season of the year are due to the half chilled condition in which people live. More coughs, colds, consumptions and fevers are produced by sitting in half-chilly rooms, on these days when it seems hardly necessary to build fires, than by all other causes.

A MIND full of piety and knowledge is always rich; it is a bank that never fails; it yields a perpetual dividend of happiness.

NEW BOOKS AND PUBLICATIONS.

REDFIELD'S TRAVELERS' GUIDE TO THE CITY OF NEW YORK. With a Map. New York: J. S. Redfield, 140 Fulton Street. Price, 25 cents.

Those who wish to see the sights of this great metropolis, and find their way with facility to objects of interest, cannot do better than invest in this little volume.

Examples for the Ladies.

Miss C——, of Troy, N. Y., with a Wheeler & Wilson Machine, earned in three years and eleven months, $2308.92; stitching 638,652 collars, the length of seam being 380,602 yards, and the number of stitches 117,102,300, an average of 100,000 a day, and 12,500 an hour. This stitching was all done by foot power, and the machine is still in perfect order. It had no extra care, but was simply oiled and cleaned daily. This amount of stitching by hand, at 30 stitches a minute, would have been more than 20 years' work.

Queries.

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

1.—FISH IN LIMESTONE WATER.—On a tract of land which I own, convenient to this city (Louisville, Ky.), is a natural basin about forty feet deep, containing sixteen acres level, and lying about 500 feet above the level of the river bed. The walls of this basin are of solid rock, from which flows, into the basin, a never failing stream of limestone water the size of an ordinary creek. At the lower end of this basin is an outlet or crevice, which can be filled at an expense not exceeding forty dollars; by filling this outlet the basin would have about fifty feet deep of fresh water in it. Can you give me any information whether this would make a good fish pond, what kind of fish would be best to stock it with, and where such fish can be had?—A. B.

2.—ELECTRIC BATTERY.—I am about to make an electric battery; the directions say that the zinc should be amalgamated, and I do not know how it is done. Will some one please answer in the SCIENTIFIC AMERICAN? Also, what is the best book for instruction in electrotyping?—S. H.

3.—HEATING SURFACE OF BOILERS.—D. B., of N. Y., in answer to my query: "How to find heating surface of boilers," misunderstands me. I wish to know how to go about measuring the heating surface In a common two flued boiler, for instance, how do I get at the area of the flues and surface on which the fire impinges on the bottom of boiler? I simply want a rule how to measure the heating surface.—A. H. G.

4.—HEATING SMALL STEEL ARTICLES.—Can any of your correspondents inform me how to heat small articles of iron rapidly without producing so much scale, either by use of chemicals or by the construction of furnace, in making knife blades and other delicate work?—P. L. S.

5.—ELECTRO-GILDING.—In electro-gilding I have had great difficulty in producing the red or fourteen carat color. Will some one inform me what the recipe for the red gold solution is, or if the solution is the same as the ordinary gold solution, and a different process used for depositing the gold on the work? Or in other words, be kind enough to give me the whole process from the making of the solution to the finishing of the work?—T. W. S.

6.—DISCOLORATION OF BRICKS BY SMOKE.—How can I remove the dark stain of smoke from a brick wall after a fire?—W. B.

7.—CONDENSATION ON WINDOWS.—Will some one inform me of the best method to prevent a show window from sweating? I have ventilated both at top and bottom, and even now, on a moderately cold evening, it is impossible to see through the outer glass. I want to use a light in the window, but cannot, as that makes it worse. Would it not be a good idea to work a small blower underneath, and pass a current of air through?—J. E. G.

8.—NOISELESS BLOWER.—Is there any way to make an old fashioned sixteen inch blower noiseless, without boxing or burying?—L. M.

9.—GLUE TESTING.—Can some one inform me how to test the strength and quality of glues? The old way of testing by setting is not a good test. I want some way of telling what the glue is made of.—T. C.

10.—DAMAGED MIRROR.—Will some of your readers tell me how I can repair a valuable mirror, off which the quicksilver has been rubbed in spots?—E. F. C.

Declined.

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

BEECH TREE.—A. K.
BOILER EXPLOSIONS.—J. A. M.
ELECTRO-MOTOR, ETC.—J. T. P.
FIREPROOF SAFES.—J. S.
GUNS SCATTERING SHOT.—J. E.
METALLURGY.—J. T.
NARROW GAGE RAILROADS.—S. & Co.
PSYCHIC FORCE.—C. G.
ANSWERS TO CORRESPONDENTS.—A. H. G.—H. A. W.—H. R. J.—H. S.—J. F.—J. H. G.—J. L.—J. W. C.—L. D.—P. J. W.—R. A. B.—R. C.—S. S. G.—T. E. N. E.
QUERIES.—B. S.—C. D. S.—C. T.—D. J. W., JR.—T. J. R.

Business and Personal.

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

Answers to Correspondents.

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

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

J. S. writes us from Chicago as follows. We give his language *verbatim et literatim*. "Ive heerd tell on masheens for purpetual motion. A Friend of mine got this thing wich I inclose and said it kept agoing all the time if yu put it on a table or anything it will move around as yu will see when yu tri four yurself. I am a poor man with eight smal chilren and wife to take care off. if I could get a patent for this thing it would happen make me a ritch man I dont think such a masheen has ever been sot up before as I know on like this I have not got another masheen like this so plese dont spoil it unlest yu cant help it to patent it by, as I must have this pattern to git more. can yu plese tell me soon if I can git a patent and how. plese have patients with it and let me know about it soon. can yu tell thro yur paper the SCIENTIFIC AMERICAN wich I read regly. P. O.—Plese answer me very soon thro yur paper." . . . With the above letter came a large sized angular seed, which, on being placed upon a table, moved about thereon in quite a lively manner, forming a very curious object. The movement ,which our correspondent supposes to be perpetual motion, is due to the wriggling of a caterpillar contained within the shell of the nut. It is the larva of one of the tortricidæ or "leaf rollers"—a family of nocturnal lepidopters. The tortricidæ are related to and do not differ much, except in size, from the clothes moth. The wings are banded, often with brilliant colors, and are folded roof-like over the body. The larvæ or caterpillars are cylindrical, with sixteen minute legs, and usually dwell in leaves which they roll up by means of silken threads; but some infest seeds and fruit buds. Certain species are very destructive to vines, apples, and grain. Those inhabiting seeds, as in this case, enter by an imperceptible opening, while very small, the mother moth laying her eggs on the seeds before they are ripe. The seed becomes the caterpillar's lodging place and larder, and finally its tomb. But before passing into the chrysalis state, it takes the precaution to bore a hole at one extremity, through which the moth may come out when developed. This specimen is a very singular larva; but it would be impossible to tell the species, unless it was reared to the moth state.

VARNISHING WALNUT FURNITURE.—In reply to M. C. M: In dressing over old furniture, the first thing to be done is to wash it over with lime or soda water, to remove all effects of grease from sweaty hands which will prevent varnish from flowing freely or hardening well. If the work requires refilling, rye flour, wheat flour, corn starch, or Paris white, ground fine in oil and turpentine, will do; but one or two coats of shellac should be laid on and rubbed smooth before applying the varnish. Work finished in oil, without varnish, should be filled with a harder substance than starch. Some use white wax reduced in turpentine; but what is better is a compound of equal parts, by weight, of whiting, plaster of Paris, pumice stone, and litharge, to which may be added a little French yellow, asphaltum, vandyke brown, and *terra di Sienna*. Mix with one part japan, two of boiled oil, and four of turpentine. Grind fine in a mill. Lay the filling on with a brush, rub it in well, let it set twenty minutes, then rub off clean. Let it harden two or three days, then rub smooth, and, if required, repeat the process. When the filling is satisfactory, finish with linseed oil, put on with a brush; wipe off, and rub to a polish with fine cotton; finish with a silk handerchief, or any fine fabric. ——, of ——.

