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Improved Apparatus for Tanning Leather.

The engravings accompanying the present article illustrate a newly patented apparatus for tanning leather, in which the principle of constant circulation in the tan liquor is so applied as, it is claimed, to greatly facilitate the process of tanning.

The inventors state that with a cylinder twelve feet long, and seven feet in diameter, 2,000 sheep skins can be tanned in the best possible manner in from four to six days with good liquor; that calf skins can be tanned in a superior manner in two weeks, and that by a slight enlargement of the apparatus in length and diameter, 200 cow hides may be conveniently tanned in three weeks.

The machine illustrated is calculated to equal in operative efficiency thirty pits of ordinary size, yet it is claimed it may be advantageously worked by one man, including the grinding of bark, preparing and changing the liquor, etc. A saving is made of the time and labor ordinarily expended in overhauling hides and changing liquor, which, in the old method, would require the labor of two men for from four to six months in tanning cow hides, and about six weeks for sheep skins.

We need not dwell upon the advantage to the manufacturer secured by the shortening of the process. The saving of interest on invested capital and in the wages account, will be evident without further remark.

The machine which we will now proceed to describe, is simple, and seemingly durable, and may be readily constructed by ordinary mechanics.

The tank, A, contains the tanning liquor. In it revolves the cylinder, in which the hides to be tanned are placed as hereinafter described.

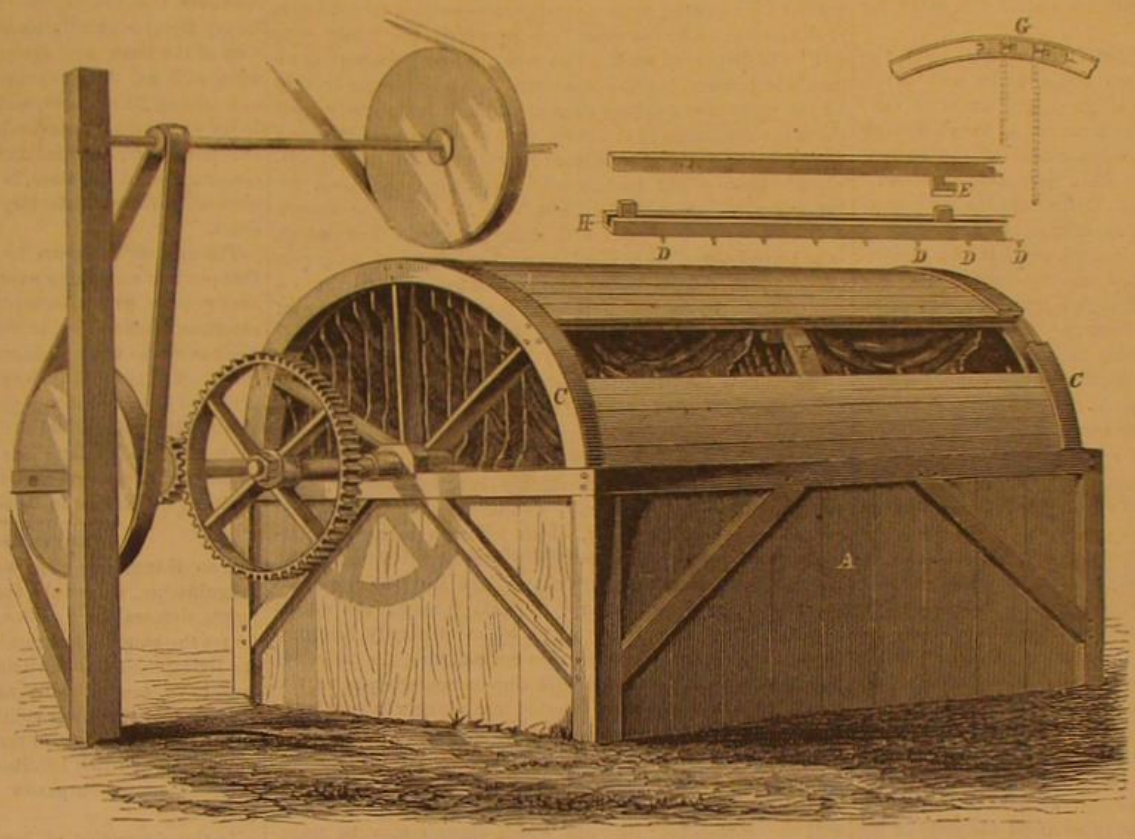
The construction of the cylinder, is as follows: Two or three (more or less) heads are keyed to a center shaft, and on these heads are placed a succession of bars or lags, shown in detail at the top of the engraving. Each of the lags is provided with brads or spikes, D, and a central hook, E. This hook, when the lags are placed in position, engages with the central head, F, and the ends of each lag fit into rebates on the end heads, and are held there by bands, C.

The brads or spikes are inserted into one side of each lag, and when the lags are placed in position, the points of the spikes enter grooves in the juxtaposed lags, as shown in detail at G. The lags are kept at the proper distance from each other by blocks inserted in the grooves at the ends of each.

The hides to be tanned are hung on these brads, and are thus prevented from rolling up, and their whole surface is exposed to the action of the liquor at each revolution of the cylinder.

The liquor is kept constantly agitated, and its strength is evenly and uniformly distributed, thus insuring perfect saturation and uniformity in the quality of the leather.

Patented, through the Scientific American Patent Agency, August 9, 1870. For further information address John & S F. Robinson, Skowhegan, Me.



ROBINSON'S IMPROVED TANNING APPARATUS.

Hard on Evans.

The Commissioner of Patents has published an order refusing to recognize Charles H. Evans, of Philadelphia, or any firm of which he is a member, as a patent agent, for gross misconduct. Evans puts in his answer the plea that his duties as editor and publisher of the *American Engineer* involved so much of his time that he was compelled to delegate his patent business *entirely* to his clerks, and that he was aware that in several instances they neglected to attend to their business. This is the second case of discipline applied to patent agents by Commissioner Fisher, who seems determined to put a stop to the frauds practiced upon innocent and unsuspecting inventors on the part of patent solicitors.

The Aurora Borealis.

There have been of late several brilliant displays of the Aurora Borealis, *or* Northern Lights, and the indications are that the present fall and coming winter will witness a succession of magnificent auroral demonstrations. These are accompanied with the usual magnetic disturbance and interruption of telegraphic working. The true character of the phenomena is still undetermined, but there would seem to be little room for doubt that they are electrical, and are mainly induced by the magnetic action or disturbances of the sun. The photosphere of the sun is in a state of great perturbation, and has been for some time past. At times the spots have been so extensive as to be almost visible to the naked eye. Cyclones and storms, of an extent and violence almost inconceivable to us, are taking place on the surface of our great luminary, and the auroras which render our nights brilliant and magnificent are, in some way, undiscovered, and perhaps undiscoverable by us, the result of these terrible manifestations.—*Telegrapher.*

IMPROVED DOOR AND SHUTTER BOLT.

The old style of bolt used on doors and outside shutters, which forms a staple article of large demand in the hardware trade, is familiar to all; it is made by riveting staples on a base plate, the plate being affixed to the door or shutter by screws, the bolt being carried by the staples and held from sliding too far back by a stop piece.

Fig. 1

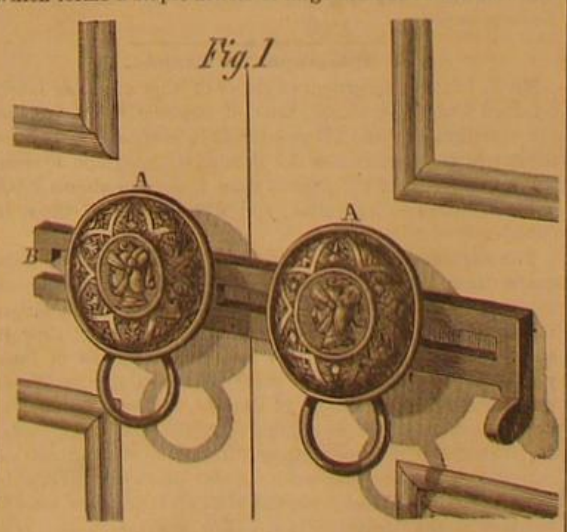
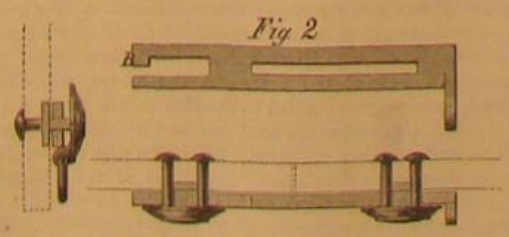


Fig. 2



The objections to this style of bolt are so obvious and many, that it is strange they have not been long ago superseded by some better contrivance. They are clumsy and unsightly in appearance; are not capable of any change of form or usefulness; the rain or moisture gathers under the base plates; rust forms and soon disfigures, and even in time destroys the shutter; from rust and strain, also, the screws by which the plates are affixed to the shutter, and the riveted staples and stop pieces, become loose, or so weak as to be of little practical value for fastening purposes.

In the improved bolt here illustrated these objections are obviated. Fig. 1 is a perspective view; Fig. 2 contains details of construction.

The ornamental studs, A, being provided at the back with wrought-iron rods or nails at the time of casting the stud, the rods are driven through holes previously bored in the door or shutter, and may then be either riveted or clenched on the other side; before driving the right-hand side stud, the bolt is placed back of it, so that the clenching rods pass through the slot in the bolt; friction plates are also provided on the studs back of the bolt, to keep the bolt from rubbing the shutter; the friction plates may be made in separate pieces, or may be cast on the studs: the slot of the bolt, being temporarily widened to allow the friction plate or shoulder to pass through, is then closed to the proper width, and each stud is then ready, with the bolt permanently connected, to be driven through the shutter. This style of bolt can be made self-locking after the shutters are closed, and fastened by cutting the slot at the end of the bolt, a little wider, part way, leaving the stop piece, B; the bolt after being shot home drops down enough to leave the stud in the recess of the slot, and can be easily unlocked from the inside, by depressing the other end of the bolt in pushing it back.

The studs may be made of great variety of ornamental figure, and to correspond in pattern with the handsome door hardware now so fashionable; they can be cheaply silvered, bronzed, japaned, or galvanized, and by reduction to suitable size, will form a handsome ornamental fastening for inside shutters. In this improved bolt, the old fashioned separate ring and staple are done away with, and the studs may be provided with rings or not as desired.

The bolt is of wrought iron, and the stud may be cast or struck up in any suitable metal. The ornamental character of the whole strikes the eye at once, and its strength and usefulness will, we think, be conceded. With all these improvements, these bolts can be made, we are told, from twenty to forty per cent cheaper than the old style of bolt, according to this pattern. The whole right will be sold.

Patented, through the Scientific American Patent Agency, June 21, 1870, by Geo. B. Green, 1,754 Warnock street, Philadelphia, whom address.

ARTESIAN WELL IN NEBRASKA.—The labors of the parties who had been boring for the last eighteen months in Lincoln, the capital city of Nebraska, for salt water, were crowned with success. At the depth of 600 feet below the surface, in a stratum of sandstone, a lead of the great subterranean sea of salt water was recently struck, and the briny torrent came struggling up around the auger and shot into the air some eight or ten feet. It has since flowed strongly and steadily, and with great force and increasing strength, forming a briny rivulet. It is believed by the experts who have seen the flow, that when the auger is withdrawn and tubing inserted, a stream of water will be projected from the well to the hight of fifty feet, making it the most magnificent artesian well of salt water in the world.—*Nonpareil.*

THE Commissioner of Mining Statistics gives the product of precious metals in the United States last year at $83,500,000, distributed thus: California, $20,000,000; Nevada, $14,000,000; Oregon and Washington Territory, $4,000,000; Idaho, $7,000,000; Montana, $12,000,000; Colorado and Wyoming, $4,000,090; New Mexico, $500,000; Arizona, $1,000,000; other sources, $1,000,000.

ELECTROLYTIC INSULATION.

We have to direct the attention of our telegraphic readers to a novelty in electrical science, and to a question which may, or may not, become of great practical importance in electro-telegraphy,—more especially in connection with underground lines. This novelty—for it is a new application of old facts—is what has been termed *Electrolytic Insulation*; and the question is whether this mode of insulating a current, or, rather, of insulating from each other two conductors forming the "sending" and "return" paths of a current, can be utilized for telegraphic circuits. We will first describe what electrolytic insulation is; and we will then state what we know of the results which have hitherto been obtained in its experimental application.

Supposing that we are called upon to insulate from each other two wires respectively attached to the terminal elements of a battery—say of four Daniell cells; the plan which first suggests itself is simply to place these wires apart *in air*, or in other words to utilize this common dielectric for the purpose of insulation. If, however, the wire be several hundred yards in length, we have to use another dielectric—stoneware or porcelain, glass or ebonite, etc.—at the points of support. Or, we may completely encase one of the wires in a dielectric of another class, such as gutta-percha or india-rubber; using the uncovered wire, instead of the earth, for the return current.

All these are examples of *dielectric* insulation. But the wires may be insulated from each other, under any given electromotive force, "by means of good conductors of electricity (metals and electrolytes) so arranged as to generate an electromotive force which opposes the escape of the current when the latter is transmitted in a particular direction." The insulator is then electrolytic. If, for instance, we respectively connect the wires above mentioned to the poles of another battery of four cells of Daniell, so that the electromotive forces of the two batteries may be opposed to each other, no current will pass; although a complete conductive circuit exists. Now this second battery—which is not required to transmit a current, but merely to exert statically a certain opposing tension or electromotive force—may be constructed in the form of an elongated cylinder, of any required length, composed of a tube, or series of concentric tubes, having as a central element the wire to be insulated. The tube, or tubes, and central element, being metallic, and being separated from contact with each other by means of a fibrous material containing an electrolyte, or moisture, constitute in fact a voltaic battery (if the opposing metallic surfaces be dissimilar), or a secondary battery (if the opposing surfaces be similar). The poles of this battery will be constituted respectively by its outer surface and the inner conductor; and the number of cells connected in series, and consequently the electromotive force of the arrangement, will be as the number of concentric tubes. It will be seen, therefore, that if the poles of a Daniell battery of equal electromotive force be respectively connected, through a galvanometor or other indicating instrument, with the poles of this elongated battery, at one of its extremities, no current will pass through the conductive circuit thus constituted *until the poles at the other extremity be brought into metallic contact*. When this occurs, there will be a complete *metallic* circuit, free from any opposing electromotive force, for the currrent from the Daniell battery; and this current, starting from one pole of the latter, will traverse the inner conductor of the cable battery and the wire uniting its poles at the distant extremity, returning by the external tube, or *vice versa*. Signals may thus be produced, at one extremity of the cable battery, by uniting its poles at the other extremity.

Professor Miller, F. R. S., of King's College, thus describes an experimental or model cable on this principle, and some of the results obtained with it, which have not hitherto been published:

"The cable was made in a series of lengths of a yard each. I was informed that each of these lengths consisted of a conducting core of galvanized iron wire one yard two inches in length, coated with a fibrous material—this coated wire was inclosed in a soldered leaden tube one yard in length. The tube was then covered with thin zinc foil, and this in its turn was coated with fibrous material. The whole was then inclosed in a second leaden tube one yard long. Each layer of the fibrous material had been previously steeped in a strong solution of sulphate of magnesia, and allowed to become partially dry by exposure to the air.

"The composite tubes prepared as above described were laid side by side on an uninsulated wooden table covered with sheet lead (earth). The projecting ends of the galvanized iron core were connected alternately with the wire adjoining, by means of binding-screws and short pieces of copper wire, so as to make one continuous conducting cable, of 97 yards in length; the three other lengths needed to make up the 100 having been damaged.

"One extremity of this conducting wire was attached to a galvanometer and through this, by means of a commutating key, was permanently connected with the negative pole of a two-cell Daniell's battery, the positive pole of which was connected with the 'earth,' or with the outer surface of the cable through the leaden table.

"The other end of the cable was connected with a series of three resistance coils, consisting of 1,000 yards of fine silk-covered copper wire, 32 gage; and the other end of these resistance coils was insulated, but could be connected to earth at pleasure by means of a key.

"Every time that this connection of the earth with the galvanometer was made, the needle of the galvanometer was strongly deflected, and signals were transmitted through the resistance coils and cable.

"When thus arranged, the entire cable itself formed a battery of two cells, acting so as to produce a current in the *opposite direction* to that generated by the signaling battery, the electromotive force of which latter somewhat exceeded that of the current which the cable tended to produce, but which it did not actually furnish.

"That this really was the case was shown by reversing the direction of the current from the signaling battery, so as to cause it to *coincide* in direction with that from the cable. The galvanometer was immediately deflected with energy, and the needle thrown against the stop at 90°. The insulation effected by the cable was thus shown to be due to the electrolyte, and not to any interposed dielectric."

It is not often that a fundamentally new system of constructing electric telegraph lines, "ingenious, and founded upon a principle the correctness of which cannot be doubted in the main"—as Prof. Miller states the present system to be—is brought to our notice. Whether or not this device of electrolytic insulation be susceptible of being adapted to the practical requirements of telegraphy, it merits attention, and should be studied by advanced telegraphists. Our opinion is, that if certain mechanical difficulties in the construction of an electrolytically insulated cable can be satisfactorily overcome, this system might certainly become available for underground lines. The competent opinions which have been given as to the durability of such a cable are very favorable; metallic corrosion being obviated by the application of the principle upon which Sir H. Davy protected the sheathing of ships, whilst the decay of the fibrous material would not appear to impair its electrolytic property, nor to lead necessarily to any metallic contact between the elements of the cables.

We have recently witnessed an experiment—which may readily be repeated upon a small scale—with a modification of the apparatus above described, in which the "thin zinc foil" was dispensed with. The cable, at first possessed of no insulating power, becomes converted into a secondary battery by the passage of a strong current through it laterally from the inner conductor to the outer tube or *vice versa*. We may suggest the following miniature reproduction of this experiment to those of our readers who have time and taste for investigation. A galvanized iron wire 20 inches in length may be covered uniformly with hemp or cotton fiber, which is to be moistened with a solution of sulphate of magnesia (Epsom salts). This coated wire is then to be inserted into a leaden tube, 18 inches in length, the internal diameter of which should be just sufficient to allow of the insertion. If the negative pole of a Daniell's battery of 4 or 6 cells in series be now connected through a galvanometer (or "quantity" indicator) with one end of the inner wire, and the positive pole be connected with any portion of the tube, a strong current will traverse the arrangement. It will be noticed, however, that this current rapidly becomes weaker, and, when its intensity has fallen to a sufficient extent, it will be found that the arrangement, which has now become "polarized" or converted into a secondary couple, will insulate the current from one—or perhaps nearly insulate that from two—cells of the primary battery. Signals through the miniature cable may now be obtained by momentarily bringing the free end of the inner wire into contact with the tube. If this tube be in turn covered with fibrous material, as in the case of the inner wire, and inserted into a larger tube of lead; the cable, when subjected afresh to the process of polarization, will have acquired a double insulating power. By connecting up a battery, through a galvanometer, at each end of the cable, an electrolytical insulated telegraphic circuit will be represented; through which signals may be transmitted from either terminal by uniting the poles of the battery at that terminal, which is best done with the aid of a key to which the poles are connected.

It need scarcely be pointed out that the *inner* tube or tubes of an electrolytically insulated cable may be of very slight thickness, and that the same observation applies also to the fibrous coatings. Doubtless there are many difficulties to be overcome before this mode of insulation can become practically available in telegraphy; but it is quite possible that, in the future history of this science-art, electrotytic insulation may be made to render good service.—*Electric Telegraph and Railway Review.*

The Telegraph in Canada.

Mr. F. L. Pope, telegraph engineer of this city, has lately returned from an extensive tour of observation in Canada, and contributes to the *Telegrapher* an interesting report upon the extent and condition of the Dominion Telegraph system.

It appears that at the present time there are almost 2,000 miles of wires in operation, and 675 telegraph offices in Canada.

The engineering and construction of the Canadian telegraph lines display a great deal of British thoroughness, together with much of the conservatism that characterizes that nationality. They have apparently been very slow to adopt any of the innovations and improvements of later years, but their construction everywhere strikes the eye as being careful, substantial, and durable, while the lines are everywhere kept in such admirable repair that the general result is exceedingly satisfactory. The style of construction is nearly everywhere the same. Cedar poles are invariably employed, 25 to 30 feet long, and of much larger size than is common in the United States. They are placed ten rods apart, or 32 to the mile, and so firmly set that it is exceedly rare to find one out of the perpendicular. Glass insulators are invariably employed, one being placed on a locust pin inserted in the top of the pole, and the others, one above another, upon brackets nailed to the side of the pole, in the usual way. Cross-arms are used but in rare instances, even with a great number of wires. No. 9 English galvanized wire is universally employed. The lines of the Montreal Company are built by a gang of men, under an experienced foreman, who has been employed by them for twenty years. They work during the entire season, being provided with tents and provisions, so that they encamp at night wherever they may happen to finish their day's work.

The Grove battery is employed on all main circuits, except for unimportant branch lines, where the bichromate battery is sometimes substituted. For locals an excellent form of Daniell's is in general use, in which the containing vessel is of copper, and constitutes the positive element of the battery. The favorite relays are those of Chubbuch, of Utica, and Williams, of Boston. Relays of the Williams pattern are now made in Montreal, and are being much used. The old standard Chubbuck register is found everywhere.

Taken altogether, the telegraphic system of the Dominion impressed me as being in a very prosperous condition. The Montreal Company pays an annual dividend of 10 per cent upon a capital of $750,000. The actual cash value of the property of the Company, however, exclusive of franchises, etc., can scarcely be under $1,000,000, if taken at any reasonable valuation. The competing lines have been so recently established that it is impossible as yet to form an accurate idea of their condition and prospects. It is probable, however, that the total amount of business done will be largely increased by the competition, as is the case in this country, and even in the event of the competing companies doing a profitable business, the revenues of the Montreal Company will not be seriously effected.

As by far the greatest portion of the Montreal Company's business is done upon a 25 cent tariff, it would hardly seem to leave a large margin for profits. It must be remembered, however, that the expense of line repairs (in this country a heavy item) is greatly lessened by the substantial construction of the lines, and interruptions are much less frequent than with us. The expense of operators—another large item—is less by 25 per cent, and the Canadians are also fortunate in an exceptionally favorable climate. It is probable that this latter fact, in connection with the excellent mechanical construction of the lines, is sufficient to account in a great measure for the satisfactory condition of the annual balance sheet.

The enterprise shown by the managers of the Montreal Company in supplying every portion of their territory, however remote, with telegraphic facilities, is worthy of warm commendation. The traveler who penetrates to the lumber regions of the upper Ottawa, the distant coasts of Gaspe, or the heart of the Adirondacks, now finds that the wires have preceded him, and it will probably not be many years before a cable line will be laid through lakes Huron and Superior, connecting with a land line to Red river and across the plains of Sackatchewan, and over the Rocky Mountains, to join the Western Union line in British Columbia.

Luxury in Ancient Rome.

If anything more were wanted to give us an idea of Roman magnificence, we would turn our eyes from public monuments, demoralizing games, and grand processions; we would forget the statutes in brass and marble, which outnumbered the living inhabitants, so numerous that one hundred thousand have been recovered and still embellish Italy, and would descend into the lower sphere of material life to those things which attest luxury and taste, to ornaments, dresses, sumptuous living, and rich furniture. The art of using metals and precious stones surpasses anything known at the present time.

In the decoration of houses, in social entertainments, in cookery, the Romans were remarkable. The mosaics, signet rings, cameos, bracelets, bronzes, chains, vases, mirrors, mattresses, cosmetics, perfumes, hair dyes, silk robes, potteries,—all attest great elegance and beauty. The tables of thuga-root and Italian bronze were as expensive as the side-boards of Spanish walnut, so much admired in the great exhibition at London. Wood and ivory were carved as exquisitely as in Japan and China. Mirrors were made of polished silver. Glasscutters could imitate the colors of precious stones so well that the Portland vase, from the tomb of Alexander Severus, was long considered as a genuine sardonyx; brass could be hardened so as to cut stone.

The palace of Nero glittered with gold and jewels. Perfumes and flowers were showered from ivory ceilings. The halls of Heliogabalus were hung with cloth and gold, enriched with jewelry. His beads were silver, and his table of gold. Tiberius gave a million of sesterces for a picture for his bedroom. A banquet dish of Disilus weighed five hundred pounds of silver. The cups of Dresus were of gold. Tunics were embroidered with the figures of various animals. Paulina wore jewels, when she paid visits, valued at $35,000. Drinking-cups were engraved with scenes from the poets. Libraries were adorned with busts and presses of rare wood. Sofas were inlaid with tortoise shell, and covered with gorgeous purple.

The Roman grandees rode in gilded chariots, bathed in marble baths, dined from golden plate, drank from crystal cups, slept on beds of down, reclined on luxurious couches, wore embroidered robes, and were adorned with precious stones; they ransacked the earth and the sea for rare dishes for their banquets, and ornamented their houses with carpets from Babylon, onyx cups from Bythnia, marble from Numidia, bronzes from Corinth, statues from Athens—whatever, in short, was precious or curious in most countries. The luxuries of the bath almost exceeded belief; and on the walls were magnificent frescoes and paintings, exhibiting an inexhaustible productiveness in landscape and mythological scenes.

DECLINE OF TURKISH MANUFACTURES.—The manufactures of Turkey are reported, to be on the decline. The steel manufactories for which Damascus was famous no longer exist. The muslin looms of Scutari and Tirnova, which numbered two thousand in 1812, are now reduced to less than two hundred spindles, and Broussa and Diabekir, once famous for their velvets, do not now produce one tenth they did forty years ago.

[For the Scientific American.]

THE EXCURSION OF THE BOSTON BOARD OF TRADE OVER THE PACIFIC RAILROAD---THE PULLMAN PALACE CARS.

The excursion train of the Board of Trade, of Boston, was a success,and I desire to add my testimony to that of the party which went in the Pullman train, as to the excellence of the arrangements, which far surpassed anything I have found here or elsewhere. Considering the number of persons, the extent of the journey, the magnitude of the grades,the beauty of the scenery at several points, it may be truly said that the excursion was a great success, and stands unrivaled in the annals of railroad traveling. It must be acknowledged that Messrs. Pullman deserve much credit for their enterprise and ingenuity. At the same time, it would be a libel on their intelligence to say that improvements cannot be made in the Palace Cars. Having had much experience in them, and having given much thought to the subject, I trust I shall not be considered querulous if I suggest some alterations which I am sure will be considered improvements by the class of travelers who generally occupy the palace cars, and are willing to pay to be comfortable.

Taking for dimensions the actual measurement of a "drawingroom car," built by the C. B. and A. road, at Aurora, Ill., namely, from buffer to buffer, 64 feet, as the standard or maximum length, and deducting 7 feet for platforms,etc., in order to get the inside dimensions, we have 57 feet. Six lengths of couches, including the partitions and one state room, at 7 ft., 49 ft., leaving for wash stand and water closet, 8 ft. The "saloon car" measures 3 ft. 4 in. more. I presume this space to be occupied by the organ on one side and a linen closet and desk or secretary, on the other

The principal defect in these cars is the want of sufficient accommodation for ablutions, etc. There are only two washbasins for twenty-eight persons, supposing that only two occupy each section and the two state rooms. There are only two water closets, and, as these have no water, they should be called dry closets, or broom closets. The next defect is in the unnecessary width of the couches for one person. They are about 40 in., which, allowing for the sides of the car, and calling the outside width 9 ft. 11½ in., leaves about 3 ft. space between the lower couches. About half of this space is taken up by the curtains when the berths are made up for the night, so that,when everybody is stowed away, a clear space remains for the conductor or servants to pass along of about 18 in., enough for that purpose, but not enough to enable one to dress in with any degree of convenience.

Now for the remedies. Discard one state room in the 64-ft. car and put in one or two wash basins and another water closet, to be allotted to ladies, and, in the 67-ft. car, leave out the organ and secretary, and give more washing room and more closet room. Put into every water closet a small tank and a portable basin, towels, etc., and enlarge the aperture in the seat, as well as the conductor from the seat downwards. These small alterations will add much to the sanitary comfort of valetudinarians, as well as all others. To the first they are absolutely essential

As to the couches, if I cannot have them in the center of the car, leaving a space for servants on each side, and assuming that a section is to lodge only two persons, I would have them only 30 in. wide, giving 20 in. more in the center,which would add much to the comfort by day, and to the convenience for dressing in the morning, and going to bed at night.

The present couches are very badly formed for comfort by day, the seat being very hard, rounded in form, and with no convenient back or arms to rest upon. These should be upholstered with reference to the comfort of the occupants by day. Space enough should be left under the couches to stow away small valises, bags, and bundles, which now occupy the the limited center space, or are put away in distant closets, to the inconvenience of passengers. Now, there is only room under the couches to lose boots, shoes, and umbrellas. In order to give the required room, the seat need not be raised, nor the cushion curtailed. All that is wanted, is to leave off the deep ornamental facing board. More conveniencies are wanted for hanging up small articles,and some better arrangement for locking the upper birth. The present handle is much in the way of the heads of those occupying the lower couches in dressing. The system of ventilation seems to be imperfect; the occupant of the lower couch can control his window, and let in air, rain, or cinders, at pleasure; but the occupant of the upper couch gets only a modicum of air, filtered through the lower atmosphere.

Other small defects, which create a good deal of delay and dissatisfaction, are the small cocks supplying the very small basins with water, homeopathic towels, and the total absence of means for cleaning one's mouth, excepting by using the one drinking glass in the water closet, or outside the door at the risk of one's life. I do not mean to be understood as recommending railroad companies, or Pullman companies, to supply both brushes and yard-square towels, and a tumbler for each person,with a reservoir to spit in; but I insist on the practicability and convenience of having larger cocks, two mugs or tumblers to each basin, towels at least two feet square, and a general outlet or reservoir for mouth cleaners. It is no answer to say that the traveling public don't use tooth brushes,or require large towels, and much washing, and that they can sit on a hole 8x6.

I am sure that those who make long journeys and are willing to pay to be comfortable, will fully appreciate the small things I enumerate as essential to health and comfort It is no answer to say, that there never were before such conveniences as we have lately experienced, and that if the public don't like the arrangements, they should remain at home. These and similar answers are made when travelers suggest alterations; and it is also answered, that to add more weight or more space,would be inconvenient and costly. So far from desiring to add more weight, or more space, in width or hight of cars, or more cost, I would curtail the couches and all their fittings 25 per cent in width, and leave out much of the ornamentation, so as to reduce weight and cost, as well as the expense of occupancy.

Having touched on some of the inconveniences which all admit in the arrangements for the outward man, I must say a word as to the commissariat cars and appendages. The one I measured was 59 ft. long. The amount of space, the weight and cost of the cooking room,where some stores are also kept, are far beyond the necessities or wants of the traveler, who looks most to comfort, health, and economy. The attempt usually made to furnish a bill of fare equal to Delmonico or Parker, is not only a failure in quality, but a grievance in cost, and it also involves great heat in the dining car. In my experience, the cooking room was invariably in the front end of the car, so that all the heat, and bad smells, and confusion of getting through a narrow passage, in contact with servants and cooks,became a positive evil. I can conceive of no reason for ventilating the cooks at the expense of the passengers, unless it be thought that the more uncomfortable they make the latter, the less will they consume.

In hot weather, on long journeys, people do not require a great variety of food. A few good and simple dishes are all one wants, with good hot coffee, bread and butter, ice and water. In our California journey, the tables in the dining car, about 3 ft. by 2, were expected to seat four persons, and there was room enough for simple, well-cooked food, but not enough for the long list of half-cooked vegetables, meats, pies, puddings, jellies, pickles, etc. The tea and coffee were poor, especially the tea, the bread very good, and the attendance unexceptionable. My remarks must be considered as applying mainly to the drawing-room cars. The saloon cars are perhaps more convenient for small parties, being more private, but they also suffer from want of washing conveniences.

The California Pullman train was too long for comfort or safety—about six hundred feet, and nearly double the weight of an ordinary passenger train containing the same number of passengers, hence considerable delays were inevitable, which, added to the delays from hot journals, consequent to a new train, made the journey longer by a day, each way, than will generally be necessary to go from the Atlantic to the Pacific.

R. B. F.

East India Architecture---The Famous Taj.

The famous Taj, the gem of India and the world, the Koh i-noor of architecture, is situated about three miles from Agra, on the west bank of the Jumna. On approaching it, one sees white marble minarets rising among the trees. We halt at the grand portal of the great garden, and the entrance hall, or gate, so arrests us that we feel inclined to ask, with a little feeling of disappointment, Is this the Taj? This being a splendid building of hard red stone—whether sandstone or granite, I cannot remember—inlaid with white and black marble, and various colored stones. Its arched halls are spacious. We were conducted to the upper story, and from a great open arch, behold the Taj! All sensible travelers here pause, when attempting to describe this building, and protest that the attempt is folly, and betrays only an unwarranted confidence in the power of words to give any idea of such a vision in stone. I do not cherish the hope of being able to convey any true impression of the magnificence and beauty of the Taj, but, nevertheless, I cannot be silent about it. From the arch in the gateway the eye follows a long, broad, marble canal, often full of crystal water, at the extreme end of which rises the platform on which the Taj is built. Each side of the white marble canal is bordered by tall, dark cypress trees, and on feast days about eighty fountains—twenty-two being in the center—fling their cooling spray along its whole length, while trees of every shade, and plants of sweetest odor, fill the rest of the garden.

The buildings which make up the rest of the Taj are all erected on a platform about twenty feet high, and occupying a space of about 350 feet square. These buildings consist of the tomb itself, which is an octagon, surmounted by an egg-shaped dome of about seventy feet in circumference, and of four minarets, about a hundred and fifty feet high, which shoot up like columns of light into the blue sky. One feature peculiar to itself is its perfect purity; for all portions of the Taj—the great platform, the sky-piercing minarets, the building proper—are of pure white marble. The only exception—but what an exception!—is the beautiful ornamented work, of an exquisite flower pattern which wreathes the doors and wanders foward the dome, one huge mosaic of inlaid stones of different colors. Imagine, if you can, such a building as this—

> "White as the snows of Apennine,
> Indurated by frost,"

raising amid the trees of an Eastern garden rich in color, fruit and flowers, and standing against a sky of ethereal blue, with nothing to break its repose save the gleaming wings of flocks of paroquets, adding to the glory of color; and all seen in perfect silence, with no painful associations to disturb the mind, or throw it out of harmony with the pleasing memories of a wife and mother buried here by a husband who loved her for twenty years of married life, and who lies beside her.

We walk up from the great portal along the central marble canal, ascend the platform by twenty steps, and crossing the marble pavements, enter the Taj with a feeling of awe and reverence. Our admiration is increased as we examine the details of the wondrous interior. The light admitted by the door does not dispel but only subdues the gloom within.

We stand before such a screen as we have never seen equaled. Divided into several compartments and panels, it sweeps around marble cenotaphs that lie within it, and represent the real tombs seen in the vault beneath. It is of purest marble, so pierced and carved as to look like a high fence of exquisite lace work, but is really far more refined and beautiful: for everywhere along those panels are wreaths of flowers composed of lampis, lazali, jasper, heliotrope, chalcedony, carnelian, etc.; so that to make one of the hundreds of these bouquets a hundred stones are required. The Florence mosaic work does not surpass it. And all this vision in stone was raised by a Mohammedan Emperor over his dream of love—the wife who died more than two hundred years ago, when Christian Kings and Emperors were sent into dark and "weeping vaults"—"the longest weepers for their funerals!" with no ornaments save spiders' webs. When a musical note is sounded beneath this dome how strange are the echoes from within it. They are unearthly like those of an Æolian harp.

But who, it may be asked by that trying order of readers, called the lovers of knowledge—was this Emperor, and who was his wife, so honored? The father of the builder of the Taj, Jehanghir was the first ruler in India who received an ambassador from England, Sir Thomas Roe, in the reign of James I. Jehanghir married a famous beauty, Niher-ul-Nissa, the widow of Sher Afgan, who, four years previously had been assassinated by this same Jehanghir. Her name was changed first into Noor Mahal, "the light of the harem," and afterwards to Noor Jehan, "the light of the world." Jehanghir, it may be noticed, as a characteristic of the times, had *impaled* eight hundred of the race of Tamour, who were "in his way" to the throne.

Shah Jehan succeeded him, having murdered his own brother in order to do so. He married Arzumund Banoo, the niece of the "light of the harem," the daughter of her brother. She was a good wife, and brought to her husband several children, among whom was Aurungzebe, who was the last ruler of the united empire of the great Akbar, his grandfather. After burying his wife in the Taj, Shah Jehan became a miserable debauchee. He has, however, been very quiet and sober the two hundred years he has lain beside Arzumund Banoo, beneath the marble dome.

The cost of the Taj, I may add, was upward of three millions of pounds sterling. Thousands of workmen were engaged upon it for long years. So much for the price of a sentiment. Was it too much? And how shall we balance the account between sentiment and silver?—*Days in North India.*

Trade-Marks.

In the April number of the *Bulletin* for 1869, in an article entitled "Memoranda on the Law of Trade-marks," we called the attention of manufacturers to the importance of this subject both in its legal and industrial aspects. Since the publication of that article, the common law rights in regard to this species of property, which had previously existed, have been considerably enlarged and extended by statute, and incorporated into the Patent Law of 1870, forming a part of the new patent system.

By the provisions of the Act, any person or firm, domiciled in the United States, or any corporation created by the authority of the United States, or of any State or Territory thereof; or any person, firm, or corporation, resident or located in any foreign country which affords similar privileges to citizens of the United States, and who are entitled to the use of any "lawful trade-mark," or who intend to adopt and use any trade-mark for exclusive use within the United States, may obtain protection on complying with certain requirements.

Such trade-mark remains in force for thirty years, and can be renewed for thirty years more.

The official fee for recording is twenty-five dollars, and for an extension the same.

Any "lawful trade mark," already in lawful use, may be recorded; but no proposed trade-mark, which is not, or can not become a "lawful trade-mark," or which is merely *the name of a person, firm, or corporation only*, unaccompanied by a mark sufficient to distinguish it from the same name, when used by other persons, or which is identical with a trade-mark appropriate to the same class of merchandise, and belonging to a different owner, or already registered, or received for registration, or which so nearly resembles such last-mentioned trade-mark as to be likely to deceive the public.

The rules for the assignment and recording of trade-marks are the same as for patents.

Adequate remedies are also afforded for the wrongful use of registered trade-marks by other parties.

This new law is of great importance to all manufacturers, enabling them to protect their articles of manufacture, and to obtain an honest monopoly and security against fraudulent and unscrupulous competitors.

[We copy the above from the *Bulletin of the Wool Manufacturers*, published in Boston. The importance of the law protecting trade-marks is well stated, and many manufacturers are availing themselves of the benefits which it affords. As an illustration of the application of the law, we mention the fact that a well-known firm in this city has taken four patents on peculiar trade names applied to umbrellas made by them. The fact is significant. Special instructions are furnished at this office.—EDS.

THE numbering of the people in New York city is finished, and the population is set down at 930,856, while in 1860 it was reported at 813,669. Figures are commonly regarded as of unimpeachable veracity, but there seems to have been a peculiar manipulation of them in the census-taking of the Empire City at some former time.

TRANSPIRATION IN PLANTS.

The idea that plants transpire like animals is due to Muschenbroeck, one of the professors who have contributed most to rendering the University of Leyden illustrious. To test his theory he covered with a plate of lead the whole circumference of the root of a whole poppy, so as to prevent the vapor of the earth from interfering with his experiment. The plant was then covered with a bell glass cemented to the lead. After that, each morning when the naturalist came to visit the imprisoned plant he observed that even during the dryest nights its leaves were covered with an innumerable number of those drops of water to which the name of dew is given, and the sides of the glass themselves were quite obscured with it. It is not, then, from the air that the dew of the meadow and the leaf comes, but, as the Dutch naturalist learned, from the transpiration of the plant; dew is only their perspiration condensed.

This fact being thoroughly established, it only remained to decide the amount which vegetable transpiration produces. Mariotte tried a very elementary experiment on this head. Having cut off a branch and covered the section with impermeable cement, he observed that the leaves while withering had lost two teaspoonfuls of water in two hours, at a time when the air was tolerably warm. The naturalist therefore concluded that in twelve hours the branch would lose a dozen teaspoonfuls.

But such an estimate was far from being exact. Guettard managed better; he conceived the idea of not separating the branch from the plant, but of inclosing it in a globe of glass, terminating outwardly in a neck which was inserted into a flask. When all was hermetically sealed, the moisture transpired, condensing itself little by little on the sides of the globe, fell drop by drop into the bottle situated beneath it, and could be collected without the slightest loss, so that Nature was left to herself.

Inclosed in this apparatus, a branch of a cornel tree, weighing only five drachms and a half, distilled each day an ounce and three drachms of water; that is to say, it transpired double its weight in twenty-four hours, results which were far from being expected. See engraving.

When, on a burning summer's day, exhausted and steaming with perspiration, we see in a by-nook of a parterre the



garden sunflower, we admire its heavy floral crown turned toward the luminary which it ceaselessly accompanies in its course, and its simple motionless leaves; but this apparent calm veils a most unexpected vital energy.

Who indeed would think that the perspiration exhaled by the leaves of the plant is more copious than that which moistens our foreheads? Yet science has proved this; after demonstrating the existence of vegetable transpiration, it has dared to estimate comparatively the product of it.

An old physician, of Padua, Sanctorius, whose originality has become celebrated, had the patience to pass a great part of his life in a pair of scales, weighing and re-weighing himself every minute of the day, in order to ascertain how much loss his body underwent by transpiration. (Experiments show that on an average a man loses a kilogramme [2 lbs., 3 ozs., 4½ drs. avoirdupois] of watery vapors by means of his skin in twenty-four hours).

Hales, without having the same perseverance, attempted to ascertain what weight of water a sun-flower lost daily by its leaves. For this purpose he put one of these plants into a pot, the upper surface of which, hermetically closed with a plate of lead, only presented one small neck through which it could be watered. By weighing this sun-flower daily his scales showed him that it lost, by the transpiration of its leaves alone, twenty ounces of water in the twenty-four hours.

The experimenter having subsequently calculated the difference in extent between the skin of a man and the leaves of a sun-flower, found that the former is to the latter as 26 to 10, and that consequently, with equal surfaces, the insensible transpiration of the sun-flower is seventeen times as great as our own.

Contagious and epidemic diseases are now believed by scientists to be caused by living organisms which float in the air in the form of fine dust. These organisms enter the human system through the breathing passages and lungs, germinate, and spread over the body with astonishing rapidity. Professor Tyndall, of London, recommends the use of filters of cotton wool, to be so applied to the nostrils as to cause the air to pass through the cotton, thus effectually arresting the infectious dust.

HICKMAN'S HAND CORN PLANTER.

Our engravings represent a hand corn planter, which, it is claimed, is equally adapted to use in sod land and old cultivated land, and in wet as in dry soil. It is also claimed that with it, walking at the rate of two miles per hour, a man can plant from ten to twelve acres per day of ten hours.

A machine that could plant on sod has long been a desideratum for Western farmers, and the inventor informs us he has already received a large number of orders for this planter from Western men.

The machine has recently received the highest premium at



the Douglas Co., N. C., Fair, the only one at which it has yet been exhibited.

In old ground it covers the seed itself, so that no further manipulation is necessary.

The machine consists of a handle, A, a magazine, B, to hold the seed, a sod knife, C, which in old ground is replaced by one of another form, D, and specially adapted to wet ground, so that clogging is obviated, and much time is saved which has been lost in the use of other planters which have hitherto been used. Another form of blade, J, is used on dry ground.

The machine further consists of a gate, E, attached to a pivoted frame, F, which frame acts through a pivoted arm, G, to partially rotate a wheel placed in the chamber, H.