LIQUID GLUE.—To H. W. M. No. 1.—Fill a bottle two thirds full of common glue, and fill up with whisky; cork it up and set it by for three or four days; it will dissolve without application of heat No. 2.—Soak in cold water all the best common glue you wish to make at one time, using only glass, earthenware, or porcelain dishes; dissolve in the same water by gentle heat, then add nitric acid sufficient to give the glue a sour taste, like vinegar, say from ½ ounce to 1 ounce to each pound of glue. No. 3.—Acetic acid, 1 ounce; pure soft water, 6 ounces; glue, 3 ounces; gum tragacanth, 1 ounce. Mix, and, if not as thick as required, add a little more glue.—AUNT CLARA.

SKELETON LEAVES.—To J. V. M.—Steep the leaves in rain water, in an open vessel, exposed to sun and air. Water must occasionally be added to compensate for loss by evaporation. The leaves will putrify and the membranes begin to open; then lay them in a clean white plate filled with water, and with gentle touches take off the external membranes, separating them cautiously near the middle rib. The process requires a great deal of patience and considerable time for the tissues to decay and separate. Or, for a quicker method, take a tablespoonful of chloride of lime in a liquid state, mixed with a quart of soft water. Leaves, or seed vessels of plants, should be soaked in the mixture about four hours, then well washed in a large dish filled with water, and left to dry, with free exposure to air and sun. Some of the larger species of forest leaves will require to be left rather more than four hours in the mixture.—AUNT CLARA.

PENCIL LEAD.—To H. J.—The easiest way of producing not only black lead, but all sorts of pencils, is by the following process which combines simplicity, cheapness, and quality. Take white or pipe clay; put it into a tub of clear water, to soak for twelve hours, then agitate the whole until it resembles milk; let it rest two or three minutes, and pour off the supernatant milky liquor into a second vessel; allow it to settle, pour off the clear water, and dry the residue on a filter. Then add black lead in any quantity. Powder it, and calcine it at a white heat in a loosely covered cruciole; cool, and most carefully repulverize; then add prepared clay and prepared plumbago, equal parts. Water to mix. Make into a paste, and put into oiled molds of the size required; dry very gradually, and apply sufficient heat to give the required degree of hardness—the pieces to be taken carefully from the molds and placed in the grooves of the cedar. The more clay and heat employed, the harder the crayon; less clay and heat produce a contrary effect. The shade may also be varied in the same way. The molds must be made of four pieces of wood, nicely fitted together.—AUNT CLARA.

CLEANING BRASS.—In your issue of October 14th, Vol. XXV., G. N. K. asks for a recipe for cleaning brass. I have been a locomotive fireman, and have used the following with much success: Take one tablespoonful of oxalic acid, add one half pint soft water, and then add a small package of tripoli (such as you buy for ten or twenty cents), or, say two good table spoonsful. This will bring a beautiful polish. Allow the mixture to remain on a few minutes, and wipe off with dry waste or woolen rag.—A. G. H., of Mo.

INDELIBLE PRINTING INK.—W. E. C. (query 23, Sept. 23rd), can make this by mixing 1 pound varnish (such as is used for ordinary printing ink), 1 pound black sulphuret of mercury, 1 ounce nitrate of silver, 1 ounce sulphate of iron, 2 tablespoonsful lamp black. Thoroughly grind together, adding enough turpentine to reduce to the requisite consistency.—A. L. D. M., of Texas.

W. G., of Va.—White lead or zinc paint, upon a roof used to collect water for culinary purposes, would, in our opinion, be apt to contaminate the water.

APPLICATIONS FOR EXTENSION OF PATENTS.

SEED PLANTER.—James D. Willoughby, Vineland, N. J., has petitioned for an extension of the above patent. Day of hearing, January 24, 1872.

CANE GUN.—J. F. Thomas, Ilion, N. Y., has petitioned for an extension of the above patent. Day of hearing, January 10, 1872.

MAKING BLADE FOR PENCIL SHARPENER.—Walter K. Foster, Cambridge, Mass., has petitioned for an extension of the above patent. Day of hearing, January 10, 1872.

PLATE FRAME FOR PHOTOGRAPHIC CAMERA.—William Lewis and William H. Lewis, Brooklyn, N. Y., have petitioned for an extension of the above patent. Day of hearing, January 17, 1872.

Recent American and Foreign Patents.

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

CANE STUBBLE HOE.—Gustavus H. Wright and Amory K. Johnson, of New Orleans, La.—The ordinary plantation hoe, although extensively used, is not well adapted for the cultivation of sugar cane when the latter is in the condition known as stubble cane, and the object of the present invention is to furnish an implement every way calculated for that purpose. It consists in a hoe with three (more or less) broad tines, and with a cutting edge on the opposite end. The plate of the hoe, below the edge at the end of the teeth, is longer than the ordinary hoe, and is whole or entire for nearly half that length. The teeth or tines are formed by cutting out portions of the plate, leaving the tines about the same width as the portions cut out. The ends of the teeth are beveled to a point. The cutting blade is above the eye, of any desired width and length, it being an elongation of the plate, beveled to an edge, which adapts the hoe for cutting weeds and similar purposes. Stubble cane requires a peculiar system of culture and peculiar implements to cultivate it to the best advantage. This hoe is claimed to be perfectly adapted to the purpose, and to meet a want which has long been felt by sugar planters.

DEVICE FOR DISCHARGING GRAIN FROM RAILWAY CARS.—Samuel W. Hawes, of Jersey City, assignor to Richard W. Hawes, trustee, of Hohokus, N. J.—This invention consists in the improvement of devices for discharging grain from cars, usually discharged into elevators or into vessels or barges at the docks. To provide for the varying hight of the tide, on tide water, it is necessary to have the delivery spouts made adjustable or removable. Such an adjustable spout is provided with an endless apron, by which, when suitably actuated, the grain may be elevated or carried on a level. Ordinarily, the spout is made in two parts jointed together, so that the outer or delivery end may be raised or lowered, as may be found convenient, to suit the point of delivery. The spouts may be made in any form, open or closed, and when it is necessary to move the grain horizontally, or even to elevate it, the revolving endless apron may be combined with the delivery spout. In an ordinary car, the valve tube will be from twelve to fifteen inches in diameter, so that a car load may be discharged in three or four minutes, the delivery spouts being, of course, made in proportion as to size. This improvement may be applied to wagons as well as to cars, and its advantages over the ordinary mode of delivery are many and obvious.

COFFIN.—Samuel Avery, of Phœnix, N. Y.—This invention is an improved manner of joining the end and side pieces of burial caskets, and other articles made of wood, at the corners; by a curved metal plate, comprising a quarter of a circle, more or less, according to the angle to be formed by the pieces to be joined, with a flange on the inside near each edge. The plate is fitted upon the outsides of the boards, with its flanges in deep grooves formed across the boards for them, and a key is driven between the ends of the boards; or the boards are so fitted as to force the walls of the grooves against the flanges in such a manner as to bind and lock the corners very securely together. The object of the improvement is to provide a more simple and economical mode of securing the sides and end pieces together than the present modes; also, a mode by which the case may be readily put together, after the boards have been veneered, polished, etc., without scratching and injuring them, and to provide ornamental covers of elaborate design cheaply, which may be produced in the castings of the said plates.

BALE TIES.—J. F. Rusling, of Lawrenceville, Pa.—This improvement, in ties or fastenings for baling cotton, straw, hay, and all similar articles, consists in a lever, curved at its fulcrum end, and having a slightly spiral or irregular form at its free end, by means of which the ends of the bend are brought together by a lever purchase, and the fastening made secure by passing the long end of the lever beneath the band or wire, thereby giving a constantly increasing leverage as the long end of the lever is brought down to the band. In this manner the band is strained tightly around the bale in the act of fastening the tie. The lever is made slightly spiral, or so curved near its long end that when the end is tucked under the band, it rests in the curve, while the strain at the point of resistance (near the fulcrum) makes the fastening complete. The operation, where a flat or hoop band is employed, is the same in effect, but a link is not used, the ends of the band being simply perforated, and a wire attached. In fastening, the band slides in the curve of the lever with the effect before stated, and the end of the lever is tucked under the wire. The long end of the lever is readily disengaged by a slight blow of the hammer or with an awl or spike, when the elasticity of the bale will throw the ends asunder and loosen the band without cutting or otherwise injuring the tie.

COAL BOX.—Charles W. Coffin, Pittsburgh, Pa.—This invention relates to a box for handling coal on steamboats or elsewhere, constructed so as to combine lightness with durability and convenience.

PICKET FENCE.—Charles H. Strowger, Webster, N. Y.—This invention relates to a picket fence, supported upon horizontal wires, stretched between posts placed one at each end of the fence, the invention consisting in the manner of connecting the supporting stakes or braces with the upper set of wires.

DOOR FASTENER.—John Pool, Elizabeth City, N. C.—This invention relates to the combination of an ordinary door fastener or pivoted hook with a driving spike or shank, in such a manner that the former may be turned freely in the slot of the latter, and the device as a whole rendered applicable to right and left hand doors, and in corners, angles, etc.

THILL COUPLING.—James W. Oulton, Amherst, Canada.—This is a simple, strong, durable, convenient, and cheap thill coupling, so constructed as to hold the thills securely when in a working position, and which will allow the thills to be instantly detached when raised into a vertical position. A yoke passes beneath the axle and receives the arms of the clip. The forward end of the yoke is extended, and has a cross head formed upon it. The cross head is perforated longitudinally, and is made open upon its upper side to receive the cross head of the thill iron. The forward side of the cross head of the yoke has a deep notch formed in it to receive the thill iron, and has rearwardly projecting lugs formed upon its edge to keep the cross head in place when the thills are in a working position. The cross head of the thill iron is made round to fit into the cavity in the cross head of the yoke, and has notches formed in it, in such position that, when the thills are raised into an upright position, the said notches may be in proper position to receive the lugs of the yoke, so that the cross head of the thill iron may be conveniently slipped into the cavity of the cross head. By this construction, when the thills are in a working position, it will be impossible for the coupling to become detached, and at the same time the coupling will have a long bearing.

POWER HAMMER.—Isaac Althouse, Columbus, Ohio.—This invention consists in having the upper end of the hammer rod, which works in vertical guides connected to the crank employed for lifting the hammer by a connecting rods composed of two sections, jointed together at or about the center, in such manner that the crank will have freedom to pass the center in the lowermost part of its path without obstruction, the said jointed rod at the same time affording a short positive connection of the hammer stem with the crank, which is simple and cheap to make, and works with but little friction or noise. These two sections are long enough to let the hammer strike on the anvil before the crank comes to the vertical line; then they double on the joint to some extent and let the crank pass the center freely. The same action takes place when there is anything on the anvil to be hammered, whether thick or thin. The arrangement provides a simple, cheap, and efficient positive connection, requiring but little space between the hammer stem and the crank.

SHIELD AND TOWEL RACK FOR WASH STAND.—John M. Oakley, Green Point, N. Y.—This is a simple and convenient device for attachment to wash stands, to serve as a shield or guard to protect the wall from being spattered with water, and to serve as a rack to receive the towels, which will greatly add to the convenience of this necessary article of furniture.

HORSE SHOEING REST.—George Stansel, Johnsville, N. Y.—This invention has for its object to furnish an improved device for holding the horse's foot while clinching the nails and finishing the foot, and which will hold the foot steadily and securely, enabling the work to be done quickly and well, thus relieving the operator from the labor of holding the foot in the ordinary manner.

POWDER FLASK.—Andrew Diezel, Omaha, Neb.—This invention relates to a new and useful improvement in a self charging apparatus to be applied to powder flasks, and used for similar purposes; and it consists in the construction and arrangement of parts by which to accurately measure the powder and charge the gun by simply pressing the flask into the muzzle and withdrawing it, two motions only being necessary.

LATHE CHUCK.—Charles E. Albro, Fulton, N.Y.—A shank enters the spindle of the lathe by which the chuck is revolved. Upon this shank is formed a chuck bar. Two movable jaws are supported and moved by screws, having each a right hand thread on one end and a left hand thread on the other, and passing through the chuck bar. These screw threads engage with corresponding threads cut in the jaws. Each screw has a cog wheel upon it, and an intervening wheel, by which the motion is conveyed from one screw to the other; but the intervening wheel may be dispensed with, if desired, and the two wheels be made to engage directly with each other, or be used ndependently of each other. These gear wheels work in a slot or mortise in the chuck bar. By this arrangement the screws have no longitudinal movement, and, by virtue of the right and left hand threads in the jaws, the rotation of the screws will carry the jaws toward or from the center, according as the screws are turned, thus bringing a drill or other tool or article to a true center by simply turning a wrench on either of the ends of the screws. In the ends of each of the jaws there is a V shaped recess for receiving the shank of a drill or other tool, a screw tap or nut, a bolt for cutting screw threads, or articles for being drilled, bored, or turned by stationary drills or turning tools. The main object in using two screws is to move the jaws parallel with each other to and from the center. A single screw with the right and left hand threads will move the jaws, and some device other than the second screw and the gearing may be employed for keeping the jaws parallel

BALE TIE.—John Spraguen Davis, Louisville, Ky.—The body of this tie consists of two short curved side bars connected at their ends by two cross bars. The inner edges of the middle parts of the side bars project inward to form lips, which, in connection with the side bars, form seats for keys. The outer sides of the keys have an edge or acute angle formed upon them to fit into the seat formed for them between the side bars and the lips of the end bars. The ties are applied by bending the ends of the bale bands into loops which are passed down through the tie, and through which the keys are passed. When strain comes upon the band the curvature of the side bars forces the keys close against the lips of the end or cross bars, clamping the ends of the bands between the said keys and lips with a force proportioned to the strain upon the bands. The rounded form of the keys prevents the ends of the bands from being bent so sharply as to make said bands liable to break under the action of cold or when bent cold.

ANIMAL GAG.—W. H. Harrison Hallock, Mattituck, N.Y.—A ring, of metal or other suitable material, is of sufficient size to permit the arm of the attendant to pass through after the ring has been inserted in an animal's mouth for the purpose of administering medicine or extracting any substance which may be lodged in the animal's throat. Projecting from the sides of the ring are two ears, and pivoted to the latter is a curved cross bar provided with a handle. The said cross bar is also provided with an aperture at one end; which permits it to pass over the extremity of one of the ears, upon which is a screw thread, the cross bar being held upon the ear by a nut, as shown. The opposite end of the cross bar is flattened and fits within a slot in the other ear, being secured therein by a screw pivot, which passes through the ear and through the cross bar. When it is desired to change the space between the ring and cross bar the pivot is removed, and the bar moved in the slot until the pivot can be passed through another aperture in the ear. This adjustability of the cross bar adapts the instrument to the varying sizes of the jaws of different animals. In some cases, when the animal is unruly or vicious, and it is desirable to hold the head of the animal firmly to prevent lateral movement thereof, adjustable side bearers are pivoted at their lower ends to the ears. The bearers press on the sides of the animal's mouth. The various parts of the instrument that come in contact with the animal's mouth are to be covered with rubber, or other suitable material, to protect the animal from injury.