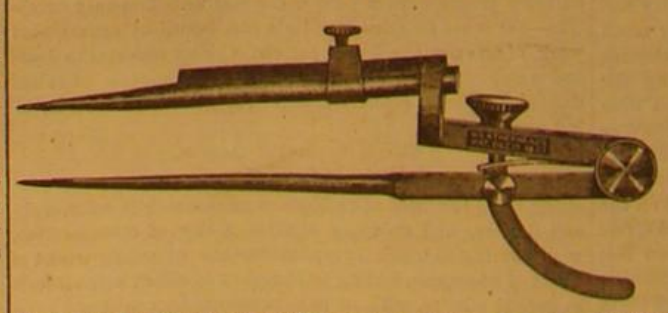
The wheel referred to is a cylinder of wood having a recess in one side, of the right capacity to contain the required number of grains. The grain falls upon this cylinder from the magazine, B, and, in turning, the cylinder or wheel passes under a flat brush of stiff bristles which prevents the passage of any more than the number of seeds desired.

In use the planter is taken in the hand as shown and pressed into the ground perpendicularly. Then the top of the handle is pressed backwards which causes the foot, I, of the pivoted frame, F, now resting upon the surface of the soil to withdraw the gate, E, from the aperture which it covers, and at the same time through the pivoted arm, G, to turn the wheel in the chamber, H, above described, so as to drop the seed. The planter is then raised perpendicularly out of the ground with a quick motion which covers the seed.

Patented, through the Scientific American Patent Agency, May 10, 1870, by Henry Hickman, of Omaha, Nebraska, whom address for State and county rights or for the planters themselves, which will be supplied singly or in quantity as desired.

WEATHERHEAD'S DIVIDERS.

The accompanying engraving illustrates a new form of dividers, having a movable point in one of the legs, adjusta-



ble so as to be lengthened or shortened for skiving as well as for ordinary drawing or marking circles. A larger circle may also be drawn than can be done by the same size of dividers made in the old style.

A common sized carpenter's pencil can also be used in place of the detachable point when desired, and the instrument can then be used in ordinary drafting. It is thought that this form of dividers will find favor with mechanics in all branches of the arts requiring the use of such an implement.

These dividers are manufactured by A. A. and G. L. Cooke & Co., Milford, Mass., and may also be obtained at the hardware houses of Patterson Bros., No. 27 Park Row, New York and of Nathusius Kugler & Morrison, No. 329, Bowery, New York.

Rights of Passengers on Railways.

The following is a recent decision in the Supreme Court of Maine, in the case of Goddard *vs.* the Grand Trunk Railway Company:

The plaintiff, a passenger in the cars of the company, surrendered his ticket to a brakeman who was authorized to receive it. Afterwards the brakeman denied receiving the ticket, called the plaintiff a liar, charged him with trying to avoid the payment of his fare, and with having done the same thing before; threatened to split his head open; shook his fist violently in the plaintiff's face, and only stopped the assault when the whistle sounded for the next station. It appeared also that the plaintiff was at the time in feeble health, having been for some time in the care of a physician; that he had neither said nor done anything to provoke the assault; that he had paid his fare, received and surrendered his ticket to the brakeman, who had delivered it to the conductor, in whose hands it was afterwards identified; that the defendants were notified of the misconduct of the brakeman, but instead of discharging him retained him in their service, where he was as the time of the trial. In view of the aggravated character of the assault, and the attendant circumstances, the jury rendered a verdict for the plaintiff of exemplary damages to the amount of $4,850. The defendants alleged exceptions; but the Supreme Court, in a very careful review of the case, fully sustains the verdict, both on the ground of its intrinsic justice and of public policy.

"The carrier's obligation," says the learned and thorough opinion of Judge Walton, "is to carry his passenger safely and properly, and to treat him respectfully, and if he intrusts the performance of this duty to his servants, the law holds him responsible for the manner in which they execute the trust. The law seems to be now well settled that the carrier is obliged to protect his passenger from violence and insult, from whatever source arising. He is not regarded as an insurer of his passenger's safety against every possible source of danger; but he is bound to use all such reasonable precautions as human judgment and foresight are capable of to make his passenger's journey safe and comfortable. He must not only protect his passenger against the violence and insults of strangers and co-passengers, but *a fortiori* against the violence and insults of his own servants. If this duty to the passenger is not performed, if this protection is not furnished, but, on the contrary, the passenger is assaulted and insulted, through the negligence or the willful misconduct of the carrier's servant, the carrier is necessarily responsible."

Fall-planted Trees and Vines.

Excessive wet, says the *Ohio Farmer*, is one of the very great evils to which the roots of newly planted trees are liable, the heavy rains of fall so completely saturating the earth around them that they are in danger of rotting during the winter. There is most danger, of course, where the land is flat, and has a compact subsoil. The most certain remedy is to drain as thoroughly as possible, and where not convenient at this time deep and wide furrows should be made, so as to allow the surface water to escape.

Loosening of the roots, by winds and freezing, is another danger to which fall-planted trees are especially liable on clay lands and in wet seasons. This danger is avoided by draining and proper care in planting. After the trees are set and the earth pressed firmly on to the roots, a little higher than the natural surface, a mound of additional earth should be piled around the stem eight to twelve inches or more in hight, according to hight and size of the tree, so as to prevent its being disturbed by the winds or heaved out by freezing. This mound of earth will also prevent the girdling of the trees by mice. Large trees should be supported by stakes, if exposed to high winds.

Mulching of newly planted trees, by placing a quantity of rotted manure or chip earth around them in the fall, is highly beneficial, especially for dwarf trees, and where the mound of earth is not required to hold them in position. This mulching protects the roots, in a measure, from frosts and enriches the ground. Where this is not done in the fall, it should invariably be done in the spring as a preventive of injury by drouth, as well as to enrich the soil and keep it mellow. Dwarf pear trees need this annual mulching with straw to keep them in a thrifty condition, and enable them to mature good crops of fruit.

Grape vines and raspberry bushes are liable to be injured by the winter when transplanted in the fall; hence, they should be protected by bending the stems down to the surface of the ground, and covering with earth. Straw or litter is not good, as it is liable to harbor mice or to generate mildew. The covering should be removed as soon as the buds begin to open in the spring. This kind of protection is recommended to be practiced every year for all the better kinds of raspberries, as they are found to bear surer and larger crops in consequence.

According to the *Engineer*, a Mr. Weeb has printed the Lord's Prayer from a copper-plate in a space not exceeding the one thousandth of an inch.

Improved Padlock.

This lock is the invention of Mr. A. M. Adams, the inventor of the wood pavement, described and illustrated in another column. Its general working and details may be gathered from the accompanying engravings. Fig. 1 shows the lock when the hasp is locked, and Fig. 2 shows the same unlocked.

The hasp is locked by simply pressing it down to the position shown in Fig. 1. The hasp, on being so pressed, strikes the end of the bolt, B, forcing it back on a pivot, C, the slot in the center of the bolt, B, permitting the bolt to retreat against the action of a spring, and also to press against the end of the locking bolt, A, forcing the latter into the catch of the hasp as shown. The locking bolt is then caught and held by a tumbler actuated by a spring lying under the plate, D, and consequently not shown in the engraving.

When the lock is to be opened the key, E, is inserted as shown in Fig. 2, and turned into the position shown. The key has two wards, one of which turns under the plate, D, and releases the locking bolt, A, from the spring tumbler; the other ward presses against the part, F, of the bolt, A, and forces the latter back against the point, G, of the bolt, B, withdrawing A rom the catch of the hasp. The table end, H, of the bolt, B, which rests against the end of the hasp when the hasp is locked, is now rapidly forced up by the spring, throwing the hasp open, as shown in Fig. 2.

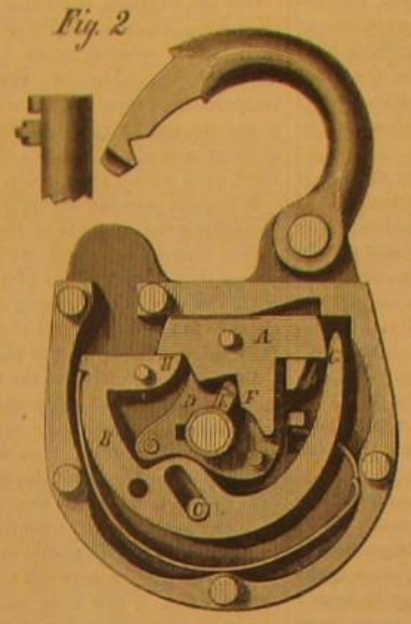
The lock is extremely simple, and the parts are very strong and easily made in quantity by machinery.

This padlock was patented, April 12, 1870, by A. M. Adams, whom address for further information, at 42 Fair street, Newark, N. J.

Fig. 1



Fig. 2



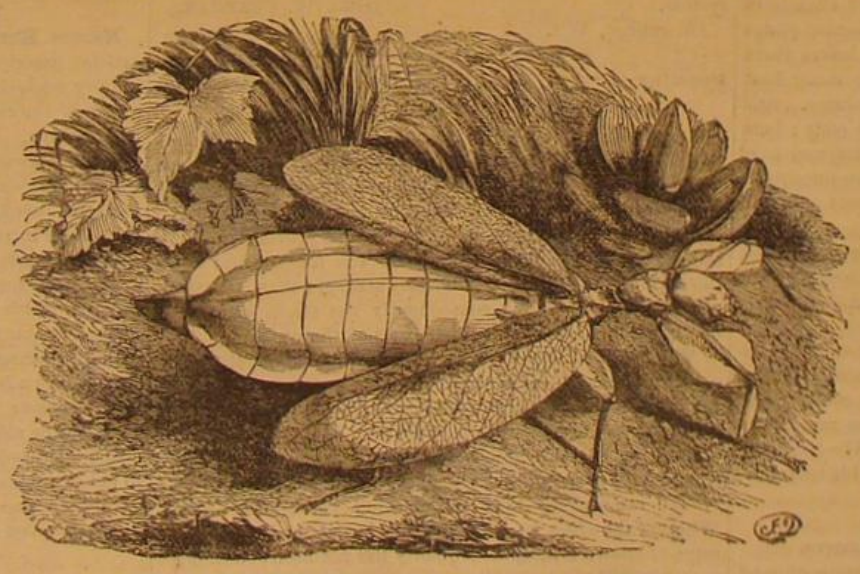
ADAMS' IMPROVED PADLOCK.

THE MANTIS.

The leaf-insects are found in very warm countries, but those from China and the East Indies are the best known. These insects are large, grotesque-looking things, uncommonly like a set of short, yellow twigs joined together by faded leaves. The limbs of the insects are long and slender, but flattened out in some places, and their bodies are either excessively slender and twig-like, or are flattened and large. The color of the insect, when it is alive, blends so perfectly with the tints of the surrounding leaves and boughs, that a careless observer would pass it by as a part of a plant. Hence the name of the leaf-insect. The female insect here represented has a large flat body with fine projecting edges, and when the wings, with their delicate lace-work markings, are folded over it, the whole looks like a crumpled and faded leaf. This appearance is increased by the flat, leaf-like expansions on the limbs, and by the curious markings on the fore part of the body, which joins the hind part just as some leaves are attached to twigs having round swellings on them. The males usually have a long and slender body, and the arms start from it just as small branches do from larger ones.[1] They are remarkably quiet insects, and will remain perfectly still for a long time, and in very peculiar positions. One of the favorite positions is to let the hinder part of the body rest flat on a branch, and to elevate the long body and arms in the attitude of prayer. One kind is called the praying mantis, from its constantly putting on this curious attitude. But really it is a natural hypocrite, and if it could speak it would say, "Let us prey," instead of "Let us pray." The posture of supplication is put on to take in the little flies which are so unreflecting as so believe that the blood-thirsty creature is a cool and inoffensive leaf. The flies alight close to the mantis, or even upon it, the clasped hands relax, and, in an instant, the unfortunate little insect is seized and crushed in the grip from which there is no escape. The resemblance of some of the kinds of mantis to the surrounding foliage is so great that it not only serves to entrap prey, but it also acts as a defense for and preservative of the insect; for birds on the look-out for flies and beetles pass the faded-looking mass of leaves and twigs as unworthy of their attention.

Some of the leaf-insects resemble green-leafed plants, and others those which are more or less autumnal in their tint. The female mantis lays its eggs upon plants, and covers them with a glutinous case, in which they are arranged in rows very elegantly. Some of the large kinds of mantis are from four to six inches in length. The males are very pugnacious, and can be made to fight most desperately by placing them opposite each other. They lift up their bodies, and use their long arms like sabers, and squeeze and bite until one is worsted. The leaf-insect is, perhaps, the best example of natural mimicry, and this gift of nature has, of course, nothing to do with the will of the creature.

The accompanying illustration will convey to the reader a general idea of this singular insect, though it is difficult without seeing an actual specimen, to appreciate its extraordinary resemblance to a vegetable production.



THE WALKING LEAF-INSECT.

Professor Chandler on the Purity of Croton Water.

The water supplied to the citizens of New York, at the liberal rate of sixty-five gallons to each person daily, is collected by the various branches of the Croton river from an area of 338 square miles in Westchester, Putnam, and Dutchess counties. The character of this water-shed is a sufficient guaranty of the purity of the water. The surface of silicious gravel rests on hard laurentian gneiss, and is open pasture or woodland, with few swamps. No factories line the streams, which are liable to contaminate the waters with refuse chemicals, and no towns or large villages exist anywhere in the district to pollute the waters with sewage. A recent survey of the water-shed has indicated fifteen points at which dams can be erected for the creation of large storage reservoirs, whose joint capacity would be 67,000,000 gallons, or a supply, at the present rate of consumption, for 1,000 days. One of these dams, 650 feet long, is now in process of construction at Boyd's Corner, in Putnam county, twenty-three miles from the mouth of the aqueduct. When this dam is completed it will flood an area of 303 acres, and the reservoir thus produced will contain 3,369,206,857 gallons, or a supply for fifty to fifty-five days of drouth.

Examinations were made of Croton water which had been in contact with lead for different lengths of time, under usually occurring circumstances, of which the following are the results:—1. A gallon of Croton water from a lead-lined cistern, in which it had stood for several weeks, was found to contain 0·06 of a grain of metallic lead.

2. A gallon of water which had remained six hours in the lead pipes of the chemist's residence yielded 0·11 of a grain of metallic lead, a considerable portion of which was visible to the eye, in the form of minute white spangles of the hydrated oxycarbonate ($PbO, HO + PbO, CO_2$).

3. Water drawn from one of the hydrants of the School of Mines' laboratory, in the middle of the day, when the water was in constant motion, yielded traces of lead. This water reaches the school through about 100 to 150 feet of lead pipe.

These results indicate the source of many hitherto unaccountable cases of lead poisoning, and are of a character to alarm the residents of New York, and to lead them to adopt precautionary measures for protection against this insidious cause of disease.

Many have already introduced as a substitute for lead pipe the "tin lined" or "lead-incased block-tin" pipe.

Prof. Chandler informs us that he has made a careful analysis of the water of lake Gilead, which has been recently turned into the Croton, and he found it to be singularly wholesome and pure. This is gratifying news to New Yorkers.

SHOEMAKERS' MEASURE.—No. 1 is 4¼ inches in length, and every additional No., ⅓d of an inch.

Corrosion of Iron Gas and Water Mains.

In an editorial on this subject the *Gaslight Journal* remarks that the deposits which form in the interior of iron water-mains, cause serious annoyance and loss to many of our water companies. To so great a degree does this evil extend, that strenuous efforts are being made to substitute some other material for iron, which shall possess all its valuable qualities, and at the same time be free from liability to corrosion, and consequent obstruction. The appearance of this internal deposit is very singular and assumes various modifications. Sometimes the corrosion is of a uniform thickness, and appears to attack the surface of the iron evenly, while at others, the whole diameter of the pipe is jagged with tubercles of various sizes and shapes, occurring at irregular intervals.

Thus far no satisfactory explanation has been given of the causes of this peculiar deposit. That it is a species of oxidation is very clear, since the mass formed has all the external characteristics of iron rust; but why it should assume such peculiar physical properties, and present a configuration so unlike the outward forms of other oxidation, has not yet been satisfactorily explained.

The effect of this incrustation is obviously very disastrous to the economical distribution of water, as the diameter of the main is so much diminished as to reduce their capacity to that of much smaller caliber than they were originally constructed. In addition to this, the strength of the pipe is much impaired by this process of oxidation, and it is rendered much less able to bear sudden concussions and heavy pressure than previous to the formation of the deposit. This must be apparent to all intelligent observers, for it is at the expense of the iron that the incrustation arises. These facts are but too well known to engineers, who are fully cognizant of the difficulty under which they labor in endeavoring to remedy the evil.

The same evil obtains in regard to gas pipe, only in a less degree. The corrosion forms dust and scales, which drop off in time, and obstruct valves, traps, elbows, and connections. This is especially observable in inclined and vertical piping, such as lamp-posts, etc.

It has been a question with practical men, whether to substitute some other material for iron, or to adopt some means of internally coating iron mains, so as to preclude all possibility of the formation of accretions.

Methods have been tried to coat the interior of iron water-pipes with some substance which would protect the surface of the iron from contact with the water. This would seem to heretofore been attended with so much expense as to remove one of the strongest arguments in favor of the employment of iron, viz.: the economy of its application. Some few years ago, the Water Board in Brooklyn, coated the interior of their iron main with a mixture of coal tar and linseed oil, applied at a high temperature, but we have never heard whether that remedy has been effectual in checking the formation of accretions. It was said to impose an additional cost of $2 50 per tun on the mains.

Recently, Prof. Henry Wurtz, of New York, has invented a peculiar cement for making gas or water pipes, and especially adapted to coat the interior of gas mains, to make them perfectly impervious even to hydrogen gas, and to prevent corrosion.

Among the materials, other than iron, which have been commended and used to some extent for water pipes, are wood, iron-bound wood, and cement, and bituminized paper.

Plain wooden pipes have been immemorially employed in some places for distributing water, and are still used in many instances. Pipes made of wood and cement have also been adopted to a limited extent. They are durable, easily made, and have been made to withstand a pressure of 400 pounds to the square inch.

The pipes constructed of sheet iron, lined and coated externally with hydraulic cement, are said to be well adapted for distributing water where very cold weather does not prevail, frost being inimical to the integrity of the pipe. So also is high pressure said to be liable to injure the continuity of this kind of piping, especially at the numerous joints and connections.

In England, pipe made of bituminized paper has been employed in distributing both water and gas, but we have not heard that it has become popular to any great extent. It also was attempted to be introduced into this country, but without success, we believe.

Another description of pipe is constructed of wood, being bored from the solid log, lined with cement, and coated exterially with coal tar. This form of pipe is said to be extremely durable, and not being subjected to expansion and contraction by change of temperature, is entirely free from leakage.

In England and France, as well as in this country, the complaints on this score are wide and deep, and a wide field is open for enterprise in introducing an especial remedy.

A FALL of one tenth of an inch will produce a river current

Correspondence.

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

Boiler Incrustation.

Messrs. Editors:—I have read with much pleasure your article on "Boiler Incrustation" in a late number of your valuable journal, and as incrustation is the source of nearly all the troubles steam boilers are heir to, I would, with your permission, say a few words on this subject. All impurities contained in water may be divided into two classes: first, such as are held in suspension, as sand, loam, or other mineral matters mechanically sustained in the waters of rivers or muddy streams; and, second, such mineral or vegetable matters as are held in solution, found in salt water and the water of most springs or wells. The first are precipitated when the water is left to stand for a length of time without agitation.

We find in all running streams that where the current is swift the water washing the sides and bottom carries with it loam and sand, which it again deposits in the eddies where the water is quiet. In a steam boiler the same thing can be done if proper regard is paid to the construction, so that a rapid circulation of the water takes place over all the surface exposed to the heat, producing a scouring, positive current, whilst at the same time receptacles are provided into which the impurities can be easily and surely deposited. Keeping in mind that the evaporation of a portion of the water increases the proportion of impurities contained in the remaining water, the receptacles must be so arranged that these impurities will fall into them.

To prevent the formation of scale all that is required is to so place these receptacles that the fire does not reach them. When water is heated its capacity to hold impurities is greatly diminished; therefore, wherever possible, large tanks or heaters should be used in which the water may be heated by the escape steam, in such a manner, however, as to leave the water as quiet as possible, and such tanks should be cleaned out from time to time.

All water holding matter in solution contains a large percentage of carbonic acid; in fact, its power of holding minerals in solution depends on the quantity of carbonic acid. When such water is used in a steam boiler it should be first heated, and the more it is agitated the better. This should be done in an open tank, from which it should flow into the heater, or be pumped through. The boiler should have receptacles reaching nearly to the water line, with large dish-shaped openings, so as to form quiet spaces at the water line, where the scum can concentrate, and be finally precipitated into the receptacles.

A positive circulation of the water over the heating surface, and a reservoir for the collectien of impurities, not exposed to the action of the fire, is an absolute preventive of incrustation and the whole train of injuries caused by it, for no boiler can be considered safe in which solid incrustation can be formed on the surface exposed to the action of the fire. Circulation of water takes place in all steam boilers, but there is a wide difference between the mere change of water and a sweeping current passing over the heated plates from the part farthest from the fire until it leaves them where the heat is the greatest, continually absorbing heat and increasing in velocity as it increases in volume. And here, where the heat is greatest, should be the eddy; here should the steam quietly separate from the water, and here also, should be a reservoir for the deposit of the impurities which the remaining water is now unable to hold either in suspension or solution.

I hope that practical engineers, aware of the importance of this subject, will give us their experience through your columns.

Joseph A. Miller.

Boston, Mass.

[A free interchange of views upon the subject of boiler incrustation is desirable, both in regard to the peculiarities of the composition of scale in different parts of the country, and also in regard to the success or failure of various means employed to prevent and remove incrustations. We hope correspondents will give their experience upon this subject.—Eds.

On the Heat of the Superior Planets.

Messrs. Editors:—On account of the remoteness of most of the superior planets from the sun it has been supposed that they do not receive sufficient solar heat to promote vegetation and support animal life. Uranus and Neptune, in particular, are called the arctic planets from the presumption that the absence of warmth there must be complete, and that they exist in a state of frigidity almost beyond our power to conceive.

By taking the average solar heat of the earth as a standard or unit, it amounts to a mathematical deduction that the heat of Mars must be very greatly less than that of the earth, while that of Jupiter is so small a fraction as to be almost equal to a deprivation. The latter planet, for instance, revolves in an orbit more than five times (5·16) farther from the sun than the earth; and, according to a well-known law of optics, it receives from the sun a little more than one twenty-seventh $\frac{1}{27.2}$ as much heat as the earth. To the inhabitants of Jupiter (if any such there be) the sun appears about one twenty-seventh the size it appears to us, the rays of light and heat diminishing in the ratio of the square of the distance.

It is evident, I think, that were the heat of the earth to be reduced to the mere fraction I have named, vegetation and the ordinary processes of growth and reproduction would cease. The tendency to radiation by night would be far in excess of the amount of heat received by day. The coldness would continue to increase until the lowest forms of organized life, which might survive for a time, would at length wholly cease to be propagated. We are then justified, apparently, in inferring that the planet Jupiter must be destitute not only of human inhabitants, but of all forms of animal life.

But, conceding it to be true that Jupiter, from its remoteness from the sun, receives, on equal areas, but one twenty-seventh of the heat supplied to the earth, still the relative value and effect of that heat may, and doubtless does, depend on the character of the atmosphere enveloping the planet.

Our observations show that the effect of the sun's rays is proportioned to the density of our atmosphere, inasmuch as their heat is greatest in the lowest valleys, while, in ascending high mountains, we encounter a gradually decreasing temperature, proportioned to the hight and rarity of the atmosphere, until a region of perpetual snow and ice is reached at no greater elevation than about three miles above the sea-level, even within the tropics.

It is quite possible to conceive of an atmosphere capable of permitting the entrance of the sun's rays towards the planet while preventing their withdrawal. Professor Tyndall proves that a layer of air two inches in thickness, saturated with the vapor of sulphuric ether, would offer very little resistance to the entrance of the solar rays, but would cut off fully thirty-five per cent of planetary radiation.

But before resorting to the necessity of supposing, for the superior planets, the existence of a chemically prepared atmosphere to increase their supply of solar heat, let us see if such necessity exists. Let us, on the contrary, simply suppose the atmosphere enveloping Jupiter to be substantially of the same constituents as our own, and at the same time of an increased bulk and quantity precisely proportioned to the excess in size of that planet over the earth.

By a comparison between the mass of Jupiter and the mass of the earth it has been satisfactorily demonstrated that a pound weight removed from the earth to the surface of Jupiter would there, by reason of the greater attractive force of that planet, weigh about two and one half pounds. And this greatly excessive force being at all times directly employed as well upon the atmosphere of Jupiter as upon all other substances or bodies within its influence, the density of that atmosphere at the planet's surface must be proportioned to the downward pressure of the superincumbent weight.

Assuming that the atmosphere of Jupiter, at the planet's surface, is two and one half times denser than our own, I are not prepared to say (although the calculation thereof would not be difficult) what would be its precise effect or degree of augmentation upon the sun's rays. But by analogy to the observed effects on the earth, to which I have alluded, I take it for granted that it would have the effect to render the heat of Jupiter quite adequate to all the wants of life, if not equal to that of our earth. And, carrying out this idea, and applying it to the cases of the other planets, I am far from believing that the want of a proper amount of solar heat forms an obstacle to the production and development of animal life in its highest forms on any of the planets of our system.

Geo. W. Chapman.

Milwaukee, Wis.

Popular Errors Regarding the Watch---Breaking of Main Springs.

Messrs. Editors:—A majority of people have an impression that over-winding breaks the main spring. That accident can never occur in such watches as are provided with "stop work," which allows only a definite number of turns to the spring; and it seldom occurs in those not so provided, because the main spring hook, against which the force comes when the spring is fully wound is usually stronger than the teeth of the main wheel, and consequently the strain comes, not on the spring, but on the other parts of the watch.

The cause of breakage is an unexplained mystery; no person yet has been able to give a reason satisfactory for it. A spring that has been in use one year is no more liable (as far as known) to break in ten years than in ten minutes. It is a tolerably well-established fact, however, that more springs come into the shop broken during certain known conditions of the atmosphere than when other conditions prevail. Whether the effect be produced by electric, hydrometric, or some unknown atmospheric quality has not been determined, probably will not be, until some extended and minute system of be observations be instituted. The complaint used often to be made, when watches with fusee and chain were more in use than now, that the rascally watchmaker had stolen a piece off the chain while in his hands for repair. This opinion was entertained because sometimes the careless watchmaker had left the "stop work" so as to lack one turn of allowing the watch being completely wound up, which of course caused it to lack about six hours of running its full time. No watchmaker was ever so silly, no matter how dishonest he might be, as to steal a piece of chain; what would he do with it? it is utterly worthless to him, and worth even less than that to anybody else, and to steal it he must spend at least half an hour of time and labor, all for nothing; most of the modern watches have no chain, and consequently the accusation is now very rare.

More injury is done to watches by winding with an unsuitable key than is generally supposed. When not properly fitted it slips off, giving the whole train of wheelwork a severe jar from recoil; its effect on the watch is similar to that produced on the wearer, when he sits down on a seat which is about four inches lower than he expected. After a few such shocks, in winding it will be found to slip back occasional, and unless timely repairs are made it will some day go down with a crack, that will involve an expense of several dollars to repair as it should be. A key, all brass, properly fitted, is the best; a key with soft steel pipe is the next best, and a hard steel key worst of all. The soft key will not spoil your watch, for if either give way it will be the key, leaving the square of the watch perfect. Hardened keys will not yield to wear, consequently the watch must, and if the winding square be spoiled, no poor workman can replace it properly, and a good one only at considerable expense, experience will prove keys to be cheaper than winding squares.

Cleveland, Ohio. R. Cowles.

Fire Surface in Portable Engines---Improvements Demanded.

Messrs. Editors:—I wish to say a few words to you in relation to the fire surface of portable engine boilers. I am in the habit of running them in the harvest field, giving power to thrashing machines. I took one into the field this season. It had run two previous seasons, one hundred and fifty days steaming, and I could not carry sufficient steam to give the proper amount of power. I thought that the boiler must be dirty, but there was no means provided for seeing the fire surface, so I could not know whether it was clean or scaly. I had just put in a fire of wood, and was looking at the steam gage, which indicated eighty pounds, the hand vibrating a good deal.

The engine was using up the steam as fast as the boiler was generating it, when, to my astonishment, the steam gage began to indicate higher steam, and in spite of all that I could do to check it, in four or five seconds it went from eighty to one hundred and forty pounds. Then there arose a cloud of dust from the smoke stack and the pressure fell rapidly, when I discovered that nearly all the tubes were leaking.

At the time this took place the glass gage and gage cocks showed three inches of water above the crown of the furnace. I let the water out of the boiler, and I took off a hand-hole plate behind the furnace. I found scale that had fallen from the tubes; it was three-sixteenths of an inch thick, and the parts that had been in contact with the tubes were covered with red oxide of iron. The tubes must have been red hot when the scale came off. There have been a number of portable boilers blown up here within the last few years, and the engineers have been killed every time. No person could account for the explosions. I think that I give you the key to some of them.

The remedy is so simple that I think it is time that it was made use of. The tubes should be in vertical rows, one tube above the other, with a space of an inch between each row, so that a cleaning tool could be used on every tube. More steam would be made with thirty clean tubes than with forty dirty ones. There should be a manhole plate on the shell of the boiler behind the furnace and over the tubes, so that if any person used a boiler rendered dangerous by scale and dirt he would be guilty, and the makers would be blameless. There are thousands of them needed here, but the expense of renewing the fire surface after every two hundred days' run prevents their general use.

John Mailer.

San Francisco, Cal.

The Ailanthus Silkworm.

Messrs. Editors:—I have read with much interest your articles, descriptions of insects, by Mr. Day, and noticed an inquiry made by a correspondent from Brooklyn as to the origin of the caterpillar lately noticed in the ailanthus trees in Brooklyn. I have reliable information that they are the Chinese silkworm, the seed of which was sent to the Patent Office, Washington, and distributed among the ailanthus trees in Brooklyn by an enthusiastic gentleman to whom they were intrusted for that purpose; the result of that singular present may be seen in the sad spectacle of trees stripped of their welcome verdure in exchange for dismal cocoons, which hang and dangle, entirely useless, and often at inaccessible points. I have killed many worms, and now kill all the large moths (they are night butterflies), as each female lays a large number of eggs, sometimes a second brood in one season. I do not spare a cocoon, and even those that I see on the sidewalks in the street, I crush. I have started a sort of crusade against this pest, and have interested others to aid in their destruction. I have seen none in New York, except on one ailanthus tree on the Fifth avenue. Perhaps those last ones came from the same source. * * *

Balancing Cylinders.

Messrs. Editors:—I noticed in the Scientific American of the 3d inst. an article on balancing cylinders by W. O. Jacobi, of Mellenville, N. Y., in which he tells you how a cylinder can be cross-balanced, but he does not state how to take the cross-balance out. Now, in your remarks you say; "If cylinders can be so balanced, which we doubt, the mechanical world would like to know it." I have had an experience of upwards of twenty years, and in that time have had a number of such cases through my hands. When a cylinder is brought to my shop to be balanced, if it is cross-balanced I cause the owner of it to bring on his machine and also his horse power and horses, the same as if he was coming to thrash for me. We then hitch on the horses and get up the same speed on the cylinder as in thrashing; and I have seen a machine shake so much that no man would work near it. I took out the cylinder and laid it on horizontal steel bars and found it all right balanced on them. I then bored a hole in the end of a stave on one end of the cylinder, and put in about two pounds of lead. I then went to the other end of the cylinder, and bored a hole on the opposite side and put in about two pounds of lead, and the cylinder was again in balance.

I then lifted the cylinder into the machine and started up the horses to the full speed. I found it was no better. I took the cylinder out again and laid it on the horizontal steel bars]

and took out the lead from both holes. I then bored holes into the ends of the staves exactly opposite to those already tried, and put the lead into them. I then tried the cylinder into the machine, and got up speed, with no better results. I took the cylinder out of the machine again, and drew out the lead, and then I bored a hole in the end of a stave, about ninety degrees up from those already bored, and put in the lead as before, and the same at the opposite end, and of course it balanced on the steel bars.

I then tried it into the machine, and when I got up the speed I found it greatly improved in the running of the cylinder. I then bored holes beside those last bored, and put in more lead into them equally at both ends, and on trial found it improving. I kept on adding until the machine began to shake again, which proved I had overdone it; so I took out some of the lead until I had it running perfectly steady.

That is my experience with one machine. I have had better success with others. I have sometimes succeeded at the second trial, and on one occasion I tried four times before I was successful.

Morrison, Ill. WILLIAM ANNAN

Balancing Saw-Mill Crank.

MESSRS. EDITORS:—The trouble of A. M. G., of Vt., as stated in your paper recently, seems to lie between the standing balance and the running balance, as applied to crank motion. A weight equal to the weight of pitman, gate, and its attachments, placed in the crank wheel opposite to the wrist pin, and equidistant from the center; or a weight lighter in proportion as the distance from the center is greater than that of the wrist, will balance pitman, gate, etc., *only* while at rest. The balance weight in the wheel (when the mill is in motion) has a *centrifugal* motion only. The gate has a lineal motion only, while the pitman has a compound motion of both the centrifugal and lineal. When in motion, the weight of the wheel overbalances the parts that have the lineal motion, in proportion as the speed increases up to that point of speed in which the weight will travel the half circumference of its circle of motion, in the same length of time that a similar weight, starting from a point of rest, would fall by action of gravity, a distance equal to the diameter of this circle of motion.

At this point of speed the balance-weight in the wheel entirely ceases to be balanced by those parts that have only a lineal motion, and becomes of itself a great *overbalance*, causing the very difficulty it was intended to remedy. At this speed also or any higher than this speed, the weight in the wheel will only balance parts that have a positive centrifugal motion. How much of the weight of a pitman has a centrifugal motion, it may not be easy to determine. A considerable experience with crank motions, and a series of experiments with different weights of balance on the same crank, and under the same circumstances, seem to prove the above theory, and show that, at the speed at which an upright saw ought to run, a weight that will balance the crank arm and wrist pin, together with about one third of the weight of pitman, will run more smooth and steady—more nearly in balance, than with much lighter or heavier balance weights.

Painesville, Ohio. H. H. COE.

A Remedy for Ivy Poisoning.

MESSRS. EDITORS:—Having seen a short notice in your paper of the 13th of August, in reference to poison ivy, I will give you some of my experience with it.

A friend of mine and myself were hauling logs in the summer of '64, to build a dam with. There was a chopper in the woods cutting the logs, and we were loading and hauling. We used to get one load in the morning before the dew was off them, and in some way we got poisoned. We afterwards found that one of the trees had a large poison ivy vine on it, and the chopper had cut the large part of the vine off, and left the small clingers on the tree.

The young man that was with me was poisoned in his leg, where he had ridden on the log. His legs swelled up so he could not sit or stand. A doctor was called, who said that it would take at least three weeks to get him out of bed. My own hands and wrists were so bad I could not work. Some one proposed to me to get the leaves of the plant known to me as the poison nightshade (our correspondent doubtless means belladonna—EDS.), boil them in new milk to a poultice just stiff enough to stay on the parts, and bind it on, renewing it as often as the poultices should get dry. We both did this, and in less than four days my friend and myself were out riding.

I have seen it tried in numbers of cases since, and never saw it fail. This happened in the south central part of the State of Illinois.

St. Paul, Minn. C. E. DAVIS.

Wanted---Cheap Ice Machines for the South---Ice Five Cents per Pound in Natchez, Miss.

MESSRS. EDITORS:—I am a regular subscriber to your excellent paper, and feel that I could not do without it. After I am through with the duties of the day, I take it up, and reading it through, find mechanics, chemistry, agriculture, in fact everything that is necessary to relieve the mind of *my occupation*. Your letters and articles on chemistry, etc., have been most interesting, and reading them has prompted me to make an inquiry, and call upon the thousands of inventors of our country for an invention that will supply the greatest general need existing, and amply pay the inventor.

In this, and nearly all cities on the Mississippi river, the supply of ice is exhausted. Ice has been sold for three cents per pound; "from and after Sept. 15th, will be kept for the sick—parties must show physician's certificate;" and ice is *five cents per pound*.

This price is not exorbitant, because dealers will lose 50 Per cent in wastage, bringing ice from New Orleans. Now, I ask, is it not possible for *one* of our thousands of American inventors to perfect such a machine as can be sold to families, by the use of which they can dispense with ice, and cool their own cistern or well water? Certainly, if machinery can be perfected to make ice in New Orleans in August, machinery can be invented to cool water, at small expense.

Natchez, Miss. T.

Finale about the Fly-Catching Plant.

MESSRS. EDITORS:—Some thirty years ago my father had in his conservatory two plants which he then called the rarest plants and greatest wonders in the vegetable world (the *Mimosa pudica* being already an old friend), and those two were the *Dionæa muscipula* (fly-catcher) and the *Nepenthes destillatoria* (pitcher plant). Now-a-days they may be found in almost every hot-house.

The *Sarracenia purpurea*, common in our Northern swamps (and the *S. flava* in the South), is another wonder, and seems to combine in itself the fly-catching and water-collecting powers of both the above. But it is *not*, as your correspondent in the SCIENTIFIC AMERICAN, October 1, is inclined to believe, the plant referred to in *London Society*, as quoted in your issue of September 3. That plant is the *Arum muscivorum* (Linn), or *Dracunculus crinitus* (Schott), and is entirely different from any of the above. The insects collect in its spatulate calyx, while in the above the leaves are the irascible parts.

It is difficult to describe these four plants without woodcuts, by a few lines short enough for a journal not specially devoted to the matter.

As to the belief, that the "fly-catching" business is a part of the inner economy of the plant, we may, will all deference, rest assured that there is no ground for such a belief. Insects are caught and killed by the *Lychnis viscosa*, which is not sensible to their presence on the sticky stems. On the other hand, the *Mimosa* closes her leaves at the touch of a fly, without catching it. We find dead insects on many vicious plants, or parts of plants, even on the tender leaves of the little *Drosera*. Easy as it is for us to see clearly the natural office of insects in their relation to plants, as regards fructification, we cannot believe yet that plants catch and retain insects for their own living. CARL MEINERTH.

Newburyport, Mass.

"Buzzing Up" once more.

MESSRS. EDITORS:—I see in a late number of the SCIENTIFIC AMERICAN that a correspondent has tried the "buzzing up process," and has failed. As he quotes my language, I feel it my duty to reply.

I am writing for him and for science. I, too, have failed this year, and many other times, but many more times I have succeeded wonderfully, and I stake my name and character that it is not a hoax. It is a thing that refuses to be done, unless done just so.

I am not a spiritualist, but I have helped to move a small table by human electricity, but the séance at first was a long one, requiring patience. Why don't our friends the spiritualists get hold of this and make something of it? I am afraid it is going to take its place among the lost arts.

I am an old man, and in a peculiar position, or I should be trying it every day till I had conquered it. Besides, I am giving all my spare time to a mechanical improvement.

Princeton, Wis. WM. M. RICHARDS.

Curious Freak of a Thermometer---An Explanation.

MESSRS. EDITORS:—I have just received No. 14, SCIENTIFIC AMERICAN, in which "R. L. C.," of Connellsville, Pa., asks for information relative to the action of his thermometer. I have been using thermometers for measuring high temperatures several years, and have invariably found that after about a uniform length of time they became unreliable from the "checking," so to speak of the bulb. They will be all cracked up into little irregular squares, which for a while hold together, but finally a trifle of air or steam finds its way into the bulb; forced in by atmospheric pressure, when, Presto! the mercury flies to the top of the tube, and, of course, the same atmospheric pressure which forced it there holds it there until the top of the tube is broken off when it can be shaken out.

Let R. L. C. examine the bulb of his thermometer carefully with a glass, and he will see the cause of the difficulty, probably. WM. E. HYDE.

West Killingly, Conn.

How to Utilize Coal Dust.

MESSRS. EDITORS:—Having read a few remarks on the great quantity of coal dust lying useless at the collieries in pit, I thought I would make a few remarks upon its vast usefulness in manufacturing if properly manipulated into a soft coke for the use of smith work. If this be soft, bright, coal dust, as this kind of coke is most economical and desirable in smith work generally, it makes clean and very hot fires. A welding heat can be got with little trouble, and it leaves a clean fire with but very little slag or cinder after. There will be no doubling up of small articles in thrusting them into the fire. It should then be worth as much as the best coal.

Shelbourn Falls, Mass. J. P.

Brown's Pen Picture of the "Lord's Prayer."

Messrs. Trubshaw & Miller advertise in another column for agents to obtain subscribers for photographic copies of a very artistic piece of pictorial penmanship. The subject is the "Lord's Prayer," and the artist is Professor D. F. Brown, of Brooklyn, who expended six years of close labor in its execution. It is probably one of the most remarkable works of the kind ever executed with a pen. Few persons have either the skill or persistent patience to accomplish such a task. The heads of Christ and the twelve apostles, together with pictures of the crucifixion and other scenes in the life of Christ, comprising many full-length pictures, are arranged in a beautiful design, the portraits being accurate copies of celebrated pictures preserved in art galleries, and from the pencils of the great masters. The text of the "Lord's Prayer" is interspersed among the various groups and figures, the whole forming a unique and very attractive picture. It was executed entirely with the pen.

A Cheap and Efficient Low-water Detector.

MESSRS EDITORS.—Drill a one fourth inch hole at the low-water mark, either in the head of the boiler, in the crowning sheet of the fire-box, or the upper part of the flues. Tap out the hole to a full thread with a common taper tap. Make a plug of common tinman's solder the size and shape of the tap used; screw in the plug (it will cut its own thread); cut it off smooth with the outside surface of the boiler. If well put in it will never blow out under any pressure of steam. So long as covered with water the plug will not melt.

If the water gets below the plug so that the iron gets to a dangerous heat, the solder plug will melt out. A gentleman informed me that he had the plugs melted out of the crowning sheet of his fire-box three times, and each time found the water below the plug. SAFETY.

Remarkable Solar Phenomenon.

Prof. Langley, writing from the Observatory, Allegheny September 26, to the Pittsburgh *Commercial*, says:

The appearance of spots on the sun large enough to be visible to the naked eye, is a rare occurrence, but it may now be noticed by any one who takes the trouble to observe them. The aspect of the sun, through a large telescope, is one, just now, of singular interest, and it seems to claim special attention from the observers.

Here, where the remarkable changes of the solar surface have formed the subject of remarkable observation, daily maps of the position of the spots are made, and their singular variations have been the object of most interested scrutiny.

The side of the sun now turned toward us is, to-day, covered with hundreds of them, of all sizes, and in all stages of growth, while the opposite side, to be presented to us a few days later, is comparatively bare.

The area of one of the spots which is now near the center of the disk, has been computed from careful measurements and found to exceed 2,300,000 square miles. Such immense numbers convey no very definite impression, and perhaps a more vivid idea of the size may be gained by comparing it with that of the earth, whose entire area is less than a tenth part of that just given.

This is the area of the penumbra—an immense expanse of variegated forms, crossed by channels and convergent streams of luminous matter, all shifting under some action like that of some whirlwind which is twisting them from one position to another, and changing their forms from hour to hour. The current sometimes appears to rush downward, carrying with it great masses of the luminous matter to lower depths, and opening, as it does so, black cavities of a size commensurate with the scale on which this action is carried.

The largest of these cavities is seen to be overhung with parts of the brilliant surface, which visibly break away in enormous portions and sink in it, out of sight; indeed, it is quite within the truth to say that a globe the size of the world might be dropped in without touching either side. It is impossible to convey an adequate idea of the impression of infinite and exhaustless energy, of which one is conscious, while beholding this with adequate optical aid. Masses, the size of whole continents, are utterly changed in shape or disappear from one day to another, sometimes the observer watches them, and the whole "spot" is, to all appearance, being slowly rotated by the cyclones which are visibly working there.

This is one of many centers of similar action, not all on the same scale, but baffling the eye by their number and incessant change of form, which the draftsman labors after in vain, and which even the photographer can but imperfectly render. At one of our largest observatories, the photographer is employed to make a daily chart of these changes, and an inspection of its truthful and unbiased record will convey a more conclusive sense of the almost awful magnitude and energy of the solar forces, than the most vivid description.