PRIVY SEAT COVER.—William Street, New York city.—This invention has for its object to improve the construction of privy seat covers, so that, when open, they may have the upper side of the seat cover turned forward, so that any dampness or frost that may collect upon the lower side of said seat cover may be turned away from the person using the seat; and it consists in the construction and combination of the various parts of the seat cover. By this construction, when the covers are turned back, they are raised and moved back, their rear edges being raised the highest, so that they will take a position with their upper sides forward, the lower or damp side of the cover being thus turned back.

REVOLVING FLOWER STAND.—Thomas Leslie, Brooklyn, N.Y.—The object of this invention is to furnish a convenient apparatus for supporting flower pots and watering the same, and which may be used for various other purposes. The pots are sustained on limbs from a revolving column, which revolving brings the pot under a rose sprinkler, the water flowing from a suitable reservoir. Cups in which the pots stand collect the surplus water, and it is conducted through the hollow limbs or branches into a suitable reservoir. The apparatus is modified in various ways that do not affect the general plan.

FIRE ALARM.—Henry L. Brower, New York city.—The present invention is designed to render more useful a fire alarm for which letters patent were granted November 15, 1870; and for this purpose an alarm movement, connected with a delicately constructed thermostat and mechanism, is placed on each floor of the building (preferably in the halls of the different stories), and connected together by this apparatus now devised, so that when, by reason of the raising of the temperature from a fire in any one hall or story, the alarm will be given in each hall at one and the same time. To accomplish this the inventor employs an alarm movement and thermostat spring, with a dial plate and finger, which may be adjusted to indicate any degree of temperature, which will enable the spring to liberate the movement and give the alarm. With this alarm on each floor of a dwelling, arranged as described, a fire cannot occur on any floor, or get under way sufficiently to raise the temperature of the atmosphere two or three degrees without notice to the inmates throughout the house, thus allowing them time to make their escape, if not to extinguish the fire.

SAWING MACHINE.—James Anthony Elston, Elston Station, Mo.—The principal feature of this invention, is the attachment, to a reciprocating saw, of a jointed saw frame, of horseshoe form, to either arm of which the saw may be attached, the two arms being connected at the extremities by a vertical arc bar, the whole being designed to adapt the saw for cutting large or small timber. Also, a frame or table, combined with wheels and braces, arranged on the outside of the table, to give it firm support, constitutes a part of the invention. By means of the horse shoe formed jointed saw frame, the machine may be used for cutting down trees as well as for cutting logs.

PRINTING PRESS.—Robert J. Coons, Greensburg, Pa.—We would be glad to give our readers some idea of the details of this invention, but it is of such a nature that it would be useless to attempt it in such a notice. The press is designed for job work, and is undoubtedly a good one. It is very compact, entirely automatic in its performance, and its parts are such as will enable it to be made in a strong and substantial manner.

PERMUTATION LOCK.—Daniel L. Tower, of New York city.—This appears to be a substantial and reliable lock, capable of a great variety of combinations, through the agency of devices which cannot be described without diagrams. Lockmakers will be able, however, to refer it to its proper class by the enumeration of its parts, which are a jointed bolt, rack bar, two pinions, a bar having an arm and finger attached, a disk with a cam groove, a grooved disk shaft, and a spring staple, together with other parts upon which no claim is based.

ALARM LOCK.—Jackson T. Taylor, Newnan, Ga.—This is an improvement in door locks, whereby an alarm bell is struck whenever burglars attempt to unlock it. The hammers which strike the bell are worked by spring levers, and the lock is permutable, so that it can be set upon a great variety of combinations. Provision is made for unlocking the lock in the dark, by the sounding of the bell, which indicates when the knob has been turned properly in either direction to correspond with the combination, the strokes of the bell being counted by the operator.

CASTER FOR SEWING MACHINE.—George K. Proctor, Salem, Mass.—This is an application of casters to the legs or frames of sewing machines, tables, stands, and the like, by means of levers, in such a manner that by pushing a lever downward by the foot, the support of the table or machine will be quickly shifted from the feet or legs to the casters to admit of moving the said machine or table about the room readily. The invention consists in the arrangement of these levers, the largest being pivoted to one of the end frames, carrying a fulcrum caster, and journaled at the other end in the two shorter levers, which are placed or pivoted perpendicular thereto. When the foot piece is so forced down, it springs under a catch, which holds it until disconnected by hand to lift the casters off the floor and let the table down upon its legs again.

HARVESTER.—Harry H. Bridenthall, Jr., New Derry, Pa.—This invention has for its object to improve the construction of harvesters and mowers, so as to make them more convenient in use and more effective in operation, causing the cut grain to be deposited in gavels at such a distance from the standing grain as to be out of the way of the machine in its next round. It consists in the construction and combination of various parts, to explain which diagrams would be necessary, but which are well adapted to accomplish the end sought.

DEVICE FOR CUTTING STENCIL PLATES.—This stencil cutter is made of brass or other suitable material, cast of rectangular or other form and suitable size. The cutter is made of cast steel, and so formed as to produce the aperture for the desired letter or mark when applied to the material to be cut. The cutter is affixed to the plate by fitting its upper part into the mold wherein the plate is cast, so that eventually the two will be firmly united by casting. In this manner the cutter is cheaply made of best material, it being unnecessary and too expensive to use steel for the body, while the blade must be made of the hard substance. From the plate projects a tenon of cylindrical or other form, into a corresponding socket of the handle. Within the handle is, at the side of the socket, a clamping spring, which serves to retain the block in place. The block is also perforated over each mark or letter, in order to facilitate the removal of the cut out pieces. In using the cutter the block is secured in the handle, placed upon the article to be cut, and forced down by a hammer blow. The next cutter to be used is then readily substituted in the handle for the first, placed in position, and applied by hammering. The cutting blades for every set of type are of equal length and hight, in order to produce uniform letters. The width of the several blocks is preferably such that, when the material is ruled into equal spaces and one block applied to the middle of each space, the letters will all be equally far apart. Mr. Henry Bolthoff, of Central City, Colorado Territory, is the inventor of this improvement.

SPIKE EXTRACTOR.—William H. Ives, of Luzerne, N. Y.—The ordinary spike drawing claw bar has a round heel, which serves for the fulcrum when the head of the spike is low down; but, after the spike has been drawn a short distance, the bar has to be mounted on a stick, stone, or other object to make it high enough, sometimes having to be blocked two or more times. This is very objectionable, as the blocks are not always at hand, unless carried for the purpose, and they are apt to slip away, and difficult to manage. The inventor therefore applies an adjustable block to the said bar, having two or more points or heels, which may be employed to support the end, having the claws at different hights, said block being made adjustable to bring the lower heel under the heel of the claw bar, and the hight of the two together, or move it away to use the heel of the claw bar alone; also, to move the upper heel towards or from the claws, as may be found desirable. The adjustable block has an aperture shaped to correspond with the form of bar, but slightly larger, so as to allow it to slide freely thereon, by its own gravity, when the bar is placed in a vertical position. A set screw may be employed to prevent the fulcrum block from being dropped off the bar when the tool is not in use.