One who has been accustomed to watch them must feel the inadequacy of any attempt to describe these "spots," and still more so of the fatality of trying to convey his own impression by any extravagance of description or comparison.

The wonder must lie in the consideration of authentic measurements, which are left to tell their own story.

The public may not share the interest of the professional observer in such matters, but our own planet is too intimately connected with these phenomena not to make them claim some interest from all of us. Why these magnetic needles move responsively to these great changes in the sun, or why auroras will light up our winter sky, at intervals more frequently repeated as this solar action is more violent, are questions which astronomy is now trying to answer. The fact that they do so is certain; the cause is still wholly unknown to science.

FAIR OF THE SOUTH CAROLINA INSTITUTE.—This fair will be held on the Washington Race Course, in the city of Charleston, S. C., commencing on the first Tuesday in November next, 1870, and continue through the week. The grounds are unsurpassed in extent, and embrace the race track so celebrated in past years. Extensive buildings are in progress of erection, and every facility will be afforded to accommodate all classes of exhibitors.

Improved Wood Pavement.

Although for heavy traffic in large cities the public are demanding a pavement that shall combine the luxurious ease and beautiful surface of wood pavements with greater durability than has hitherto been secured by the use of wood for this purpose, yet for light traffic in all localities, and especially in Western cities near to large supplies of timber, there is but little doubt that wood will long remain a favorite material for the construction of roads.

We herewith illustrate a novel method of constructing such roads, recently patented by A. M. Adams, wherein, by the peculiar formation of the blocks, the concrete is formed into fluked wedges, which wedges cement and lock the blocks together, and thereby form an almost solid keyed arch, possessing, it is claimed, greater strength and durability than other wood pavements which have preceded it.

The manner in which the angular recesses in the blocks are boxed up prevents the concrete from spreading, and it will be noticed that by the peculiar arrangement of the blocks, each one of them is wedged and bound by four different wedges of concrete, and each wedging wall of concrete by four different blocks of wood, so that the more weight or pressure there is applied to the upper surface of the pavement the more solid and compact it becomes, every shrinkage of the blocks being compensated for by downward movement of the concrete filling. The effect of travel on it is to constantly drive down the wedges of concrete, thereby rendering the pavement more compact and firm by use. The pavement thus formed is impervious to water and forms an excellent foothold for horses.

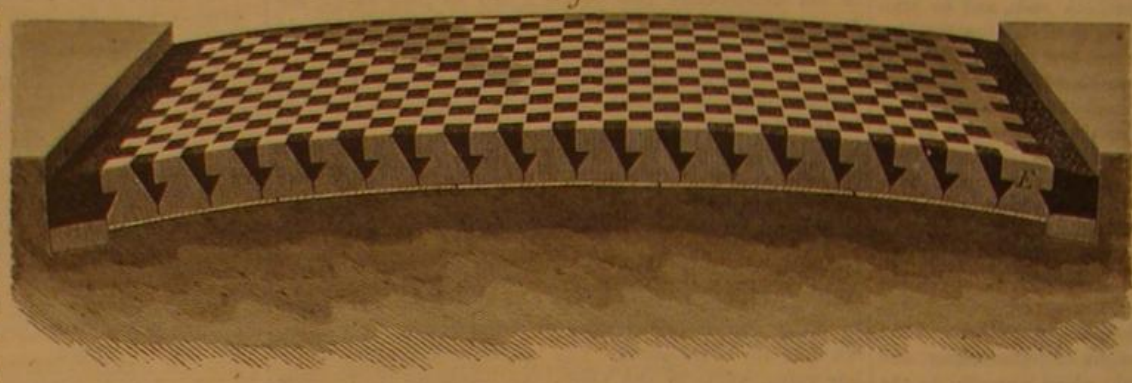
Fig. 1 represents a section of completed pavement; Fig. 2 is an enlarged detail showing the method of placing the blocks; Fig. 3 illustrates the method of sawing the blocks.

The blocks are first cut from the timber on a bevel shown by the line, A, Fig. 3. Portions are then cut off, so as to truncate one of the sharp edges of each prism thus formed, as shown at C. An acute-angled groove, D, is then cut in the back of each block. The timber used is 6 inches by 10½ in section, and the blocks are cut 6 inches in length. The blocks when thus cut are 6 inches square at the base, and 6 by 4 inches at the top.

The pavement is laid as shown in Fig. 2. Having leveled the bed of the road and laid a suitable foundation of concrete and well tarred flooring, the blocks are laid upon this flooring, placing them in rows, as shown, running with the line of the street, the vertical back of one block being made to face the diagonal front of the one behind it. There is thus formed between the back and front of every two blocks a pit the upper portion of which forms an acute angle, while the lower portion or base forms a right angle as shown at B. Every alternate row is laid so as to box up both ends of each and every one of the angular pits, as shown. The pits are then filled with concrete, well rammed, so as to fill up the pits solid to the surface. The whole pavement is then covered with a coating of pitch, coal tar, or any other suitable substance.

The lower end of the beveled face of each block is made vertical to brace the blocks together and prevent them from mounting each other, and also to prevent the concrete in the pit, B, from being forced down under the blocks.

Fig. 1



ADAMS' WOOD PAVEMENT.

Fig. 2

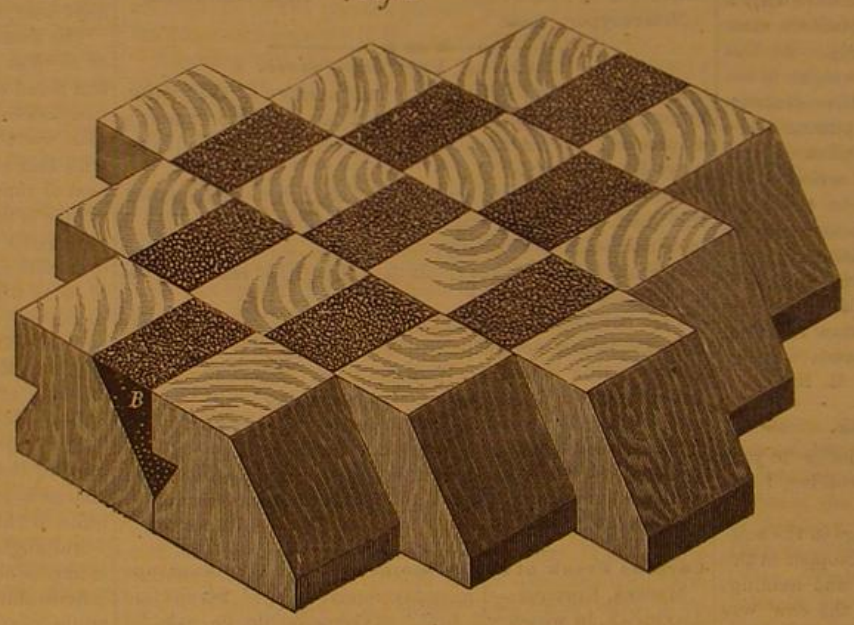
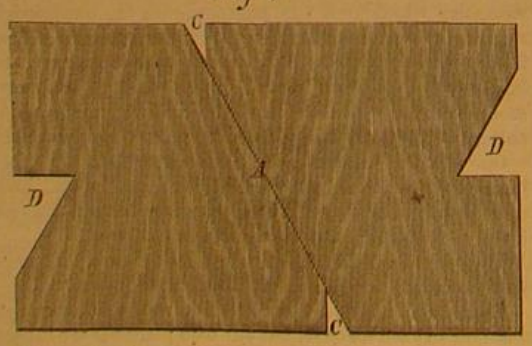


Fig. 3



For further information address the patentee, A. M. Adams, 42 Fair st., Newark, N. J.

Agriculture and Manufactures.

In an address recently delivered by Horace Greeley at the St. Louis Industrial Exhibition, the veteran journalist said:

"It were superfluous, I trust, to argue or demonstrate that Agriculture and Manufactures are natural allies, who ought to be near neighbors. However obscured by prejudice or partisanship, this truth is instinctively recognized by the general mind. Say to any purely agricultural community, 'We will establish works for the production of iron, steel, woolens, glass, porcelain (or almost anything else), among you, which will thenceforth employ a thousand hands, provided you will give us a square mile of eligible land for our buildings, and subscribe $100,000 to our stock,' and those requirements will be promptly satisfied—he who for fifty years has maintained that manufactures are a curse, cheerfully paying his proportion if he must, though he would rather let the whole sum be made up by others—out of regard for his consistency, of course. And even this delicate consideration will not prevent his doubling, because of that factory, the asking price of his farm.

"There is no region or district devoted to agriculture, which would not be benefited by the establishment therein of manufactures, and *vice versa*. Industry supplies the larger, and I think, better portion of the education of the masses; and it is vitally important to them that the portion of its processes which they are severally called to observe should be diverse and multiform as may be. If you tell me that a country might buy its metals and fabrics most advantageously by devoting all its industrial energies to the production of a single staple—say corn or cotton—to which its soil and climate are admirably adapted, I demur that all its industrial capacity *cannot* be devoted to the growth of that or any one staple, and that we need, not merely iron, copper, wares, and cloth, but the ability and skill required and developed by their production. Nay: We need that development and expansion of our else latent and dormant capacities which can only be secured through a diversified national industry. Had we been content to receive our fabrics from Europe, the most important and beneficent uses of india-rubber would probably have remained undiscovered to this hour: had we to this day bought of the old world our clothes ready made, the sewing machine would not yet have been invented. I deem it a very moderate estimate that the old world is this day richer by at least a billion of dollars because of American inventions and discoveries which would not have been made had the fathers of this republic seen fit—as they were abundantly urged to do—to keep our workshops in Europe, and devote their labor exclusively to the cultivation of the soil."

The Suez Canal.

A writer in the Boston *Traveler* gives the following notes on the present condition of the Suez Canal:

The Wabash and Erie Canal, 460 miles in length, occupies a space of 400,672,400 cubic feet, or more than half as much as the Suez Canal. Take seven of the largest canals in the United States, and any two of them will represent an amount of labor as large as does the Suez Canal. The difficulty with the Suez Canal is found in the fact that it is not, and never will be done. Storms of sand and land slides combine to defeat the object for which this avenue was constructed, and nothing but a perpetual dredging will keep it in a passable condition, making the work of keeping it clear of sand bars a constant repetition of the original work. But all this does not prevent it being a great success.

The system of lights, signals, pilotage and towage is now so complete that the navigation in the canal is as safe and convenient as the entrance into New York harbor, while the constant dredging and excavating is every day improving the channel.

How much of a financial success it may be I cannot tell, as the number of men constantly employed exceeds one thousand, and the number of dredging machines over one hundred, which is a separate bill of expense from the tug-boats, pilots, etc. But at $2 a tun as toll upon ships, and $2 upon each passenger, there must be taken—now that it is crowded—at least $80,000 a day, besides the receipts for towage, pilots, supplies, wharfage, etc. As far as Egypt is concerned, it has been already of sufficient advantage to cover all expenses. The fresh water canal, which was built along the line of the larger, to supply transportation and water for beast and man while at work, has already changed the face of the country for miles on either side of it. Before its construction the railroad to Suez was often blocked by sand, which, like the snow in New England, blew up in great drifts over the track, and sometimes stopped the passage of trains for weeks. But since the presence of fresh water has covered a strip of the desert with vegetation, the track of the railroad has been changed, and, running along this canal, is never troubled with sand drifts; and the amount of labor saved on the railroad would construct the canal in two years. Without an inhabitant ten years ago, this was a useless, dismal waste; but to-day, towns and villages, thrifty and enterprising, stand at short intervals.

The Carpenter Self-Heating Fluting Machine.

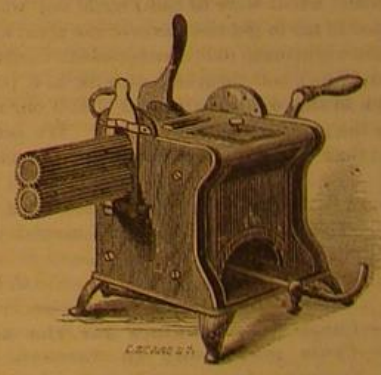
Among the many small labor-saving machines which have now become household necessities must be ranked the fluting machine. The one we herewith illustrate has advantages over others we have seen, which render it one of the most simple and convenient of its class.

It is designed to be heated by gas, or a spirit lamp, and the fluting rollers are kept constantly and uniformly heated to the required temperature. The machine is simple, substantially constructed, and totally obviates the necessity of change of the heaters from the fire to the rollers, which heaters need frequent renewal, involving expense and trouble. A saving in time is also effected, which, in addition to the other advantages named, must render this machine a popular and useful implement. It is now on exhibition at the Fair of the American Institute, in this city, and judging from the expressions of favor elicited from those who examine it, its merits are generally appreciated.

The fluting rollers are hollow cylinders fluted on their exterior surfaces, and are placed upon heating mandrels, about twice as long as the fluting rollers themselves. These mandrels have one portion inclosed in a heater—a small stove in which a gas jet or spirit lamp heats them, and the heat is conducted along to the portions upon which the fluting rollers are placed.

This application is so simple and obvious that it seems somewhat singular that it was not sooner thought of.

Only the upper mandrel revolves. The fluting roller on this mandrel is driven by a feather on the mandrel, and imparts motion to the lower fluting roller, which turns on its mandrel as a bearing.



A tension screw serves to adjust the pressure so that there is no danger of cutting the most delicate fabric.

A cam lever opens the fluted rollers, and holds them apart so that both hands may be used to introduce the fabric to be fluted. This is an improvement we have not seen on any other machine of the kind, and is a great convenience.

Wooden shields on both sides of the machine protect the hands from heat. These shields are secured to the sides of the heater, and perfectly remove all inconvenience from radiated heat.

Patented, June 28, 1870, by Miss Mary P. Carpenter, of San Francisco, Cal. The machines are manufactured by Henry Cromwell, 28 Barclay street, New York, to whom letters and orders may be addressed.

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To Advertisers.

The circulation of the SCIENTIFIC AMERICAN is from 25,000 to 30,000 copies per week larger than any other journal of the same class in the world. Indeed, there are but few papers whose weekly circulation equals that of the SCIENTIFIC AMERICAN, which establishes the fact now generally well known, that this journal is one of the very best advertising mediums of the country.

To Inventors.

For twenty-five years the proprietors of this Journal have occupied the leading position of Solicitors of American and Europ ean Patents. Inventors who contemplate taking out patents should send for the new Pamphlet of Patent Law and Instructions, for 1870.

SMOKE CONSUMPTION.

The perfect consumption of smoke in furnaces is desirable on other accounts than those usually mentioned in the general discussion of the subject; namely, the prevention of waste of fuel and the contamination of the atmosphere. But were there no other object than those specified there would still be sufficient to stimulate invention to the production of some efficient remedy. Under steam boilers, furnaces have been and are constructed so as to consume smoke as perfectly as desired. An instance of this kind was noticed on page 137, Vol. XXI., of the SCIENTIFIC AMERICAN, and directions for setting boilers so as to secure perfect combustion were given on page 129, Vol. XVII.

But in smelting furnaces vast quantities of combustible material escapes from the stacks, and besides being wasted, renders the air in their vicinity a vast smoke cloud, covering everything with smut. The inconvenience of this is great. The loss where coal is so cheap as is the case in iron districts, is not so great as to cause much concern, were it not that the fuel thus escaping is in the very best condition known for perfect combustion, and would, if consumed, give an intense concentrated heat unattainable in smelting furnaces constructed in the ordinary way.

We have before shown that finely pulverized fuel is in a much better condition for perfect and rapid combustion than when it is coarse, and we need not say that the more rapid and perfect combustion is, the more concentrated and effective will be the heat. The minute subdivision of carbon is carried to the farthest point in imperfectly consumed smoke. Send a stream of oxygen or of heated air into the hot smoke, and the energy of the combustion is astonishing to one who has never tried the experiment.

It is only from a want of a proper supply of oxygen that it is smoke at all. Put oxygen enough into such furnaces, and the gases issuing from their smoke stacks will be as clear and transparent as air itself.

The problem of furnishing a proper supply of oxygen must not be considered without due reference to the proper point at which the supply should be made to reach the heated gases. The combustible gases require, in order to unite with oxygen, a sufficiently elevated temperature, and for rapid and complete consumption they also require that the oxygen should be intimately mixed with them in the proper proportions.

The inventor of smoke consuming devices is obliged to content himself with a more or less gradual admixture, since he could not, even were it desirable, burn the gases instantaneously without explosions. These gases or vapors are, moreover, always mingled with incombustible gases, so that they have to be treated in a diluted state, which retards combustion so much that it would be difficult to reach the point of explosive rapidity where there is a free draft, although such explosions are common enough in domestic stoves and furnaces.

Further difficulties arise from the employment of mixed fuels, especially if there is a want of uniformity in the admixture, as where pea coal and coal dust are mixed with the shavings and sawdust of wood-working establishments.

From these considerations we are led to the following conclusions, that to successfully consume smoke from fuels of different qualities, and from mixed fuels, there should be auxiliary admissions of air beyond the first entrance. In other words, the entrance of the air should take place not only all along the stratum of solid burning combustibles, but beyond it, and yet within the limit where the heat becomes so far diminished as to render combustion impossible.

Second, there should be means of adjusting and controlling this admission so as to vary it for various qualities of fuel, in order to get at all times and under all circumstances the best results.

There have been some methods of smoke consuming employed which nearly fulfill the conditions required, so far as perfect consumption of the smoke is concerned; but we think there is room for others cheaper and more manageable, which our inventors might supply, and for this reason we have been led to give the present brief summary of the difficulties to be surmounted, and the principles of smoke consumption.

EFFECT OF ARTILLERY DISCHARGES UPON WEATHER.

When two phenomena are observed to uniformly or nearly uniformly occur together, or when one uniformly or nearly always succeeds the other at the end of a short interval, the mind at once suspects some correlation between them. If it can be shown that following the continued discharges of artillery rain generally falls within such an interval as to not forbid the idea of correlation, this idea may fairly be entertained until it is shown that there is no fixed relation between the phenomena.

We feel bound to say that although we have long been skeptical in regard to the quite popular belief on this subject, we are gradually coming to the opinion that there may be something more than mere superstition in the supposition that cannonading brings rain.

It is now stated that since the opening of the present war in Europe that part of Germany in the vicinity of Frankfort has been almost constantly visited by rain and thunder storms, a most unprecedented thing at this season of the year. The German press has had its attention called to this fact, and in the light of other recorded facts has almost unanimously attributed these unusual storms to the firing of cannon and small arms in Alsace and Lorraine.

We find in an exchange the following facts bearing upon this interesting subject:

"The *Ungarische Lloyd*, in an interesting article, says that the history of the wars of the last eighty years are full of accounts of the great meteorological changes which have followed violent engagements in war.

"In 1861 Lewis called attention in Silliman's *American Journal* to the fact that violent rains and heavy cannonading appeared to stand in intimate connection. He said: 'In October, 1825, I observed a very plentiful rain immediately after the cannonading which took place in celebrating the connecting of Lake Erie with the Hudson. I published my observations on this event in the year 1841, expressing the opinion that the firing of heavy guns produces rain in the neighborhood. After the first battle in the last war between France, Sardinia, and Austria, there followed such important rains that even small rivers were impassable, and during the great battle of Solferino there broke out such a violent storm that the fighting was interrupted.'

"In July, 1861, McClellan's troops on the upper Potomac had four separate engagements on four days, and before the close of each violent rains fell. On the 21st of July Bull Run was fought in Virginia, and on the 22d rain fell the whole day till late at night. Under the heading, 'Can we produce rain when and where we like?' the Cincinnati *Woechentliche Volksblatt* for the 10th of July, 1862, remarked:

"'The cannonading (during the war) on the York River and James River, as well as the cannonading of Corinth and on the Mississippi, were followed by such fearful storms that the land was inundated.'

"The Bohemian campaign of 1866 was accompanied during the whole course by violent rains."

These facts point clearly to the correlation of artillery discharges with rain fall, yet they are hardly numerous enough, and other attendant circumstances are not sufficiently known to warrant the scientific acceptance of the theory as sound. The attention of scientific men is, however, so well directed to observation of the meteorological events succeeding heavy cannonading that the question will eventually be settled on valid authority.

If the notion that the explosive combustion of gunpowder can induce rain be definitely determined to be a true one, we shall at least have made one step towards controlling the weather by artificial means.

ARTIFICIAL STONE---THE SOREL PROCESS.

There is no field of invention which to-day is more replete with general scientific and practical interest than that pertaining to the manufacture of artificial stone. While, in the working of iron, men have sought out means whereby it can be rapidly and cheaply converted into the forms required, the world has to the present day been content with working stone after the same general method used in the construction of the pyramids. The rudest of all materials is thus changed by immense labor into costly forms; and the attempts to obviate the necessity for this labor and expense, have been confined to a very recent period.

The idea that stone could be cheaply produced by artificial means, and molded to any form required, has gradually forced itself upon the minds of modern inventors, and has borne fruit in a large number of processes more or less practical and adapted to secure the end in view.

Very many of these processes have, however, failed to secure such results as to warrant their general adoption Some require the steeping of the stones in some solution after they are molded to remove or transform some contained material, or to add something which could not be advantageously added in earlier stages of the process. Among these is the celebrated Ransome process, which has not given uniformly satisfactory results.

Other sorts of artificial stones are sand concretes made with cements of various degrees of hydraulicity, and many of them of such inferior quality as to render them utterly unreliable for use as building material.

The process invented by M. Sorel, a celebrated French chemist, produces results which we have never seen equaled by any other. It has for its basis the use of oxychloride of magnesium, a new cement discovered by M. Sorel, who was also the discoverer of oxychloride of zinc. The process has been patented in this country, and the patent is owned by the Union Stone Co., of Boston, Mass., who apply it to the manufacture of all kinds of stone molded in ornamental forms for building purposes. They also apply it to the manufacture of emery wheels, needle sharpeners, oil and water stones, soapstone register rings, and faces for sad-irons, etc. In short, they work any kind of stone by this process, first disintegrating it by suitable mills and molding it again into any form wished, and by the use of the cement named consolidating the mass to even greater strength than it originally possessed, without alteration of color or apparent texture.

We have now before us specimens of marble, sand-stone, blue-stone, etc., which look exactly like the original stone, yet which are even more dense and hard than the stone from which they are made. The marble, which is a beautiful specimen, having a fine crystalline fracture was made of common marble-yard refuse. In fact, there is no sort of mineral solid material which the magnesium cement does not seem capable of uniting, and holding with great tenacity. The process of making stones by this method is as follows: Natural magnesite—carbonate of magnesia—is first calcined, which reduces it to the oxide of magnesium. In this state it is mixed dry in the proper proportion, by weight, with the powdered marble, quartz, sand, or whatever material forms the basis of the stone. It is then wetted with bittern water, which converts the oxide of magnesium into the oxychloride. The now semi-plastic mixture is rammed into molds, where it speedily hardens, sufficiently to be taken out and laid on skids. In two hours' time the stone is so hard that the heaviest rain will not wash the corners off, and in from a week to two weeks the stones may be marketed and used.

These stones are, according to good authority, capable of withstanding even more severe weather tests than natural stones. Tests made in Boston as to their strength are certified to have given better results than natural stone; and certainly the specimens we have, indicate that they are in no way inferior to the natural stones they severally represent.

The hydraulicity of magnesium salts has attracted the attention of several of the most eminent chemists in the world.

In a note recently read before the Academy of Sciences, in Paris, by M. Deville, he called attention to the action of water upon magnesia. A portion of a specimen of magnesia, prepared by calcining the chloride sent him several years previously by M. Denny, was kept constantly exposed to water under the taps of his laboratory. After a time it assumed a remarkable consistence, it could scratch marble, and, though subjected to atmospheric action for six years, it underwent no perceptible change.

The substance proved to be a crystallized hydrate. Subsequently, with magnesia prepared from the hydrate, he obtained similar results, and casts of medals after having been placed in water assumed the appearance of marble.

Magnesia obtained by calcination of the chloride prepared by treatment of sea-water, though its hydraulicity is partially destroyed by calcining at a white heat, exhibits remarkable hydraulic qualities when brought to a red heat. Equal parts of chalk or marble and magnesia formed into a plastic mass, becomes hydrated and extremely hard when acted upon by water. A paste made from dolomite, calcined below a red heat and powdered, forms, under water, a stone of extraordinary hardness.

The experiments of M. Deville show that to the hydraulicity magnesia is due the union of the particles of chalk or marble in forming a compact, homogeneous stone, and numerous obvious applications of this property of magnesia in the arts will readily suggest themselves.

M. Frémy, in his published researches on hydraulic cements, attributes the setting of hydraulic lime, first, to the hydration of the aluminate of lime, and, second, to the reaction of the hydrate of lime upon the silicate of lime, and the silicates of alumina and lime.

It is evident from these observations that the oxychloride of magnesium is a cement of great power and durability, and that as an hydraulic cement it ranks among the best known to modern science. Its application to artificial stone manufacture, we think, solves the problem of how to make such stones of proper density, durability, strength, and capability of taking a high polish. If we may credit the statements in regard to cost of manufacture, there seems no reason why stones of this kind should not be able to more than compete with cut stones of any variety and for any purpose.

PROGRESS IN THE MANUFACTURE OF COLORS.

In no department of technology has there been more progress than in the manufacture of colors. The art of dyeing dates far back in antiquity,and it was one of the first in which chemistry began to take a part, while in the brilliancy of its results it surpasses all others. We are aware that certain itinerant lecturers are in the habit of adorning their sentences by allusions to the lost arts and reference to the Tyrian purple as something transcending anything we are able to produce at the present day. This is all very well for a lyceum audience, and helps the speaker to display his knowledge of the classics, but, in point of fact, the magnificent purple invented by Prof. Hofmann, and now made in quantities such as the ancients never could have dreamed of,is far beyond any trifling color that may have been lost to us.

We are not much of a believer in the value of lost arts, as compared with those we have found by the aid of the scientific knowledge of the present day. It is somewhat curious, that in Egypt, where the people were very fond of adorning their monuments with fresco paintings, the art of making the colors was kept as a secret by the priests. It was a priestly privilege to mix colors, just as it was the monopoly of noblemen to make glass in France in the middle ages.

The Tyrian dye was the same as that which is obtained from the coast of Mexico at the present day. A sea mollusk yields the peculiar color. The little snail has a bag containing the purple color—this is pierced by a needle, and the thread drawn through it, until the material is exhausted, the snail is again thrown into the sea, where the wound heals and the bag fills up with a new supply of the precious dye. Several thousand animals are required to color the thread for the manufacture of a few yards of cloth. The cloth becomes very expensive, but the inhabitants of Mexico will pay fifteen or twenty times as much for it as they will for articles dyed with the much more magnificent aniline colors.

The Romans were acquainted with a variety of colors, but the downfall of the Empire seriously deranged the business, and it finally disappeared altogether. The discovery of America was of great importance to this branch of industry. From the Western Continent was obtained various kinds of woods, and the Cochineal. To dye with the latter color required considerable skill, and the application of chemical knowledge. At first, alum was employed,which was afterwards exchanged for tin salt, by which a dye was obtained far surpassing the purple of the ancients.

One of the first books on the subject of dyeing was printed in Venice, in 1548, and attracted great attention. It was the occasion of the introduction of many new processes into Germany, France, Holland, etc.

In England great opposition was made against the introduction of indigo and Brazil wood by the manufacturers of other colors. Even the clergy were impressed into the service, and, during the reign of Elizabeth, matters were carried so far as to lead to the destruction of all the indigo there was on hand, and the absolute prohibition of the introduction of this article into the country, and it was not until the middle of the last Century, that all restrictions were removed, and the people were at liberty to make free use of this fine blue color. There was another instance of extraordinary legislation in the case of cotton printing in England. The manufacturers acquired so great skill, and the goods were so much admired and worn, that the Government felt it their duty, in the interest of the silk manufacturers, to prohibit the wearing of calicoes. For ten years this law was in force. Afterwards, by the payment of heavy taxes, cotton printing was allowed, and it was not until so recently as 1831 that the disabilities were removed, and cotton printing was left untrammeled.

Dyeing and printing have made enormous progress, partly through improvements in machinery and partly through the discovery of new colors. Originally the printing was done with small movable blocks, but,at the present time,the whole pattern is engraved upon copper cylinders, and one workman can print as much calico in a day,by the improved machinery, as 100 printers, aided by 100 journeymen, were able, in the same time, to accomplish under the old system. It is said that a piece of goods 6,000 feet long, something over a mile, can be printed with four colors within an hour. This is certainly a wonderful improvement upon the slow block process of olden times. The progress in the introduction of colors has kept pace with the invention of new machinery. In addition to the ancient organic colors, modern science has taught the use of mineral pigments, and we now have Scheele's green, prussian blue, manganese brown, chrome yellow, antimony yellow, chrome red, artificial ultramarine, and many others. The progress in the manufacture of colors carries with it a similar advance in cognate branches—for example, tannic and gallic acids are now produced on a scale entirely unprecedented. Although the tanning of leather remains the chief use of the extract of oak bark, other applications have grown up, and tannic acid has become of great use in the manufacture of ink, of black dyes, and in medicine and photography. Chrome yellow led to a demand for bichromate of potash, and this, in turn, was applied to galvanic batteries, to the manufacture of the green sesqioxide for printing bank notes, to the preparation of chromic acid for use in the manufacture of various ethers, and of oxygen gas.

Nearly all of the organic colors have been made,artificially, by chemists, and there appears to be every reason to anticipate that indigo and alizarine will ultimately be made by some synthetical method, thus completing the list of artificial pigments. Our notice of the progress in this branch of industry would be very incomplete without some reference to the most important contribution to dyeing that has been made in centuries, and that is the invention and discovery of aniline colors. These colors are of such rare beauty that they leave nothing further to be desired. The great variety of shades, and the magnificence of the dyes so far excel anything the world has ever seen before, that it is difficult to conceive of further progress in this direction. From the crudest material we now extract the sweetest perfumes, and the brightest colors, and this is but one in a thousand of the contributions that chemistry has made to the arts during the past century.

PORTABLE DWELLING HOUSES.

Our readers will many of them distinctly remember when the "Gold Fever" first broke out in this country, and people eager to make their fortunes, were rushing into the wilds of California, that the need for cheap dwellings became so pressing, as to warrant the building of portable houses on the Atlantic seaboard, and the shipping of them all the way round the "Horn" to San Francisco.

It seems then, that the only question necessary to answer in order to decide upon the feasibility of reviving this industry is—"Will it pay?" We believe it will

In the suburbs of New York, there exists a very large demand for cheap frame houses, as well as for wood houses of some considerable pretension to architectural design and finish. The materials of which these houses are at present built, is brought from a great distance, and in its crude state, from localities where labor and power for driving machinery are cheap, to a place where power, labor, and shop room, are as dear or dearer than in any other place on the Atlantic side of the Rocky Mountains. All the waste is thus transported, and, though to some extent utilized as fuel, still adds to the cost of buildings.

Now according to well-demonstrated principles of industry, this order of things ought to be exactly reversed. The work should be done where power and labor are cheap, and the waste should not be transported thousands of miles, as is now the case.

It seems to us from these considerations, that the time is ripe for a revival of building portable houses. On the one hand is a vast market, on the other is cheaper labor, inexhaustable power at nominal cost, and material in abundance. Much of the work in a frame house may be rapidly and cheaply performed by machinery. The bulk of the planing, boring, mortising, turning, sawing, might be done in this way in large establishments, and houses so built might, in our opinion, be sent to this market at thirty three per cent less than their present cost, a very fair profit being allowed to the manufacturer.

A catalogue of designs from which orders could be made, could easily be prepared, comprising all the requisites to meet the various tastes and wants of purchasers; or purchasers might order from designs of their own or of resident architects, if preferred.

So far from appearing to contain any element of impracticability, these suggestions appear to us entirely practicable, and in accordance with the plain laws which govern other industries.

SCIENTIFIC INTELLIGENCE.

COMPARISON OF NATURAL AND ARTIFICIAL ICE.

The French company *Messageries impériales*, wishing to ascertain what kind of ice would be preferable for their vessels navigating the Suez Canal, caused experiments to be made under identical circumstances with several varieties, with the following results: Time required to melt 200 pounds of ice:

Natural ice of Switzerland	107 hours
" " Norway	115 "
" " Massachusetts	138 "
Artificial ice, Carre's machine	130 "
" " Tellier's machine	144 "

If these experiments were conducted with accuracy, they would seem to prove that artificial ice would have the preference over the natural production of our lakes and rivers for transportation on ship board, and for refrigerating mixtures. One series of experiments is scarcely sufficient to settle a question of this importance.

BEST POLISHING POWDER FOR GLASS AND METAL.

Lord Rosse had some difficulty in polishing the mirrors of his great telescope, and after trying various powders, finally adopted the red oxide of iron, jewelers' rouge, carefully prepared for the purpose.

The hydrated sesquioxide of iron is precipitated from a solution of pure sulphate of iron (green vitriol), and thoroughly washed. It is then well compressed to free it from moisture, and afterwards exposed to a somber red heat, as viewed in the dark.

The important precautions to be observed are to employ an excess of ammonia, pure sulphate of iron, and not to raise the heat above the point just indicated. The product ought to be a deep red with a shade of yellow.

Lord Rosse tried soda and potash, but was not able to obtain as good an article as with ammonia; the color was unsatisfactory and it did not polish as well.

NEW USES OF CHLORIDE OF ALUMINUM.

The anhydrous chloride of aluminum was found by Deville to be the most convenient compound for the manufacture of metallic aluminum. He prepared it by passing dry chlorine gas over alumina mixed with lampblack and oil, and collecting in a suitable receiver. It can also be made in this way on a large scale, but the expense is such as, together with the cost of sodium, to keep up the price of aluminum beyond the possibility of extensive use. The discovery of new antiseptic properties in the hydrated chloride of aluminum may lead to its more extensive manufacture, and consequent reduction in price.

Mr. John Gamgee, so favorably known for his recent preserving process, has found that the hydrated chloride of aluminum possesses excellent antiseptic properties. It is said to be quite as potent as chloride of zinc and carbolic acid, and is at the same time non-poisonous, and devoid of unpleasant smell. The fact that clay is one of the best disinfectants we have, has long been known; but the use of the chloride of aluminum for the same purpose has been probably overlooked in consequence of its not occurring as a waste product in any chemical industry. If, however, it should be required in a large quantity, it could be prepared from many highly aluminous slags, by treating them with sulphuric acid, after the removal of the silica, and then by mixing the sulphate of alumina with chloride of calcium by double decomposition, precipitating sulphate of lime, and leaving chloride of aluminum in solution. A cheaper way would be to take the commercial sulphate of alumina and common chloride of calcium for this purpose. On allowing the aqueous solution to evaporate at a very gentle heat and afterwards cooling, crystals of hydrated chloride are produced.

If an attempt be made to drive off the water from the hydrated chloride by the application of heat, decomposition will take place. Hydrochloric acid is evoked under these conditions, and oxychloride of aluminum is formed, and by finishing the process alumina is obtained as the ultimate fixed product.

That the chloride of aluminum has certain solvent properties for cellulose and other organic matters has been observed, and the use of salts of alumina in calico printing is one of the most ancient chemical processes known to the industrial arts.

If we really have a better antiseptic in the chloride of aluminum than we possess in carbolic acid and chloride of zinc, it is a discovery of great importance.

ALUMINA MORDANT FROM CRYOLITE FREE FROM IRON.

Since cryolite has become an article of commerce, its use has been extended to various industries in which it was not anticipated that it would ever play a part. It was originally supposed that the only possible value it could have would be as a source of metallic aluminum, but that use for it now amounts to nothing, while other applications have led to the importation into the United States of at least 5,000 tuns per annum of the mineral.

M. Hahn proposes to use cryolite as a source of a pure alumina mordant. He stirs up in water 100 parts of finely divided cryolite in 88 parts of milk of lime, and heats the mixture to boiling by steam, in a wooden tank that contains no iron.

The mineral is completely decomposed, the fluoride of calcium settles to the bottom, and the supernatant liquid is decanted. This consists chiefly of aluminate of soda, which he neutralizes with pyroligneous acid, and leaves to settle. After considerable time, and as soon as the liquid is perfectly clear, about two thirds of it are drawn off and evaporated to furnish acetate of soda. In the residue are one atom of alumina, and one atom of soda; to this is added one atom of acetic acid, and two atoms of concentrated sulphuric acid, and after agitation for considerable time, there will result a saline solution, composed of the double sulphate of soda and alumina, containing about 4 per cent of alumina. To obtain a neutral solution it is prudent at the outset to take less acid, and to have an excess of alumina in the wooden boilers.

The mordant thus prepared is absolutely free from iron; it becomes a jelly when heated, but remains liquid in the cold. One of the largest print works of Berlin prefers it to any alumina mordant in the market.

The fluoride of calcium resulting from the operation is employed as a valuable flux—it is, in fact, artificial fluor spar in a very fine state of division, and thus capable of intimate mixture with any mineral it is proposed to fuse with it. The acetate of soda obtained in the process can be used for the manufacture of pure acetic acid, or by heat can be converted into the carbonate. The fluoride of sodium can be used as a valuable reagent in the laboratory, or may be manufactured into caustic soda.

OZONE FROM RAPID COMBUSTION.

We mentioned at the time of its presentation the paper of Mr. Loew, of the College of New York, on the formation of ozone by rapid combustion. The publication of this paper led to considerable controversy in Europe, and a number of chemists reported the experiments. Carl Tham finds the observations of Mr. Loew to be correct.

A small quantity of ozone is always found in that part of the air which is immediately in contact with the lower part of the hydrogen flame, and its presence can be shown by drawing the air through a glass tube. The point of the tube ought to be inserted into the lower half of the flame, and the draft must be strong enough to divert the flame a little from the perpendicular, but not enough to draw the unconsumed gases through it, as they at once destroy the ozone. Burning charcoal yields no ozone for the reason that the carbon absorbs both atoms of oxygen to produce carbonic acid. This method of the formation of ozone is of great interest, and may eventually lead to its practical application in bleaching and disinfecting. It would appear to be a cheaper and better way to evolve the active oxygen than by electricity.

ACTION OF HOT VAPORS UPON WOOD.

Some interesting experiments have recently been tried upon the action of various vapors upon wood. If the vapor of bisulphide of carbon be passed over wood, the oxygen and hydrogen of the cellular tissue are expelled and pure carbon will be left behind. This carbon emits a metallic sound when struck, and if a wooden bell be carbonized in this way it will have the tone of silver. Wood carbonized in the vapor of alcohol yields a fibrous coke as white as silk.

It would be interesting to extend the research to other vapors to see whether a coal could not be obtained of greater absorbing properties for gases, as well as of coloring matters, to be used as a substitute for bone black.

THE GRAPE SUGAR INDUSTRY.

During the year 1868, there were sixty establishments in Germany devoted to the manufacture of glucose, which produced 22,000,000 pounds of sirup, and 8,800,000 pounds of grape sugar. The starch employed in the manufacture was made from potatoes. In this country where corn is so cheap, the greater part of the starch for grape sugar is made from it in preference to potatoes. The consumption of glucose is constantly on the increase, as it is required in the manufacture of domestic wines.

American wines are deficient in sugar—they rarely contain more than 12 per cent, and this amount can only yield 6 per cent alcohol; it is therefore customary to make up the deficiency by the addition of grape sugar. Cane sugar was at one time employd for this purpose, but it had the effect of destroying the peculiar aroma and bouquet of the wine, and its use was abandoned.

OSMOSE.

Under this heading the editor of *Les Mondes* states that he has received intelligence from the large beet-root sugar manufactory at Arlowetz, Southern Russia, stating that the osmose process has been applied there under peculiarly favorable conditions, whereby, on the large scale 25 per cent of sugar has been obtained from the third crystallization, instead of only 8 per cent, as when the usual methods are applied.

FAIR OF THE AMERICAN INSTITUTE.

Some important additions to this exhibition have been made since our former writing, which greatly increase the attractions of the Fair. One of the principal additions is the Carré ice machine, exhibited by M. J. Bujac, 17 Broad Street, New York. It is impossible, without drawings and a lengthened description, to give the reader any definite idea of this remarkable invention.

The apparatus consists of a cylindrical, dome-topped, vertical boiler, into which the aqua ammoniæ is introduced, part of which enters an "exchanger," a "complement," and an "absorption vase." A large tube issuing from the dome connects it with a liquefactor, which is an extensive series of connected tubes, nearly horizontal, contained in a sheet-iron tank filled with cold running water. In this the gas, under the pressure and the cold, is liquefied, its latent heat being carried off by the cold water, whilst the liquefied ammoniacal gas passes out at the lowest end by a small tube, into a "recipient," where it collects. This vessel is connected by a tube with a "distributing valve," through which the liquefied ammoniacal gas expands into four stacks of zig-zag tubes contained in a "freezing cistern." The freezing cistern consists of a wooden tank lined with iron, in which are placed four lines of vertical zig-zag tubes, into which the volatile ammoniacal gas enters from the distributing valve. Between these tubes, twenty-four metallic cans, or freezers, filled with water are placed, and the whole interior of the tank is filled with a bath of strong brine, or, preferably, solution of chloride of calcium, which is incapable of being frozen by the temperature produced, and is made to circulate between the tubes and freezing cans, by a stirring apparatus. These stacks of zig-zags connect at bottom with a cylindrical tube, called the "collector." When now the distributing valve is partially opened, the liquefied ammoniacal gas is forced in due proportion into the zig-zag tubes, where it rapidly expands into gas by the assumption of the heat necessary for its vaporization from the surrounding brine, which in its turn abstracts the heat from the water in the cans (by virtue of which only it can retain its fluidity), and thus converts it into ice, and accomplishes the chief purpose of the machine. But the apparatus, acting continuously, now gathers the resulting ammoniacal gas, redissolves it in the weak aqua ammoniæ of the boiler which it has previously abstracted and cooled, and then returns it to the boiler to be again deprived of its gas.

The refrigerating power of this apparatus will surprise any one who is not familiar with its working. In a scientific, as well as practical point of view, it is the most instructive and interesting object of the Fair.

A decided novelty is the "Dynamometer Balance Wheel," exhibited by the inventors, R. B. Hamel and J. B. Holden. It consists of an independent loaded or weighted wheel, running and operating upon the inner surface of the rim of an outer wheel, and driven by a pinion attached to a shaft that works within the cylindrical shaft of the outer wheel. When the resistance is increased, the weighted wheel ascends higher up the rim of the outer wheel, and when it is decreased, it descends and stores the power applied, giving it out again when the resistance is again increased. This wheel is also designed to be used as a hoisting machine, in which application great efficiency is claimed for it.

The Union Stone Company, Boston, Mass., show a very fine collection of emery wheels and grinders, of excellent quality. These wheels are made by the Sorel process, that is, the emery is cemented by the use of oxychloride of magnesium, for which process this company own the American patents. The process is also applied to making window trimmings, building stone of all kinds of ornamental designs, soap-stone register rings, soap-stone faces for sadirons, billiard balls, etc., etc. A notice of this building stone, with full description of the process of manufacture, will be found in another column.

William Taylor & Sons, of the Columbian Iron Works, 25 to 39 Adams Street, Brooklyn, New York, show a small "Starkey" steam engine, which is very compact, and in some respects unique in design. On one end of a plain bed plate is securely bolted the steam cylinder, through both ends of which the piston rod passes—slides being dispensed with. The back end of the piston rod is keyed to a crosshead, to which are connected two side rods. These side connecting rods pass—one on each side of the cylinder—to a second cross head, which is connected to a crank by an ordinary stub end and strap. On top of the main steam cylinder, and at right angles to it, is a smaller cylinder, in which are the steam ports, with an ordinary valve, which is a sector of a circle. A steel shaft or rod passes through the center of the valve, and through the covers of the valve cylinder, in which are stuffing boxes for that purpose. On top of the valve are two set screws, to regulate the pressure of the valve on its seat. Attached to the valve shaft is an arm running parallel with the piston rod, and connected to one of the side rods by a link, so that the connecting rod will communicate to the valve the required motion to open and close the ports of the engine. When the crank passes the centers, its rapid rising and falling motion opens the ports quickly; and when the crank is at half stroke the rods move in nearly a horizontal line, keeping the valve wide open, so that the full power of steam is obtained. By the peculiarities of this simple movement the steam is admitted to the steam cylinder at that part of the stroke where it is most wanted, and cut off where not wanted.

Severance and Holt, 16 Wall street, New York, show a splendid Leschot's Patent Diamond-pointed Steam Rock-Drilling Machine. These machines were fully described and illustrated on page 282, Vol. XII., of the SCIENTIFIC AMERICAN. The one exhibited, however, presents an improvement on the machines described in the article referred to, the feed gear being modified so that the drill can be run down as fast as it can be withdrawn, which in deep boring saves much time.

William W. Tupper & Co., No. 206 West street, New York, show several sizes of their patent sectional grate and grate bars. These grates are adapted to all kinds of fuel, and especially for the consumption of small nut or pea coal, where the largest amount of air opening is desired. They have met with a well-deserved and gratifying success, having been, we are told, supplied to over 5,000 different steamers, factories, etc.

A model and drawing of an iron steamer, designed to make the trip from New York to Liverpool in six days, combining this high rate of speed with perfect sea-going qualities, first-class passenger accommodations, and large carrying capacity, is shown by W. W. Vanderbilt, Naval Architect and Consulting Engineer, 569 Broadway, New York. The dimensions of this vessel are as follows: Length on water line, 500 feet; beam at water line, 60 feet; do. over launch, 93 feet; depth of hold, 32 feet; number of decks, 5; total tunnage, 8,000 tuns; freight capacity, 4,000 tuns; coal capacity, 2,000 tuns; draft of water, 18 feet 4 inches. The vessel is intended to carry two vertical beam engines, 100 feet apart; cylinders, 110 inches diameter and twelve feet stroke. The ship is to be propelled by four side wheels, the forward wheels to be 40 feet in diameter, and the after wheels 45 feet.

The powerful organ exhibited by Jardine & Son, is an instrument of remarkable power and brilliancy of tone.

But of all the things shown, that which will most attract those interested in naval sports, is the case of silver ware exhibited by Tiffany & Co., 550 and 552 Broadway, New York. It contains all the cups contested for in the recent yacht races. We give a list of the articles shown: The Queen's cup, won by the *America*, in 1851, and still retained by the New York Yacht Club; the cup won by the *Phantom* in the contest with the *Cambria;* the cup presented to the New York Yacht Club, by Com. James Ashbury, owner of the *Cambria*, and won by the *Magic;* the cup won by the *Cambria;* Newport citizens' prize cup, won by the *Phantom;* and specimens of the elegant designs for which the above firm are widely celebrated.

Edward D. McCracken, 617 Sixth Avenue, NewYork, shows an alternating battery, so constructed that two series of elements alternate with each other in their action, without any rupture of the circuit. Clock-work revolves a circuit changer, which alternately passes the current around each of the two electro-magnets, so that an armature is alternately drawn to each. This armature forming part of both circuits, is provided with two springs, one of which reaches the poles of one of the magnets before the other is removed from the poles of the other magnet. The two series of elements therefore act together for an instant, while the change is making. It is claimed that rest given to each series of cups, by this arrangement every five or six minutes, greatly increases the power of the battery.

CORRECTION.—Canfield's elevator was incorrectly described in our issue of October 8th, and as injury might therefore result to the proprietor, we gladly make a correction at this time. This elevator is a self-sustaining, hand-hoisting machine, with automatic brake by which the platform and load are retained at any point—the hoisting rope freeing the brake whenever lifting, and the lowering by check line being under perfect control. The machine is a very ingenious, simple and reliable one, and we regret that injustice was done it through information obtained from an unreliable source. This elevator was described and illustrated in No 1, Vol. XXI., of the SCIENTIFIC AMERICAN, a fact of which our reporter was unaware when the notice referred to was written. The elevator is shown by F. P. Canfield, 71 Sudbury street, Boston, Mass.

IT is the design to establish, in connection with the Louisville Medical College, a complete analytical laboratory, to be kept open nine months in the year, where students can pursue practically a complete course in qualitative and quantitative analysis and pharmacy.

NEW BOOKS AND PUBLICATIONS.

THE MEDICAL ADVISER. A Full and Plain Treatise on the Theory and Practice of Medicine, especially adapted to Family Use. By Rezin Thompson, M.D., Permanent Member of the American Medical Association, and Author of "Thompson on Fever," etc. National Publishing Co., Cincinnati, Ohio, and Memphis, Tenn. Jones, Junkin & Co., Chicago, Ill.

This is one of those popular treatises on medicine with which the country has been supplied from time to time, and the usefulness of which is open to grave doubt. It is indeed very questionable whether the tinkering amateur doctoring, which results from the introduction and perusal o such books in families, does not do more harm than good, and it is quite certain that many such books are written in a style that renders them totally unfit to be placed in the hands of youths or read aloud in the family, as the author of this work states in his preface, this one is designed to be. This book is certainly not one that we should deem fit to be so read, or one which we should expect would improve a youth if read privately. If certain subjects connected with human physiology are to be discussed at all, they should be discussed in the plainest manner. A spade should be called a spade. All attempt at imagery or facetious allusion which may tend to excite a prurient imagination should be totally avoided. The author of this book evidently has lacked the skill and courage to treat subjects connected with the reproductive organs in this way. Meig's treatise on "Obstetrics" would, in our opinion, be a far less objectionable book to read in a family than this. What shall we think of an author who, in writing a work for family reading, pens such a paragraph as the second on page 351 of this work; italicizing what he evidently deems humorous allusions to delicate subjects, and tainting the whole passage with prurience by such a course. Better, a thousand times, have stated everything with detailed plainness than to thus sham a delicacy which the style of the paragraph shows the writer to be incapable of feeling. There are also evidences in the work that the author is not on the level which modern physiology has reached, in regard to this subject. In regard to the catamenia, our author evidently believes in heroic compulsion, whenever the discharge fails to take place in young females, regardless of the condition of the constitution, and whether regularly occurring ovulation demands the discharge. Those who purchase this work and endeavor to follow the author's directions in cases of this kind, will assume risks they will be wise to avoid. If doctoring is to be done at all, let it be done by skilled physicians, and let no one be encouraged by such works as this to become self-appointed tinkers of health. The book is a large octavo, very much larger in our opinion than is necessary to contain all the useful information we find in it.

SCHOOL-HOUSE ARCHITECTURE. Illustrated in Seventeen Designs in various Styles, with full Descriptive Drawings in Plan, Elevation, Section, and Detail. By Samuel F. Eveleth, Architect. New York: Geo. E. Woodward, 191 Broadway.

This is entirely a book of designs, with detail drawings and full specifications. The designs are all good, and in some cases very elegant. The work is published in the fine style which characterizes the well-known architectural works of its publisher. It is in quarto form, handsomely bound, and will be found a useful work not only to architects, but to all interested in the construction of school buildings.

A SET OF ALPHABETS of all the Various Hands in Modern Use, with Examples in each Style, designed as a Text-Book. By Frederick S. Copley. New York: Published by Geo. E. Woodward, 191 Broadway.

This book contains a collection of most beautiful designs, which will be found of great service both to young and to experienced draftsmen. The mechanical method of constructing letters in various styles is illustrated and described in full, in a clear and definite manner, and special attention is paid to cyphers and monograms. The book is got up in splendid style and is very ornamental as well as useful.

SPECIAL INSTRUCTOR ON LUMBER SURVEYING, for the Use of Lumber Manufacturers, Surveyors, and Teachers. By Charles Kinsley, Practical Surveyor and Teacher of Surveying. Published by the Author, Calais, Me., and St. Stephen, N. B.

This is a good little book, and will be found a valuable guide on the subjects of which it treats.

LINEAR PERSPECTIVE. For the Use of Schools and Students in Surveying. By Joseph Ropes. Fourth Edition. Philadelphia: J. B. Lippincott & Co.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

1,904.—REDUCING IRON OR IRON ORES.—J. Y. Smith, Pittsburgh, Pa. July 5, 1870.

2,147.—CUTTING, BORING, GRINDING, AND PULVERIZING STONE, ETC.—B. C. Tilghman, Philadelphia, Pa. August 1, 1870.

2,264.—MACHINE FOR MAKING PAPER BAGS.—M. E. Knight, Boston, Mass August 29, 1870.

2,268.—LITHOGRAPHIC PRINTING MACHINE, AND APPARATUS FOR PREPARING THE STONES USED IN LITHOGRAPHING.—R. M. Hoe, New York city. August 29, 1870.

2,282.—METAL OR ALLOY.—J. C. Booth, Philadelphia, Pa. September 1 1870.

2,288.—TETHER.—J. W. Upson, Tallmadge, Ohio. September 1, 1870.

2,297.—PUDDLING FURNACE.—S. Danks, Cincinnati, Ohio. September 2, 1870.

2,325.—APPARATUS FOR WORKING BRAKES FOR RAILROAD CARS AND FOR WORKING FEED-WATER PUMPS IN CONNECTION THEREWITH.—G. Westinghouse, Pittsburgh, Pa. August 11, 1870.

2,269.—DISINFECTANT AND INSECT OR VERMIN REPELLER.—C. H. Jackson, New York city. August 16, 1870.

2,273.—BALE TIE.—E. P. Jones, Sunflower county, Miss. August 17 1870.

2,327.—PAVEMENT.—A. G. Day, Seymour, Conn. August 24, 1870.

2,363.—PROCESS FOR FORMING VACUUM IN FREEZING APPARATUS.—G Parker, Meriden, Conn. August 29, 1870.

2,381.—APPARATUS TO BE EMPLOYED IN OPERATING SEWING AND OTHER MACHINES.—E. J. Leyburn, Lexington, Va. August 31, 1870.

2,385.—PERMANENT WAY OF RAILWAYS.—D. R. Pratt, Worcester, Mass. September 1, 1870.

2,392.—MACHINERY FOR WASHING WOOL.—John and William Yewdall, Philadelphia, Pa. September 2, 1870.

2,402.—MACHINE FOR WEAVING HATS.—J. Van D. Reed, New York city. September 2, 1870.

2,409.—SHAFTING AND MACHINERY FOR TRANSMITTING POWER.—J. B. Morrison, St. Louis, Mo. September 3, 1870.

2,410.—KNITTED FABRIC AND MACHINERY EMPLOYED THEREIN.—H. A. Clark, Boston, Mass. September 3, 1870.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

SHIRTS.—S. H. Strouse and Joseph Strouse, New York city, has petitioned for the extension of the above patent. Day of hearing Dec. 7, 1870.

PAPER-PULP ENGINE.—Joseph Kingsland, Jr., Franklin, N. J., has applied for an extension of the above patent. Day of hearing Dec. 7, 1870.

HORSE RAKE.—John J. Squire, De Soto, Mo., has applied for an extension of the above patent. Day of hearing Dec. 7, 1870.

MACHINE FOR CUTTING VENEERS FROM THE LOG.—Joseph H. Goodell, Logansport, Ind., has petitioned for an extension of the above patent. Day of hearing Dec. 7, 1870.

PROCESS OF GRINDING PAPER PULP.—Joseph Kingsland, Jr., Franklin, N. J., has petitioned for the extension of the above patent. Day of hearing Dec. 7, 1870.

It Is Said

That every extensive advertiser has to pay a very large sum for experience before he learns how to invest his money judiciously. It would be better to intrust the business to a responsible Advertising Agency, like that of Geo. P. Rowell & Co., No. 40 Park Row, New York, and thus gain the benefit of experience without cost. Contracts can be made with them as low as with publishers direct.

No One Doubts

The value of a Patent Universal Clothes Wringer, and no one, after one trial, will find less reason for doubting the value of a Doty Washing Machine. If one is complete and labor-saving, so is the other.—[Cleveland (Ohio) Farmer.

Answers to Correspondents.

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

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

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

L. M. V., of Mass.—The following are recipes for making gun-cotton for photographic and other purposes:—No. 1. Take of cotton 1 oz., sulphuric acid 5 fl. oz., nitric acid, 5 fl. oz.; mix the acids in a porcelain mortar, immerse the cotton in the mixture, and stir it for three minutes with a glass rod, until thoroughly wetted. Transfer the cotton to a vessel of water, stir well with a glass rod, decant the liquid, pour more water on the mass, and repeat the process until the washing ceases to give a precipitate with chloride of barium. Drain the product on filtering paper, and dry in a water bath.—No. 2. Mix 4½ oz. of pure, dry nitrate of potash with 30 fluid drachms of sulphuric acid (sp. gr. 1·845), and stir into this mixture carefully 120 grains of best carded cotton. As soon as saturation is complete (in about one minute, if proper care has been used), throw the cotton into a large pan of clean rain water, and change the water repeatedly until litmus ceases to show the presence of acid, then squeeze it in a cloth, and, after being well pulled out, dry it at a temperature of about 180°.—No. 3. One part of finely carded cotton is immersed in 15 parts of a mixture of equal measures of nitric acid, of specific gravity 1·32, and sulphuric acid of specific gravity 1·845. The cotton must be completely immersed in the mixture, otherwise it becomes so hot as to undergo instant decomposition. After a few minutes' immersion it must be plunged into a large volume of cold water, and then washed so long as the least trace of acid is perceived, when the moist mass is placed upon litmus paper. It is then to be carefully dried at a temperature below 212° Fah. When prepared for military purposes it is found advisable to prolong the immersion in acid for forty-eight hours, and to continue the washing for several days. As thus prepared gun cotton scarcely differs from unchanged cotton in appearance; it is white and fibrous, and rather harsh to the touch.

R. B., of Mass.—We think that in projecting a ball with line attached from a howitzer, as is done in case of shipwreck, the line would modify the law which gives greatest range at 45°, and probably reduce this angle in order to get the longest range. We have, however, nothing but opinion to offer on this subject, perhaps some of our correspondents may have experience. Zinc is a preventive of rust in steel or iron when brought in contact with the latter metals. The dentist who keeps his steel tools in a zinc box is right in so doing. A few zinc rivets inserted in a steel square will keep the steel bright in spite of moisture from the hands, etc. The cause is that owing to the different electric conditions maintained between iron and zinc, when placed in contact the zinc is oxidized, and the iron is kept bright at the expense of the zinc.

J. S., of Nova Scotia.—Put the rusted horseshoe nails into a tumbler, a stout barrel with pivots in the centers of the heads, and a hole cut in the side with a lid fitted to it, will do. Put in some sharp sand and leather cuttings—waste from shoemakers' shops—and the nails. Set the barrel revolving slowly, and let them scour till they are as bright as you want them. Finish with leather cuttings without the sand.

E. S. H., of Ill., thinks if R. L. C., of Connelsville, Pa., will examine the bulb of his thermometer he will find a diminutive crack in it, which will account for the curious freak desecribed by him. This is undoubtedly the true cause of the mischief.

J. S., Jr., of Mass.—No one has been able to answer any ultimate "why," in all the existence of which we are cognizant. We are able scientifically to determine *how* things are, but science knows nothing, nor never—from the nature of things—can *know* the why. Speculation attempts to supply "whys" by hypotheses. Faith takes them on trust.

W. M. M., of Mich.—The solution to problem 1, of mechanical movements, published on page 71, current volume, is correct, but it is not new. Problem 3 is correctly solved. Your devices claimed to be solutions of problems 3 and 4, will not work in practice.

J. W. H., of N. Y.—The solution you sent us is a correct one though not new. There must have been a mistake in the answer to which you refer, probably in the number of the problem referred to, and perhaps you mistook the initials of another correspondent for your own.

J. K., of Ohio, wishes to know how shell ornaments are polished. We suppose he means the inlaid shell work, mother of pearl, etc. First reduce to a flat surface by filing and scraping. Then rub with pumice stone, follow with a rubbing with putty powder, and finish with a buff-stick and rotten stone moistened with diluted sulphuric acid.

J. D., of Wis., is a dealer in eggs and butter. He wishes to get the best recipes for the keeping of eggs fresh during the summer months, and a recipe for coloring butter. We have no doubt some of our correspondents can give the most recent and improved practice in these matters.

W. H. L., of Pa., and his neighbors are greatly troubled with small "red ants," which infest all the rooms of their houses. Can any one who has been thus tormented, and who has found a remedy give information how to rid houses of these insects?

N. K. B., of N. Y.—Put a few drops of carbolic acid solution on the leaves in various parts of the old book which has the musty smell, and close the book for a few days until it becomes thoroughly impregnated with the odor. This will destroy the musty smell.

E. S. G., of West Indies.—Any process by which the particles of two pieces of metal can be brought within the range of the attraction of cohesion, and thus joined, may be properly called welding.

C. L., of Mo.—Were we to keep such a liquor as lager beer in anything but wood, we should prefer tin plate for the material of which the vessel was to be made, and to use a tap of block tin or pewter.

W. E., of N. Y.—You can not find all the information you wish in any one treatise. You should send for catalogues of the publications of various industrial publishers, and select such as treat on the subjects named.

W. K., of D. C., wishes practical dyers and cleaners to inform him how discolorations of clothing produced by urine can be remedied.

City Subscribers. — The Scientific American will be delivered in every part of the city at $3·50 a year. Single copies for sale at all the News Stands in this city, Brooklyn, Jersey City, and Williamsburgh, and by most of the News Dealers in the United States.

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.

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

Belting that is Belting.—Whenever Wanted always send for the Best Philadelphia Oak-Tanned, to C. W. Arny, Manufacturer, 301 Cherry st., Philadelphia.

For Fruit-Can Tools, Presses, Dies for all Metals, apply to Mays & Bliss, 118, 120, and 122 Plymouth st., Brooklyn, N. Y. Send for circular.

E. A. Dayton, Richmond, Va., sells all kinds of wood-working and other machinery, steam engines, etc., at Manufacturers' Prices. Southern Buyers will save money purchasing there.

Musical readers will notice the announcement of the Messrs. Smith, in another part of this paper.

"The Technologist," the great illustrated industrial monthly, devoted to Engineering, Manufacturing, and Building. 40 pages, $2 per year; single copies 20c. Advertisements 40c. a line. Address Theodore R. Thieler, "Technologist," 178 Broadway, New York. Agents Wanted.

Broughton's Lubricators do not need any cock to draw off water, as steam does not condense in them In this, and other respects, they are superior to any other. Made by H. Moore, 42 Center st.

Practical Treatise on Soluble or Water Glass, just published. Price $3 30, mailed free, by L. & J. W. Feuchtwanger, Chemists and Drug Importers, 55 Cedar st., New York.

Valuable Patents exchanged for cash, real estate, or other property. Communications desired from both property owners and patentees. E. E. Roberts & Co., Consulting Engineers, 15 Wall st., New York. See advertisement in big type.

Swingle's Patent Combined Boring and Mortising Machine. It bores and mortises at one operation. Having had this in constant use for several years, at our own works, we guarantee its giving satisfaction. Price $150. Built by the Allen works, cor. Jay and Plymouth sts., Brooklyn, N.Y., bet. Catherine and Bridge st. ferries. Illustrated circulars sent on application.

A French gentleman, speaking English, seeks an engagement in a railway or engineer's office; is fully qualified as Draftsman, Mathematician, and Accountant, having had great experience in the above branches in several European offices. First-rate city references. Address C. P., 103 MacDougall st., New York.

Practical and Scientific Books for Mechanics, Manufacturers, Chemists, and others. Henry Carey Baird, Industrial Publisher, 406 Walnut st., Philadelphia. Catalogues by mail, free of postage.

Lubricating Packing, for spindles and journal-box bearings, No oil required. Address The Manhattan Packing Manufact'g Co., 1,360 Broadway, New York.

Wanted.—Parties manufacturing barn-door rollers will please send their address to T. F. Hamilton, Geneseo, Ill.

Peck's patent drop press. For circulars, address the sole manufacturers, Milo Peck & Co., New Haven, Ct.

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

For foot-power engine lathes address Bradner & Co., Newark, N.J.

For Am. Twist Drill Co.'s Patent Grinders, and other fine tools, address J. W. Storrs & Co., 252 Broadway, New York.

Parties in need of small Grey Iron Castings please address Enterprise Manufacturing Co., Philadelphia.

Excelsior Stump Puller & Rock Lifter. T. W. Fay, Camden, N.J.

For Sale—One half the interest in McGee's Patent Self-boring Faucet. Address T. Nugent, Morristown, N. J.

Pattern Molding Letters to put on patterns of castings. Wholesale and retail, by H. W. Knight, Seneca Falls, N. Y.

Propeller Engine Cylinders, 28 inches square, for sale cheap, by Daniel W. Richards & Co., 92 Mangin st., New York.

Pictures for the Drawing Room.—Prang's "Lake George," "West Point," "Joy of Autumn," "Prairie Flowers." Just issued. Sold in all Art Stores. "Three Tom Boys." "Bethoven," large and small.

Roofing Materials, House Sheathing, Roofing Felts, & Paints, full directions for applying. Mica Roofing Co., 78 Malden Lane, New York.

Building Felt (no tar) for inside & out. C.J. Fay, Camden, N. J.

Screw Wrenches.—The Best Monkey Wrenches are made by Collins & Co. All Hardware dealers have them. Ask for Collins Wrench.

Profitable Canvassing.—"Universal Sharpener," for Table Cutlery and Scissors. A correctly beveled edge can be obtained. See Adv't.

Blind Stile Mortising and Boring Machine, for Car or House Blinds, fixed or rolling slats. Martin Buck, Agent, Lebanon, N. H.

Best Boiler-tube cleaner—A. H. & M. Morse, Franklin, Mass.

"Your $50 Foot Lathes are worth $75." Good news for all. At your door. Catalogues Free. N. H. Baldwin, Laconia, N. H.

The Best Hand Shears and Punches for metal work, as well as the latest improved lathes, and other machinists tools, from entirely new patterns, are manufactured by L. W. Pond, Worcester, Mass. Office 98 Liberty st., New York.

One 60-Horse Locomotive Boiler, used 5 mos., $1,200. Machinery from two 500-ton propellers, and two Martin boilers very low. Wm. D. Andrews & Bro., 414 Water st., New York.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Keuffel & Esser, 116 Fulton st., N.Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves.

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

It saves its Cost every sixty days—Mitchell's Combination Cooking Stove. Send for circular. R. B. Mitchell, Chicago, Ill.

Incrustations prevented by Winans' Boiler Powder (11 Wall st. New York,) 15 years in use. Beware of frauds.

To ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's manufacturing news of the United States Terms $4·00 a year.

Recent American and Foreign Patents.

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

Seed Planter and Guano Distributer.—W. L. Trayuham, Warrenton, Ga.—This invention has for its object to furnish a simple, convenient and effective machine for planting seeds and distributing guano and other fine fertilizers, which shall be so constructed as to adapt it for attachment to an ordinary plow.

Horse Power.—Lewis A. Peter, Neffs, Pa.—This invention has for its object to furnish an improved horse-power, simple in construction, effective in operation, strong, durable, and not liable to get out of order, and which will enable the same amount of work to be done with a less number of horses than ordinary horse-powers.

Semolina Mill.—Gustav A. Buchholz, Regents Park, England.—The object of this invention is to convert grain, by a kind of shearing action, into semolina, or into flour. This is effected by the use of an arrangement of machinery wherein the grain is passed between the cutting surfaces, resembling, in arrangement, the upper and lower stones of a flour mill, the runner, however, taking, by preference, the place of the bed or lower stone.

Mats or Flexible Racks for Car Floors, etc.—Samuel Lewis, Williamsburgh, N. Y.—This invention has for its object to furnish an improved mat, or flexible rack, designed especially for application to street-car floors, and other similar purposes, which shall be so constructed that it may be readily rolled up for transportation, or storage, or to remove it from its place for sweeping and cleaning purposes.

Cooking Stove.—John B. Jones, Memphis, Tenn.—This invention relates to improvements in cooking stoves, and consists in an improved arrangement of the application of vaporizing burners, for burning gasoline and other like substances, for heating at different points without heating up the whole stove, as is the case when coal or other solid fuel is used; also in improved vaporizing burners for the same, and also in an improved arrangement of the water boiler.

Egg Beater.—D. M. Swartz, Lewisburg, Pa.—This invention relates to improvements in egg beaters, and consists in an adjustable clamping or attaching apparatus, for attaching to vessels of different sizes across the top, also, an adjustable attachment of the operating parts to the said support for adjusting the said operating parts to the centers of the vessels of different sizes, and, also, in an extension beater shaft, whereby the beaters may be raised or lowered in the vessel, according to its depth.

Buffing Device.—Henry Barrett, Brooklyn, N. Y.—This invention relates to an improved buffing device for finishing spoons, and consists in the application to the large buffing wheels now commonly used, and arranged for attachment to the spindle of a lathe, of a short spindle, on which is mounted, a little distance from the side of the said large wheel, a small buffing wheel, adapted for polishing the inner surface of the bowl of the spoon, the said wheel being detachably connected to the spindle so that others, of different sizes, may be attached.

Machinery for Manufacturing Semolina and Flour.—Gustave A. Buchholz, Regents Park, England.—This invention consists in a novel arrangement of the pairs of acting rolls, which cut up and reduce the grain supplied to them, which admits of the rolls being driven from central spur gearing, and this renders the construction of the machine very compact and less costly than heretofore. The pairs of ripping and cutting rolls, say, for example, six in number, are set around a common center, and at such a distance therefrom as to allow of the inner or near roll of each pair being driven directly from a central gear wheel.

Shuck Hackling Machine.—Tappey, Lumsden & Steel, Petersburgh, Va.—This invention relates to improvements in machines for hackling corn shucks, and other like substances, and consists in an arrangement of one large toothed cylinder, having the teeth arranged in sections with spaces between, two concaves or fixed-toothed parts of the case, and a revolving rake between the said concaves, or fixed-toothed parts of the case, all in a manner calculated to be more efficient in operation than the common arrangement of these machines with two toothed cylinders.

Cotton Cultivator.—P. R. Leatherman, Woodville, Miss.—This invention relates to improvements in machines for cultivating cotton, and consists in an improved arrangement on a frame, provided with two sets of wheels, and arranged for ready adjustment upon either set, of a vertically-adjustable plow and scraper-support, carrying plows arranged to be set to throw away from or up to the rows, as required. It also consists in an improved construction of one set of wheels, and the arrangement of the same relatively to the plows, in a way to facilitate guiding the machine.

Buffing Machines.—S. D. Tripp, Lynn, Mass.—This invention relates to improvements in buffing or sand-papering machines such as are used for sand-papering the soles of boots and shoes. It consists in an arrangement, at one end, of a case mounted on a frame in any suitable way, and provided with a fan blower and discharge nozzle at the other, of a set of sand-papering rollers, and a brushing roller, mounted on a revolving mandrel, placed along a slot in the end of the case through which the air is drawn by the fan, so as to to take with it the dust formed by the sanding rolls acting on the leather and convey it away from the operator.

Steam Trap.—S. D. Tripp, Lynn, Mass.—This invention relates to improvements in traps for the escape of the waters of condensation in steam heating and other pipes, and consists in an arrangement of a receiving vessel, into which the water is allowed to flow, on a weighted balance beam, and with a valve at the bottom, opening inward, which will be opened, when the weight of the water carries the vessel down, by the stem which projects through the discharge tube of the vessel coming into contact with any suitable stop to prevent the valve going down with the vessel, but which will resume its position on the valve seat after the discharge of the water, when, by reason of the superior gravity of the weight, the vessel is raised again.

Automatic Ventilator.—B. F. Prentis, Benwood, West Va.—This invention relates to a new apparatus for adjusting the slats on roof-ventilators, so that the same are closed to the windward and open to the leeward.

Shears for Cutting Flowers, Pruning, etc.—J. W. Barbour, Winooski Falls, Vt.—This invention has for its object to so construct shears for the cutting of flowers, herbs, etc., and for pruning purposes, that the pieces cut will be held in said shears, and not allowed to drop.

Spring Mattress.—Charles Fulton, New York city.—This invention relates to a new mattress, composed of springs, in such a manner that its entire surface will be formed and occupied by the springs, no intervals being left between the same.

Combined Horse-power and Baling Press.—Charles A. Wright, Rodney, Miss.—This invention relates to a new press for baling hay or cotton, and has for its object to materially simplify the construction of the apparatus, and to provide for a more rapid mode for baling than could heretofore be produced.

Sleigh Lock.—Freeman Talbot, Cleveland, Minn.—The object of this invention is to provide efficient means for "holding" loaded sleighs when stopped on the side of a hill or for obstructing the movement of such sleighs when descending hills, thereby relieving the team and preventing accidents.

Perfumed Parasol and Cane Head.—Albert Wanner, Hoboken, N. J.—This invention relates to a new and improved device for rendering parasols and canes more desirable as articles of sale and use.

Gang Plow.—James Wilson Treadway, Crown Point Centre, N. Y.—This invention has for its object to furnish an improved gang plow, simple in construction, and effective in operation, and which shall be so constructed that the plows will adjust themselves to the surface of the ground so as to work at the same depth upon uneven and level ground, and so that the plows may be raised from the ground independently or altogether, as may be required.

SAWING MACHINE.—Fred. J. Stevens, Columbia, N. H.—This invention relates to a new mechanism for reversing the motion of a saw mill carriage and for adjusting the log on the head-block, so that the saw can be made to cut during both movements of the carriage or only during the forward motion of the same. The invention is more particularly applicable to clapboard machines, and can be readily adjusted for cutting boards of any suitable thickness.

POTATO DIGGER.—William Dillon, Sonoma, Cal.—This invention has for for its object to furnish an improved machine for digging potatoes, which shall be simple in construction, strong, durable, effective in operation, and easily adjusted to work at a greater or less depth in the ground, as may be required.

DEVICE FOR OPENING AND CLOSING FANS.—George Bordes, New York city.—This invention has for its object to furnish an improved device for opening and closing hand-fans, which shall be simple in construction, effective in operation, easily operated, and not liable to break or get out of order.

MOLDING FOR SECURING CARPETS.—John H. Stanton, Franklin, Ohio.—This invention has for its object to furnish an improved means for putting down a carpet evenly, and holding it securely, and which shall be simple in construction, and easily and quickly applied.

ROTARY ENGINE.—Henry Jamieson, Williamsburgh, N. Y.—This invention relates to a new construction of valve gear for a rotary engine of suitable kind, and to a novel mechanism for regulating and reversing the motion of said engine.

RAILWAYS.—George Augustus Huddart, Brynkir, England.—The object of this invention is to provide an efficient support for the joints of railroad rails, and consists in the use of a trough coupling into which the ends of the rails to be joined are inserted, the end of one rail being permanently attached to the trough, and the end of the other being made fast by bolts and nuts and usual.

CAST STEEL FOR THE CONSTRUCTION OF PLOW SHARES AND CULTIVATOR TEETH.—William H. Singer, Pittsburgh, Penn.—This invention consists in producing an improved article of of cast steel, for plow shares and cultivator teeth, by recarbonizing ingots of mild-tempered cast steel (in place of carbonizing ordinary cast iron, as heretofore). The ingots are placed in a converting furnace for several days, and then allowed to cool gradually, so as to possess the requisite toughness of core, combined with the desired hardness of exterior or surface.

SUBSOIL PLOW.—L. V. B. Martin, Tuscaloosa, Ala.—This invention relates to subsoil plows, and consists in improving the general construction of the plow.

PERMUTATION LOCK FAUCET.—Wm. F. Jones, Baltimore, Md.—This invention relates to an improvement in lock faucets, and consists in the combination of a permutation lock of peculiar construction with a faucet, for the purpose of preventing any person unacquainted with the index to the lock, from drawing off the contents of the vessel in which the faucet is used.

FERTILIZER DISTRIBUTER.—J. J. Singleton, Forsyth, Ga.—This invention relates to a new apparatus for distributing guano and other fertilizing matter, and for drilling small grains and seed. The invention consists chiefly in the use of a horizontal distributing wheel or disk, and in the connection therewith of a regulating gate and discharge tube.

STEAM ENGINE.—Frank E. Kirby, New York city.—The object of this invention is to provide simple and efficient means for varying according to the load or speed of the engine, the position of the cut-off valves over the ports, and on the back of the main slide valve, by means of which the requisite quantity of steam may be measured out for each stroke of the engine, according to the load or power required.

COLORTROPE.—Oscar Nicholson, New York city.—This invention has for its object to furnish a simple and amusing toy, called by me a colortrope, and which shall be so constructed that by giving to it a rapid rotary motion, the colors of the different wheels or disks may blend together, producing beautiful combinations of color.

GENERATING STEAM.—S. B. B. Nowlan, New York city.—This invention relates to a new and useful improvement in apparatus for generating steam for various purposes.

PLOW.—J. R. P. Jett, Knoxville, Texas.—This invention has for its object to furnish an improved plow, which shall be so constructed that it may be readily adjusted for plowing sandy soils, or clayey or alluvial soils, as may be required, by simply exchanging moldboards.

SYRINGE.—George Conover, Mott Haven, N. Y.—This invention relates to a new and useful improvement in compression syringes for injecting liquids, and consists in combining with the elastic syringe a stop valve by means of which the liquid may be retained in the syringe, and in an arrangement whereby the liquid may be withdrawn, after having been injected.

METAL COMPOUND FOR BEARINGS.—T. S. Davis, Bristol, England.—Zinc or spelter is used as the basis or chief ingredient, and he adds thereto copper, tin, and nickel silver. These metals may be mixed in varying proportions and in different manners without materially affecting the result.

TURNING OVER MUSIC-BOOK LEAVES.—H. Crowther, Leeds, England.—This consists in the construction of a case or box, having within its inner circumference a projection all round the upper angle of the box, the box itself being attached to the top or inside front of the piano. In front of the box a spindle is placed, free to turn partially on its axis, and supported on bearings. In front of the box, and partially within it, is a hollow cylinder to receive a spring which operates upon the spindle before mentioned. The upper part of the spindle has a slot in it, through which an arm passes the arm being allowed to rock in the slot upon a pivot passing through it and the spindle.

UMBRELLA.—J. Raphael, Mile End, England.—The inventor inserts the ends of the ribs into the inner side of the top notch wheel or notched piece, apertures being formed therein for the purpose. The inner side of the ends of the ribs bears and works against the stick of the umbrella, parasol, and sunshade, or against a tube or ring embracing the stick; and the ribs at that part are retained in place, though free to work, by the stick and the top notch-wheel or notched piece.

ARTIFICIAL FLOWERS.—O. E. Fillion, Paris, France.—The inventor makes artificial flowers with a composition consisting of about 100 parts by weight of collodion, twelve parts of castor oil, and one or two parts of glycerin. When he desires to produce a very fine white he uses a composition consisting always by weight of 100 parts of collodion; ten parts of Venetian turpentine may, however, be varied if desired.

SELF-ATTACHING CORSET STEEL.—W. A. and H. E. Starrett, Lawrence, Kansas.—This invention consists in an apparatus for readily attaching corset steels to corsets, or detaching them therefrom, for the purpose of enabling the manufacture of the one to be entirely detached from that of the other, and of enabling the steel to be used with any style of corset.

MEANS FOR TRANSMITTING POWER.—R. W. Norwood, Courtland, Ala.—This invention consists in the application of an intermediate system of levers between a shaft rotated directly by the piston of a steam engine and a fly wheel from which machinery may be driven.

ORE WASHER.—Edwin Platt, Charleston, S. C.—This invention relates to an apparatus in which ore, thrown into a receiver, falls thence into an inclined pipe, where it is caught by jets of water forced into the pipe through nozzles by a powerful steam pump, by which jets the ore is carried upwards into a chamber having an inclined bottom, there being in said chamber a perforated barrier, against which the current of ore and water is dashed, and beneath which it passes, a portion of the water with some of the dirt also rushing through the perforations of the barrier, and the whole mass flowing onwards to an inclined trough whose upper end opens into the lower corner of the chamber, which trough the ore and water enter, and from which the water escapes through perforations in its bottom, while the ore falls to its lower end, and is removed, if cleansed, and if not it is sent into the same or another receiver for the purpose of undergoing another washing process similar to the first.

GRAIN BAND FASTENING.—Geo. W. Osborn, Parkville, Mich.—It consists of a metallic tag which may conveniently be of oval shape, having a hole near one end through which the binding cord is passed and then tied to the tag, the latter being also provided with a curved slot opening into one side of the tag, the sides of which slot converge until they meet at its inner end; the said slot serving to receive the cord and hold it securely after it has been drawn tightly around the gavel.

BEDSTEAD.—Mark Crosby, Boston, Mass.—This invention pertains to improvement in that class of bedsteads which are adapted to fold, when not in use, so as to resemble a bureau, sideboard, or other similar article of furniture, and the invention consists in the arrangement of slop pieces to hold, or assist in holding, the rails extended in the horizontal position, and in so constructing and arranging the side pieces or rails, with relation to each other and the base to which they are hinged that, when folded or brought together in a vertical position, openings will be formed for the admission and passage of air.

SASH LOCK.—E. D. Slater, Greenville, N. Y.—This invention relates to an improvement in locks for window sashes, and consists of two levers provided with bolts and a spring arranged within a case and operated by a single bar, so that both of the sashes may be kept locked, or either of them locked or unlocked without interfering with the other.

WASH BOILER.—H. T. Woodman, Dubuque, Iowa.—This invention relates to a new wash boiler which produces an automatic circulation of the suds by means of vertical pipes projecting from a perforated false bottom. This invention consists in forming said pipes by plates that are secured to the sides of the boiler so as to economize room, and in suspending the false bottom or bottoms from flanges that project inwardly from the said plates.

COMPOSITION FOR WELDING AND RESTORING CAST STEEL.—Thomas Fyans, Taunton, Mass.—This invention relates to a new composition by the use of which cast steel can be welded, and, should it have been overheated or burnt, restored to its former nature, and made capable of being forged for the finest tools.

SMOKE CONSUMING HEATER.—William Magill, Port Deposit, Md.—This invention has for its object the burning of fuel and all the smoke that arises therefrom, within the stove, in order that the greatest possible amount of heat may be generated, and turned to account in warming apartments, with the least possible waste, this end being accomplished by causing the smoke that rises through the magazine to meet a current of cold air and be thereby turned backwards and carried again through the fire-chamber, undergoing therein a second combustion.

CORNER FRICTION ROLLER.—Morris Schwerin, Newark, N. J.—This invention relates to a new and useful improvement in applying friction rollers to the bottoms of trunks, boxes, chests, and other articles.

FANNING MILL.—Nathan Kibler, Milton, Ill.—This invention relates to a new and useful improvement in mills for cleaning wheat and other grains and seeds, whereby that operation is more perfectly performed than it has hitherto been.

VAPOR BURNER.—Daniel Leonard, Chicago, Ill.—The object of this invention is to provide an attachment to vapor burners which will prevent their becoming excessively heated by the flame.

Official List of Patents.

Issued by the United States Patent Office

FOR THE WEEK ENDING Oct. 11, 1870.

Reported Officially for the Scientific American.

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MUNN & CO.,
Patent Solicitors, No. 37 Park Row, New York.