BALING PRESS.—Thomas E. Marable, Petersburg, Va.—This invention relates to a baling press in which the followers are pivoted to their beams in such a manner that, when the side doors are opened and the followers brought opposite them, the followers may be turned crosswise of the press so as to cause the ends of the bale to protrude at either side, thus enabling the bale to be capped at the ends before running it from the press. The invention also relates to a novel form of ratchet for turning the screws that work the followers.

HORSE COLLAR FASTENING.—Caleb Wheeler, Warsaw, Ohio.—This invention relates to a pair of folding curved metal plates, hinged at their ends to the extremities of a collar open at the top, the upper of said plates having one or more transverse slots, and the lower plate being provided with lugs, springing from its upper side, which enter one of the aforesaid slots when both plates are folded down, thus fastening the two branches of the collar together: said lower plate being also provided with a double spring plate which both assists in raising the upper plate when released from the lower, and also eases the downward pressure of the hames on the horse's neck.

PRINTING PRESS.—John B. Adt, Baltimore, Md.—This invention consists in the means of making the cylinder of a printing press adjustable, so that it may follow the flattened surface in the periphery of the revolving drum to which the form of type, or the stone in lithographic printing, is attached, and produce an uniform pressure thereupon.

BROOM NEEDLE.—Collin M. Cowardin, Gardner Station, Tenn.—The needle may be of any approved size or form. The eye is formed near the center of the needle lengthwise. It passes through the needle from one side obliquely toward the heel, and has a socket or cavity surrounding it large enough to receive and hold a knob that does not project above the surface. A groove on the other side leads from the eye to the heel, to receive the thread while the remainder of the needle is passing through the stock, to protect it from wear and avoid the friction that occurs when the thread lies on the surface of the needle from the eye to the heel.

HOOF PARER.—Isaac Baker, of Long Branch, Mo.—This invention has for its object to furnish an improved instrument for paring horses' hoofs preparatory to setting shoes, simple and convenient in use, enabling the hoof to be pared quickly and accurately. In using the instrument it is applied to the hoof with the clawed bar downward, and the instrument and hoof are both held with the left hand while the blade is operated with the right hand. By placing the instrument upon the front side of the hoof, the frog may be conveniently pared or trimmed. The knife is so arranged that the forward part or toe of the hoof may be pared easier than the rear part or heel, thus enabling the hoof to be pared level and as it should be for properly shoeing a horse, the main art in horse shoeing being to let the heel stand, pare down the toe, and leave the bottom of the hoof level.

HORSE POWER.—Starns S. Ammons, of Winona, Miss.—In this invention the power of the levers is applied through draft rods and push rods. A spring bar equalizes the power applied in this manner to the wheel. The power is applied directly to the wheel instead of to the shaft in the usual manner. The consequence is that the apparatus is much more strong and durable than it would otherwise be, and the wring and twist on the shaft is avoided, as well as the springing of the arms of the wheel. In applying the power to the shaft in the ordinary way, the inventor claims that a large percentage of the force applied is absorbed in keeping the arms sprung to the required tension to convey the necessary power from the wheel. By his arrangement, he claims, this difficulty is obviated and a large amount of power is saved.

HARROW.—James Wigle, of West Point, Ill.—This invention relates to improvement in the class of harrows composed of sections hinged together in such a manner as to operate more or less independently of each other. The improvement consists in the construction and arrangement of a device for coupling the several harrows, whereby each harrow may rise and fall to accommodate itself to variations or undulations in the surface of the ground entirely independent of the others—that is, without affecting the position or operation of them.

SLATE FRAME.—Henry M. Clay, of Easton, Pa.—This invention consists in a new way of constructing corner pieces for slate frames. The slate frame is grooved on both sides and provided with loops for the purpose of receiving pencils. Elastic corner pieces, made of annular form, with central holes and with projecting wings, are secured against the edges of the frame by glue or in any suitable manner. The advantage of these corner pieces is that they may be firmly applied to the frame and can be hung upon a hook or nail. They may be strengthened by springs imbedded therein.

WELL AUGER.—Hillery R. King, of Poplar Bluff, Ark.—This is a hollow auger for boring in the earth. It consists in providing the lower or cutting end of an auger with a short web or a section of a spiral flange in addition to the continuous spiral, whereby clogging is prevented and a suitable support for two cutters is formed.

CULTIVATOR.—Philip R. Jenkins, of Cottonville, Iowa.—This invention has for its object to furnish an improved cultivator, which shall be so constructed that it may be easily adjusted for use as a riding or walking cultivator, as may be desired. It consists in the construction and combination of various mechanical devices (which cannot be explained in a mere verbal description) forming a light, durable, and evidently effective machine.

HARNESS.—Jonas C. Spooner, of Houlton, Me.—This is a new and useful improvement in breast yoke attachment for harness, which holds the tongue steady while passing over rough ground. To the ends of the breast yoke are attached rings to receive the straps that connect it with the hames or breast collar of the harness. The martingale is passed around and secured to the middle of the breast yoke. To the middle of the breast yoke is also attached a snap ring or hook, which is sprung into the ring attached to the end of the neck or pole yoke; or, if desired, the snap hook may be attached to the end of the pole yoke and snapped into a ring attached to the breast yoke. By this device the tongue will be held steady, even when passing over rough ground, and it will give the horses much better control over the carriage than when they are connected with the tongue in the ordinary manner.

MUSIC LEAF TURNER.—George C. A. Class, of Chicago, Ill.—The object of this invention is to provide a simple and effective attachment to pianos, music desks, and instruments, whereby the leaves of music can be easily turned to either side by a slight treadle motion. The invention consists in a new arrangement of vibrating levers or arms, which are, by cords connected with the treadles, and provided with elastic end pieces for taking hold of and turning the paper by friction, and also consists in the use of a new self adjusting paper holder. The apparatus can be applied to pianos, organs, music and reading desks, and similar devices

ROCK DRILL.—John Chapman, Amsterdam, N.Y.—This invention relates to a new machine for revolving and striking the shank of a rock drill, with the object of obtaining an equal amount of effective power to a suitable depth. It consists in the improvement of mechanism for elevating the shaft of a rock drill. The upper portion of the drill shaft, made prismatic, is fitted loose through a disk and cog wheel. The latter receives rotary motion by another toothed wheel from the driving shaft. By this shaft the drill shaft is constantly rotated. From the face of the disk project ears which support pivoted pawls. These pawls have friction rollers at their outer ends, while their inner ends are pointed. The friction rollers rest on a circular stationary track, and revolve thereon around the axis of the shaft, as the disk is being revolved by the same. Above the rollers is suspended from a plate another ring or track, of about the same diameter as that first mentioned. In this track are two pendent cams, and the first named track carries two projecting cams. Whenever the rollers are in contact with the edges of the cams, the outer ends of the pawls are depressed, and their inner ends raised against shoulders of the drill shaft. The latter is thereby slightly elevated, so as to clear the drill from the rock, and then, as the rollers are in contact with the cams, dropped again, having been turned while thus elevated. In this manner the changes of position are effected without undue friction of machinery. The strokes are imparted to the drill shaft by means of a weight, and are subsequent to every slight elevation of the same by pawls, and rather independent of the same; that is to say, the drill shaft is loosened by being slightly raised and lowered, and is then struck by the drop. The machine can be used to drill to a suitable depth by attaching sections to the lower end of the drill shaft, as may be found necessary.

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120,361.—FURNACE, ETC.—E. R. Austin, Norwalk, Conn.
120,362.—ATTACHING KNOBS.—M. W. Barse, Olean, N. Y.
120,363.—BOTTLE FASTENING.—W. S. M. Beal, Baltimore, Md.
120,364.—DRAWING STAND.—W. Bell, Buffalo, N. Y.
120,365.—HAY ELEVATOR.—J. Bolles, Jackson, Ohio.
120,366.—GOVERNOR.—C. P. Bowen, Silver City, Idaho Ter.
120,367.—EARTH CLOSET.—W. J. Bradshaw, Cleveland, Ohio.
120,368.—COMPOSITION.—G. L. Burnham, Providence, R. I.
120,369.—ARTIFICIAL STONE.—I. Coleman, New York city.
120,370.—WARDROBE.—A. Davis, Reno, Nev.
120,371.—CANAL BOAT.—N. T. Edson, New Orleans, La.
120,372.—SHAFT COUPLING.—J. Eisele, Philadelphia, Pa.
120,373.—WASHER.—F. A. Farley, Pine Meadow, Conn.
120,374.—BEDSTEAD.—W. Farson, Philadelphia, Pa.
120,375.—ANIMAL TRAP.—H. S. Frost, Watertown, Conn.
120,376.—REGULATOR.—W. L. Gebby, New Richland, Ohio.
120,377.—PRINTING PRESS.—G. P. Gordon, Rahway, N. J.
120,378.—LIME KILN.—M. Groh, J. V. Weitz, Cleveland, Ohio.
120,379.—MOTOR.—P. Guzman, Paris, France.
120,380.—UTILIZING WASTE.—D. W. Hanna, Pittsburgh, Pa.
120,381.—WHIP SOCKET.—J. Heberling, Mt. Pleasant, Ohio.
120,382.—CHAIR.—L. Heywood, Gardiner, Mass.
120,383.—LAMP BURNER.—T. Hipwell, Camden, N. J.
120,384.—PLOW.—J. M. Huie, E. Card, San Francisco, Cal.
120,385.—PENDULUM.—H. B. James, Trenton, N. J.
120,386.—SNAP HOOK.—E. M. Kinne, Cuba, N. Y.
120,387.—PITCHER.—G. Ph. Lang, P. Lauster, Allegheny City, Pa.
120,388.—GUN LOCK.—T. J. Massie, Arrington, Va.
120,389.—REIN HOLDER.—C. A. Messenger, Syracuse, N. Y.
120,390.—LATHER BRUSH.—W. H. Miles, Jr., New York city.
120,392.—MADDER.—A. Paraf, New York city.
120,393.—MADDER.—A. Paraf, New York city.
120,394.—DOUGH BOARD.—N. B. Petterson, McGregor, Iowa.
120,395.—FIRE ALARM, ETC.—W. J. Philips, Philadelphia, Pa
120,396.—LOCK.—O. E. Pillard, New Britain, Conn.
120,397.—COMPOSITION.—J. B. Rand, Concord, N. H.
120,398.—TYPE SETTER, ETC.—D. B. Ray, New York city.