108,082.—COVER OF CULINARY BOILER.—P. J. Abbott and Job Abbott, Dexter, Me.
108,083.—MEAT AND VEGETABLE MASHER.—G. A. Anderson and C. J. Baker, Albany, N. Y.
108,084.—CRUCIBLE FOR MELTING IRON AND STEEL.—J. E. Atwood, Pittsburgh, Pa. Antedated October 8, 1870.
108,085.—GEARING FOR WAGON.—J. B. Auger, Poughkeepsie, N. Y.
108,086.—BAKE OVEN.—A. A. Aull and J. A. Aull, Bellefontaine, Ohio.
108,087.—COMBINED PUMP AND SIPHON.—J. D. Averell and G. A. Higgins, New York city, and Thomas Gordon, Shrewsbury, N. J., assignors to G. A. Higgins. Antedated September 30, 1870.
108,088.—PROCESSES FOR THE MANUFACTURE OF CARBONATE OF SODA, HYDROCHLORIC ACID, ETC.—H. M. Baker, Washington, D. C.
108,089.—MANUFACTURE OF ALUMINATE OF SODA.—H. M. Baker, Brooklyn, E. D., N. Y.
108,090.—MANUFACTURE OF NITRIC ACID.—H. M. Baker, Williamsburg, N. Y.
108,091.—SHEARS FOR CUTTING FLOWERS.—J. W. Barbour (assignor to himself and Elisha Allen), Winooski Falls, Vt.
108,092.—BUFFING APPARATUS FOR FINISHING SPOONS.—Harry Barrett, Brooklyn, N. Y.
108,093.—POTATO DIGGER.—A. L. Bausman, Minneapolis, Minn.
108,094.—HORSE HAY FORK.—Stewart Bebout, Waterford, Ohio.
108,095.—PLOW.—B. C. Blomsten, Waupaca, Wis.
108,096.—DEVICE FOR OPENING AND CLOSING FANS.—George Bordes, New York city.
108,097.—MANUFACTURE OF BISCUIT.—C. D. Boss and C. D. Boss, Jr., New London, Conn.
108,098.—LOCK.—James Brady (assignor to the Branford Lock Works), Branford, Conn.
108,099.—LOCK.—James Brady (assignor to the Branford Lock Works), Branford, Conn.
108,100.—MACHINE FOR BRUSHING YARN.—John Brady, Fall River, Mass.
108,101.—CHOCK FOR HOLDING ROPES.—D. D. Brown, Oswego, N. Y.
108,102.—MANUFACTURE OF SEMOLINA AND FLOUR.—G. A. Buchholz, Regent's Park, London, England.
108,103.—MANUFACTURE OF SEMOLINA AND FLOUR.—G. A. Buchholz, Regent's Park, London, England.
108,104.—MOUSE TRAP.—Edward Buckman and Alexander Buckman, Brooklyn, N. Y. Antedated September 30, 1870.
108,105.—STOVE FASTENER.—J. C. Burdin, Ladoga, Ind.
108,106.—LAMP.—O. M. Chamberlain (assignor to himself and George Moore), New York city.
108,107.—RAILROAD TICKET.—C. A. Chamberlain, Pittsburgh, Pa.
108,108.—BRUSH.—R. J. Combs, Bergen, N. J.
108,109.—CANDLESTICK.—F. C. Cone, San Francisco, Cal. Antedated October 5, 1870.
108,110.—FOUNTAIN PEN.—F. C. Cone, San Francisco, Cal. Antedated October 8, 1870.
108,111.—SYRINGE.—George Conover, Mott Haven, N. Y.
108,112.—IRON FENCE.—Sommers Crowell, Philadelphia, Pa.
108,113.—MACHINE FOR SETTING UP BARRELS.—Amos Cutter, Boston, Mass.
108,114.—MACHINE FOR CUTTING LOCKS IN HOOPS.—Amos Cutter, Boston, Mass.
108,115.—MACHINE FOR MAKING BARREL HEADS.—Amos Cutter, Boston, Mass.
108,116.—MACHINE FOR BLOCKING AND STRETCHING HATS.—Joseph D. LaMar, Brooklyn, N. Y., assignor to himself and John De Vries, New York city. Antedated September 24, 1870.
108,117.—POTATO DIGGER.—William Dillon, Sonoma, Cal.
108,118.—FEED CUTTER.—C. R. Donner, Sonora, Cal.
108,119.—TOBACCO CUTTER.—J. G. Dreher, Pine Grove, Pa.
108,120.—GRAIN SEPARATOR.—Anthony Duus, San Francisco, Cal.
108,121.—MACHINE FOR FELTING.—Rudolf Eckemeyer, assignor to J. T. Waring, Yonkers, N. Y.
108,122.—ADJUSTABLE PILLOW.—Henry Eilers, Cincinnati, Ohio.
108,123.—APPARATUS FOR BENDING RAILROAD RAIL.—G. D Emerson, Calumet, Mich. Antedated September 26, 1870.
108,124.—CAR COUPLING.—L. A. Evans (assignor to himself and W. C. Boatwright), Chester, Pa.
108,125.—WASHING MACHINE.—Franklin Feazel, Lacon, Ill.
108,126.—HAND CORN SHELLER.—J. E. Finley, Memphis, Tenn.
108,127.—DEVICE FOR STARTING STREET CARS.—G. P. Frick, Baltimore, Md.
108,128.—SPRING MATTRESS.—Charles Fulton, New York city.
108,129.—COMPOSITION FOR WELDING AND RESTORING STEEL.—Thomas Fyans (assignor to himself and A. T. Thomson), Taunton, Mass.
180,130.—CAR ROOF.—John Garry, Cleveland, Ohio.
108,131.—SASH CORD FASTENER.—Christian Gies, New York city.
108,132.—SOLE SEWING MACHINE.—J. P. Greely, Boston, assignor to himself, J. B. Leonard, Chelsea, and Benjamin Greely, Dedham, Mass.
108,133.—NECK TIE.—L. A. Grill, New York city.
108,134.—PERMUTATION LOCK.—Henry Gross, Cincinnati, Ohio.
108,135.—CANE STRIPPER.—C. A. Hege, Friedberg, N. C.
108,136.—TRUNNION FOR STEAM ENGINE AND CALENDER.—Thomas Hill, Vallejo, Cal.
108,137.—VALVE GEAR FOR STEAM ENGINES.—Thomas Hill, Vallejo, Cal.
108,138.—COMPOSITION FOR WELDING, PUDDLING, AND BRAZING METALS.—A. J. Hindemeyer (assignor to S. C. Collins), Philadelphia, Pa.
108,139.—APPARATUS FOR FINISHING TERRET.—Constantine Hingher, New Brunswick, N. J.
108,140.—SWAGING MACHING.—G. M. Hinkley, Milwaukee, Wis.
108,141.—BUTCHER'S KNIFE.—Peter Houseman and C. C Campbell, Rural Retreat, Va.
108,142.—RAILWAY RAIL JOINT.—G. A. Huddart, Brynkir, Wales.
108,143.—HINGE.—Abraham Huffer, Hagerstown, Md.
108,144.—WINDOW WASHER AND SCRUBBING PAD.—J. C. Hull, Meadville, Pa.
108,145.—COMPOSITION FOR PRINTING ROLLER.—I. G. Husted, Brooklyn, N. Y.
108,146.—WATER-CLOSET HOPPER.—Alfred Ivers, New York city.
108,147.—MACHINE FOR MANUFACTURING CHAIR SEAT.—E. S. Jackson, Bethel, Vt.
108,148.—ROTARY ENGINE.—Henry Jamieson, Williamsburgh, N. Y.
108,149.—PLOW.—John R. P. Jett, Knoxville, Tenn.
108,150.—EMBROIDERING ATTACHMENT FOR SEWING MACHINE.—A. W. Johnson, Middletown, Conn.
108,151.—UMBRELLA.—Frederick Johnson and Wm. Hatchman, London, England, assignors to T. C. Morton Paton, N. Y.
108,152.—COOKING STOVE.—John H. Jones, Memphis, Tenn.
108,153.—PERMUTATION-LOCK FAUCET.—W. F. Jones, Baltimore, Md., assignor to himself and C. A. Edmondston, Halifax, N. C.
108,154.—FEEDING DEVICE FOR FANNING MILL.—Nathan Kibler, Milton, Ill.
108,155.—SASH HOLDER.—George King, Frederick, Md.
108,156.—STEAM ENGINE.—Frank E. Kirby, New York city.
108,157.—MANUFACTURE OF POTTERY WARE.—Isaac W Knowles, East Liverpool, Ohio.
108,158.—APPARATUS FOR PRECIPITATING GOLD AND SILVER FROM SOLUTIONS.—W. S. Laighton, Norwich, Conn.
108,159.—COTTON CULTIVATOR.—P. R. Leatherman, Woodville, Miss.
108,160.—MAT.—Samuel Lewis, Williamsburgh, N. Y.
108,161.—LEATHER RENOVATOR.—W. G. Lumbard, Georgetown, Ill.
108,162.—GOVERNOR FOR STEAM ENGINE.—John D. Lynde, Philadelphia, Pa.
108,163.—HEATING STOVE.—William Magill, Port Deposit, Md.
108,164.—SUBSOIL PLOW.—L. V. B. Martin, Tuscaloosa, Ala.
108,165.—PILE FOR CORRUGATED BEAMS.—Richard Montgomery, New York city.
108,166.—TRUNK LOCK.—Joseph Morgan, New York city Antedated September 24, 1870.
108,167.—TRAY FOR GAS PURIFIER.—Peter Munzinger, Philadelphia, Pa.
108,168.—WASHING MACHINE.—G. R. Nebinger, Philadelphia, Pa.
108,169.—APPARATUS FOR EVAPORATING SORGHUM JUICE, COOKING FEED, ETC.—Thomas J. Newby, Richmond, Ind. Antedated October 1, 1870.
108,170.—COLORTROPE.—Oscar Nicholson, New York city.
108,171.—SASH FASTENER.—John G. Nicolay, Springfield, Ill.
108,172.—UNIVERSAL JOINTED TREADLE.—Altred Nielson, New York city.
108,173.—TRANSMITTING-POWER APPARATUS.—Richard W. Norwood, Courtland, Ala. Antedated October 1, 1870.
108,174.—STEAM GENERATOR.—Samuel B. B. Nowlan, New York city.
108,175.—MACHINE FOR FORMING HAT BODIES.—Isaiah Nutt (assignor to himself, John Wharton, and Abraham C. Wheaton), Newark, N. J.
108,176.—COMBINED PLOW AND SCRAPER FOR ROADS.—T. B. Parker, Lincoville, Pa.
108,177.—MANUFACTURE OF PAPER.—Henry Pemberton, Allegheny City, Pa.
108,178.—HORSE POWER.—Lewis A. Peter, Nefls, Pa.
108,179.—THREE-HORSE EQUALIZER.—J. C. Pfeil, Arenzville, Ill.
108,180.—FIREPLACE.—Thomas Phillips, Cadiz, Ohio.
108,181.—WOOD PAVEMENT.—A. Warner Platt, New York city.
108,182.—WINDOW BLIND.—Stephen Pocock, Woodstock, Canada.
108,183.—COMBINED ELEVATOR AND CONVEYOR.—Thomas J. Powell, Naples, N. Y.
108,184.—PARLOR SKATE.—John Pollitt (assignor to himself and Lyman Martin), Indianapolis, Ind.
108,185.—AUTOMATIC VENTILATOR.—B. F. Prentis, Benwood West Va.
108,186.—GATE.—Simon Regan and Edward Meusy, Lamotte, Iowa.
108,187.—EXTENSION TRUNK.—James Rice, Middletown, Ind.
108,188.—PISTON-ROD PACKING.—E. A. Richmond (assignor to himself and Charles Watson), San Francisco, Cal.
108,189.—MACHINE FOR DRESSING FELLIES.—Wm. H. Rodebeaver, Miamisburg, Ohio.
108,190.—CURTAIN FIXTURE.—Franklin Root, Hartford, Conn. Antedated September 30, 1870.
108,191.—REMOVING GREASE FROM WASTE LEATHER.—J. P. Rust Peabody, Mass.
108,192.—APPARATUS FOR WATER-PROOFING FABRICS WITH GUTTA-PERCHA.—E. A. Schuette, New York city.
108,193.—CASTER FOR TRUNK.—Morris Schwerin, Newark, N. J.
108,194.—SASH FASTENER.—Philip T. Share, Baltimore, Md.
108,195.—FLOWER TRELLIS.—Philo B. Sheldon, Bath, N. Y. Antedated September 26, 1870.
108,196.—FERTILIZER DISTRIBUTER.—Joseph J. Singleton, Forsyth, Ga.

108,197.—COMBINED CORN HARVESTER AND HUSKER.—Augustus Smith, Pontiac, Ill.
108,198.—PURIFYING BRINE FOR THE MANUFACTURE OF SALT.—F. M. Smith, Syracuse, N. Y.
108,199.—WASH FOR THE CURE OF SCAB IN SHEEP, ETC.—Hugh Smith, San Francisco, Cal.
108,200.—CARPET FASTENER.—John H. Stanton, Franklin, Ohio.
108,201.—SAWMILL.—Fred. T. Stevens, Columbia, N. H.
108,202.—APPARATUS FOR HEATING AND VENTILATING BUILDINGS.—Joel Stover, Richmond, Ind.
108,203.—EGG BEATER.—Daniel M. Swartz, Lewisburg, Pa.
108,204.—SASH HOLDER.—Hiram B. Swartz, Milton, Ohio.
108,205.—ADJUSTABLE TWEER.—Peter Sweeney, New York city.
108,206.—SLEIGH LOCK.—Freeman Talbot, Cleveland, Minn.
108,207.—SHUCK-HACKLING MACHINE.—W. H. Tappey, Wm. C. Lumsden, and Alexander Steele, Petersburg, Va.
108,208.—PRESS.—W. I. Tate (assignor to himself and H. R. Mitchell), Philadelphia, Pa.
108,209.—WATER WHEEL.—Albert P. Teachout, Madison, Ohio.
108,210.—SASH FASTENER.—W. H. Thomas, Brooklyn, N. Y., assignor to Turner, Seymour & Judds, Wolcottville, Conn.
108,211.—COOKING STOVE.—Edgar L. Thomson and Abraham Hursh (assignors to Hattie B. Thomson and Abraham Hursh), Philadelphia, Pa.
108,212.—HEATING STOVE.—Alvah Traver, Troy, N. Y.
108,213.—SEED PLANTER AND GUANO DISTRIBUTER.—W. L. Traynham, Warrenton, Ga.
108,214.—GANG PLOW.—James Wilson Treadway, Crown Point Center, N. Y., assignor to Oliver A. Whittemore, Denver, Colorado.
108,215.—STEAM TRAP.—S. D. Tripp, Lynn, Mass. Antedated Sept. 26, 1870.
108,216.—LEATHER-BUFFING MACHINE.—S. D. Tripp, Lynn, Mass. Antedated Oct. 1, 1870.
108,217.—DITCHING MACHINE.—Henry Vannatta, Jefferson, Ill.
108,218.—HANDLES FOR CANES AND UMBRELLAS.—Albert Wanner, Hoboken, N. J. Antedated Oct. 1, 1870.
108,219.—COOKING STOVE.—Leroy D. Webber, La Porte, Ind.
108,220.—COOKING STOVE.—Alexander Wemyss, Philadelphia, Pa.
108,221.—LANTERN.—Wm. Westlake, Chicago, Ill.
108,222.—LANTERN.—Wm. Westlake, Chicago, Ill.
108,223.—NUT LOCK.—Shepherd H. Wheeler, Dowagiac, Mich.
108,224.—TOY LOCOMOTIVE.—James E. Wickham, Hartford, Conn.
108,225.—MACHINE FOR MAKING NAILS.—A. P. Winslow, Cleveland, Ohio.
108,226.—WASH BOILER.—Harvey T. Woodman, Dubuque, Iowa.
108,227.—FENCE.—Nathan Woolsey, Ottawa, Ill.
108,228.—STONE-CUTTING MACHINE.—Hugh Young, Middletown, Conn., and James L. Young, New York city. Antedated Oct. 1, 1870.
108,229.—LEATHER-CUTTING MACHINE.—A. L. Zent, Roanoke, Ind.
108,230.—PROPELLING VESSELS.—Jean Lucien Arman, Bordeaux, France.
108,231.—ANVIL LAST.—David Bainbridge, Philadelphia, Pa.
108,232.—CHURN DASHER.—Silas E. Bauder, Birmingham, Ohio.
108,233.—APPARATUS FOR SPINNING HEMP, FLAX, AND OTHER FIBROUS SUBSTANCES.—Ernest Basin, Paris, France.
108,234.—CURLING IRON.—J. O. Bentley and Jas. Jackson, Philadelphia, Pa.
108,235.—EXTRACTING IRON FROM THE SLAG OF BLAST FURNACE.—E. J. Bird, Frostburg, Md.
108,236.—SPRING FAN.—Otto Brueck, New York city.
108,237.—PUMP VALVE.—D. W. Clark, Tidioute, Pa.
108,238.—ROAD SCRAPER AND DITCHER.—George Clark, Dover, assignor to himself, Franklin B. Ives, Tiskilwa, and R. L. Dean, Dover, Ill.
108,239.—CORN PLOW.—W. C. Clifton, Elk River township, Iowa.
108,240.—COOK STOVE.—W. C. Davis, Cincinnati, Ohio.
108,241.—DISINTEGRATING FIBROUS MATERIAL FOR PAPER PULP, ETC.—A. H. F. Deininger, Berlin, Prussia.
108,242.—WATER ELEVATOR.—Isaiah Dekle, Thomasville, Ga.
108,243.—PLOW.—Isaac Eastwood, Lanark, Ill.
108,244.—BEEHIVE.—Chas. Embrey, Williamsport, Md.
108,245.—CASTING DENTAL PLATE.—J. U. L. Feemster (assignor to G. W. Scott), Greencastle, Ind.
108,246.—FLOUR BOLT.—Jacob Fickinger, Kingsville, Ohio.
108,247.—PLOW.—Asahel Franklin and F. M. Franklin, Springfield, Ohio. Antedated Oct. 1, 1870.
108,248.—DITCHING MACHINE.—Sam'l F. Gard, New Orleans, La.
108,249.—FEED CUTTER.—F. E. Garner, Cornwall, Conn.
108,250.—SAW MILL.—David G. Gay, Eugene City, Oregon.
108,251.—MAIL-BAG FASTENER.—David G. Gay, Eugene City, Oregon.
108,252.—TRUSS.—Jacob Geiss, Belleville, Ill.
108,253.—TRUSS.—John Goodier, Philadelphia, Pa.
108,254.—CAR COUPLING.—W. F. Grasler, Muncy, Pa.
108,255.—ROCKING CHAIR.—Charles Grawitz, Buffalo, N. Y.
108,256.—SHUTTER FASTENER.—Henry Grow, Philadelphia, assignor to himself and W. G. Smith, Norristown, Pa.
108,257.—ELECTRO-MAGNETIC BURGLAR ALARM.—Wm. B. Guernsey, Jersey City, N. J.
108,258.—BAKE OVEN.—Jas. Hall, Cincinnati, Ohio.
108,259.—BELT GEARING.—George B. Hamlin, Willimantic, Conn.
108,260.—CULTIVATOR.—V. P. Harris, Greensburg, Ind.
108,261.—REVERSIBLE KNOB LATCH.—A. M. Hill, New Haven, Conn.
108,262.—GUANO DISTRIBUTER AND SEED SOWER.—B. F. Hinkley, Baltimore, Md.
108,263.—DRY GAS METER.—Perry Hodge, Seneca Falls, N. Y.
108,264.—PUMP.—D. O. Holman (assignor of one half his right to J. P. Sanders), Adams, N. Y.
108,265.—PUMP.—D. O. Holman, Adams, N. Y.
108,266.—WASHING MACHINE.—Benjamin Illingworth, Freeport, Ill.
108,267.—AUGER HANDLE.—William A. Ives, New Haven, Conn.
108,268.—DOOR SPRING.—William F. Kells, San Francisco, Cal.
108,269.—MACHINE FOR CLEANING AND DITCHING RICE FIELDS.—S. M. King, Lancaster, Pa.
108,270.—HOLDER FOR SPINNING RING.—G. W. Knight (assignor to Geo. Draper & Son), Hopedale, Mass.
108,271.—MANUFACTURE OF BLACKING.—J. L. Lucas, Saratoga Springs, N. Y.
108,272.—SHOVEL PLOW.—Luppe Luppen, Pekin, Ill.
108,273.—SHOVEL PLOW.—Luppe Luppen, Pekin, Ill.
108,274.—SHOVEL PLOW.—Luppe Luppen, Pekin, Ill.
108,275.—SHOVEL PLOW.—Luppe Luppen, Pekin, Ill.
108,276.—SHOVEL PLOW.—Luppe Luppen, Pekin, Ill.
108,277.—RAILWAY CAR AXLE BOX.—G. F. Lynch, Milwaukee, Wis.
108,278.—WORK BOX.—J. E. Marvel, Seaford, Del.
108,279.—HARROW.—John Mellinger, Greensburg, Pa.
108,280.—TREE BOX.—Harry Merrick, Brooklyn, N. Y.
108,281.—LOOM.—John Miller, Eldridge, Ill.
108,282.—KING BOLT.—F. B. Morse, Plantsville, Conn.
108,283.—DIE FOR SWAGING CARRIAGE CLIP.—F. B. Morse (assignor to D. H. Smith & Co.), Plantsville, Conn.
108,284.—IMPREGNATING FIBROUS MATERIALS FOR PACKING, ETC.—Eliza D. Murfey, New York city.
108,285.—SATURATING FIBROUS MATERIAL WITH POWDERED SUBSTANCES FOR BEARINGS AND PACKING.—Eliza D. Murfey, New York city.
108,286.—MATERIAL FOR PACKING AND BEARINGS.—Eliza D. Murfey, New York city.
108,287.—MANUFACTURE OF STEEL.—Charles M. Nes, York, Pa.
108,288.—APPARATUS FOR COOKING AND EVAPORATING.—T. J. Newby, Richmond, Ind.
108,289.—FRUIT DRYER.—J. B. Okey, Indianapolis, Ind., assignor of one half his right to F. A. Lehr.
108,290.—MOLD FOR SHAPING AND DRYING CIGAR BUNCHES.—Adolph Pearl, New York city.
108,291.—MANUFACTURE OF VINEGAR.—Paul Plodeck, Cleveland, Ohio.
108,292.—LOOM.—W. J. Porter, New York city, and William Cross, Jersey City, N. J., assignors to Edward H. Faulkner, New York city.
108,293.—BOX OPENER.—Nathan Purdey, Providence, R. I.
108,294.—GRAIN DRILL.—John L. Riter, Brownsville, Ind.
108,295.—FEEDING MECHANISM FOR WOOD SCREW MACHINERY.—C. D. Rogers, Utica, N. Y.
108,296.—MITER MACHINE.—L. W. Rosecrans, Marshalltown, Iowa.
108,297.—CHURN.—Henry Saggan, Newark, N. J.
108,298.—COAL-VAULT GRATE.—G. W. Scott, Greencastle, Ind.
108,299.—TRUNK CLAMP.—A. J. Sessions, deceased (by Ellen L. Sessions, administratrix, assignor to John H. Sessions), Bristol, Conn.
108,300.—CASTERS FOR TRUNK.—A. J. Sessions, deceased (by Ellen L. Sessions, administratrix, assignor to J. H. Sessions), Bristol, Conn.
108,301.—WELL TUBE.—A. J. Shirley, Plymouth, Ind.
108,302.—APPARATUS FOR GENERATING GAS FOR HEATING.—Levi Stevens, Washington, D. C.
108,303.—CRUTCH.—John Wentworth Tuttle, Newton, Mass.
108,304.—MOP HEAD.—W. P. Valentiné (assignor to himself and J. R. Drake, Buffalo), N. Y.
108,305.—PLANING MECHANISM.—C. Van Haagen (assignor to himself and A. Van Haagen), Philadelphia, Pa.
108,306.—TURNING AND BORING MECHANISM.—Claus Van Haagen (assignor to himself and Anthony Van Haagen), Philadelphia Pa.
108,307.—MACHINE FOR SAWING STONE.—Luther Ward, Trenton, N. J.
108,308.—HEAD-REST.—Mahlon Warne, Philadelphia, Pa.
108,309.—NECKTIE.—H. P. Wetmore, Elizabeth, N. J., and John G. Bitchcock, New York city.
108,310.—BORING APPARATUS.—Jerome Wheelock, Worcester, Mass.

REISSUES.

4,149.—HOT-BLAST STOVE FOR BLAST FURNACE, ETC.—Jas. Henderson, New York city, and J. M. Lawford, Philadelphia, Pa., assignees of John Player, deceased.—Patent No. 65,209, dated June 11, 1867; patented in England, April 21, 1866.

4,150.—APPARATUS FOR HEATING THE BLAST FOR FURNACES USED IN SMELTING IRON, ETC.—James Henderson, New York city, and J. M. Lawford, Philadelphia, Pa., assignees of John Player, deceased.—Patent No. 65,600, dated June 11, 1867; patented in England, March 25, 1865.

4,151.—BRUSH.—James McQuide, Lansingburg, N. Y., assignee of John Marchbank.—Patent No. 59,696, dated November 20, 1866.

4,152.—PRINTING TELEGRAPH.—Geo. M. Phelps, Brooklyn, N. Y.—Patent No. 89,387, dated May 11, 1869.

4,153.—MANUFACTURE OF CAST STEEL.—L. La Breche-Viger, Montreal, Canada, assignor to W. W. Averell, Bath, N. Y.—Patent No. 95,256, dated September 28, 1869; reissue No. 3,635, dated February 15, 1870.

4,154.—GUN CARRIAGE.—J. W. Wilson, New York city.—Patent No. 100,482, dated March 1, 1870.

DESIGNS.

4,389.—STOCKING.—Thompson Appleton, Lake Village, N. H.

4,390.—BLACK-BOARD ERASER.—J. H. Atwater, Providence, R. I.

4,391.—ADVERTISING DESK.—Albert Brummel, Indianapolis, Ind.

4,392 and 4,393.—TYPE.—Robert Bruce, Brooklyn, N. Y., assignor to David Wolfe Bruce, New York city. Two Patents.

4,394 to 4,397.—CARPET PATTERN.—Robert R. Campbell (assignor to Lowell Manufacturing Company), Lowell, Mass. Four Patents.

4,398.—CARPET PATTERN.—Jonathan Crabtree (assignor to John Gay), Philadelphia, Pa.

4,399.—OIL-CLOTH PATTERN.—Leonce F. Dandre, Paris, France.

4,400.—STOVE.—J. D. Flansburg, Philadelphia, assignor to Seymour Raymond and Joseph Campbell, Middletown, Pa.

4,401 and 4,402.—TYPE.—Julius Herriet (assignor to D. W. Bruce), New York city. Two Patents.

4,403.—OIL-CLOTH PATTERN.—James Hutchison, Newark, N. J., assignor to T. Potter, Son & Co., Philadelphia, Pa.

4,404 to 4,406.—OIL-CLOTH PATTERN.—Henry Kagy (assignor to T. Potter, Son & Co.), Philadelphia, Pa. Three Patents.

4,407.—HINGE.—A. C. Kasson, Milwaukee, Wis.

4,408.—INKSTAND.—David Merritt, Philadelphia, Pa.

4,409 and 4,410.—FLOOR OIL-CLOTH PATTERN.—C. T. Meyer, Newark, N. J., assignor to Edward C. Sampson, New York city. Two Patents.

4,411 to 4,414.—CARPET PATTERN.—Elemir J. Ney, Dracut, assignor to Lowell Manufacturing Company, Lowell, Mass. Four Patents.

4,415 and 4,416.—OIL-CLOTH PATTERN.—James Paterson, Elizabeth, N. J., assignor to Thomas Potter, Son & Co., Philadelphia, Pa. Two Patents.

4,417.—SHOW-CASE.—W. H. Reiff, Philadelphia, Pa.

4,418.—TEA AND COFFEE SERVICE.—E. G. Webster, Brooklyn, N. Y.

EXTENSIONS.

HYDRAULIC BRICK PRESS.—Ethan Rogers, of Cleveland, Ohio.—Letters Patent No. 15,778, dated September 23, 1856.

MODE OF CONSTRUCTING WALLS AND FLOORS OF CELLARS.—Sophia A. Moen, of Stamford, Conn., and Philip L. Moen, Worcester, Mass., administrators of the estate of A. R. Moen, deceased.—Letters Patent No. 14,323, dated February 26, 1856; reissue No. 367, dated April 8, 1856.

OVEN.—Hosea 'Ball, of New York city.—Letters Patent No. 15,753, dated September 23, 1856; reissue No. 3,666, dated October 12, 1869; reissue No. 4,026, dated June 14, 1870.

MACHINE FOR NOTCHING HOOPS.—Emily J. Lamson, of Weymouth, Mass., executrix of the estate of Daniel Lamson, deceased.—Letters Patent No. 15,768, dated Sept. 23, 1856.

ORE WASHER.—Samuel Thomas, of Hokendauqua, Pa.—Letters Patent No. 15,827, dated Sept. 30, 1856.

VISE.—C. C. Walworth, of Boston, Mass.—Letters Patent No. 15,862, dated October 7, 1856.

PLATE-HOLDER FOR PHOTOGRAPHIC CAMERAS.—William Lewis, of Brooklyn, N. Y., and Wm. H. Lewis, of New York city.—Letters Patent No. 15,854, dated October 7, 1856.

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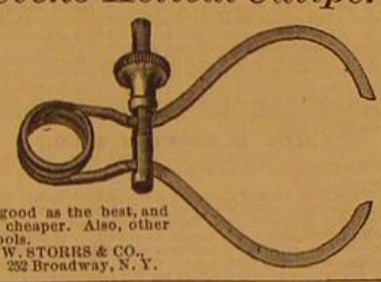
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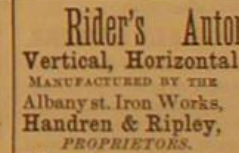
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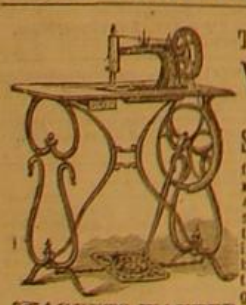
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THE ONLY FAMILY KNITTER MADE that fills the bill. Send for circulars and samples to LAMB KNITTING MACHINE MF'G CO.,
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SCIENTIFIC AMERICAN

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

Vol. XXIII.—No. 18. [NEW SERIES.] NEW YORK, OCTOBER 29, 1870. $3 per Annum. [IN ADVANCE.]

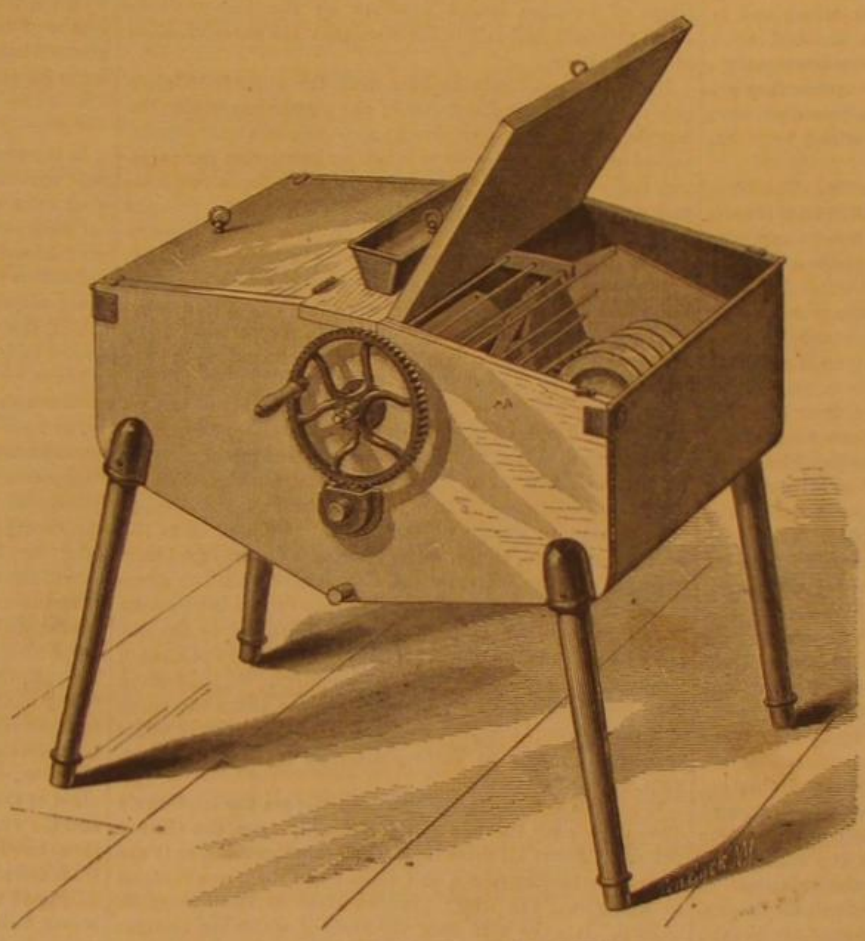
Improved Dish-Washing Machine.

Machines for washing dishes, which can do this work well and rapidly, are a *desideratum* for hotels, restaurants, large boarding-houses, hospitals, asylums, as well as for private families. The one of which the annexed engraving is a perspective view, is extremely simple, and it is claimed does its work in a perfect and rapid manner.

It consists of a trunk or box, the sides of which are made of wood or sheet metal of a suitable kind, and having its bottom and ends formed of a continuous sheet of galvanized iron or other suitable metal, and containing a water or dasher wheel of peculiar construction, with racks of various forms to hold the dishes to be washed, the racks being made of galvanized iron wire, and so constructed and placed as to sustain in the proper position for cleansing any and all of the various dishes in modern use.

The efficiency of the machine depends chiefly on the form of the dasher wheel. This wheel is made one wing at a time, so that the wings, four in number, each have the form of portions of the shell of a frustum of a cone. These are placed in pairs, their concavity outward, so that the apex of one pair is opposite the base of the other. As a consequence of this construction and proper attention to the proportioning of the wheel, it follows that in rotating it by means of the winch, gear, and pinion, the water will be thrown forcibly toward one side of the trunk or box, and in reversing the motion it will be as forcibly thrown toward the other side, so that both sides of plates or other dishes may be acted upon as described below.

In use the dishes are placed in the trunk on the proper wire racks, and the lids are shut and buttoned down. Hot water, with or without soap as may be necessary, is then introduced through a hopper-shaped strainer trough at the top of the machine. Four or five quarts of boiling water and a tablespoonful of soft soap, or its equivalent of hard soap, is sufficient. The crank is then turned to the right and left alternately for from two to three minutes. The water is then drawn off, and about the same amount of rinsing water is poured in, and the dashing is repeated. The covers are then opened, and the dishes being hot will dry in a few minutes. The drying may be, if desired, accelerated by turning the dasher wheel, which forces a current of air over the dishes. This invention is the device of an Illinois lady, and it is another proof that the female sex is not without its share of inventive talent.



CLARKE'S DISH WASHER.

Patented, Dec. 7, 1869, by T. D. Clark, whom address for urther informaton at Xenia, Ill.

How Counterfeit Notes are Made.

A party of men, say from three to a dozen, get together and hold frequent meetings, and act according to a plan laid down. One or two will find out some copper-plate printer in the employ of the bank note company—in fact all such printers are known by the party. These men will then manage to meet one of the printers in the evening, get acquainted, drink, and have a good time generally with him, and so proceed for a few evenings. Then they offer him from $50 to $100 to procure a certain kind of impression. This impression is made in this wise: The printer will take the impression upon tin foil from the plate from which he is printing, which can be done in a moment. Thus you see every line and the size is obtained correctly. From this tin foil an electrotype plate is made. They then get some plate printer that can be found about the city, have a good time with him, and engage him at twenty dollars a day to do the printing. By this plan thousands of copies are struck off that defy detection, except in the quality of the paper, which will differ from the genuine. The place of manufacture is generally at some distance from New York, like Staten Island, Flatbush, or sometimes Baxter street or some similar locality in this city. It is a strange fact in every case where a party of this kind exists, that every member lacks confidence in his associates. Every move made by one is narrowly watched by the others of the party. It would be death to an informant or spy that did not look well to himself.

A Wooden Railroad.

A railroad with rails of wood has recently been built from Quebec through the village of Jacques Cartier, about fifteen miles. The Quebec *Chronicle* speaks of it as follows:

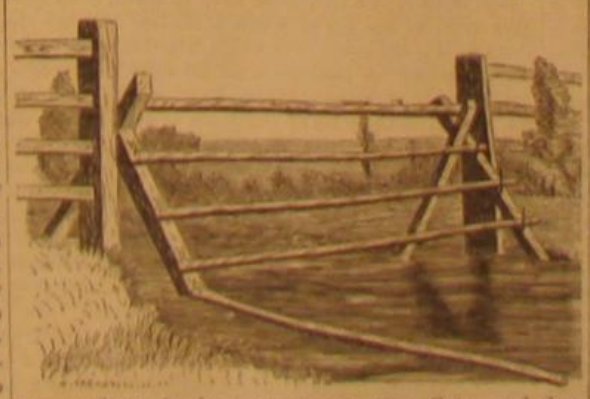
"The problem of wooden railways for colonization purposes may now be said to be solved, and as a proof of it, it is necessary to say that we passed over the road yesterday, at a rate of from twenty to thirty miles an hour, a speed which is seldom passed on any of the iron roads in this Province. The cars conveying the party yesterday were simply rudimentary vehicles, known as platform carriages, but sufficient evidence was given that the line when completed will be as easy and smooth for traveling purposes as upon the old established iron or steel rails. The road is built upon a 4 ft. 8½ inch gage, being the ordinary width of the modern English and American railways. Each rail is 14 feet long, 7 inches in depth, and 14 inches in width—sawn and prepared at a temporary mill recently erected by the contractor on the line for the purpose. Each rail rests on several sleepers to which they are fastened by wedges—by a process so simple that the rail when required, can be removed or reversed by any ordinary mechanic. The locomotive is from the Rhode Island Iron Works, and is most assuredly a splendid piece of mechanical ingenuity, while it is supposed to weigh 21 tuns, loaded, without the tender."

[Will the *Chronicle* inform us as to the cost of the above road per mile.—EDS.

Flood Fence.

Mr. Asa Hartshorn, of Ashtabula county, Ohio, writes as follows to the *Agriculturist*:

"I assisted my father fifty years ago in making a set of



bars, as shown in the cut, in New London, Conn., and they remained good thirty years or more. The posts, or crotches, should be fastened firmly by stones, or be set well into the bank of the stream. Two staples and one link are required to each bar. These should be made of ¾-inch iron. The other ends of the bars rest on ¾-inch pins. In time of a flood one or more of the bars may float up and swing around down stream, and when the water subsides, they may be returned to their places.

"These floating bars have the advantage over any other gate, as they open, and let all flood-wood and trash pass. I am an old man, and have whittled it out, so you can see how it should be on the stream. The round top pole rests in the crotch of the posts above high water, and in this way any stream twenty-five feet wide can be fenced with safety."

Elastic Tires for Traction Engines.

Engineering states that an interesting trial was recently carried out between Rochester and Chatham of a five-horse traction engine constructed by Messrs. Aveling & Porter, of the former place, and fitted with tires formed of india-rubber segments attached to iron plates by a process patented by Messrs. L. Sterne & Co., Great Queen street, Westminster, these plates being bolted to the wheel tire and further secured by iron rings. The front pair of driving wheels of the engine are 3 ft. 6 in. in diameter, and are fitted with indiarubber segments 12 in. long, 4 in. wide, and 3 in. thick. The rear pair of driving wheels are 5 ft. in diameter, and are fitted with india-rubber segments 12 in. long, 6 in. wide, and 3 in. thick. The rubber is firmly attached to ¼ in. steel plates, which are bolted on to the ½ in. wrought-iron tires, the segments being still further secured by ½ in. wrought-iron rings placed on each side of the wheel.

The trial, which was conducted by Messrs. Aveling & Porter, took place on Friday last in the presence of a number of Government officials, and some of our leading engineers. The engine started from Messrs. Aveling's works, at Rochester, with two long four-wheel lorries and a load of iron girders, giving a total weight of about 13 tuns. It proceeded at a pace of about 4 miles an hour through the slippery streets of Rochester, traveling steadily up Star hill, which has a gradient of 1 in 12 for more than 300 yards. It made several sharp turnings round corners, the radius of the path of travel being not more than 15 ft. With one ordinary iron skid on the rear wheel of the hindmost lorrie, it descended Rome-lane—a steep falling grade—under complete control. The rough and irregular stone causeway, the timber bridgeway of the Chatham Dockyard, and the rough and broken ground near the landing quay on the Medway were all smoothly and successfully traversed. The girders were landed on the quay, and the engine then returned to Rochester. The ground near the landing quay is full of hillocks of cinder, clinker, stone, bricks, scrap iron, etc., but, although the engine ran over all these substances, not a cut nor permanent indent was to be found afterwards in the india-rubber segments.

The great advantage of Messrs. Sterne's method of attaching the india-rubber in segments over the solid ring is, that if a segment gets damaged it is easily and quickly removed and replaced by a spare segment at a moderate cost. The motion of the engine during the run was easy, and the india-rubber readily impressed itself into the inequalities of the roadways. To avoid all possibility of slip in wet streets and on clay soils, Mr. Aveling proposes to introduce steel staples or crossbars, so arranged as to take the traction without neutralizing the benefit derived from the elastic action of the rubber. There is no doubt a decided advantage in Messrs. Sterne's method of utilizing the india-rubber. Traction engines with their wheels thus tired will prove useful under the special local circumstances, such, for instance, as where they have to traverse paved or very uneven roads. But here to our mind, the advantage of rubber tired wheels ceases, and we believe that the engine in question, or, in fact, any of Messrs. Aveling & Porter's engines, would work as well without as with this addition, and that in most cases the 130*l.* or 140*l.* which these appliances cost, could be more profitably expended on the engine in other ways.

We may observe in conclusion, that there is no fear of the rubber parting from the plates to which it is attached by Sterne's process. Its adhesion has been tested by Mr. Kirkaldy, who found that a direct pull of 6,316 lbs., or 177½ lbs. per square inch, was required to separate the two. In compression the rubber segments stood 66½ tuns per square foot, returning to their normal condition after the pressure was removed.

THE quartz miners of California are predicting a long continuance of wet weather. Swallows and martins in Lower California have raised their broods quickly this summer and departed. This phenomenon, it is asserted, is a sure sign of a wet winter. What wonderful meteorologists these little birds must be

THE ISLAND OF CAPRI.

[From Chambers' Journal.]

In the tideless sea of the Mediterranean there rise two immense rocks, bound together, as it were, by a long hill, on which are scattered white houses, surrounded by an overabundant foliage. The brilliant rays of the sun harmonize with the deep azure of the sea, the gray tint of its rocky shore, and the dark shadow of its giant trees. At the foot of those abrupt rocks may be traced deep, round holes, worn away by the action of the water, which makes a roar as of distant artillery when its waves pour into them. Higher up are immense grottos, from which the stalactites hang in sharp points, or, united at last to the rock itself, become a part of it.

Two large masses rise in the sea, to remind him who sails past of a cathedral with its towers unfinished, through one of which the largest steamships may easily pass—a Gothic porch of nature's building; and when the northern point is doubled, the low landing place is visible, and you are on shore at Capri. The remembrances of imperial Rome have left their impress there. It is a lovely spot, where nature seems too powerful for man. It is like the Sleeping Beauty; and human energy is powerless to grapple with it. The soil on this rocky island is so scarce that the inhabitants treasure it with the utmost jealousy; they inclose it in walls; they arrest its natural fall into the sea by making terraces; they shelter it from the sun by the shade of thick trees; and, in return, it is not ungrateful for the care lavished upon it as all that it produces is of the most excellent quality. The cereals are of the best; but at what an expense they are grown! Each grain is put into the earth separately; were it sown broadcast, the wind, to which the island is so exposed, would carry it away.

Oranges and lemons are of first-rate quality. The olive trees, which are abundant, yield so rich an oil that it is specially sought for to use at table. The white fig of Capri is as celebrated as that of Smyrna, and the vine yields a wine renowned among Italian vintages. The red, which is rather sweet, has a pleasant flavor of raspberries; the white, which is dry and sharp, has a taste of violets so strong that the Neapolitan merchants imitate it by infusing orris root into any ordinary wine, and sell it at ten times its value.

Even with the incessant pains they take to draw from the earth all it can produce, it is quite insufficient to feed the three thousand inhabitants. The Capriotes live like primitive races, by fishing and the catching of small birds, for which their island is a place of rest in mid-ocean during the months of April, May, September, and October. Then may be seen immense flights of quails, thrushes, turtle-doves, and woodcocks, which are taken by nets. All round the island, wherever there is depth of earth in which to fix a stake, they put in the broken masts of vessels at certain distances, between which the nets are spread by the help of a cord and a pulley, exactly as a sail is hoisted on board a ship. The birds arrive in innumerable flights about half an hour before daybreak, fly into the nets, and are picked up by men lying in ambush.

When the quails are more than usually plentiful, they are sold in the market of Naples at four centimes each, and sometimes exported as far as England. The number caught varies from forty to seventy thousand. In the spring they are thin and poor, having suffered from the privations of winter; but in the autumn they are well fed and very succulent, and form a principal source of the riches of the people.

In the whole island there are but two towns, Capri and Anacapri, one at the east, the other at the west end of the island. Each has its own territory. There can be no disagreement when the cultivated ground is separated by an abyss: the people can only meet on the neutral territory of the place of embarkation.

The twins might be supposed to live in peace, yet it is not so; they hate each other profoundly, and never lose any occasion of testifying it. The fishermen load each other with abuse when they meet; they each tear the other's nets. Each town has its own patron saint, and mocks its neighbor's. As the Capriotes mount the hill to Anacapri they spit at the chapel, which is half way up. No marriages occur between them, and the children pull each other's hair when they meet.

An example will suffice to show how far this animosity is carried. As the island cannot grow sufficient corn, there is always a supply provided for six weeks, in case of war. This is kept at Anacapri, as being the least accessible part of the country, and it is never touched but in case of extreme need. It happened that in the month of March, 1826, there was such a succession of tempests and contrary winds that all communication with the mainland was rendered impossible for nineteen days, and the town of Capri found itself without bread. The syndic wrote to his brother officer at Anacapri to ask for corn, to avoid starvation. The council met, and returned for their reply that they should be happy to send some for the syndic's own use, as he was not a native of the island; but the Capriotes should not have any, as they would be only too glad to see them perish by famine. The syndic of Capri proposed to his townsmen to give an answer to this cruel insolence by taking their guns and seizing the provision they needed by force. But he stood alone, and bread was made of potato starch mixed with bean flour, until the storm subsided.

A narrow path covered with sparkling stones, so steep as to be a staircase in some parts, leads from the shore to Capri, a town protected by walls and gates, to which a drawbridge is attached. It extends in a crescent on the summit of one of the hills, and presents a most picturesque appearance from beneath; the houses perched on points of rock which crop out from the masses of verdure beneath. As the rocks are calcareous, whitewash is cheap and abundant, and each house has its annual bath, giving it a clean, bright aspect, which is sadly belied when it is entered.

The streets are infested with small black pigs, which wallow in a mass of dirt, where the flies congregate, and the children play in rags. The town is interspersed by streets so narrow that two persons can scarcely pass, often roofed over, and the houses so open that the whole interior can be seen, giving a curious picture, which reminds you of the East in the middle ages.

As the isle of Capri is inseparably connected with the Emperor Tiberius, who retired here from Rome to indulge in seclusion and pleasure, it is naturally the first object of the traveler to visit the remains of his once gorgeous palaces. These were no fewer than twelve, which he dedicated to the twelve highest divinities; but after his death they were ordered to be destroyed by the senate, to mark their disgust at his sensuality and atrocious crimes.

The one consecrated to Jupiter, which the tyrant preferred to the others, and where he shut himself up for nine months after the death of Sejanus, still shows some of its foundations. Mounting up a steep road from the town through groves of medlars, orange, and fig trees, for about an hour, a mass of ruins marks the site; a fallen column, a broken step, the fragment of a cornice, prove that they were made of marble; but the walls seem to have been of brick, in the shape of lozenges bound together by the indestructible Roman cement, and laid in the form that the ancients called *opus reticulatum*.

Man, time, and lightning have made the ruins indecipherable; the roofs have disappeared; the plaster has fallen; the marble has been ground down; some vaults alone remain, arched chambers where there is neither inscription nor painting, and which the people use for stables. Cattle ruminate and asses sleep where the lord of the world, who thought himself the equal of the gods, tried to drown his guilty conscience in debauch, and paced his rooms in terror at imaginary enemies. A few white mosaics bordered with black are the sole remnant of ancient refinement. There is a semicircular hall, upon which open small side rooms, marked by arches in the walls, which is supposed by the guides to have been the theater of the palace.