120,399.—ALARM.—A. Q. Ross, Cincinnati, Ohio.
120,400.—CRUSHER.F.B.Schoenstein,A.Klein,San Francisco,C.
120,401.—TREADLE.—H. C. Smith, Cleveland, Ohio.
120,402.—LIFTING JACK.—L. P. Smith, Middletown, Pa.
120,403.—CARTRIDGE.—G. R. Stetson, New Haven, Conn.
120,404.—MEASURER.—W. Thomson, Jr., Madison, Wis.
120,405.—PANEL RAISER.—D. F. Walker, Minneapolis, Minn.
120,406.—FURNACE.—G. W. Walker, Boston, Mass.
120,407.—HARVESTER.—J. D. Wilber, Poughkeepsie, N. Y.
120,408.—HOE.—E. Wilcox, East Cleveland, Ohio.
120,409.—GAS.—W. C. and G. W. Wren, Brooklyn, N. Y.
120,410.—MATURING COFFEE.—J. Ashcroft, Brooklyn, N. Y.
120,411.—STEAM ENGINE.—G. V. Atwood, Mount Hope, Ala.
120,412.—TILT HAMMER.—P. Breen, Auburn, N. Y.
120,413.—HARNESS BUCKLE.—O. Brown, Albia, Iowa.
120,414.—PROPELLER.—J. P. Bruce, Brooklyn, N. Y.
120,415.—BELL PIANO.—C. G. Buttkereit, Toledo, Iowa.
120,416.—REGULATOR.—J. B. Coolidge, Boston, Mass.
120,417.—COFFEE POT.—J. Cragg, Baltimore, Md.
120,418.—AXLE.—J. W. Cremin, New York city.
120,419.—FASTENER.—J. M. Crossman, South Orange, N. J. and G. S. Rice, Tarrytown, N. Y.
120,420.—ESCAPE.—J.W.Davis,J.Vermillion,Washington,D.C.
120,421.—RAIL CHAIR.—T. Donahy, Empire City, Nev.
120,422.—CHAIR.—J. W. H. Doubler, Darlington, Wis.
120,423.—PLANTER.—N. Earlywine, Centerville, Iowa.
120,424.—CORN PLANTER.—T. M. Edgar, Paris, Tenn.
120,425.—STAND.—O. Ferris, Pawling, N. Y.
120,426.—WOOD PLANER. N.C.Freck,S.Strock,Millersburg,Pa.
120,427.—STENCH TRAP.—M Gafney, Newark, N. J.
120,428.—SPARK ARRESTER.—J. Gates, Portland, Oregon.
120,429.—BRAKE.—S. N. Goodale, St. Lo is, Mo.
120,430.—COUPLING.—W. F. Grassler, Muncy, Pa.
120,431.—HARVESTER.—G. S. Grier, Milford, Del.
120,432.—CAR WHEEL.—J. B. Handyside, Glasgow, N. B.
120,433.—MILLING MACHINE.—W.Hawkins,San Francisco,Cal.
120,434.—FRICTION CLUTCH.—G.W.Hedges,San Francisco, Cal.
120,435.—CULTIVATOR.—P. Hewitt, Farmland, Ind.
120,436.—PAPER BOX.—H. R. Heyl, Philadelphia, Pa.
120,437.—NECK TIE.—A. Hoffstadt, New York city.
120,438.—BLASTING PLUG.—J. H. Holsey, Butler, Ga.
120,439.—STOVE.—G. Z. House, New York city.
120,440.—HAY FORK.—C. A. Howard, Pontiac, Mich.
120,441.—FASTENER.—G. M. Hubbard, New Haven, Conn.
120,442.—DINNER PAIL.—H.C.& W.W.Ketcham,Newark,N.J.
120,443.—DRYER.—H. Knight, Westminster, Mass.
120,444.—SEAT.—D. and N. Kroninger, Eagle Point, Pa.
120 445.—HARNESS.—A. W. Lawton, Rochester, N.Y.
120,446.—HARROW, ETC.—J. Lefeber, G. W. Shults, Cambridge City, Ind.
120,447.—DRYER.—A. W. J. Mason, New Orleans, La.
120,448.—PLANER.—C. E. McBeth, F. Bentel, W. C. Margedant, Hamilton, Ohio, and H. Climer, Muscatine, Iowa.
120,449.—FLY TRAP.—S. F. McGown, Rockville, Ind.
120,450.—SAD IRON.—J. Melder, Munchen, Bavaria.
120,451.—SALVE.—J. Mickel, East Birmingham, Pa.
120,452.—DRYER.—D. Miller, Marietta, Ohio.
120,453.—CIGAR LIGHTER.—J. B. Miller, Rondout, N.Y.
120,454.—WIRING BLINDS.—J. H. Nelson, Little Falls, N.Y.
120,455.—DESK, ETC.—A. A. Porter, Griffin, Ga.
120,456.—COUPLING.—T. W. Porter, Boston, Mass.
120,457.—LIGHTNING ROD.—O.Preston, South Dansville, N.Y.
120,458.—FORK TINE.—W. H. Rodden, Toronto, Canada.
120,459.—RANGE.—E. F. Rogers, Chelsea, Mass.
120,460.—SHOE.—J. A. Rose, G. J. Mason, Prairie City, Ill.
120,461.—TREADLE.—A. B. Shaw, Medford, Mass.
120,462.—SHIRT BOSOM.—S. Sibley, Boston, Mass.
120,463.—OYSTER DREDGE.—T. P. Sink, Fairton, N.J.
120,464.—THERMOMETER.—J. H. Smiley, Caroline, N.Y.
120,465.—BORER.—E. H. Smith, Whitestown, N.Y.
120,466.—SOLDERING.—L. A. Smith, Kansas City, Mo.
120,467.—PRESSING.—J. B. Tarr, Fairhaven, Mass.
120,468.—SAWING SPOKES.—T. J. Tolan, Delphos. Ohio.
120,469.—LIGHTING GAS.—J. Vansant, San Francisco, Cal.
120,470.—ENGINE.—G. M. Venable, Memphis, Tenn.
120,471.—SUPPORT, ETC.—M. Warne, Philadelphia, Pa.
120,472.—LOCK.—S. C. Weddington, Jonesborough, Ind.
120,473.—AXLE BOX.—C. W illiams, Adrian, Mich.
120,474.—KNITTING MACHINE. H.Williamson,Wm'sburg,N.Y.
120,475.—PIPE WRENCH.—A. H. Woocruff, Lansing, Iowa.
120,476.—LUBRICATOR.—A.N.Allen,R.H.Dewey,Pittsfield, Ms.
120,477.—HOLD BACK.—J. Armstrong, Newark, Ohio.
120,478.—VELOCIPEDE.—L. M. Asbill, Edgefield County, S.C.
120,479.—HEATER.—B. T. Babbitt, New York city.
120,480.—HEATER.—B. T. Babbitt, New York city.
120,481.—PAVEMENT.—W. O. Barton, Elizabeth, N. J.
120,482.—STONE DRESSER.—T. W. Baxter, Chicago, Ill.
120,483.—BIRD CAGE. G.J.Bolz,M.Grebner,J.M.Jagel,N.Y.city.
120,484.—GATE.—G. C. Bovey, Cincinnati, Ohio.
120,485.—CHAIR.—N. S. Bowdish, Richfield Springs, N.Y.
120,486.—BRUSH.—C. Brintzinghoffer, G. Eckert, Phila., Pa.
120,487.—MUFF TASSEL.—S. Brody, New York city.
120,488.—TRUCK, ETC.—G. B. Bryant, Pottsville, Pa.
120,489.—CAR WHEEL.—G. B. Bryant, Pottsville, Pa.
120,490.—GRATE.—J. Caven, Indianapolis, Ind.
120,491.—REFRIGERATOR.—J. Chappel, Chenango Forks, N.Y.
120,492.—HINGE.—P. P. Child, St. Louis, Mo.
120,493.—FASTENING.—A. B. Clark, Richmond, Ind.
120,494.—COAL BOX.—C. W. Coffin, Pittsburgh, Pa.
120,495.—WAGON.—F. W. Cole, Philadelphia, Pa.
120,496.—FLOUR CHEST, ETC.—T. J. Corr, Bloomington, Ill.
120,497.—STOVE.—A. P. Corse, Troy, N.Y.
120,498.—BOLSTER.—G. Couch, St. Louis, Mo.
120,499.—GIG SADDLE.—J. W. Crouch, Rushville, Ohio.
120,500.—SAWING MACHINE.—J. D. Culver, Catlin, Idd.
120,501.—NAIL MACHINE.—F. Davison, Liberty, Va.
120,502.—STONE CRUSHER.—C. L. Desmolins,Avallon,France.
120,503.—PIPE ELBOW.—F. Dieckmann, Cincinnati, Ohio.
120,504.—WASHER.—W. J. Dodge, Syracuse, N. Y.
120,505.—MILLSTONE DRESSER.—H. Dolmetch, Canton, Pa.
120,506.—FENCE.—T. Donehoo, Richmond, Mo.
120,507.—PLANTER.—A. W. Dunlevy, Fair Play, Ohio.
120,508.—FLUE JOINT.—A. C. Fletcher, New York city.
120,509.—TEETH.—T. A. D. Forster, Philadelphia, Pa.
120,510.—LOOM.—W. V. Gee, Philadelphia, Pa.
120,511.—JACK.—W. H. Greenwalt, Strikersville, Pa.
120,512.—WRINGER.—L. Hale, Hollis, N. H.
120,513.—BINDER.—H. M. Hall, New York city.
120,514.—HEAD BLOCK.—S. W. Harris, Jamestown, N. Y.
120,515.—LUBRICATOR.—W. H. Harvey, Bangor, Me.
120,516.—BOILER.—J. F. Hayen, Buffalo, N. Y.
120,517.—FOLDING STEP.—W. Henry, New York city.
120,518.—HEATER.—G. Hibberd, Wheeling, W. Va.
120,519.—SAFETY VALVE, ETC.—G.Hibberd,Wheeling,W. Va.
120,520.—PEN CASE, ETC.—W. S. Hicks, New York city.
120,521.—UPSETTING TIRES.—E. Hitt, A. Lent, Katonah,N.Y.
120,522.—HOIST.—E.J.Hulbert,A. N. N.Aubin, Portland,Conn.
120,523.—BRUSH.—D. W. Lapham, Baltimore, Md.
120,524.—VISE.—H. E. Long, Decatur, Ill.
120,525.—SYRINGE.—H. N. Mattison, New York city.
120,526.—COUPLING.—G. W. McEuen, C. Eves, Millville, Pa.
120,527.—BRAKE.—R. D. Napier, Limehouse, England.
120,528.—GRIDIRON.—C. Noble, Philadelphia, Pa.
120,529.—CARTRIDGE.—A. Payne, Bridgeport, Conn.
120,530.—TENT, ETC.—W. H. Penrose, Fort Lyon, Col. Ter.
120,531.—SODA WATER, ETC.—A. Piccaluga, Paris, France.
120,532.—TURNING WOOD.—G. Pickering, Janesville, Wis.
120,533.—DOOR CHECK.—J. Pool, Elizabeth City, N.C.
120,534.—MILK HOUSE.—J. A. Brice, Beckleysville, Md.
120,535.—FASTENING.—B. Ranger, Brattleborough, Vt.
120,536.—MILL PICK.—A. Rasner, Dayton, Ohio.
120,537.—TRUSS.—S. S. Ritter, Philadelphia, Pa.
120,538.—CURTAIN FIXTURE.—A. Roelofs, Philadelphia, Pa.
120,539.—NAPHTHA, ETC.—H. H. Rogers, Brooklyn, N. Y.
120,540.—SASH HOLDER.—A. V. Sanford, Binghampton, N.Y.
120,541.—ALARM LOCK.—C. Schnepf, Marietta, Ohio.
120,542.—SAW SET.—D. Shaw, Cincinnati, Ohio.
120,543.—SASH BALANCE.—G. E. Smith, Fitchburg, Mass.
120,544.—PLANTER.—J. H. Sorey, Flora, Ill.
120,545.—MOTOR.—C. L. Stevens, Galesburg, Ill.
120,546.—FENCE.—C. H. Strowger, Webster, N. Y.
120,547.—RAIL JOINT.—J. R. Sullivan, Woodland, Cal.
120,548.—ENGINE.—W. J. Tate, Philadelphia, Pa.
120,549.—CORN SHELLER.—A. B. Thompson, Oswego, N. Y.
120,550.—TABLE, ETC.—J. Thornton, Oswego, N. Y.
120,551.—WHIP HOLDER. J.Thornton,E.G.Latta,Genesee,N.Y.
120,552.—FREIGHT CAR.—T. R. Timby, Tarrytown, N. Y.
120,553.—GUN CARRIAGE.—T. R. Timby, Tarrytown, N. Y.
120,554.—BLACKING BOX.—J.Van Santvoord, Mt.Vernon,N.Y.
120,555.—BATHING APPARATUS.—C. Venn,Kastnersville,Can.
120,556.—WHITE LEAD.—C. L. Wheeler, Pittsburgh, Pa.
120,557.—PADLOCK.—W. Wilcox, Middletown, Conn.
120,558.—DARK CHAMBER. I.F.Woodward,McMinnville,Tann.
120,559.—ROAD SCRAPER.—W. S. Worley, Arcola, Ill.
120,560.—PLOW.—J. Worrell, J. H. Rynerson, Clayton, Ind.
120,561.—TRACE BUCKLE.—A. Worster, Syracuse, N. Y.
120,562.—FEED MILL.—Z. S. Cracraft, Ottawa, Ill.
120,563.—LOCK.—N. Kenny, New York city.