Had it not been that Tacitus and other historians had related its history and poured contempt on its builder, none could guess who had been the master of this heap of rubbish. But when we look at its situation, it must be acknowledged that it was well chosen; it is isolation in the midst of magnificent nature. Placed on the summit of the rocks to the west of the island, the immense panorama has its equal only in the Bay of Rio Janeiro or of Constantinople. The azure surface of the sea is cut on the one side by the harmonious lines of the isles of Ischia and Procida, softened by the distance; beyond is the Cape of Miseno, where Tiberius himself was to meet death in the house of Lucullus. The charming coast-line, dotted with villages and groves, forms the curve of the bay towards Naples, which is marked by a large white spot, stretching on to Torre del Greco, Torre dell' Annunziata, and Castellamare.

Where Cape Campanella juts into the sea the land again disappears near the isle of the Sirens, to form the Gulf of Salerno. Above all these beauties towers Vesuvius, as if she were the guardian of sea and shore; and then, as a contrast to the great, the lesser beauties close at hand must be noticed. It is the wild flora, the seeds of which are brought in profusion by every breeze, and are the ornament and regeneration of a ruin. Pansies, pinks, eglantine, and broom give life and beauty to the skeleton; whilst emerald lizards glide through the leaves, and swallows wing their rapid flight overhead.

A few steps from the palace is a small platform overhanging the sea, called the "Leap of Tiberius." The tradition is, that from this place his prisoners, after suffering horrible tortures, were thrown into the sea in his presence, their bodies torn by the sharp rocks which lie at the foot of the precipice. It is above eleven hundred feet in hight, and a moderate-sized stone occupies twenty-seven seconds in reaching the ground. The rock is as straight as a wall, with here and there a sharp point jutting out, covered with a tuft of verdure.

Still farther, on a pyramidal heap of earth, is an isolated gray ruin, to the top of which a modern staircase leads. Possibly it is the tower from which Tiberius watched for the signals which he established on all sides, to give him the first warning of the insurrections he so much feared. A beacon lighted on the coast of Campania would be easily distinguished here. Or it might be for the study of the stars, as it is well known that he was an adept in astrology, which he studied during his retreat at Rhodes. It will easily be believed that the people attach everything to his memory; they call him "our Tiberius;" if they show a grotto, it is where he sacrificed to the gods—or a cavern, it is where his prisoners were confined; the old people speak as if they had known him, and the children stammer his name.

The Emperor would be much surprised if he could again revisit his old haunts: where he had dungeons full to overflowing, and executioners always ready, there is now not a prisoner in the island. Theft is almost unknown; two murders are mentioned as having formerly taken place; but the peaceful and industrious habits of the people keep them from violent crimes. Each knows the other by name—life has no secrecy; a bad man would soon be discovered, unmasked, and obliged to leave the island. The greater part of the inhabitants have never been on the mainland. Any one coming from Naples astonishes his simpler neighbors by his descriptions of carriages drawn by horses, there being neither cart nor vehicle of any sort in Capri; as the roads are nothing more than staircases, they would not admit of them.

The popular ignorance is great; there is a school in each of the towns, but only one master, who divides his days between them; and at eight years of age the children are sent to assist in the fishing, or to gather mulberry leaves for the silkworms, or grapes from the vines.

Any notice of Capri would be incomplete without a word about the Blue Grotto. The entrance from the sea is so narrow that the persons in the boat must lie down; but as soon as that is passed you enter into fairyland. The water, clear to the bottom, is of an exquisite celestial blue, which is reflected from the calcareous rocks in their pure whiteness. It is a palace of turquoise, built above a sapphire lake. The drops of water from the oars sparkle like pearls with a blue tinge. The effect on the body is most singular, the part under water of a swimmer is silvery white, with blue shadows round the muscles; whilst the head and neck, which are out of the water, are of a bronze color, looking like an alabaster statue with a bronze head. It is certainly one of the most beautiful natural curiosities in the world.

A fisherman was the first to discover it in 1822, though there are some indications that it was known to the ancients. Much has been written as to the cause of so singular a phenomenon; perhaps the most plausible is, that owing to the peculiar form of the entrance, the sea is saturated with light, which is shut up within, and throws its rays to the farthest depths of the vault. In another part of the coast there is a grotto where the color is that of pale green; it is very similar to its neighbor, but not quite equal in beauty.

ROLLING LOADS.

In the present day, excepting only Government wagons, rude agricultural carts, and wheelbarrows, every thing running upon wheels is seated on springs. This fact is a practical acknowledgment of the essential difference between a moving and a stationary load. When a vehicle is at rest the deflections of the springs are constant, and afford as exact a measurement of the insistent load as could be obtained by taking the wheels over a weigh bridge. If the load continued to press with the same intensity upon the wheels when in motion springs would be useless, as their deflection would remain unaltered, and a solid block might, consequently, do their work. But experience has taught us that on the smoothest railroad the springs are at once sensitive to the slightest movement, and that they may be advantageously introduced, and come freely into play, even in the instance of the slowly-revolving turned rollers traveling on the accurately-faced roller-path of a large swing bridge. The deflection of the springs of a vehicle in motion is alternately greater and less than the mean deflection when at rest, and the irresistible inference is that the wheel will press upon the supporting medium with a maximum intensity corresponding to the greatest deflection of the spring. No better opportunity of appreciating the practical effect of this condition could be obtained than is afforded by the running of a couple of trains at high speed in parallel lines and in the same direction. The observer in one train can then note the movement of the springs, with the horizontal element eliminated and the vertical alone apparent. It is hardly possible under these circumstances to avoid drawing a parallel between the train and a ship in a moderately smooth sea. The rising and falling of the several springs correspond with that of the waves, the mean deflection and the mean line of flotation are the same, respectively, as when the train is at rest and the ship in perfectly smooth water; but the maximum stresses must be deduced from the maximum deflection of the springs in the one case, and from the immersion measured from the crest of the waves in the other; a very long railway carriage with a large number of wheels would have no vertical movement itself, neither would a very long ship. Expanding this deduction, we are led to the conclusion that a long-span bridge will suffer no increase of strain from the varying deflections of the spings induced by the unavoidable deviations from mathematical accuracy in the levels of the permanent way, although the rails themselves may be subject to strains some 30 per cent greater than those due to the load at rest.

There may, however, be some other agency at work increasing the strains under a rolling load beyond that evidenced to the senses by the springs; and, as this is a question of paramount importance in the economic design of railway bridges, it is no matter of surprise that it has engaged the attention of the most eminent mathematicians and experimentalists. The results of the earlier experiments on the influence of rolling loads were certainly very alarming, as they appeared to indicate that one tun moving at 30 miles an hour was as destructive to the beam as two and a half tuns at rest. Observations of the deflections of actual bridges, however, soon reassured engineers, as the deflections under speeds of even 40 or 50 miles per hour were not practically greater than those due to the same load at rest. Theoretical considerations, at first sight, might erroneously lead us to anticipate a greatly increased deflection under a rolling load, since they indicate the maximum deflection of an elastic beam under a suddenly imposed load to be double that of the final deflection after oscillations have ceased. The reason for this is obvious enough, for the work done by the beam must be equal to that done by the load, and as the latter is equal to the product of the load into the ultimate deflection, the former must be equal to the product of the mean resistance of the beam into the same deflection; hence the *mean* resistance of the beam must be equal to the load, and as the resistance is *nil* at the commencement of the bending, it must be equal to double the load at the termination.

But the conditions of the rolling load on a railway bridge are not analagous. The load is not sufficiently suddenly applied, and the horizontal motion and *vis viva* of the train destroys other conditions. It might at first be concluded that at least the cross girders of a bridge spaced at intervals of a yard only, and where consequently at 60 miles per hour the load would be imposed in the thirtieth part of a second, would constitute a case of suddenly imposed load and double strain, but experience does not bear out this conclusion. In an instance observed by the writer the deflection of some 8 in. cross girders, amounting to ⅝ths of an inch under the driving wheels of the engine when at rest, was increased to ¾ in. only when the engine traversed the bridge at considerable speed. In fact, in this case it was evident that the work done in deflecting the several girders was not performed, as in the case of a suddenly applied load, by a *vertical* descent of the weight at each girder, but by increased *horizontal* traction on the whole train; in the same manner as the wheel of a road vehicle passing over soft ground consolidates its path by the formation of a rut, at the expense of an additional pull, and not by an up-and-down hammering of the wheel.

One element of increased strain on the main girders of a railway bridge under a moving load is sufficiently apparent, but on investigation turns out to be insignificant in effect. The rails, if normally horizontal, will obviously be deflected below the horizontal line when the load is traversing the bridge, and the path of wheels therefore will be approximately an arc of a circle. The resulting centrifugal force will take effect upon the girder in a practically vertical direction, and in terms of the load the increased bending stress will, of course, be equal to the square of the velocity in feet per second, divided by 32 times the radius of the deflective curve in feet. In practical cases this increase, as we have before observed, will be found insignificant.

The most recent researches of mathematicians show that the passage of a train of ordinary length does not afford sufficient time for the attainment of molecular equilibrium in the girder, and that the increase of strain is not worthy of note. M. Bresse has shown that with a train of indefinite length, moving at the highest practical velocity, the strain, neglecting the effects of possible concussion, may be one-third greater than that due to the same load at rest; but that if the initial camber of the rails be four-thirds of the statical deflection, this increase, under the same reservation, will not take effect.

It is apparent, therefore, that if any important modifications are required in girders subject to a rolling load, it can only be to provide against the effects of shocks arising from irregularities in the roads and other similar causes. The interposition of springs protects the iron-work from direct impact, or some difficulties would be encountered in dealing with the light cross girders of railway bridges. Experiments on the effect of falling weights give very conflicting, and in some instances, unintelligble results. We can easily understand that a rectangular bar of any proportions, provided it be of the given weight per foot, will stand the same intensity of blow, whether it take effect on the flat side or on the edge of the bar; because the work done in fracturing the bar will be proportional to the product of the breaking weight into the ultimate deflection, which will be a constant amount for all rectangular bars of a given span and weight per foot. It is not so apparent, however, that a round bar of the same weight per foot will sustain the same blow as the rectangular bar, nor that the deflection will be proportional to the velocity of impact instead of the square of the same, yet both these are deduced facts from experiment.

The general tenor of the evidence gradually accumulated by engineers relative to the effect of moving loads tends to prove that no additional stength is on that account required in the main girders of railway bridges above some 20 ft. in span, provided the permanent way be kept in fair order, but that the cross girders should be calculated to sustain the load corresponding to the maximum deflection of the springs, which will ordinarily be some 25 per cent greater than the normal load. There are no grounds for the adoption of a factor of safety of ten in railway practice where moving loads are concerned, as urged by some writers, although that factor is quite justifiable in the instance of machinery, where genuine sudden strains have to be encountered.—*Engineering.*

Spontaneous Generation.

The decision of the question of spontaneous generation is one of the utmost moment, even from a practical point of view. It is no mere philosopher's problem, the solution of which would have but little influence on the well-being of our race; on the contrary, it is a matter most intimately concerning our own physical health—and in some cases our very existence, while it is no less important as regards the animal or vegetable productions on which we depend for food or clothing. Unhappily it is a problem, the satisfactory solution of which seems as far off as ever. In each succeeding generation men arise who prove to their own satisfaction, at least, that spontaneous generation does occur. Their experiments are made with all the ingenuity that science can devise, with all the care that an honest love of truth, and an earnest desire to find it, will allow of. In some cases the evidence they bring forward seems conclusive; but only for a time. Sooner or later a flaw is detected in the mode of experimenting, in the instrument employed, or in the chain of reasoning, and once again the old paths have to be trod under new and different conditions.

If we had to select among our foremost naturalists one who more than any other might have been expected to uphold the doctrine of spontaneous generation, that one would have been Professor Huxley. But, like a doughty man of science that he is, he will not be led astray by personal predilections, but boldly and unhesitatingly draws inferences from the evidence before him—inferences wholly unfavorable to a doctrine which, from what he has said on former occasions, we assume he would gladly support did he feel himself at liberty to do so. The point in dispute, we need hardly say, is as to whether what we call living matter is, under all circumstances, as it certainly is under most, the direct product of pre-existing living matter, or whether it may not occasionally be generated *de novo*, from a combination of elements under conditions as yet unknown to us. Happily, we can at the present day discuss these matters without fear of pains and penalties, and without uncharitable assumptions or aspersions. In whatever mode the new life appears, the miracle of its production remains the same—the attributes of Divinity are wholly unshaken.

So far as we can discern, all parties are agreed that in the majority of instances the new growth is the direct offspring of the old, and therefore if we can by any means destroy the vitality of the parent, check its multiplication, or prevent the access of new germs, we can "stamp out" any particular growth as effectually as we can rid ourselves of cattle plague or small-pox. Observers tell us that we are surrounded by infinite myriads of germs of inconceivable minuteness, invisible even under our best microscopes, and only rendered apparent by optical experiments such as those of Dr. Tyndall; and that these germs, under favorable conditions, progress and multiply, it may be, to our sore discomfort. These germs are, on the generally received theory, supposed to be the product of pre-existing organisms. How, then, were these organisms formed in the beginning, if not by the combination of certain proportions of oxygen, carbon, hydrogen, and nitrogen, as it is asserted similar organisms may be still formed? Why limit Creative power to one primordial fiat, and deny the continuous and constant operation of the same Great Cause? But while the general belief will be much strengthened by the recent utterances of Professor Huxley, there is now, as there always has been, a small class of observers who are led to conclude that in certain instances new growths or germs may be and are developed under circumstances precluding the existence of parental organisms of the same description. They take most elaborate precautions to prevent the accesss of germs from without; they expose fluids to a degree of temperature known, or at any rate supposed to be destructive to all forms of life; and yet at the expiration of a short time they find evidences of vitality, and they are led to infer that life has been formed in their experimental flasks, and has not been introduced from without. Some of the more recent experiments in this direction have been particularly suggestive. The chemical elements found in all living creatures have been supplied in certain definite proportions, and life has appeared, while in other cases, where the proportions have been differently combined, or the elements have been of a different character, not a speck of vitality has been observed.

Now, if these experiments be free from flaw, we shall only have to study the conditions under which living specks are produced to be able to regulate their production almost at will; and we shall be able to "stamp out" any objectionable manifestations as we can be under the opposite hypothesis of successful formation. As mere matter of practice, then, if we had to deal with a murrain or a blight, it would be of little import how that murrain originated—whether by "biogenesis," or parental development, if we may so call it, or by "abiogenesis," or spontaneous generation. If we only knew all the conditions under which development took place, we should be able to contend successfully against these plagues, or at least we should in most instances be able to avoid exposing ourselves, our herds, or our crops to conditions favorable to their production; and this is why the settlement of the question of spontaneous generation, as it is somewhat erroneously termed, is so all-important to practical men.

As we have seen, the decision of Professor Huxley on the present state of the question is, that the notion of spontaneous generation is fallacious, and both he and Professor Tyndall seem to be of opinion that there is some flaw in Dr. Bastian's experiments; and in so far as the production of those wonderful spiral coils, which the latter gentleman finds under certain circumstances, it would seem most probable that, in spite of all his precautions, the access of foreign material has not been effectually prevented. Professor Tyndall points to one weak place in Dr. Bastian's experiments; when he declares that, in spite of the removal of the air from the experimental flasks by means of the air-pump, it is perfectly impossible to remove all the germs with which the air had been charged. But if this be the case, then these germs have a faculty of retaining their vitality under a temperature greatly exceeding that which has hitherto been deemed sufficient utterly to destroy vitality.

When it is stated that the living things supposed to arise out of non-living materials, and gradually to emerge from the region of the invisible into that of the visible, are no larger in the latter stage than $\frac{1}{10000}$ of an inch in diameter, it will be seen that, while it would be difficult indeed to suppose any place from which they could be perfectly prevented from obtaining access, it would be equally difficult to suppose that such infinitesimal specks could resist such an elevation of temperature as that to which they were subjected by Dr. Bastian.—*The Gardeners' Chronicle.*

MR. FAVARGER, an accomplished French teacher and lecturer, advertises in another column a series of French readings. Having acquainted ourselves with M. Favarger's system of instruction, and listened to some of his readings, we cordially recommend those who desire to improve their knowledge of and taste for the French language, to attend this course. We also recommend his system of instruction to those who desire to learn the French language.

On the Use of Tin-foil for Preserving Substances Liable to Change on Exposure to Air.

Tin reduced to thin sheets has for many years been employed for preserving a great number of substances from the action of air and moisture. The thin leaves (foil) of this metal are essentially repellent to moisture. When cemented to the surface of damp walls, they protect the paper-hangings which may be afterwards applied, and they are in like manner used for lining the interior of boxes and drawers in which dried medicinal leaves and flowers are kept. It has long been the practice to inclose chocolate in tinfoil, to prevent the fatty matter contained in it from soiling the paper which forms the outside wrapper; in the same way butter of cacao itself is preserved, and some sorts of sweet-meats, sausages, and cheese are among the articles similarly protected. Tobacco-pouches are lined with tin-foil to preserve the flavor and humidity of the tabacco. Cakes of opium are kept in a moist and uniform state by wrapping them in this material, and bisulphate of soda is kept in the same way, for use in making artificial Seltzer water with Briet's apparatus. Lastly, on account of the opacity of tin-foil to the rays of light, bottles are coated with it for the purpose of excluding light from vegetable substances which would be injured by its action.

Notwithstanding the knowledge of all these facts it might be said that the application of tin-foil for the preservation of substances liable to change is still rather limited and there seemed to be a prospect of its admitting of a more general use than has hitherto been made of it. At the same time there was an absence of any precise experiments for the purpose of determining in a scientific manner the degree of impenetrability of tin-foil. Having been engaged for some time in the investigation of this subject, I have obtained the following results:

For many years past I have observed that cacao butter, which readily becomes rancid even when kept in bottles into which it has been introduced in the melted state, if the bottles be opened from time to time, does not undergo the same change when molded in tablets and wrapped in tin-foil. This fact, which was confirmed by many observations, and could only be explained by assuming the impenetrability of tin-foil to atmospheric air, formed the starting-point for some experiments in the same direction, which proved satisfactory. Thus, a piece of well-burned quicklime, inclosed in a double wrapper of tin-foil, was exposed to the atmosphere of the laboratory by the side of another similar piece which was exposed without protection. While the latter became slacked, that which was protected by the tin-foil, and weighed 92·2 grams on the 1st of December, 1867, had only gained 3 decigrams in weight at the expiration of one month, and after being kept until the 25th of March, 1868, it had only increased 94 grams. It had thus gained only 1·8 grams in four months. On being then taken out of its metallic envelope much heat was developed from absorbtion of moisture, and it fell into powder.

Satisfied by this experiment of the efficacy of tin-foil for preserving bodies from the action of air and moisture, it seemed probable that substances the most susceptible of change might be kept in the same way. It was found that substances so deliquescent as chloride of calcium and liver of sulphur, and effloresecent salts such as carbonate and sulphate of soda, remained almost unchanged when wrapped in tin-foil, increasing or diminishing only to a few thousandths of their weight in several weeks.

Other experiments were made of a more precise charactert It is well known that fresh lemons become rapidly dried and ultimately hard when exposed to the air, and they also become parched and covered with mold. I had endeavored to prevent this drying and molding by plscing the lemons in close vessels, in dry air, in sand, and also in bran, but none of these methods proved efficacious. Thus, for example, in twenty-one days the lemons lost on an average, 17·33 per cen of their weight in sand, and 17·13 per cent in bran. Experiments were made for the purpose of ascertaining the effect of enveloping the fruit in tin-foil, and also of coating it with a film of collodion. Some of the fruit prepared in each way, and some unprepared, was weighed, exposed to the air, and again weighed at intervals of a month. This method was applied to lemons and oranges, and the following results were obtained:

1. The unprepared fruit became rapidly dried. In two months the lemons had lost 42 per cent of their weight, while oranges, in the same time, had lost 26 per cent.

2. Collodion, when applied to the fruit alone, exerts but a feeble preservative influence in retarding spontaneous evaporation. In two months lemons coated with collodion had lost 29 per cent, and oranges 23·5 per cent.

3. Tin-foil almost entirely prevents the drying of the fruit. In two months, lemons had only lost 1·58 per cent, and in three months 3·16 per cent. In one case the loss was only 0·92 per cent during the longer period. Oranges lost about 5 per cent in two months. On the removal of the metallic envelope, the fruit was found to be as fresh and fragrant as when the experiments were commenced. These observations and experiments will tend to show the remarkable power of tin-foil in preserving substances inclosed in it from the influence of air and moisture derived from air, and may induce those who are interested in the subject to extend the application of this preservative means.—*E. Baudrimont, in the Jour. de Pharm. et de Chemie.*

VARNISHES FOR HARNESSES.—One-half pound india-rubber, one gallon of spirits of turpentine; dissolve by a little heat to make it into a jelly, then take equal quantities of hot linseed oil and above mixture, and incorporate them well on a slow fire.

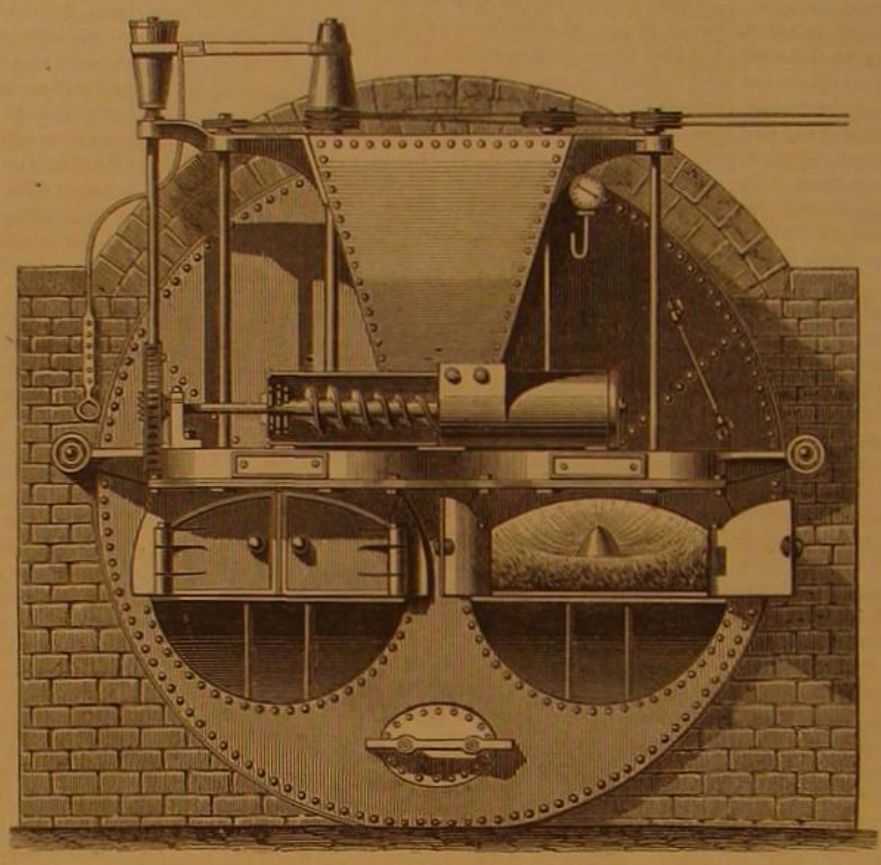
ON THE EFFICIENCY OF FURNACES AND MECHANICAL FIRING.

BY C. F. DEACON, C. E., BRITISH ASSOCIATION, SECTION G.

Having for some time past given a large share of my attention to the subject of the efficiency of furnaces, I have to bring before you a few results of my experience in this most interesting and important inquiry.

Since the time in which Wye Williams lived and labored, Professor Tyndall and Dr. Frankland have shown that the energy of combustion is within wide limits independent of the density of the air, the natural inference *at first sight* being that in furnaces the temperature of the air does not affect the efficiency. One of Wye Williams' well-known experiments was to introduce a bent plate perforated with fifty-six half-inch holes into the center of a furnace where one or two bars had been removed for its reception. "Adequate mixture," says Mr. Williams, "was thus instantly obtained, as in the argand gas burner; the appearance, as viewed through the sight-holes at the end of the boiler, being even brilliant, and as if streams of flame instead of streams of air had issued from the numerous orifices. It is needless to add that nowhere could a cooling effect be produced, notwithstanding the great volume of air introduced."

Now I cannot at present do more than state the simple fact that I have tried similar arrangements in many different instances and under several different conditions, and that I have rarely failed to produce a cooling effect. The arrangement by which the results have been arrived at may be thus described: A few of the ordinary fire bars are removed from the center of the flue. A pair of longitudinal bearers about six inches apart are then introduced, their upper surfaces being level with the common fire bars. On these bearers are placed small arched tranverse bars, each about one inch thick, in contact with one another. Semicircular holes are cast in the transverse surface of these bars, so that when placed together on the bearers they present the appearance of a tunnel about nine inches high pierced with numerous small holes, an arrangement not differing widely from that of Wye Williams, except that the tunnel, being of loose cast-iron pieces, is no more liable to deterioration by heat than common fire bars. If the mere fact of admitting air to the hydrocarbons at the moment of their generation, and in minutely divided lines, is sufficient to insure their combustion, surely nothing could do so more effectually than this arrangement. But the result.



MODE OF FIRING FURNACES MECHANICALLY.

A large quantity of fuel being placed upon the incandescent carbon in the furnace, we have, after the expiration of a few seconds, a splendid display of white flame, not entirely smokeless, but comparatively smokeless, unless the quantity of air admitted is very large; white flame and intense heat—evidence of the precipitation of the carbon particles and of their combustion after precipitation; smoke burning—not smoke prevention; greatly increased temperature of the furnace door, evidence of increased radiation of heat. But, as I said before, in almost all cases a loss of efficiency in the furnace—a reduction in the absolute temperature of the flame. Was Mr. Williams deceived by that radiant heat? I cannot avoid the conclusion that he was in some cases at least. But the furnaces adopted with economical results contained elements not yet described. The ash-pit was divided into three chambers by two vertical sheet-iron partitions, made fast to the longitudinal bearers in such a manner that all air entering it at the central chamber must pass through the arched bars, while that entering by the two side chambers reaches the fuel in the ordinary manner. Now, observe the difference: Here we have a long central fire chamber open to the air only at one end. The air before entering the fire chamber passes over the surface of highly-heated sheets of iron, traverses in turn the cross pieces of the little arched bars and the heated surface of the ribs. Even with this simple change the results are, I believe, in all cases, altered from failure to success. A heating effect has been obtained where a cooling effect only could be produced before.

To sum up my own observations on this subject, I find: (1) That the admission of cold air in quantities sufficient for the complete combustion of the gases in ordinary furnaces is attended with a loss of efficiency in all cases, even if that admission takes place in finely divided streams immediately over every portion of the fuel from which the gases are rising. Radiant heat, and consequent temperature of the furnace door, are enormously increased; smoke, however, is considerably reduced. (2) That by the comparatively slow motion of air over heated surface, and its consequent rarefaction and increase of velocity when issuing from the orifices of the arched bars, a much more perfect chemical union is insured. The flame is not so luminous, but a higher rate of efficiency is obtained. Radiant heat is decreased, the furnace door is rendered less hot, and smoke is more perfectly prevented. The old Cornish system of dead-plate firing when conducted very carefully, and in such a manner that the incandescent fuel at the back of the furnace is never allowed to burn into holes, has, as we all know, certain advantages. But when the back of the furnace is left to itself, I believe it to be a most difficult matter to avoid the admission of cold air *en masse*, a condition which cannot but be attended with loss of efficiency; and in my attempts to discover the best method of mechanical firing, I could not find that those systems in which the coal had a progressive motion from the front to the back were free from these defects. Such methods appear to me to owe their advantages—for no doubt they have advantages—to other causes than that of the perfect combustion of the hydrocarbons; and is not the comparative freedom from smoke in this system of firing the result, in a great measure, of that union of carbon from the front with carbonic acid from the back, producing carbonic oxide, and inevitable loss of heat—the pernicious principle resorted to by a whole army of smoke-burning patentees? The apparatus which appears to me most correct in principle does not profess to compete with the more perfect mechanical stokers, inasmuch as the clinkers are removed by the firemen in the ordinary manner. In short, since my attention was drawn to the subject, I have come to the conclusion that the principle of what was probably the first attempt ever made in mechanical firing—I speak of Stanley's patent—is capable of the highest possible efficiency. Twenty years ago nearly every furnace in Lancashire was fed by the apparatus popularly known as the "hopper." In a box on the front of each furnace two fans revolved horizontally. Fuel was drawn from a hopper by rollers which crushed and let it fall on to the two fans, which in their turn propelled it into the furnace. It was possible to adjust the speed in such a manner that the fuel was spread uniformly over the whole surface of the bars. I would merely add that when the two-flued Lancashire boiler replaced the wagon and egg-ended boilers then in use, the hoppers were taken down, possibly in some places applied to the new flue boilers, found not to throw the fuel evenly over the bars, and discarded. In Leeds, however, they are still in use to a considerable extent, probably because some makers there took the trouble to adjust them to their altered circumstances. For a single two-flued boiler the hopper, as now in use at Leeds, requires about twenty toothed wheels, and at least two worms to drive the crushers and other portions; and notwithstanding the fact that the teeth of those wheels are constantly breaking, and that the whole apparatus trembles under the sudden check caused by a large lump of coal falling between the small crushing rollers, manufacturers who have tried it for so many years, give universal testimony as to its economy. I understand that one engineer in Leeds still makes a considerable number of them. This apparatus does not, of course, prevent smoke, but it distributes the smoke from a given quantity of fuel over a longer period than in hand-firing, and reduces its blackness in the same proportion.

Now, does it not appear that if we can retain the manner of throwing on the fuel, very considerably simplify the means, and use it in conjunction with the fire-bar arrangement already described, we shall have a very efficient furnace and a perfect preventer of smoke? The only drawing I can show you will sufficiently explain the nature of the new arrangement so applied to a two-flued boiler, at a period when the greater part of the improvements were effected. The twenty toothed wheels and two worms have been reduced to one worm and wheel; the two hoppers (one over each flue) to one hopper in the middle of the boiler face. The crushing rollers have been done away with altogether, and an arrangement substituted which crushes and meters the fuel as effectually but much less suddenly. Through the fuel in the middle of the hopper passes a cast-iron screw with a tapering helix of small diameter at the center, but increasing gradually up to the internal diameter of its containing-cylinder outside the hopper. The two halves of this screw are right and left handed, respectively. It has a slow revolving motion, and its action on the coal contained in the hopper is evidently of a nibbling kind, while it metes out to the fans of each flue the desired quantity of fuel. There are other details which have not been overlooked, such as the well-known heaping up of the coal on the dead plate, the cause of which has been entirely removed. And last, but not least, the whole machine is fixed to a frame made fast to the boiler, by three bolts through the shell, no holes whatever being out in the boiler face. The fires made by this apparatus are perfectly level, and are absolutely free from even light smoke.

I hold in my hand a report prepared about four months ago, on the efficiency of the apparatus in question. It is founded on very carefully made evaporative experiments, the conclusion being that the feeder, when used for the first time in competition with the best hand-firing that could be obtained, gave an increased efficiency of 9·696 per cent over and above the efficiency already attained with the argand furnace alone. The cost of the combined apparatus is, of course, much lower than that of any of the more elaborate mechanical stokers—little more than one half—but I believe the efficiency is higher.

Balloons for War Purposes.

The experiments made at Woolwich by balloons inflated at the Royal Arsenal Gas Works have, on the authority of the London *Artizan*, shown that a hight of 100 fathoms, at a horizontal distance of 600 fathoms from an enemy, would enable the observers to secure a wide expanse of view. The balloons with which experiments were made at Woolwich were held by two new cords fastened to the net-work, and terminated at two different points on the ground, to give greater stability to the balloon, and to provide against one cord snapping, or being cut by the enemy's fire. By the new system of military telegraphy for field service, and by means of wagons at present being placed in store in the Royal Arsenal, lines of telegraph can be carried through the air from the earth several miles distant. The wire can be paid out as fast as the balloon travels, so that if a captive balloon should break away, communication could be kept up with it for six miles; or two or more balloons can be sent up, and kept in telegraphic communication with each other by means of similar lines, so that telegraphic operations can be made from the balloon to headquarters, and thence to the base of operations.

By means of these new military telegraphic appliances the most rapid intelligence, and consequent speedy word of command, can be given. In sieges, war balloons are useful in giving information of depots, points of attack, batteries, inner intrenchments, the explosion of magazines in marshes, to spy out ambuscades that may be in waiting, to rally columns, and to telegraph points of assembly on attack. The observing officers were enabled to survey an area of thirty square miles. It was found that by practice great skill can be attained in judging of distances, and the relative position of masses of troops; while more minute details could be subsequently obtained at leisure by field glasses as to the position of mountain gorges, passes, limits of woods, and the course of streams. The trials hitherto made have been chiefly carried on by professional aeronauts with hired balloons; and it is believed that the British Government have at the present time no war balloons in store.

The result of the observations of Captain Brackenbury and Captain Noble, sent out from Woolwich on behalf of the English Government to the respective seats of war, together with trials and other sources of information, will, it is believed, result in war balloons being manufactured in the Royal Arsenal, and that officers of royal engineers, from generals downwards, will be trained in their use.

Diet of Belgian Miners.

The miners of Belgium eat, according to a report recently published in that country, 2 lbs. of bread per day, about two oz. of butter, 1 oz. of coffee and chickory mixed, while for dinner they have in the evening a portion of vegetables mixed with potatoes, weighing at the most 1½ lbs. They have meat on Sundays and festivals, but during the week they drink neither beer nor other fermented liquors. Coffee is their only beverage. Yet these workmen are hardy and healthy.

It is not the coffee which sustains them, for it constitutes but $\frac{1}{15}$ of the nutritious properties of their aliment, though M. de Gasparin, in a paper read some years ago before the French Academy of Sciences, attempted to prove, from certain tables, that the waste in liquid excretion is less when coffee is drunk than at other times. The miners' coffee is not like the French *cafe au lait*, for it has but one tenth part of milk in it; he drinks several pints in a day, and eats only bread and butter until the vegetable meal of the evening. The albuminous substance which enters into the rations of the Belgian miner is thus reduced from 23 grammes to 15 grammes of azote. Here is, therefore, proof that life and health can exist throughout a whole population with less nutritive substance than is generally considered necessary.

Ozone and Explosives.—M. Jouglet is said to have discovered that ozone has a tendency to decompose explosive compounds. Nitro-glycerin and chloride of nitrogen explode instantly when exposed to an atmosphere of ozone, while common powder changes so slowly that six weeks' exposure is necessary to its decomposition.

THE ART OF TYING KNOTS.

The knack of tying a good strong knot in heavy rope, or even in lighter cord, is so handy in many professions that we make no apology for devoting a large space to the subject. For illustrations of the explanations here given, see accompanying cut.

1 and 2 are simple loops, showing the elements of the simplest knot.

3. Simple knot commenced.
4. The same completed.
5. Flemish knot commenced.
6. The same completed.
7. Rope knot commenced.
8. Rope knot completed.

31. Simple boat knot with one turn.

32. Crossed running knot, strong and handy. Looks difficult, but by taking a cord about one eighth of an inch in diameter and tying the same two or three times with the picture you will find no difficulty in mastering it. It is a common knot in some parts of the country.

33. A knotted loop for end of rope. Use various, to prevent the end of the rope from slipping, etc. Very readily untied.

34. Simple (lashing) knot commenced.

35. The same finished. (See 51). In making 34 it is necessary to hold the simple knot, as shown in 33, by some pressure on the knot until it is ready to draw tight for the finish.

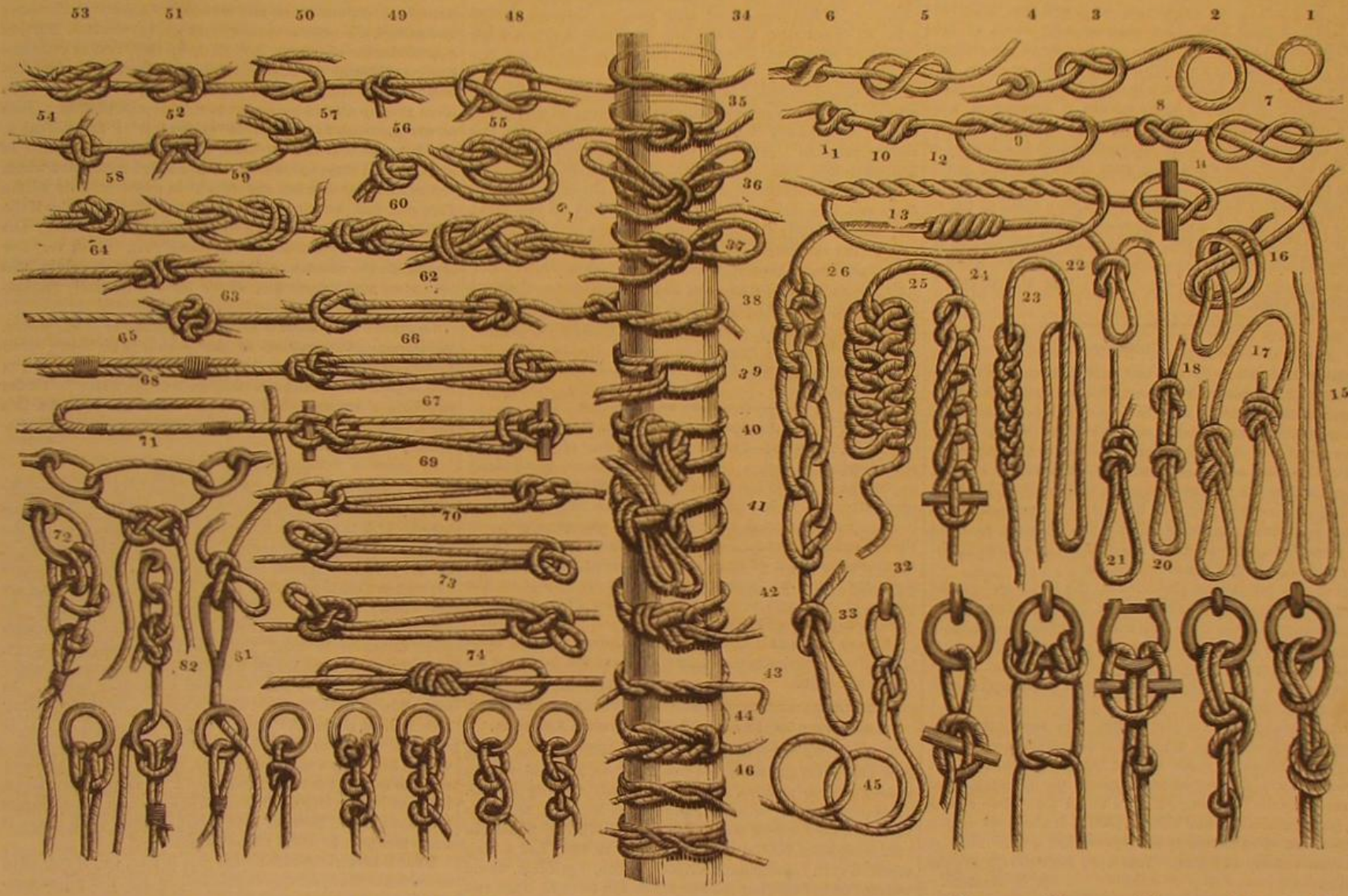
36. Is the same knot with two turns, sometimes called a rosette. This is very easily untied, as will be seen by tracing the loose ends back in the illustration.

back view. This is a common knot. The two ends to be united are seized together and tied in a common simple knot This will not untie or slip, but if the strain is great the rope is apt to part at one side of the knot. It is a rough and awk ward knot but useful on account of the quickness with which it can be tied.

58. And the ordinary knot, the ends used separately.

59. The same knot open. This knot is made by making No. 3 on one rope, holding it open so that we can pass the end of the other cord through the first loop of the last, making it with a second loop. Then draw it tight. It is a strong, ship-shape knot, and can be further strengthened by lashing the two ends together.

60 and 61. Knot used for the same purpose as the simple Flemish. 60 is the tightened or finished knot.



9. Double knot commenced.
10. The same completed.
11. Double knot, back view.
12. Six-fold knot commenced.
13. The same completed. This is closed or "nipped," drawing the two ends with equal force.
14. A "boat" knot, made with the aid of a stick. This is a good knot for handling weights which may want instant detachmeat. Lift the weight very slightly, push out the stick, and the knot is untied.
15. Simple hitch (or double) used in making loop holes.
16. Loop knot commenced.
17. Loop knot finished.
18. Flemish loop or "Dutch" double knot.
19. Running knot.
20. Running knot to hold; the end knot nearest the bend of the rope is the check knot.
21. Running knot "checked."
22. Double loop for twist knot.
23. The twist knot completed. It is made by taking a half turn on both the right hand and left hand cords and passing the end through the "bight" so made.
24. Chain knot, a series of loops. The end of the cord is fastened, a simple loop made and passed over the left hand, the right hand retaining hold of the free end. The left hand then seizes the cord above the right and draws a loop through the loop already formed, the left then finishes the knot by drawing it tight. This is repeated until you have all the knot wanted, when it is secured by passing the free end entirely through the last loop. This is a kind of knot much in vogue for the knotting of leather whip lashes, etc. It is very convenient.
25. Double chain.
26. Double chain secured and pulled out as when in use. Notice the mode in which the end is thrust through the last loop.
27. Lark's head; useful to sailors as a mooring knot.
28. The same, double looped.
29. The same on a ring of a boat. The advantage of instant release by the use of the stick has been noted in No. 14.
30. A treble lark's head. First tie a single lark's head, and then divide the two ends and use each singly as shown in the cut.

37. Knot with single turn; unties as easily as 36, but the "strands," that is to say, all parts of the knot must be laid as in the true or reef knot (see 50 and 51) or a "granny" knot will be produced which will not hold. One who ties this knot well will be a master of this art.
38. Timber hitch or slip knot, with double hitch. The greater the strain the tighter this knot will hold. It looks as if it might give way, but it will not.
39. Running knot with two ends.
40. The same with check knot, which cannot be opened except with a marlin spike.
41. Running knot with two ends, with a check knot (to the running loops) which can be untied by drawing both ends of the cord.
42. Running knot with two ends, fixed by a double Flemish. When an object is to be encircled by this knot, pass the end on which the check knot is to be through the cords before they are drawn tight. This requires a deal of practice.
43. Ordinary twist knot.
44. Double
45. Form of loop for builder's knot.
46. Builder's knot finished, used by workmen in securing building materials.
47. Double builder's knot.
48. Weaver's knot. On the small scale, lay the ends of the two cords to be united between the thumb and first finger of the left hand, the right hand end undermost; pass the right hand cord back over the thumb to form a loop, and bring it back under the thumb and hold it fast. Now put the end of the upper or left hand cord over the right hand cord and through the loop. Catch it with thumb and finger of the left hand and tighten by drawing the right hand.
49. Weaver's knot completed.
50. True or reef knot commenced.
51. The same completed. Useful for small ropes, but if ropes are unequal in size it is apt to draw out into the shape shown by 52. To obviate this the two ends issuing from each side of the knot are whipped or lashed together.
53. A "granny" knot, the ends not lying alongside of each other.
54. Granny knot with a strain in it, showing its uselessness.
55, 56, 57. Commencement, finished front view, and finished

62. English knot commenced.
63. English knot tightened (front view).
64. English knot tightened (back view).
65. Spice, with two ties.
66. Shortening by loops and turns where the end of the rope is free.
67. Shortening knot, can be used when either end is free.
68. The same, with double bend and ties.
69. The same, passing through the knots.
70. Another method of shortening, called making a "sheep shank" or dog shank. Unsafe unless the shank (the loose loop) is attached to the contiguous rope by a stout "seizing," that is a cord tied around it.
71. Shows a dog shank that will hold without seizing.

From 73 to 84 explain themselves without especial allusion to them. It is only necessary to remark in conclusion what is true of knots, if not of men, that the best looking ones are the best; not only "handsome is that handsome does," but "handsome does that handsome is." The neatest knot, in short, is almost without exception the most serviceable, most quickly tied, and most quickly untied.

The Skin Permeable to Liquids.