REISSUES.

4,612.—Division A.—MANTEL, ETC.—D. K. Innes and W. W. Magill, Cincinnati, Ohio.—Patent No. 117,294, dated July 25, 1871.
4,613.—Division B.—MANTEL, ETC.—D K. Innes, W. W. Magill, Cincinnati, Ohio.—Patent No. 117,294, dated July 25, 1871.
4,614.—WOOD BENDER.—H. McDonald, Shortsville, N. Y.—Patent No. 31,182, dated Jan. 22, 1861; reissue No. 4,548, dated September 12, 1871.
4,615.—DREDGE BOX.—A. F. Tripp, Buffalo, N. Y.—Patent No. 106,430, dated August 16, 1870.
4,616.—MATTRESS.—E. L. Bushnell, Poughkeepsie, N. Y.
4,617.—Division A.—BARREL FILLER.—S. C. Catlin, Cleveland, Ohio.—Patent No. 99,159, dated Jan. 25, 1870.
4,618.—Division B.—BARREL FILLER.—S. C. Catiin, Cleveland, Ohio.—Patent No. 99,159, dated Jan. 25, 1870.
4,619.—GRIDIRON, ETC.—S. Lee, Taunton, Mass.—Patent No. 118,462, dated August 29, 1871.
4,620.—LOCK, ETC.—J. H. Lyon, New York city.—Patent No. 25,428, dated Sept. 13, 1859; reissue No. 849, dated Nov. 8, 1859.

DESIGNS.

5,326.—CARPET.—T. Barclay, Glasgow, N. B.
5 327.—CARPET.—J. Bouet, Kidderminster, England.
5,328.—BILLIARD TABLE.—L. Decker, New York city.
5,329.—CARPET.—E. Demoussy, Paris, France.
5,330.—CARPET.—C. Dresser, London, England.
5,331 to 5,333.—CARPET.—O. Heinigke, New York city.
5,334 to 5,336.—CARPET.—W. Mallinson, Halifax, England.
5,337 and 5,338.—CARPET.—J. J. Patchett, Halifax, England.
5,339 to 5,341.—CARPET.—H. Robinson, Halifax, England.
5,342.—TYPE.—A. McLeester, Philadelphia,.Pa.
5,343 and 5,344.—CHANDELIER.—F. R. Seidensticker, West Meriden, Conn.
5,345.—LATCH.—W. E. Sp rks, New Haven, Conn.
5,346.—CHEST HANDLE.—W. E. Sparks, New Haven, Conn.
5,347.—SASH LIFT.—A. Wunder, New Haven, Conn.

TRADE-MARKS.

506.—COMPOUND.—G. M. Denison, Essex, Conn.
507.—SPECTACLES.—J. Diamond, Pittsburgh, Pa.
508.—SALVE.—J. Lovett, Allegheny City, Pa.
509.—FISH LINE.—G. H. Mansfield, Canton, Mass.
510.—FIRE BRICK, ETC.—McConnell, Porter & Co., Scioto-ville, Ohio.
511.—LIQUID SLATING, ETC.—J. D. Wilder, Chicago, Ill.

EXTENSIONS.

STEAM GENERATOR.—F. Latta, of Cincinnati, Ohio.—Letters Patent No. 18,160, dated October 20, 1857.
MELODEON.—S. A. Jewett, of Cleveland, Ohio.—Letters Patent No. 18,399, dated October 13, 1857; reissue No. 1,658, dated April 19, 1864.
CHAIN MACHINE.—L. Toune, of Providence, R. I.—Letters Patent No. 18,490, dated October 20, 1857; reissue No. 928, dated March 13, 1860.
PLANTER.—T. W. White, of Milledgeville, Ga.—Letters Patent No. 18,482, dated October 20, 1857.
IRON SPOON.—G. I. Mix, of Yalesville, Conn.—Letters Patent No. 18,513, dated October 27, 1857; reissue No. 4,506, dated August 8, 1871.

Inventions Patented in England by Americans.

From October 3 to October 16, 1871, inclusive.

[Compiled from the Commissioners of Patents' Journal.]

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BRAKE.—C. Westinghouse, Jr. (of Philadelphia, Pa.), London, England.
BUTTON HOLE CUTTER.—J. G. Powell, Philadelphia, Pa.
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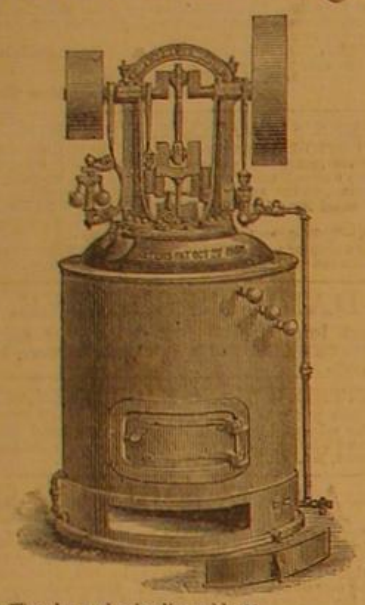

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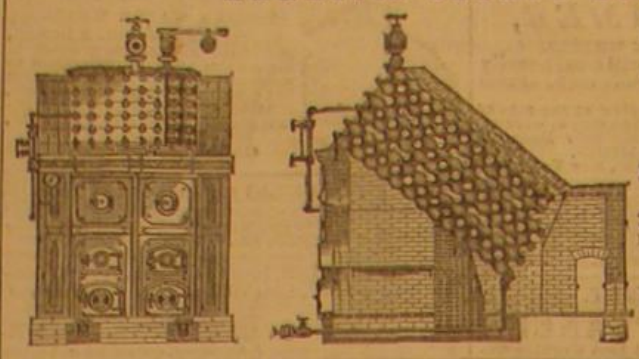

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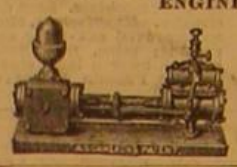

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