De Bloch describes in the *Moniteur Scientific* a series of experiments made with different kinds of liquids, none of which could exert any chemical or physical action on the skin. Bordeaux wine, having been experimented with, was found to have penetrated the skin of the arm, washed and wiped dry, after it had been immersed for one hour in the wine, since, on washing the arm with a weak solution of perchloride of iron, the skin was black colored, owing to the formation of a tannate. The author, says Mr. Crookes, seems to have forgotten that the permeability of the skin for liquids is employed in medicine as a therapeutic agent. We, he continues, recollect the case of a lady who bathed in chicken broth, twice daily, for therapeutic purposes; and milk, also is in this way introduced into, and absorbed by, the system.

Nature is the only workman to whom no material is worthless, the only chemist in whose laboratory there are no waste products, and the only artist whose compositions are infinitely varied, and whose fertility of invention is inexhaustible.

Correspondence.

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

Balancing Saw-mill Shafts.

Messrs. Editors:—In answer to A. McG., of Vt., I think the counter balance is the trouble with his mill. Such mills are numerous in this State. I have had many years experience in using and repairing them, and have always found a counter balance, beyond enough to equal the crank pin, an injury. In my practice I have removed several, with good results. If his mill is driven with any kind of water wheel on the crank shaft it needs neither counter balance nor fly wheel. The less the weight the lighter it will run. If driven with a belt or gears from other shafting, a fly wheel of 500 to 800 pounds is needed to receive the shocks of the reciprocating motion, thereby keeping it from the belt or gears.

Some argue that a heavy saw sash or frame gives strength to the cutting of the saw by its weight in descending, and that a counter balance helps to raise the saw frame. Both of which theories I believe to be incorrect, except in a few mills that run so slow that when they once get down they never ought to rise again.

In many mills I find the saw travels with a speed of ten to twelve feet per second, which approaches so near the velocity of a weight falling the first two feet as in my opinion to destroy its power to help the saw to go down or the counter balance to help to raise the saw. Wm. O. Glover.

Danbury, Conn.

Smoky Chimneys.

Messrs. Editors:—Having had an offer from my employer to move into a house built expressly for me, and built under my supervision, I had an open fire-place built in the kitchen, with good fire doors attached, and when my family moved in, we found that the chimney had no draft, so I tried having it built three feet higher; but this did not make any change. So I got a tinsmith to put a pipe on, making it about nine feet higher than it at first was, but all to no purpose. One of my neighbors suggested closing the chimney up tight just above the arch, so I had a board fitted in, and we found quite a change, but it was still defective.

I then took mortar and plastered all the joints around the edges of the board. I then had one of the best chimneys in town. My wife could bake once more—something she could not do since we moved into the house, not being able to heat the stove sufficiently for that purpose. I then took off the six feet of sheet iron pipe to see if it would make any change, but it made none.

Things went well for a few weeks. We were once more eating home-made bread, when all at once things changed; the oven of the stove would not get hot enough to bake, and we would have a tremendous smoke in the morning when we made the fire. On examining, I found that some sparks had got on the board, and burnt a hole in it about six inches in diameter. I immediately set to work and put in another and lined the top with zinc. This made the chimney as good as ever. D. R. Miller.

Harrisburg, Pa.

Grand Auroral Disylays.

Messrs. Editors:—The year 1870 will long be remembered by the inhabitants of the United States, for the great number of brilliant auroral displays; and while we could hardly conceive of anything that would equal those of the past September, last evening's exhibition will far excel any of its predecessors. The day had been cool, with frequent showers, but towards evening had almost entirely cleared away. At 6:30 a heavy wind commenced blowing from the W. S. W., carrying before it vast quantities of thick black clouds, that drifted in an E. and E. S. E. direction, entirely covering the northern heavens, and at intervals breaking forth in flashes of the most vivid lightning. The heavens from the zenith to the northern horizon, were tinged with a bright green shade, alternating with that of a beautiful rose color, through which the stars twinkled with a pale yellow luster. The N. W. and N. E. points of the horizon had the most decided tinge of red; while the direct N. that of the green. The rays at times extended to the Dolphin. The intensity of the display was lessened by the brilliancy of the moon, which was just rising, and had it not been for this, the sight would have been magnificent. The display must have been visible over the greater part of the Northern States, and at an hour when every one could witness it.

Chicago, Ill., Oct. 15th. H. H. Badge.

To Kindle a Quick Fire.

Messrs. Editors:—As the winter is now near at hand, and as it surely will be a benefit to your hard-working and early-rising readers to know how to "hurry up" a cup of coffee in the cold mornings, I send you the following extract from a book of odds and ends, thinking you will consider it "the right thing at the right time." I must premise that I have not yet tried it myself.

"To make fire kindlers: Melt together a quart of tar and three pounds of resin, and when they are partly cooled, knead into them as much sawdust, with a little charcoal added, as possible; then, while the mixture is still pretty hot, spread it out on a board, and cut it into lumps about as large as hen's eggs. Leave these lumps to cool fully, and use one of them to light the fire, which it will do well, being easily ignited by a match, and burning strongly long enough to start any wood fit to burn. The above-given quantity of materials will make enough kindlers to last a year."

I should say there would be no risk of spontaneous combustion being generated in these lighters or kindlers, and that they would certainly be much less offensive in smell, when burning, than are newspapers, straw, and other things used as aids to the making of fires, besides being a great saving in time and trouble. G. O'N.

New York city.

Tin-Lined Pipe Versus Lead Pipe.

Messrs. Editors:—I read with much interest the article in your last number on the purity of the Croton water at its fountain head; that it is not polluted by factories or sewerages, but reaches our city uncontaminated with any unhealthy substance. But from the examination made by Prof. Chandler, I find this water after passing through leaden pipes for distribution through our dwellings is strongly impregnated with lead poison, the same result following several experiments.

The learned professor says the results should lead the citizens of our city to use precautionary measures for protection, and he recommends the use of tin-lined lead pipe. On this recommendation I called on the Colwells, Shaw & Willard Manufacturing Company, No. 213 Center street, to make an inspection of their tin-lined pipe and learn the price. I found there two immense hydraulic presses at work on this pipe; for, having lately increased the thickness and weight to that of the ordinary lead pipe, they have rapidly enlarged their business. This visit induced me to follow Prof. Chandler's advice by giving an order to my architect to substitute tin-lined pipe for lead pipe, which we called for in the specification. An Old Subscriber.

New York city.

[We think you did a sensible thing in changing your order.—Eds.

Asphalte Pavement.

Messrs. Editors:—I notice in a late issue of your admirable journal an article on asphalte pavement, particularly on that of Paris. When in that city in 1866 and 1867, I paid much attention to that subject, so as to form the opinion that it is the best pavement of any kind in use anywhere. In Place Vendome, I once saw a team of many horses drawing an enormous block of stone on four wheels; I waited to observe the effect; no impression whatever was made on the pavement the result was the same as if the Place had been covered with one solid sheet of granite. Neal Dow.

[We can indorse all that our correspondent says in favor of the French asphalte pavements, they are the best that we have seen.—Eds.

Longevity in Man and the Lower Animals.

The duration of life of larva in closely allied forms, varies from four years and more to a week. Fleas are said to live as long as nine months. Fish have great tenacity of life. The carp is stated to have reached one hundred and fifty years. A pike which was taken at Halibrun in Suabia, in 1497, weighing 350lbs, and measuring 19 feet, had a ring attached to it, bearing an inscription which, if genuine, would warrant us in believing the age of the fish to be at least two hundred and sixty seven years. The toad lives thirty-six years, the frog from twelve to sixteen years, and various tortoises must have seen many years if we may judge from the size to which they attain. Parrots and geese reach an age between one hundred and one hundred and twenty years, and falcons and ravens outlive one hundred and fifty years, but the little wrens live only two or three years. Of mammals, the whale and the elephant have the longest term of existence, living as they do over one hundred, perhaps to two hundred years. The horse lives twenty-five, but sometimes reaches forty years; the sheep and the goat twelve years; the lion from twenty to fifty years. Man, there is no reason to doubt, has lived long past the Psalmist's limit of threescore and ten, there being well-authenticated instances of his living over one hundred years; but it is only among highly civilized nations that satisfactory data can be obtained regarding his longevity. A minute investigation of the conditions that conduce to length of life, goes to support the theory that the longevity of animals is influenced by their amount of procreative power, and their ability to sustain wear and tear.

Distillation Temperature of the Oily Products of Coal.

The attention of our readers has been frequently directed to some one or another of the oily products of coal distillation.

The following table from Tissandier, giving the temperature in degrees Fah. at which the chief light and heavy oils distill will be useful for reference:

Light Oils	Amylène distills at	102°
	Benzine	187°
	Toluène	226°
	Xylène	271°
	Pyridine	302°
Heavy Oils	Cumène	304°
	Lutidine	311°
	Eupione	338°
	Cymène	347°
	Aniline	359°
	Carbolic acid	370°
	Naphthaline	422°
	Quinoléine	462°
	Anthracene	500°
	Chrysène	572°
	Pyrène	572°

Carpenters' Measurement of the Tunnage of a single-decked Vessel.—Multiply the length of the keel, the breadth of beam, and the depth of hold together, and divide the product by 95.

The Mechanics' Fair at Cincinnati, Ohio.

[Reported for the Scientific American.]

The Mechanics' Fair at Cincinnati, Ohio, which is just closing, is certainly as surprising and gratifying to Eastern as to Western eyes. Accustomed, as we are, to visit and record these things where time and geographical position have given great advantages, it is a matter for wonder that a comparatively new country should not only give evidence of capacity for production, but actually take the lead in many matters that we have fancied ourselves eminent in, and this not only in the handicrafts but in objects of art and in appeals to the more cultivated senses. Exquisitely elaborated rosewood furniture, cut glass, and silver abound; and in textile fabrics, household conveniences, and articles of a general character and utility, the most advanced ideas are represented. Eastern manufacturers who have looked upon the West as comparatively indifferent to anything but what is rude and serviceable, without regard to its artistic merit, would have their ideas greatly altered by a visit to this representation. It is no exaggeration to say that in general it is fully equal to any fair ever held in New York, with the single exception of the Crystal Palace exhibition. The ancient institution which has so long represented the inventors and exhibitors of the East will find very strong rivals in the Western cities if the exhibitions are characterized by the same spirit of energy and enterprise manifested in the Cincinnati Fair. With very few exceptions the articles exhibited are of Western origin, and the extent and variety are, as we have said, really remarkable.

This is no little display of a few mounds of soap, stoves, and quack medicines, such as can be seen in an hour's stroll along any city street, but a great mechanical uprising, if you will, where every one has contributed of his wares to render the Fair a success. Not to dilate unnecessarily upon this topic, we proceed to notice the most salient points in the machinery department.

The Steam Engines.

The staple trade of the Western country in this specialty is the portable engine, and the number annually made exceeds belief. If it is a matter for wonder what becomes of all the pins, it is perfectly astounding to consider what becomes of all the portable engines. Some six or eight different makers are represented here, and in many cases their productions are not merely "cast in the foundery and hove together" in technical phrase, but are thoroughly and honestly made with great attention to detail, first-class workmanship, economy, and power. It is no longer a matter of indifference whether a portable engine burns one cord of wood or twenty. As much fidelity to the interest of purchasers is shown by leading makers here, as in the East, where every pound of coal is counted. Said one manufacturer to us, "Many years ago, when I first began to make engines, it took two men to wheel wood to supply the boiler, and when I began to reduce this a little, and made engines to run on the sawdust alone, buyers laughed at me. Now, we have reached that pitch where it takes two men to wheel the sawdust away."

That this is not generally the case is true, and is only cited as evidence that portable engine boilers are not all so voracious as they are supposed to be.

Portable Engine, by John Cooper & Co., Mt. Vernon, Ohio.

This firm exhibit a portable engine unusually complete in its appointments, and fitted up as to the working parts with what we think needless nicety and detail. The best stationary engine practice is followed in proportion and design, and the object to furnish a strong machine that will not be easily deranged is happily attained. The mechanical reader will substantially understand the appearance of it when we say that the frame, guides, cylinder head, and main bearing are cast in one piece, so that it is absolutely impossible for them to get out of line; the cylinder, of course, being bolted directly to the head in the usual way. The bed-plate combines great stiffness with lightness, and the proportions of the valve and steam ports are designed in accordance with the best modern practice. The engine is supported on the boiler by two brackets at the side; the end which carries the main shaft bearing being keyed and bolted between two lugs, while the after or cylinder end is merely bolted, with slightly elongated holes to allow for expansion. In the boiler the tubes, and the water spaces between them, are both ample in dimensions, while the fire-boxes are unusually large in grate surface. They have also applied to the boiler an apparatus for purifying the water, which in the West is very injurious by reason of various mineral substances held in solution. The value of this attachment will be better understood when we say that in some localities, without it, boilers will not last two years. The exhaust nozzle is also much larger than is customary, so that the back pressure is reduced, and danger from fire by discharging sparks is lessened. A wire cloth bonnet is also applied to the smoke stack, though in some cases or positions, where it is not absolutely needed, we should regard this as a detriment, as it is well known that air alone, to say nothing of smoke, experiences great resistance in passing through interstices or meshes, consequently the tendency would be to reduce the draft. The valves are set to cut off at two thirds by lap.

An independent steam pump is applied to these engines, in most cases, which allows the engineer to supply the boiler without running the machinery.

Taken as a whole, this engine represents the efforts Western engineers are making to supply first-class work of good design and economical performance, and is a very great step in advance over the rude attempts of earlier years.

The many professional friends of Mr. Isaac V. Holmes, formerly constructing and superintending engineer of the now

defunct Novelty Works, New York, will perhaps be glad to know that he is devoting his energy and experience to this line of business with John Cooper & Co.

PORTABLE ENGINE OF GRIFFITHS & WEDGE, ZANESVILLE, OHIO.

In this machine, which is in the same class, we have a totally different type from the ordinary one. Mr. Wedge, who is an engineer of long experience and excellent mechanical ideas, has departed from the established routine sedulously followed, and designed an engine which has noticeably valuable features. No bed-plate surmounts the boiler, but at the smoke stack end the cylinder is placed vertically; the shaft bearings being carried in blocks on the shell of the boiler as usual, not, however, on the steam shell, but at the smoke-box end, so that no illegitimate strain is imparted. The cylinder end of the shaft has collars as usual, large and ample, while the outboard end is merely a common straight surface, so that it is at once apparent that the expansion to be accounted for takes place across the diameter of the boiler, and gives no anxiety.

The greatest departure, however, is noticed in the selection of the material for these engines. The cross-head, piston, piston-rod, and crank-pin, are made of steel. This insures not merely strength and lightness, but far sounder surfaces and greater uniformity in the wear than can be attained by any other metal. This involves greater cost in the construction, of course—the steel castings being worth alone twenty-five cents a pound against iron at five cents—but Mr. Wedge has not taken this step unadvisedly, and points to upwards of one hundred engines built recently, not one of which has broken down or given out from undue causes. The valves have peculiar features about them; the surfaces being cut away like a gridiron so as to reduce the wear on the faces and the power required to drive them; they are set to cut off at about five eighths of the stroke, and are claimed to be, not unjustly we think, practically indestructible, where decent care is taken.

A point of great value Mr. Wedge claims is made by inserting fusible plugs in the crown of the fire-box; he instances one case where a party had bad water, and, being deceived by the appearances in his tank, actually burned or melted out a plug every day for nearly a year! And it is claimed that with such a plug the boiler cannot be burst. The great object of these engineers has been to produce an engine that cannot be broken unless a man takes a sledge-hammer to it. Knowing full well the class of men who are of necessity called upon to run portables they have the parts as few and as strong as possible, and made of first-class materials, and as good workmanship as can be procured for money; further than this, by long experience they claim to have introduced an engine that will give better results than the average, and cite several cases where they materially reduced the quantity of coal burned.

We think their claims well put forth in this respect, and it is some promise for the future that we shall not always have the portable engines of the past. Too many makers suppose, and proceed upon the ground, that portable engines can be made by the lot and sold indiscriminately to all comers for whatever purpose, but that day has gone by, and competition has become so active that buyers will no longer be satisfied with hap-hazard work, valves with all kinds, or no lead at all, boilers that are simply big with no other value, or defects in construction hidden under all the colors of the rainbow.

We have purposely selected these two machines as most noticeable for the absence of the above features, and it is no more than justice that they should be made known.

SHARP, DAVIS & BONSALL, OF SALEM, OHIO—PORTABLE ENGINE.

This firm exhibit a neat and compact little engine, of vertical design, that is very symmetrical and well proportioned; the valve is driven by a return crank, which is slotted on the end so as to permit the motion to be changed to either forward or back, by simply shifting the stud to one side or the other.

THE STEAM PLOW.

Messrs. Standish & Coffin exhibit a steam plow which is, in principle, a traction engine carrying a series of rotating forks at the rear that cut up the soil in a most terrific manner. All the various requirements of a machine of this class appear to be provided for, and if a portion of the great weight could be reduced—it weighs nearly nine tuns—it would be still more useful. This is only the second machine of its kind however, and there is room for improvement.

Messrs. J. & E. Greenwald, of Cincinnati, exhibit a highly polished steam engine driving the machinery.

Messrs. Cope & Co. exhibit a compact and powerful little steam boiler-feeder, which is automatic in action, under perfect control, and possesses all the qualities needed in such an instrument.

LIME CATCHER.

Messrs. Stillwell, Bierce & Co., of Dayton, Ohio, exhibit a lime catcher, or purifier, which attains the end desired by passing the feed water in thin streams over highly-heated metallic surfaces, and subsequently filtering it at the bottom to remove mud, etc. It is claimed to perform its object in a satisfactory manner.

DRAWINGS.

Mr. F. Millward, mechanical engineer, exhibits some most excellent specimens of artistic drawing. There are not merely tinted or colored pictures, but are executed with the elaboration of a line engraving, and show great familiarity with the means by which the best effects are brought out.

BRASS WORK—SKILLFUL MOLDING.

F. Lunkenheimer, Cincinnati Brass Works, exhibits very fine specimens of his wares in check, globe, steam, and water valves generally. As an evidence of the skill of some person in his employ, there is shown a cup on the saucer with a spoon in the cup, all cast in one piece and at one time, showing no "fins" or marks where the flask joined, or the pattern parted; also a plate, knife, and fork cast in the same way, and a little cream pitcher, with a big belly, all cast in one piece, without core, yet exactly like the original crockery from which it was made. We were given to understand that this ingenious piece of handiwork is produced by baking the sand mold and afterwards carefully cutting it away and replacing it again similar to statuary work.

MACHINE TOOLS.

The Niles Tool Works exhibit a fine column drill, capable of many variations in direction, and very substantial in build; also a large horizontal lathe and boring mill of similar excellence.

Messrs. Pratt & Whitney, of Hartford, Conn., exhibit their famous tools, lathes, planers, shapers, etc., which were universally approved. Many Western builders examined them, and one was honest and candid enough to say that he had made and handled a good deal of machinery, but had never seen any but these that hadn't some bad work somewhere, but here he could not find any. *Verbum sap*—

Messrs. Lane & Bodley, of Cincinnati, exhibit a great variety of wood-working machinery of great utility.

REAPERS AND MOWERS.

The two specimens of mechanical skill on exhibition are truly remarkable. One of them is the World Reaper of E. Bell & Co., Canton, Ohio; the other, the Champion Mower of Whitely, Fassler & Kelly, Springfield, Ohio.

Some two years ago you animadverted pretty strongly upon the poverty of the workmanship in mowing machines, and said in general terms that they were a disgrace among machinery. So they were; but that day has disappeared, pretty much, and houses of any standing in the trade do honest work. But what do your readers say to a mowing and reaping machine constructed like a sewing machine? Most of them reply, "That is impossible." No; it is not impossible. The World Reaper is constructed upon literally the same plan as the best gun and sewing machine work. The gears are all cut—every gear, and the whole is contained in a cast iron bed hung between the wheels; the shoulders, bearings, bosses, and holes being drilled through "jigs," and all things generally so lovely in mechanical accuracy and eternal fitness as to challenge admiration. Remember this is not a sample made for the fair, but, except the superior ornamentation, all are made exactly similar.

The Champion Mower is made in the same way, except the cut gearing, and the splendors of burnished brass and steel work, to say nothing of landscapes by Teniers on the woodwork, fairly make a man wink. No less a steed than Pegasus should be yoked to this chariot, nor a meaner Jehu than Apollo, and both of them might be proud to sit on or drag it, though, to follow out the line, what these two would find to reap in their fiery course, except the whirlwind, it would be hard to say.

Great outlays for machinery and special tools have, of course, to be made, but the makers look for their appreciation in the far greater durability of such machinery over the loose and slovenly course usually pursued.

Finally and fairly we must give the Cincinnati Board of Trade, Chamber of Commerce, and Ohio Mechanical Institute the credit of having the champion fair of the country this year. By the side of that other in New York it shines like the deeds of the just; and so soon as another can be organized for another season let it be. Experience teaches some features can be improved upon, but we are very sure that the general verdict will be that all have been earnest and energetic in trying to make a creditable show of the manufactures of the West.

The Loss of the Captain.

Mr. Henry Bessemer has written a letter to the *London Times, apropos* of the loss of the Captain, proposing that turret ships with low freeboard should be fitted with an arrangement by which a heavy counter-weight could, when necessary, be lowered below the keel line, so as to give increased stability. Mr. Bessemer describes his plan as follows: "To effect this object, I propose to form a hollow channel or cavity, say of 50 ft. in length, by 3 ft. square, along the line of the keel, and into this cavity I would fit a mass of iron, its ends sharpened off so as to present fine lines to the water. This mass, when occupying the cavity, would fill it entirely, and the underside of the vessel would in consequence present precisely the ordinary appearance and contour of other vessels; this mass of iron would at all times act effectually as ballast, being in the most favorable position—viz., at a greater distance from the meta-center than any ballast inside the vessel could possibly be placed. This would be the ordinary condition of the vessel when steaming or under sail in moderate weather; the counterweight thus lying snugly in its recess is, however, capable of being at any moment lowered down some 10 ft. or 12 ft. For this purpose massive wrought-iron rams are attached to it at a point near to each end, and are capable of moving vertically in stout wrought-iron cylinders, extending from the keel upward to the lower deck, and there steadied by the floor beams, so that by means of a small hydraulic pump and valve in connection with these rams, the engineer could let down the weight, or reef it again snugly into its recess in one or two minutes with perfect ease, by the mere movement of the valve handle. A weight of 100 tuns or more, acting at a distance of some 10 ft. or 12 ft. below the keel, would more than restore the equilibrium which the inclined position of the vessel and the force of the wind would tend to destroy, and thus enable the vessel to ride out a gale with perfect safety. During the time that the ballast is unreefed it will add some 10 ft. or 12 ft. to the area of the midship section of the vessel, and so far will be a disadvantage in point of speed; but this would be of but little importance, as it would only be required on special occasions, and when steaming be always closely reefed up."

ENLARGING PHOTOGRAPHS.

Prof. Fowler, in the *Philadelphia Photographer* describes a process for producing enlarged photographs, without solar printing, which he thinks will be found good and useful. The small negative is made in the usual manner. He advises that the picture be taken with a long-focused lens at a long distance, only one principal object to be included in the view. From the negative print a transparency or positive upon glass. From this transparency make an enlarged negative in the usual manner, of any size desired. With the enlarged negatives print enlarged positives. The glass on which these positives are printed is to be rubbed over with white wax dissolved in ether, and polished with clean silk cloth.

A colorless collodion, made with ammonio-cadmium, is used. After the picture is fixed, while yet wet, it is toned for a moment with a dilute solution of chloride of gold, afterwards with bichloride of mercury. Wash the picture and let it dry.

The paper to receive the picture is prepared by floating on a solution of gelatin, ten grains to the ounce, and dried.

For use, float the paper on clean water, until it lies quite flat. Then draw it once through the water and drain. Now place it upon the collodion film of the picture, cover with blotting paper, place flat weights thereon, and let stand until dry. Then, by means of a knife, cut the edges of the collodion, and the picture may be raised from the glass, mounted on the paper.

THE question of cremation, or burning dead bodies instead of burying them, for a long time discussed, has again been mooted in respect to the victims of the war. A medical commission has been named in France to examine the subject. In ordinary graves, the natural decomposition of bodies produces deleterious gases, the injurious action of which is now admitted by all hygienists. The quicklime added in the large common trenches to hasten the destruction of bodies does not prevent the disengagement of infectious emanations from all these putrid corpses, and penetrating through the layer of earth which covers them. The business in hand is not to substitute in ordinary cases the funeral pile for interment, but to ascertain the amount of danger caused after a great battle to survivors by the inhumation of a great number of corpses with in a narrow space, and to inquire whether their combustion would not have great advantages.

DEATH OF PROFESSOR MILLER.—Our latest exchanges bring us news of the death of William Allen Miller, M.D., F.R.S., professor of chemistry in King's College, London, an accomplished scientist, author, investigator, and effective teacher. Dr. Miller died of apoplexy on the 30th ult., at Liverpool, whither he had gone to take part in the proceedings of the British Association. Born at Ipswich, on the 17th December, 1817, in his twenty-fourth year he became assistant to the late Mr. Daniell, professor of chemistry in King's College, London. He was the author of a celebrated and highly esteemed treatise on chemistry, and has contributed in various ways to the progress of science.

AMONG the most hopeful signs of Southern regeneration are the manufactories that have of late been springing up in nearly all the States. Among others, a large cottonmill is now being erected at Canton, Miss., and an extensive agricultural implement factory has been in active operation at Humboldt, Tenn., for some time past.

QUICK WORK.—At the new elevator of J. and E. Buckingham, Chicago, a few days ago, a vessel of 800 tuns burden was fully loaded with grain, 31,000 bushels, in sixty-five minutes. The machinery employed at this elevator is very perfect. Corliss engines are used. The main driving belt, of six-ply rubber is four feet wide, and cost over $3,000. The improvements in grain elevating machinery made within the past few years have greatly facilitated the handling of the grain crops.

The *Journal of Chemistry* says the name of the inventor of lucifer matches has been sought in vain. The man who first made "lucifer matches" in this country was the late Thomas Sanford, of Woodbridge, Conn., who might have been a millionaire, had he joined in an application for a patent, as solicited by other parties, which would have given them a monopoly of the manufacture.

TEST OF IRON AND STEEL BY THE MICROSCOPE.—Dr. Schott has subjected a large number of samples of iron and steel to microscopical examination, and gives as the result of his observations, that on the regularity and the smallness of the crystals of any specimen, depended the good properties of the metal. In the good qualities also the crystals were found placed very regularly near each other.

JOSEPH A. SABBATON, the eminent Gas Engineer of the Manhattan Gas Light Company, of New York city, died on the 13th inst., aged 45 years.

New Mechanical Movement.

Our readers who have given attention to the mechanical problems recently published and solved in this journal, will be interested in the study of a new movement patented by Daniel Zeigler, of Lewiston, Pa.

Fig. 1 is a perspective view of this device, and Fig. 2 is a vertical section.

A represents the frame within which is placed a fixed vertical wheel, B, provided with teeth around its entire inside circumference.

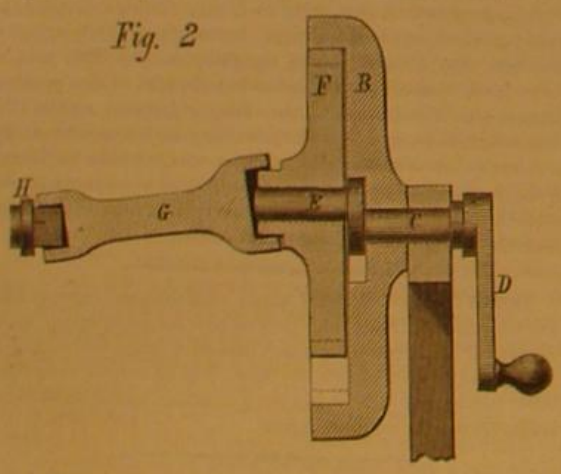
In suitable journal boxes on the frame is placed a shaft, C, provided with a crank, D, on its outer end, and having on its inner end a crank, the wrist, E, of which forms a journal for the spur wheel, F, the teeth of which are less in number than those on the fixed wheel, B.

It is now obvious that if the crank, D (for which, when desired, a pulley or spur gear may be substituted), is turned, the spur wheel, F, will revolve on the crank wrist, E. If the wheel, F, has one less cog than the fixed wheel, B, then F will be revolved a distance of one cog for every revolution of the crank, D; if F has two cogs less than B, then it will revolve a distance represented by two cogs, and so on. Applying the principle of virtual velocities to this movement it will be seen that the less difference there is in the number of teeth in the wheels, B and F, the more power there is gained.

The hub of the wheel, F, is made square and fits loosely in a square socket formed in the end of the connecting shaft, G, a similar joint connects the connecting shaft, G, with a shaft or windlass, H, which shaft may be made to propel another system of gearing similar to B and F. The number of series of such gearing, which can thus be connected, being practically unlimited, the power of the device may be multiplied to any extent consistent with strength of materials. By means of a proper connection, the shaft, H, could be made to turn a screw with almost irresistible force, and ways and means will suggest themselves to every mechanic, whereby the movement may be applied to presses, shears, punches, raising of buildings, pulling stumps, a substitute for the gearing on ordinary derricks and cranes for use on docks, and in building, etc. One great advantage of the device is, that the wheel, B, being fixed, the device cannot run back except by revolving the crank, D; thus holding a weight at any point of its ascent, and obviating the necessity of pawls or brakes for this purpose.

There being always a number of teeth in the wheel, F, meshed in the teeth of the wheel, B, it is not necessary to make these wheels of very great weight in order to get the requisite strength. The inventor states that with a crank

Fig. 2



provided with this movement, in which the wheel, B, is only nine inches in diameter, he is able to raise three tuns with ease.

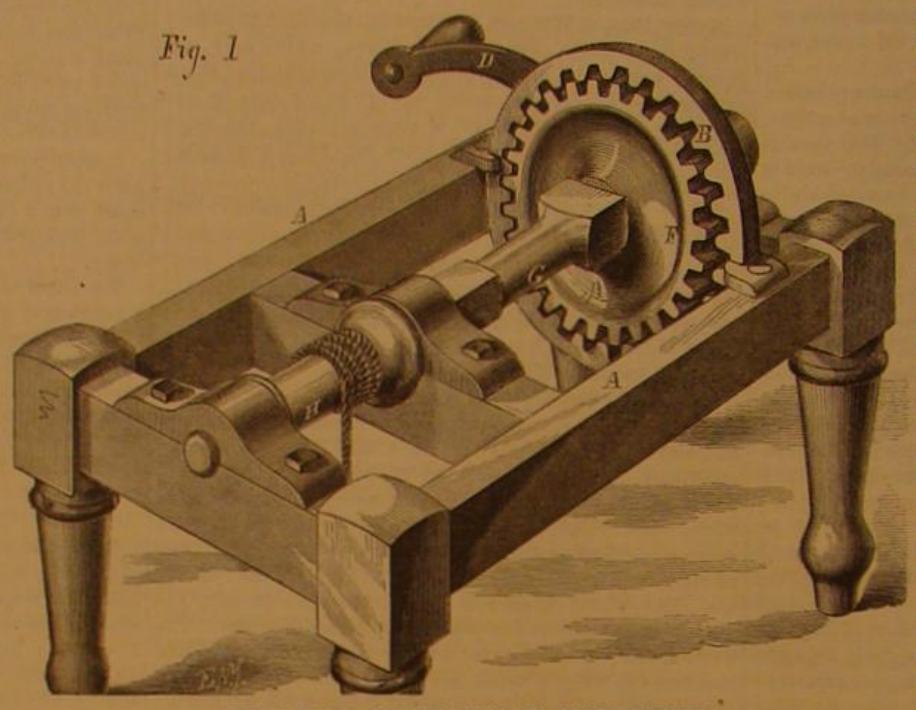
Some considerable effort has been made to solve the problem how to make one wheel revolve around a fixed wheel, and make but one revolution in so doing. This movement solves the problem when the wheel, F, has only half the number of teeth in the wheel, B.

Patented, Sept. 13, 1870, by Daniel Zeigler, of Lewiston, Pa. Address as above for further information.

The Future of Telegraphy.

The rapid progress of the telegraph during the last twenty-five years has changed the whole social and commercial systems of the world. Its advantages and capabilities were so evident that immediately upon its introduction, and the demonstration of its true character, the most active efforts were made to secure them for every community which desired to keep pace with the advances of modern times. Crude and defective as were its first methods, it was found to be indispensable. As a consequence lines were rapidly constructed which of course almost as rapidly fell into decay. The Morse or signal system seemed for a time to be the perfection of human achievement, until Professor Royal E. House astonished the world with his letter printing telegraph. This has since been superseded by improved instruments, but Professor House, if reaping but little pecuniary reward, has immortalized his name as the first inventor of the printing telegraph. For years communication with distant countries was believed to be barred by the waters which rolled between them, until, in 1856, a few persistent capitalists and electricians demonstrated the practicability of ocean cable telegraphy. This was done against the most conclusive practical and scientific demonstrations of its impracticability. The triumph of those who, against all delays and discouragements, had carried through this enterprise, was great; and it is a satisfaction to know that they have also reaped a reasonable pecuniary reward for their enterprise.

Now, almost every considerable expanse of water is traversed, or soon will be, by the slender cords which bind continents and islands together, and practically bring the human race into one great family. During these years inventors and inventive genius have been busy in devising the best methods of rendering effective this greatest of modern developments.



ZEIGLER'S MECHANICAL MOVEMENT.

There seems to be practically no limit to the possibilities of this mode of communication. Already the transmission, rapid as it has become, is found too slow, and many active and ingenious minds are at work upon the solution of the problem how the speed of the telegraph can be increased, its cost reduced, and brought within the means of even the poorest of the people.

Wonderful as has been the progress already made, the future promises equally astonishing developments. Never has there been so intense and general devotion of practical and scientific minds to this subject.—*Telegrapher.*

Enameling Slate.

By this process are produced imitations of the rarest marbles at a tithe of their cost. The substance thus produced is not only cheaper than marble, but bears a much more brilliant and permanent polish than stone will, while it has for its base a mineral infinitely stronger and more durable. The process of enameling is interesting, though very simple. It is performed either by "dipping," "splashing," or by splashing and sponging combined, and some of the more elaborate patterns by hand-graining. The colors are applied by either of these methods, and the slab is then placed in an oven or heated chamber, the temperature of which is maintained at from 130° to 250°, according to the size and thickness of the slab. In this oven it remains for a period determined by the size of the slate, generally averaging twenty-four hours. It is then withdrawn, and a coating of specially prepared enamel applied. Again it goes into the oven, emerging from thence to be vigorously pumiced to reduce all inequalities of surface This process of baking and pumicing is repeated, with some variations, three times more, and the slab is then in a condition fit for polishing. The polishing process is formed, firstly, with woolen cloths and fine sand; next, with French merino, the finest and softest that can be obtained; and finally with the hand and powdered rotten-stone.

By the processes thus hastily described, the most elaborate marbles and stones can be imitated. Specimens of Egyptian green, Lumachelle, and S. Ann's marbles, Pyrenees green, Swedish and purple porphyries, all kinds of granites, malachite, and lapis lazuli, have been so well finished as scarcely to be distinguished from the costly originals. Architect's original designs can also be executed in inlays of any pattern.

The enameled slates are principally used for chimney-pieces. They are largely in demand for facias, consoles, table tops, etc., for which their fine and durable polish well fits them.

Temperature of the Sun's Atmosphere and its Internal Molten Mass.

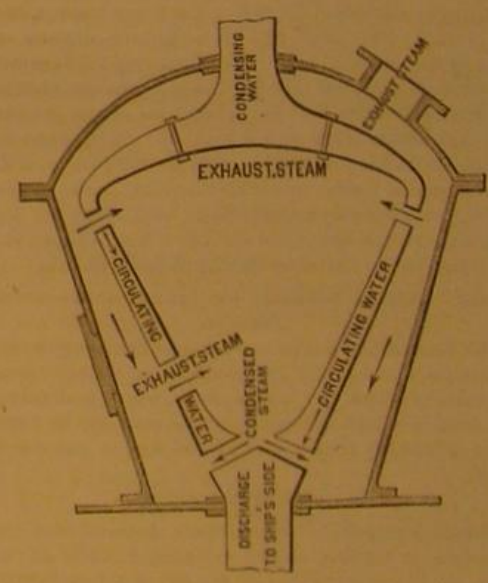
Professor Roscoe stated in the address lately delivered before the British Association that, in the opinion of Zöllner, the hydrogen which mainly composes the red flames that shoot forth with such extraordinary rapidity from the sun's surface, must have been confined under great pressure by a layer of liquid.

The difference of pressure required to produce an explosion sufficient to cause a prominence to rise 3·0 minutes, was calculated to be 4,070,000 atmospheres. This pressure is attained at a depth of 139 geographical miles under the sun's surface, or at that of 1-658th part of its semi-diameter. In order to produce this enormous pressure the difference in temperature between the inclosed hydrogen and that existing in the solar atmosphere amounts to 74,910° Cent. Zöllner also calculates the approximate absolute temperature of the sun's atmosphere to be 27,700° Cent.—a temperature about eight times as high as the oxyhydrogen flame and one in which iron must exist in a permanently gaseous form.

CONICAL SURFACE CONDENSER.

A short abstract of a paper presented to the North of England Institute of Mining and Mechanical Engineers and Shipbuilders in Scotland, by Mr. Henderson, will be of interest to our readers:

"I consider this condenser to be much simpler in construction and more effective than the one in present use, by reason of its shape, as the whole jet of exhaust steam is brought to impinge instantaneously upon a large and unbroken surface, which causes immediate condensation; whereas, with the tubular surface a very small portion of it is brought into immediate contact until the steam has passed down through the tubes, thus prolonging the process of condensation; hence the great quantity of surface required to cool the escaping steam to the necessary temperature. I have had this condenser constructed along with a tubular one—the cone representing 3 feet surface, and the tubular 15 feet—and have compared their respective efficiency, every other condition being kept alike for these models. After six different trials had been made, and an average of the results struck, I found that 1 foot of surface in the cone condenser was equal to 3½ feet of the tubular one. I have also had a trial of the cone condenser on board of a steamer with engines on the compound principle, 24 inches and 48 inches diameter. The top of cone was 5½ feet diameter, and the bottom 16 inches, length over all 5 feet. With this condenser a vacuum was formed at once, and got up rapidly to 52 inches, the engine working for fully 30 minutes. After that time the condenser got very hot. The engines, partly on that account, had to be stopped, but particularly on account of the unsatisfactory working of the circulating pump. The space in the inner vessel for the circulating water being small, every stroke of the pump causes almost a clean wash out, thus keeping the crown always cool, that being the place where all the work is done.



"With a condenser on this principle a great saving of original cost is effected, and it is much more easily overhauled, as by taking off the door at any time the whole condenser can be examined in two hours; whereas at present when the tubular condenser requires to be cleaned it takes from three to four days, and in many cases a fortnight. Again, the risk of leakage is greatly lessened from the very few joints in the cone condenser, these being only seven in number; whereas the tubular condenser contains many hundreds. The description given shows a few advantages in favor of the cone condenser, and I doubt not many more advantages will yet be discovered, and thus the construction of the marine engine greatly simplified."

The anthracite coal deposits of Pennsylvania underlie four hundred and seventy square miles of mountain and valley. More than forty million dollars have been absorbed in mining capital, about the same sum in canals, and seventy millions in railroads, constructed almost solely as a means of transportation for coal. Sixteen million tuns were sent to market during the past year.

Is placing Cherbourg in a state of defense, its mole has been armed with guns of long range; the entrances east and west are closed by *torpilles* charged with picrate of potassa, and united with one another by electric wire, so that they can be set fire to at the proper time.

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To Advertisers.

The circulation of the SCIENTIFIC AMERICAN is from 25,000 to 30,000 copies per week larger than any other journal of the same class in the world. Indeed, there are but few papers whose weekly circulation equals that of the SCIENTIFIC AMERICAN, which establishes the fact now generally well known, that this journal is one of the very best advertising mediums of the country.

To Inventors.

For twenty-five years the proprietors of this journal have occupied the leading position of Solicitors of American and European Patents. Inventors who contemplate taking out patents should send for the new Pamphlet of Patent Law and Instructions, for 1870.

CENTRAL SHAFT---HOOSAC TUNNEL.

At last, after years of toil, and at a cost of close upon half a million of dollars, the great central shaft of the Hoosac has reached the grade of the tunnel—1,030 feet below the natural surface. This shaft is elliptical, the transverse diameter being 27 feet, and the conjugate 15 feet, passing the entire depth through a compact mica-slate formation intermixed at intervals with white quartz. At the commencement of the present contract with the Messrs. Shanly, there required to be done 447 feet. This has been accomplished since June 1, 1869—say in 15 months—giving a monthly average of 29·8 feet. The largest month's work was 38 feet. At intervals of about 18 feet are floors of heavy timbers, supported by "hitches" cut in the rock, connected by ladders, in case of accident to the hoisting apparatus, and forming supports for the wooden "guides," in which the crosshead travels, under which is suspended the boiler-plate iron bucket of a capacity of about 400 gallons. The work has been impeded slightly by water, of which the shaft makes nearly three inches per hour. To raise this water, an engine of 60-horse power is constantly working, pumping all the water which collects as far down as 650 feet, caught in tanks by sloping "drip roofs." Below this, the water on the bottom has been hoisted in the iron bucket, a bucketful being sent up by the miners whenever the quantity became inconvenient. Now, the shaft being at grade, a "sump" will be sunk, and a water bucket with bottom valve used, thus avoiding the tedious task of bailing into the bucket by hand.

Workmen are now employed trimming the sides of the shaft, and preparing the "guides" for a wooden cage to be substituted for the bucket so soon as the "headings," east and west, at the bottom, are sufficiently advanced to use rock cars, when the rock will be raised to the top direct from the headings, cars and all.

The shaft being at grade necessitates, probably, the most delicate and responsible professional act an engineer may ever expect to meet, it being necessary to lay down a line less than 27 feet in length at the bottom of a dripping dark shaft 1,030 feet deep, so that both ends of the line being produced shall coincide with the terminal points of the tunnel, each being distant over 12,000 feet from the center of the shaft. To increase the initial difficulty, the top of the shaft is on the summit of a rugged mountain, from 1,500 to 1,800 feet above the grade of the tunnel at its termini. It is no light responsibility to assume charge of this operation. The State of Massachusetts has had manufactured a colossal transit instrument, of the most elaborate and perfect construction, costing $3,000. The most accurately verified lines have been laid down over the mountain, extending long distances beyond in both directions to the tops of neighboring mountains. By the accuracy of this instrument and its manipulation, the line of 27 feet (the transverse diameter of the shaft) will be permanently defined, requiring wonderful exactness, and from its extremities the "plummet" alone can reach the bottom of the shaft. These plummets must of necessity be weighty and beautifully poised, and will require to be suspended in oil to produce perfect rest and protection from the faintest vibration of the air. The most delicate cords, consistent with strength, must be used to suspend them, and after all is done that science can suggest (being perfect as to theory) any intelligent mind can understand how delicate and fraught with danger is the practical part of the operation to the engineer, and what grave effects the slightest error would produce on so small a base as 27 feet. It is quite possible the motion of the earth may effect the plummets more or less; but this point has not yet been thoroughly investigated.

The details of working in this shaft, and otherwise about the tunnel generally, would require a series of articles, but the above remarks may be of some interest, and suggest the difficulty last noted, giving civil engineers something to think over.

MEASUREMENT OF WATER FLOWING THROUGH PIPES---WATER METERS.

Measurement of water flowing through pipes, under any and all circumstances of position, pressure, and velocity, has, perhaps, more difficulties than any other with which the modern mechanic can grapple; notwithstanding which there will come a time when water meters will be brought largely into use, perfected, it may be by future effort, or imperfect, as the case may be. There exist to day, cheap water meters, sufficiently perfect to warrant their adoption until such time as the better one shall arrive. We propose in the present article to give a brief summary of the ways in which inventors have sought to measure flowing water, with some of the prominent and in most cases radical defects of each class of devices.

A water meter must be, in all cases, except where the flow is from the extremity of a pipe or channel into the open air—a water motor also. When a stream flows freely into a measuring can, the can is strictly speaking a meter or measuring instrument, and is the simplest of all instruments yet employed for the purpose; but it requires the constant attention of an attendant, to stop the flow when the measuring vessel is full, to empty the measure, and to start the flow again when the vessel has been emptied.

The next step in advance, is to make the measuring vessel work automatically to empty itself when full. Several ways to accomplish this have been employed. Valves operated by floats, springs, or weights, and siphons, are some of the means employed; but a more practical method is the use of an oscillating movement in a vessel divided into two chambers by a thin partition wall, and pivoted below its center of gravity. This construction throws the center of gravity alternately on opposite sides of the pivot, where it remains until changed by the influx of water. Isochronic oscillations will take place with this device when the flow is uniform, each oscillation bringing the full chamber into a position to discharge its load of fluid.

A small over-shot water-wheel with journals resting in a bifurcated scale beam, counterpoised at the opposite end, has also been employed; the wheel being provided with a stop for each bucket, so that it is held in position until the wheel is so weighted that it lifts the counterpoise and is released from the stop, when it makes a partial rotation and brings another bucket under the stream.

A bucket wheel having a friction brake of uniform resisting power has also been used.

All of these devices are generally provided with a counting or registering apparatus to indicate the quantity of flow, similar to that employed in gas meters. But they are all open to the objection that unless the flow be perfectly uniform, an error in their record creeps in while the position of the instrument is changing. We have seen one oscillating meter that obviated this error by the use of a second smaller bucket oscillator, which received the stream while the principal one was turning on its pivots, and discharged its accumulation into the empty bucket, as soon as the change was made. This reduced the error to so small an amount that it remained of no practical importance.

These meters are only useful where the flow is to be measured from a discharge at a single point. They cannot be placed so that one meter may measure the separate or united discharge from cocks placed at a distance from each other but supplied from a common service pipe.

The problem has, therefore come to include the production of a meter that can be placed in the service pipe itself.

The cylinder of a steam engine with its piston, made to contain a definite amount of fluid, has naturally suggested itself to inventors as a means to reach the desired end, and attempts to modify it that it would meet the requirements of the case have originated a large number of piston meters.

We know of but one of these that has been much used in this country. In England and Scotland, several varieties have been to some extent employed, but all meters of this class are open to objection on the grounds that they are generally expensive, that the reciprocating motion of the pistons absorb much of the force of the flow, the proportion of this absorption increasing with the increase of the number of strokes, and, lastly, that they are very difficult to construct so as to remain free from leakage. Leakage takes place in all such meters more rapidly when the flow through the discharge pipe is stopped, as the meter then feels the full pressure of the water. The leakage, if it occur, being constant, a very large loss may be sustained in this way. Of a number of piston meters we once saw tested at the Croton pipe yard in this city, not one was free from this fault.

The absorption of power by the reciprocation of the plunger in piston meters, has led to the substitution of a light diaphragm for the plunger, and to get rid of the leakage from stuffing boxes, many diaphragm meters employ internal tripping springs or weights to work the valves. We have, however, never seen a meter of this kind that promised or performed well in all respects. We have, however, seen a diaphragm meter, which had an exterior tripping device worked by a rotating motion from a rod communicating with the interior, which did good work, at least while submitted to our inspection. Leakage from the aperture through which the rod passed was prevented by a peculiar construction which obviated the necessity for a stuffing box.

Another family of meters, very few of which have any claim to merit, employ the method of leading out through an aperture a minute portion of the liquid and measuring that portion by a small apparatus, generally of the oscillating kind. The aperture through which the flow to be measured takes place being made geometrically similar to that through which the general flow proceeds, the amount discharged through the smaller aperture will be to the amount discharged through the larger inversely as the squares of their diameters, provided the forward and back pressures are the same at both.

We have never seen but one meter of this kind that secured this last condition. This small hole is, moreover, liable to become choked on many meters of this kind, and so destroy the geometrical similarity of the apertures.

We saw in one of our late English exchanges, a notice of a pump which consisted of a flexible tube compressed by rollers placed at the ends of the radial arms of a rotating wheel. This device was spoken of as new and novel, yet we saw the same thing three years since at a test of water meters made by the Croton Department of this city. It was, however, used as a meter, the flow through the flexible pipe moving the roller wheel which drove a registering apparatus.

Nearly all the meters ever invented, may be referred to one or other of the classes included in this summary.

There is one, however, which, though impracticable, is, on account of the peculiar principle adopted, worthy of notice.

It consists of an air chamber into which the flow takes place through a rose, placed nearly at the top of the chamber and in the end of the supply pipe, led through the bottom of the chamber. The discharge pipe issues from the bottom of the air bulb, parallel and close to the supply pipe. A third pipe also issues from the bottom of the bulb, on the opposite side of the supply pipe, and in the same manner, but opening immediately into the air. Neither of the latter pipes extend above the bottom of the bulb on the inside. A small tap at the top of the bulb, serves to admit air when requisite. Water flowing into the bulb, gradually absorbs the air and carries it away through the discharge pipe, while water remains in the bulb to supply the place of the air which has been removed. When the water has risen to a certain level in the bulb, it operates a float which trips a valve and shuts off the flow. A cock passing through the three pipes has then to be turned, when the main discharge pipe is shut off, as is also the supply pipe, and the short eduction pipe is opened, the cock being made to effect this result. The air tap at the top of the bulb being then opened, the water flows out and air again fills the bulb. A registering apparatus marking the number of times the three-way cock has been turned, indicates the amount of water that has passed through the meter.

This meter will work with great accuracy under uniform pressure and temperature, requiring no more trouble in attendance than a common wet gas meter, but uniform temperature and pressure in water flowing through pipes is not to be found.

Our readers may, from this summary, be able to gather the principal methods by which the measurement of moving fluids in pipes has been sought, as well as to gain some idea of the difficulties of the problem. The difficulties arise chiefly from the varying pressure and rate of flow, necessitating both great strength and great delicacy, two things which are hard to combine in machines to be worked by so elastic and intractable a fluid as water. There are besides, practical conditions of durability, etc., which are hard to secure in parts which work in water containing more or less mineral and organic matter.

CHEMISTRY AT THE FAIR OF THE AMERICAN INSTITUTE.

The number of titles entered in the catalogue of the Fair of the American Institute for this year, in the department of chemistry and minerology is 166, but this list represents a very small proportion of the articles exhibited that really owe their inception to the science of chemistry.

We shall, therefore, feel at liberty to speak of some articles not classified by the judges as belonging to this group, while making the round of the building.

The display of oils made by the Downer Oil Company, of Boston, is remarkably fine. The kerosene oil prepared by them is the product of fractional distillation made at a different degree from that followed in the old method, and possessing a higher specific gravity. Kerosene oil prepared in this way is quite as safe as sperm oil or rape seed, and, if it be thoroughly freed from the chemicals employed in its purification so as not to crust the wick, leaves nothing further to be desired as an illuminating oil. The flashing point of the Downer oil is so high that there can be no possibility of its igniting until it has been heated for the purpose. It requires a peculiarly constructed lamp to burn this oil, as it smokes with the burner used for the ordinary brands. The yield of an oil with so high a specific gravity must be small as compared with the products of distillation obtained from petroleum under the old system, and it can hardly come into competition with the refined petroleum for sale everywhere, but for those who can pay for it and desire a safe article there is nothing better in the market. It is a pity, however, that all petroleum could not be made as safe as the Downer oil, by

the removal of all the naphtha, so as to guard the community from the fearful accidents that have been occasioned by the carelessness and cupidity of manufacturers.

The paraffine from the Boston works is as pure as wax, and suggests the numerous uses to which that valuable article is now applied. We remember in the Paris Exhibtion, of 1855, a small sample of this substance, but at that time no one knew what it was, nor anticipated the important uses in store for it. In looking about the New York exhibition of the present day, we find paraffine used as a substitute for wax on matches, as an acid proof luting, for stoppers to bottles, in photographic operations, for the preservation of meats, and in the manufacture of candles; and the number of persons who have heard of it and understand its value has increased since 1855 directly in proportion to its uses.

The chemicals exhibited by Charles T. White & Co., are of extraordinary purity, and deserve unqualified encomiums. We have been so long dependent upon Europe for our pure chemicals that we hail with satisfaction the appearance of a firm that will emancipate us from this thraldom.

The sulphate of morphia, on exhibition, closely resembles the best Irish calcined magnesia. It is in large cakes, and the money value of the lot cannot fall short of $500. The salt is manifestly prepared with great care, and cannot be surpassed in purity and beauty of appearance.

Another alkaloid, strychnine, made into pure white crystals from the imported *nux vomica*, is in such quantities as to occasion just fears that some one might be tempted to break the vessel containing it for the purpose of making an improper use of the poison. We were struck with the pure white color of this preparation, and were informed that it was extensively used by trappers and hunters in the West, for killing wild animals. The action of strychnine upon the lower animals is such as to suggest a method of detecting it in cases of suspected poison. A frog in a tub of water containing scarcely more than a grain of strychnine, is at once thrown into violent convulsions, and plunges frantically about in the water. This is said to be the best test for strychnine.

The iodide and bromide of potassium were beautifully crystallized, and quite equal to the best German preparation.

We have not space to mention separately all the chemicals exposed by this firm, and can only express the gratification an exhibition of this kind affords us.

In our last number we gave an account of the mechanical construction of the Carré ice machine. The one on exhibition can freeze a large number of cakes of ice, 26 inches long, 9 inches wide, and 3 inches thick, which are easily removed from the molds, and, on being moistened with water and placed in a pile, will produce solid blocks of ice of any desired dimensions. It has been shown that ice prepared in this way will keep much longer than the natural production of our ponds. The principle upon which the Carré machine works is a chemical one, and is founded on the condensation of gases, originally discovered by Faraday. It requires much less power than the inventions by compressed air, ether engines, carbonic acid, sulphurous acid, or protoxide of nitrogen. It also has a great security against fire, as in case of accident, a small quantity of ammonia would serve to extinquish the flames. Theoretically, the same quantity of ammonia can be used indefinitely; but practically, owing to leakage and other causes, there is a loss that must be replaced. The agent employed by Carré is ammonia, and there was evidently no leakage in the machine, as the odor of the alkali would have betrayed it. The value of a cheap method of refrigeration is not limited to the production of ice. It has extensive application in the arts, to prevent the fermentation of the mash of malt, to improve the quality of wines by cold, to facilitate the transportation of animal food by means of refrigerating cars, to crystallize many salts by cold, to secure the better ventilation of churches, theaters, and private houses, to prevent the loss of cane sugar, and for many other purposes.

It would have been interesting to have had the use of ammonia as a motive power exhibited by the side of the ice machine, as it is claimed that with twenty pounds of liquefied ammonia, a force equal to one-horse power can be maintained for an hour. According to experiments made in Paris, a fifteen-horse power steam engine, working four hours, consumed two hundred and forty-seven kilogrammes of fuel, while the ammonia engine, working four hours and eighteen minutes, did not consume more than one hundred and seven kilogrammes. The saving was, therefore, about 60 per cent. If this be true, then the machinery for converting the ammonia into a liquid ought to be driven by an ammonia engine.

Photographing by means of magnesium light was extensively carried on at night by the use of a clock-work, devised for that purpose, by G. K. Proctor, of Salem, Massachusetts. The metallic ribbon is fed uniformly into the flames, and the light is kept up steadily as long as the operator may desire. Now that there is a prospect of our being able to make magnesium so as to sell it for the price per pound at present asked for an ounce, we shall doubtless find many new and interesting applications for this metal.

There is the usual variety of baking powders, some of which are less active poisons than the strychnine mentioned above, but not less certain in their subtile action if we give them time to perform their work. The cost of potash has compelled manufacturers to have recourse to salts of soda; and there is no longer any carbonate of potash sold under the name of saleratus, but carbonate of soda is substituted in its place. This is fortunate for the consumer, as potash is downright poison, and ought to be banished from the kitchen. Too much praise cannot be accorded to the bread preparation of Professor Horsford. It restores to flour its nourishing properties, and gives to the system just the elements of phosphorus and lime that we require for growth and strength.

The case of mineral specimens exhibited by the School of Mines, of Columbia College, is much admired and studied by persons anxious to obtain a knowledge of American minerals. A few of the specimens could not be excelled by any minerals to be found in European cabinets. We must reserve the soaps and soda water, extracts and liquors, and numerous other chemical compounds for future consideration.

SCIENTIFIC INTELLIGENCE.

COMBINATION OF SULPHUR WITH SELENIUM.

By fusing sulphur and selenium we obtain crystalline products; on treating these with bisulphide of carbon we have a series of new compounds. Two equivalents of sulphur fused with one equivalent of selenium, and the product maintained for five hours at a temperature of 212° F., yields a crystalline mass. If this be reduced to powder and dissolved in bisulphide of carbon, and the solution evaporated, various sulphides appear, having the formula—

$$Se^2S^5,\ Se^7S^{10},\ SeS^5.$$

With one equivalent of selenium and three of sulphur beautiful prisms of the color of bichromate of potash are produced. None of these compounds are permanent, and they cannot be purified by re-crystallization in bisulphide of carbon.

COMBINATIONS OF IRON AND HYDROGEN.

Professor Jacobi, of Russia, has succeeded in depositing pure iron by means of the galvanic battery, and of manufacturing numerous articles out of it. But this supposed pure iron on being placed under the receiver of an air pump, and heated to redness disengages torrents of hydrogen, *increases* in volume, and changes into a silver white metal, very malleable and ductile, and so soft that it can be easily cut with scissors. Iron prepared in this way oxidizes rapidly in the air, and decomposes water below the boiling point. All deposits of iron by the battery are rich in hydrogen, and what is very remarkable, their volume is less than that of pure iron. This is just the opposite of what takes place when palladium is charged with hydrogen. It would appear from these facts that hydrogen combines directly with iron the same as carbon, and that hydrogen increases the hardness and density of iron, while it diminishes the malleability and oxidation.

Professor Jacobi has succeeded for the first time in making pure iron, and we can now study its properties. What was hitherto supposed to be the pure metal was a compound.

NEW TEST FOR ALBUMEN IN THE URINE.

Take a mixture of equal measures of acetic acid and phenic (carbolic) acid, and make the preliminary test that water produces no cloudiness in it, and add acid if necessary, until water has no effect. The normal solution is then ready for use, and will then give the reaction for albumen, diluted by 15,000 parts water, whereas nitric acid shows no results beyond 8,000.

LYCEUM OF NATURAL HISTORY.

At the meeting of the Lyceum on Monday evening Professor Seely read an interesting paper on the volatile liquids, suitable for ice machines.

He stated that carbonic acid and protoxide of nitrogen required too powerful engines and too much machinery for their condensation to be applicable for the manufacture of ice. Ammonia needs the best of packing to prevent the escape of the gas. The learned Professor exhibited a table showing the curvature of pressure of a large class of volatile liquids, which would be of value in the study of this subject, and ought to be published.

Mr. Loew recounted some experiments tending to prove the existence of a new modification of oxygen, which was either antozone or a similar body. Some of the members of the society took strong ground that there was no such thing as antozone, while others maintained the opposite theory; and thus the doctors agreed to disagree.

Professor Wurtz made an interesting exposition of his theory of the migration of silica throughout the kingdom of life. We recently alluded to the new chemical relations of silica, and gave the substance of Professor Wurtz opinions on the subject. When the topic comes up for discussion in the society, we shall allot more space to a report of the proceedings.

Professor Henry Morton exhibited some sun photographs, taken by Professor Young, of Dartmouth College, by means of a battery of fifteen prisms. The effects are the same as were obtained at the time of the total eclipse of the sun.

FAIR OF THE AMERICAN INSTITUTE.

MECHANICAL.

The present article will close our regular notices of the mechanical and miscellaneous exhibits at the Fair of the American Institute. The reader will find in another column an article on the Chemical Department.

A very ingenious and useful device for refitting valves on steam and water pipes and steam boilers, without disconnecting them, is exhibited by C. F. Hall & Sons, 65 Murray street, New York. By its use valves can be accurately repaired without the use of emery, and in a very much shorter time. It consists of a spindle running in a guide which screws into the thread which holds the stuffing-box, the latter having been removed, and the place of the valve spindle being supplied with a milling tool, which accurately re-cuts the valve seat to the required taper. The valve is then fitted to the same size by centering the spindle at the end opposite the valve, and placing it in a small milling machine, having at one end a spindle and center which fits the center of the valve-stem opposite the valve, and having at the other end a fixed hollow conical milling tool on a line with the spindle. The spindle is made to force the valve into the milling tool, and, the valve being turned by the hand-wheel on its spindle, is rapidly cut to the required form and truth of taper. When large valves are operated upon, the valve and stem are revolved by a winch attached to the center spindle, and a dog, as in the engine lathe, at the same time it is fed up to the work by a feed screw.

The Washburn machine shop connected with the Free Institute of Industrial Science at Worcester, Mass., exhibits a 16-in. engine lathe, with 8-ft. bed, and a 9-in. speed lathe, with 4-ft. bed, which are very highly finished and admirably designed tools. These tools merit the attention of visitors, not only from their intrinsic merit, but as an earnest of the institution with which the shop is connected.

In connection with lathes are also shown an adjustable draftsman's stands designed to meet the demand of draftsmen and artisans generally, who for a long time have felt the need of a table which can be readily and conveniently adjusted to any hight and inclination, easily turned to bring either side of the work in front, and at the same time be substantial, elegant, and cheap. It is made mostly of iron, mounted on casters, and its tasteful appearance makes it equally desirable in any office, counting room, library, or sitting room.

A case of the "Young America" skates, exhibited by M. Kinsey, 95 Bank st., Newark, N. J., is worthy of notice from all those interested in the delightful exercise of skating, or in the manufacture and sale of skates as a business. These skates are simple in construction, hold fast when put on, and are very quickly attached. There are no straps to interfere with the circulation or to hurt tender feet.

A plate of steel is fastened to the boot heel, having an oval hole in the center into which the spur in the heel of the skate buttons, the spur being inserted by placing the skate at right angles with the foot, putting in the spur, and then buttoning it by turning the skate into its normal position. This done, the skate is secured by pressing home two clamping blades or plates of steel, operated by lever cams, which grip the edge of the sole, and firmly secure the skate. The clamping plates are easily adjusted to fit the width of the sole. These skates are a highly-finished and attracting exhibit.

A portable bath is shown by H. N. Taft, 37 Park Row, New York city, which is an ornamental and convenient addition to household furniture, especially where the modern improvements in houses are not available. It may even be used as an adjunct to the modern improved bath to great advantage, as the Russian or Turkish bath may practically be taken in it.

This bath is suspended from a hook in the ceiling of any room, by means of a cord and pulley. It is lowered to the floor, for use, and raised to the ceiling when not in use, where it is entirely out of the way.

A cloth screen is attached to a water-tight pan at the bottom, and a water basin at the top. This basin is lowered for introducing either cold water or warm water for a shower bath. The entrance is the same as to a tent. A valve is raised by pulling an inside cord, when the shower or spray descends, and a bath may be enjoyed without wetting the carpet with a drop of water.

In using this bath it is not necesary to step into a colder atmosphere with a wet skin after bathing, as the body can be wiped dry before leaving it, thus avoiding the chill and frequent colds contracted when leaving the ordinary bath. But the facilities afforded for shower bathing are only incidental to the main object in view, which is to afford to every family facilities for hot air and steam bathing. By means of a spirit lamp and a small heating apparatus, which accompany every bath, the temperature of the air in the bath is raised to 130 degrees in a few minutes, or steam is generated if a steam or medicated vapor bath is preferred. This bath collapses in lowering upon the floor as well as in raising. When lowered, the basin is attached to the bottom, and both are raised together. When collapsed, the screen cloth folds into the pan in the most compact manner. The bath weighs less than twenty pounds, and may be packed in a box of ten by thirty inches in size.

In concluding these mechanical notices, we may say that the Fair has proved more interesting than it promised during the first two weeks. The attendance has been large, and we judge it has been a financial success. The building in which it is held is probably the best in the city for the purpose, and though too remote from the business center, is perhaps, all things considered, pretty well located to accommodate the mass of the people who visit. We are informed the exhibition will be closed the 2d of November.

Around the World.

On Monday evening, the 17th inst., Rev. Dr. E. D. G. Prime of the New York *Observer* by invitation of the New York Association for the Advancement of Science and Art, delivered a lecture at the Y. M. C. Association building, on his journey "Around the World, telling what is to be seen; how to go; what it costs, etc."

The lecturer pointed out the route on a large map of the world, selected the most striking scenes in the journey, and graphically described the characteristics of various countries and peoples, enlivening the way with amusing incidents of travel by land and sea.

The audience was a very large one, and many were obliged to go away for want of standing room. The lecture was replete with interest to all who were privileged to listen to it, and a resolution was passed unanimously requesting the learned doctor to repeat the effort in a larger place.

[Our Special Correspondence.]

LETTERS FROM THE SOUTH.

Industries of Alabama—Her Railroads and Resources.

SELMA, ALA., Sept. 15, 1870.

The country from Mobile to Montgomery has few attractions. It is a sandy pine barren, valuable for little else than timber. Leaving Montgomery we come into the great cotton belt of Alabama. This cotton belt, as it is termed, is a flat land, almost everywhere underlaid with rotten limestone. Its special crop is cotton, and it can almost anywhere, by good farming, be made to produce a bale and a half to two bales of cotton to the acre, but with the usual farming of the country the average is hardly 400 pounds of lint cotton. Throughout its extent the water is poor, and it is generally considered an unhealthy region.

Montgomery is situated on a series of hills just on the edge of this belt. It is finely located in some respects, but the natural advantages are poorly improved. For instance, water might be thrown all over the city from a reservoir on one of the many high hills, yet they depend on artesian or driven wells. One of the artesian wells is 800, and the other 950 feet deep. The place contains many fine residences, and displays much wealth, yet we did not see great evidence of enterprise or encouragement of arts and manufactures. In architecture we noted in process of erection, by Col. J. S. Vinter, the first basement store or cellar in the place. A few years' residence in New York had so brightened his ideas as to economy of space. The place hopes for great things from the North and South Railroad to Decatur, but if the people lack the requisite energy, all the railroads in the world cannot build up their town. They now supply the city with gas made from wood. On the completion of the above railroad they intend to use Alabama coal. The Montgomery and West Point Railroad, for many years the worst managed and one of the most important railroads in the South, has lately changed hands, and is now said to be at least safe to travel over, and will soon be comfortable.

Fourteen miles from Montgomery is the famous village of Prattville. Perhaps no other town of its size has so widely extended a reputation. It is the home of Daniel Pratt, the cotton gin maker, the location of his gin and cotton factory, also of the Indian Hill Cotton Factory, and has several fine unemployed water powers. It is, however, fourteen miles from a railroad. The Prattville factory runs 4,000 spindles, and the Indian Hill 3,500. There is also in the place a large sash, blind, and door factory. The cotton factories manufacture sheetings, shirtings, and Osnaburgs. Near Prattville is another small factory called Graniteville, running 2,000 spindles, and making only Osnaburgs.

Fifteen miles east of Montgomery is one of the finest water powers, and when the owners carry out their plans they will have the largest cotton factory in the South. It is on the Tallapoosa River, and is called the Tallasse Factory. From the data I could gather I infer that part of the capital in the enterprise is English. They now run 6,700 spindles, and are putting in sets of 12,000 more of English make to manufacture yarns of the finest grade. Of these 4,000 will be running in October. I asked if they thought English machinery best. They replied, "No; but we have an arrangement in Manchester as to this, by which we get it cheaper than we could possibly buy American."

They consider Philadelphia the best market for fine yarns. They use about one half the power of the Tallapoosa, which there falls 90 feet in half a mile, and have a fall from their dam to mill wheel of 58 feet. Their factory is of granite, iron roofed, 258 feet long, 55 feet wide, and five stories high, with a wing 57 feet square. There is water power on the spot to run ten such factories. I asked if they drew much cotton from the surrounding country, and was told about one fourth of what they consumed. The rest is bought in Montgomery. An idea of the amount of cotton produced in the immediate section may be gathered from the fact that $7,000,000 worth of cotton was last year shipped by railroad and steamer from that city.

There are two other cotton factories in the State, one near Huntsville and the other at Tuscaloosa, both running from 3,000 to 4,000 spindles. In my letter on Mississippi I omitted the new cotton factory at Columbus, called the Stonewall, numbering about 3,500 spindles, which is to be increased. Also I omitted mention of the extensive Southern Car Works on the N. O. and Jackson R. R., which is an enterprise well worthy of note. Of my neglect I have had reminders in seeing their cars on nearly every Southern road.

Besides the N. & S. R. R., Montgomery is also connecting herself with Savannah and Macon by a railroad to Eufaula, which is nearly completed

Selma has more life and vigor about it than any town of the cotton States that I have seen, and well it may have, for soon it is to be the terminus and center of seven railroads, all well planned, and running through rich country. The people of the town have life and energy and are hopeful. They last year sent off over 50,000 bales of cotton; this year they expect to send off over 75,000. Its railroads are the Selma, Rome, and Dalton, running through a rich agricultural and mineral region, raising cotton, the grains, and grasses; the Montgomery and Selma, a new and long-needed line; the Selma and Mobile; Selma and New Orleans, making an air-line with the Selma, Rome, and Dalton; Selma and Meridian; Selma and Memphis, and a branch line of the Alabama and Chattanooga Railroad. The section is almost a perfect level. It is on the prairie cotton belt, and artesian wells 300 to 600 feet deep are used to obtain water. Lately what are called driven wells have been introduced, whereby good water is obtained at twenty to thirty feet. A pipe is driven down, having a pointed plug in the end; above this plug, around the sides of the pipe, are several rows of holes. As the pipe goes down it comes to a stratum of quicksand—which underlies all this country—that contains an immense bed of water. When the pipe pierces this stratum a pump is placed on the top end of the pipe, and in a little while a continuous stream of water flows. The constructor of these driven wells proposed to furnish Selma with water, at least for fire purposes, by putting down five wells in a circle, and connecting them at the top. He demonstrated his plan by experiment and got more water than their steam fire engine could use, but as yet they have not adopted it.

The gas works at Selma use Alabama coal, and it certainly makes an excellent gas. I was informed the yield was about 8,000 cubic feet per tun, and that there was coal which yielded more, but did not coke—a species of cannel. In my next I wish to speak especially of these vast mineral deposits. Selma has three founderies, all doing well, and with her contiguity to the coal and iron there is no reason why she should not have also a rolling mill. A cotton factory run by steam would pay.

I have already stated it is one of the finest cotton regions of the South, and nearly all the cotton used might be drawn, in the seed, from the surrounding country, ginned, the cotton worked into yarns, and the seed into oil, etc. There is now a small cotton-seed oil mill in Selma connected with a gin and press. It consumes about 1,500 to 2,000 tuns of seed per annum. There is no water power near Selma, but it is abundant and never-failing twenty miles or more on the line of the S. R. and D. R. R. Some manufacturers assert that, taking all things into consideration with coal at $5 a tun, they consider steam as cheap as water. I think it depends a good deal on where and of what grade the water power is. However the best of steam coal can ere long be profitably delivered in Selma at $5 or less per tun. H. E. C.

THE EARTHQUAKE.

Distinct earthquake shocks were felt throughout the country on the 20th inst., the news of which is reaching us by telegraph just as we are going to press. In this city and in Brooklyn the shocks were felt.

The earthquake manifested itself here about 11:30 A.M., causing the wildest excitement where the shocks were most severe. The earth vibrated rapidly for about ten seconds, when the undulations ceased for an interval of fifteen seconds, occurring again, and continuing for about the same length of time as before.

The effects on those who felt the quivering of the earth under their feet were various, causing some to believe that the end of all things earthly was near at hand. Mothers rushed from the densely-peopled tenements of the Tenth Ward, bearing their children in their arms, and hurried up and down the streets in a wild and bewildered manner. Every article of household furniture was left behind, and the saving of their lives seemed all that the most fortunate could hope for.

The shocks were noticed more distinctly in the Sixth Ward, although they were distinctly perceptible in the Tenth, Seventeenth, Seventh, and Fifth. Opinions seem to be greatly divided regarding the rumbling noise in the earth underneath; some claiming that the rumbling followed, others that it preceded the undulating motion of the earth, and that it continued for almost a minute, at intervals of a few seconds. After passing Park Row, the wave-like roll seemed to follow the district situated between Center street, East Broadway, and Allen street, until, reaching the Seventeenth Ward, it turned and crossed to Long Island.

In the lower part of the city, below the City Hall Park, there is very little heard of it. On Printing-House square the vibrations were very perceptible, the motion being noticed in the editorial and composing rooms of the *Tribune*. Further up-town, Frank Leslie's publishing house, on Pearl street, was affected. The foreman of the composing room was making up a form at the time, and accused a person standing near, of shaking the imposing stone. The movement of the building being repeated, all on the two upper stories rushed down stairs, leaving hats and coats behind; some even, in the excitement of the moment, carried their sticks full of type to the pavement. One is reported to have carried down an empty brass galley, and another a mallet. The clock hanging in the room stopped, the hands pointing to 11:35. The workmen on the fourth floor describe the sensation as disagreeable in the extreme, and many of them were sick for more than an hour afterward. The acid was in some cases thrown out of the batteries in the copper-plating room. Two artists in the front room of the building on the same floor were thrown from their seats. The first few who rushed down stairs and out at the front door dislodged a large sign which hung over the door. Those behind, seeing this fall, thought it to be the beginning of the general crash. The shock was not felt in the press-room. At the same moment the employés in Russell's book-bindery, situated just opposite, on Pearl street, came hurrying out. Some of the men in Frank Leslie's building, who were seated near windows, state that the shot tower of the New York Lead Company, situated near by, swayed perceptibly, much to their consternation. As no shot was casting no one was in the tower.

Further down Center street, at the *Clipper* office, the same shocks were felt, and the same results followed, all hands rushing into the street. Those in the composing room at the time assert that the large chandeliers vibrated several inches. The sensation was there described by several as similar to that of sea-sickness.

Shocks were very sensibly felt on the line of the Bowery, from Chatham square to Bleecker street. In Division and adjoining streets near Chatham, many tenement houses were so shaken that all the inmates rushed into the street, some still retaining articles which were in their hands when the shock was first felt. Stoves and articles of furniture were overturned. A house situated at the corner of Division and Catherine streets was cracked entirely down the side, gaping open almost an inch. Glasses and bottles were thrown from the sideboard and broken at the restaurant No. 15 East Broadway.

At Lord & Taylor's, on Grand street, two shocks were felt, each of about ten seconds duration. On the fourth floor, in the rear, where the women were at work, considerable excitement was occasioned. One woman, in her confusion, ran to a window and jumped to a distance of about ten feet to the roof of an adjoining shed, receiving, however, no serious injury. Another woman fainted four times in succession. No shock was felt on the first or second stories, but on the third men were unable to write, and some were unable to stand. One gentleman, who had been making a purchase, and was waiting for his change, ran from the third floor to the street, and would not re-enter the building. The clock hanging on the wall in the rear building was stopped at exactly 11:12.

At the public school on 14th street, near 2nd Avenue, there were 1,200 children. The scenes in the different school-rooms were pitiful. Children were screaming and rushing to and fro in the wildest manner, but in a very short time the whole number, teachers and pupils, were marched out of the school-building into the street. In the Grammar School, No. 19, also situated on East Fourteenth street, they barely escaped a serious panic. The Principal, Mr. Wm. Smeaton, who was seated at his desk in the boys' department at the time, perceiving that the house was shaking, at once ordered the boys to leave which they did without any ceremony. A messenger was at the same time sent to the girls department requesting the Principal to dismiss the girls at once. They went into the street without any idea of the cause of their dismissal, leaving cloaks and hats behind.

Three distinct shocks were felt in Brooklyn at 11:30. The vibration was from north to south, and the shocks were in rapid succession. The motion created a decided sensation throughout the city, especially on the Hights, where it was more distinctly felt. The Rev. Robert Spear, D. D., of Montague street, states that he was seated in his parlor, in company with his daughter, and when the first shock occurred he believed that he was about to receive a paralytic stroke. The paintings on the walls and the chandelier were agitated.

The news we are receiving, indicates that this earthquake extended over a large region of country, but we have yet heard of no serious damage.

Purification of Tannin.

In order to free commercial tannin from the peculiar odor which it derives from a greenish colored resin, Deinz recommends to dissolve six parts of it in twelve parts of hot water in a porcelain mortar, to pour the fluid into a bottle, and after the addition of one half to one part of ether, to shake it vigorously. The mixture appears cloudy and very greenish, but becomes clear after a few hours' standing, while the resinous coloring matter separates in flakes, somewhat in the shape of coagulated albumen. The fluid is then filtered, and the filtrate evaporated to dryness. Tannin treated in this way is odorless, and forms in water a perfectly clear solution.

TOMATO FIGS.—The following recipe for making tomato figs is said to be excellent:—Collect a lot of ripe tomatoes about one inch in diameter, skin, and stew them in the usual manner, when done lay them on dishes, flatten them slightly, and spread over them a light layer of pulverized white or best brown sugar; expose them to a summer's sun, or place them in a drying house; when as dry as fresh figs, pack in old fig or small boxes, with sugar between each layer. If properly managed the difference cannot be detected from the veritable article.

DISINFECTANTS FOR GERMANY.—Professor Hofmann, of Berlin, has written a letter to the editor of the *Chemical News* earnestly appealing to all chemical manufacturers for help in procuring an early supply of disinfectants on a large scale, in order to prevent the hospitals, which are being rapidly established all over Germany, Alsace, and Lorraine, from becoming the "hotbeds of all sorts of contagious poison." The disinfectants named are, liquid residues of the manufacture of chlorine, chloride of lime, green vitriol, per. manganate of potash, and carbolic acid.

NEW BOOKS AND PUBLICATIONS.

AMERICAN JOURNAL OF SCIENCE AND ARTS. New Haven, Conn.: Silliman & Dana.

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Selins Grove, Pa., May 11, 1870. Messrs. Freeman & Burr, I examined my clothes received of you to-day, and am well pleased with the fit and style of the Coat, in fact, I think I never had better fitting Coats, especially the Dress Coat. You will receive money for them by express, which is paid. You will probably hear of me again soon. Very respectfully yours, A. M. Carey.

Toledo, Ohio, June 13, 1870. Messrs. Freeman & Burr, Gents, Please send me a suit of the inclosed samples, by which you made my other suit. They fit nicely; I am afraid if I ask another measure, I will not get as good a fit. I would like to have them soon. Yours truly, A. U. Young.

For ordering Clothes by Letter, see Freeman & Burr's advertisement on last page.

The Craig Microscope.—A marvel of excellence and cheapness. Magnifies 100 diameters, a power equal to other microscopes 10 times its cost. Especially adapted to the Family circle. Illustrated circular sent. Price $2 75. Address Theo. Tusch, 37 Park Row, New York.

Peteler Portable R. R. Co., contractors, graders. See adv'ment.

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

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Parties in need of small Grey Iron Castings please address Enterprise Manufacturing Co., Philadelphia.

Excelsior Stump Puller & Rock Lifter. T. W. Fay, Camden, N.J.

For Sale—One half the interest in McGee's Patent Self-boring Faucet. Address T. Nugent, Morristown, N. J.

Pictures for the Drawing Room.—Prang's "Lake George," "West Point," "Joy of Autumn," "Prairie Flowers." Just issued. Sold in all Art Stores. "Three Tom Boys." "Bethoven," large and small.

Crampton's Imperial Laundry Soap, washes in hard or salt water, removes paint, tar, and grease spots, and, containing a large percentage of vegetable oil, is as agreeable as Castile soap for washing hands. "Grocers keep it." Office 84 Front st., New York.

Dickinson's Patent Shaped Carbon Points and adjustable holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24th, and Nov. 20, 1869. 61 Nassau st., New York.

Peck's patent drop press. Milo Peck & Co., New Haven, Ct.

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Recent American and Foreign Patents.

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

MATCH SAFE.—Charles Goldthwait, South Weymouth, Mass.—This invention relates to a new and useful improvement in boxes or safes for holding matches, and consists in forming a box or safe with separate compartments, provided with igniting surfaces, and so as to be tightly closed when not in use.

EARTH CLOSET.—Hamilton Sherman, Waverly, Pa.—This invention relates to a new and useful improvement in the mode of discharging any earth or other deodorizing material upon the deposits made in privies or commodes.

CULTIVATOR.—C. P. Norton, Prairie City, Iowa.—This invention has for its object to furnish an improved cultivator, which shall be so constructed that the plows may have a free vertical and lateral movement, and at the same time each horse will draw only his own plow; and which shall be simple in construction and effective in operation.

CAR COUPLING.—Lewis A. Evans, Chester, Pa.—This invention is founded on the principal of making the drawheads of a railway car rotary, and with orifices for the admission of the heads of the link of greater length than width; and of making the link-head wider than the said orifices, so that in order to insert the link-head through the orifice, the drawhead must be turned into a position where the length of its orifice is parallel with the width of the link-head, which having been done, and the link-head passed through the orifice in order to secure the link in the drawhead, the latter must be turned into a position where the length of its orifice is at right angles with the width of the link-head, by which arrangement the link-head is prevented from withdrawing until the drawhead is once more rotated so far as to bring its longer side again parallel with the wider side of the link-head.

COTTON BALE TIE.—Michael R. Clark, Columbia, S. C.—This invention has for its object to enable the bands of a cotton bale to be tied in such a manner that all the compression given to the bale by the press shall be preserved by the bands, and the bale on being removed from the press shall not be able to expand to any appreciable degree.

PLOW.—W. T. Bunn, Humbolt, Tenn.—This invention relates to an improvement in double-shovel plows, and consists in constructing the stock of the plow of two beams, one of which is provided with a coupling—and two shanks provided with handles, the handles being combinations of the shanks—and connecting the beams to a draft beam and the handles to each other by slats or rods provided with holes for regulating the distance between them.

ELASTIC SHAFTING.—Robert Brown, Detroit, Mich.—This invention has for its object to improve the construction of shafting in such a way that it may give or yield when the power is applied, to prevent the teeth of the gearing from being broken by the sudden shock.

COTTON PRESS.—Sinclair Booton, Seguin, Texas.—This invention relates to a new hay or cotton press, which is provided with two followers, that move simultaneously, they being connected by right and left hand screws

FIRE-ALARM THERMOMETER.—Mrs. Augusta Guest, Brooklyn, N. Y.—The object of this invention is to construct an instrument for closing the circuit of an electric fire alarm, as soon as the atmosphere which surrounds the instrument has reached a certain degree of heat.

GYMNASTIC APPARATUS.—John Smith, St. Paul, Ind.—This invention has for its object to construct a gymnastic apparatus, which is to be operated entirely by the hands, and still to call all the muscles of the body into harmonious action; taking cognizance of the principles that the fingers are the proper indices of human power, and that any strain put upon the body in excess of what the fingers can bear is dangerous and injurious.

RAILROAD CHAIR AND CLAMP.—Loyst J. Smith, New York city.—This invention relates to a new device for securing railroad chairs to the rails, and also for clamping the ends of rails together without the use of chairs.

PLOW.—J. H. Johnson, Bentonville, Ark.—This invention relates to an improvement in plows, and consists in the combination and arrangement of parts for the purpose of subsoiling, furrowing, pulverizing, harrowing, and packing the ground, two or more of the operations being performed at the same time.

TABLE.—Joseph Taft, Rockville, Conn.—This invention relates to improvements in tables, and consists in a pair of light metal stands, and a folding detachable top constructed and combined in such a way that the top may be taken off the stands and folded up into convenient shape for transportation. The said invention is designed to provide simple and cheap tables for picnics, also for hotels, in which it is sometimes required to set out tables for unusual numbers of people.

PACKING CONFECTIONERY.—George and C. B. Miller, Philadelphia, Pa.—The object of this invention is to provide for use a new and improved method and means of packing confectionery and small gift articles, and the invention consists in the arrangement of the packing box, its compartments, and the materials to be packed.

BOLT FEEDER.—E. J. Weaver, Sterling, Ill.—This invention has for its object to furnish an improved device for feeding the meal or flour to the bolt, which shall be so constructed as to feed the flour or meal regularly and uniformly, and at any desired rapidity, relieving the miller from the constant attendance that is required when the flour or meal is fed to the bolt by a "shoe" in the ordinary manner.

FOLDING BEDSTEAD.—Mark Crosby, Boston, Mass.—This invention relates to that class of French parlor bedsteads which can be folded up, with the bed, into a form resembling a neat bureau or stand, and the invention consists in a new and improved method of connecting the parts that fold together, so as to admit of the side pieces being made narrower at the middle than at the ends, while at the same time it allows the bedstead to fold readily and easily, inclosing the bedding between the folded parts.

CAR COUPLING.—W. B. Snedaker, Phœnix, N. Y.—This invention relates to a new car coupling which is so constructed that it will be self-locking and readily uncoupled.

STEAM BOILER FEEDER.—A. R. Young, Red Wing, Minn.—This invention relates to a new and useful improvement in apparatus for supplying steam boilers with feed water.

SELF-ADJUSTING ROTARY COTTON CHOPPER.—S. A. Jefferson, Franklin, Tenn.—This invention has for its object to furnish a rotary horse hoe or cotton chopper which shall be so constructed and arranged as to adjust itself to any inequalities of the ground, and which can be used twice upon the same crop.

FOLDING CHAIR.—Emil Bartels, New York city.—This invention has for its object to furnish an improved folding chair, simple in construction, convenient in use, and which may be compactly folded when not required for use.

REFRIGERATOR.—A. H. Phelps, Trenton, Mich.—This invention relates to improvements in refrigerators, and consists in a novel arrangement with the cooling chamber of a removable ice receptacle and an air circulating tube calculated to cause such movement of the air within the cooling chamber as to cool it very quickly after the ice is put in. The invention also comprises an arrangement in connection with the chamber of a thermometer in a way calculated to be more efficient in indicating the temperature.

PUMP.—Adam Knecht, Ilchester, Md.—The object of this invention is to construct a pump for deep wells which will draw water where ordinary pumps are insufficient, and one which may be placed any suitable distance away from the well to convey the water to any desired locality.

COMBINATION LOCK.—F. B. Kalkbrenner, Clinton, Mo.—This invention relates to improvements in the construction and arrangement of combination locks, and consists in the arrangement of a number of rings with V-shaped inner faces on a cylinder, made up of disks having V-faces, which provide grooves for the rings, the said disks being connected together, and the outer ones having flanges which confine the said rings. These disks and rings each have a notch across the face, which being brought into line admit the shank of a hasp, which has notches across its face, to slide into the cavity formed by the said notches in the rings and disks, after which the notches across the hasp coinciding with the rings allows them to be turned across it, thereby locking it.

CLOCK BALANCE.—R. R. Ramsdell and G. A. Whitcomb, Marlborough, N. Y.—This invention relates to improvements in balances for clocks and other instruments, for use in substitution of the pendulum, and consists in a horizontal balance, mounted at the center, and provided with weights at the ends, also in the adjusting apparatus for the weights to extend or return them, and connected to the pallet by a wire by which it is vibrated.

WINDOW AND DOOR SCREEN.—David Goodwillie, Chicago, Ill.—This invention relates to improvements in the construction of the screens used for windows and doors for excluding flies, mosquitoes and other insects, and it consists in so arranging the frames and attaching the wire screens as to make use of the screens for holding the frames together for cheapening and simplifying the construction by avoiding the necessity of using the tenons and mortises now used, which are more expensive than this improvement. The invention also consists in improvements in supporting the screens in the windows.

WRENCHES.—James F. Cass, L'Orgnal, Canada.—This invention relates to improvements in socket wrenches, and consists in a cambination with a piece of metal having a socketed end of one or more sleeves arranged in the socket, the smaller within the larger, for nuts of different sizes, so arranged that the smaller sleeves will be forced inward against spiral springs by the nuts if too large for the said sleeves, but the smaller nuts will be received and acted on by the said smaller sleeves.

ELECTRIC FUSE.—Charles A. and Isaac S. Browne, North Adams, Mass.—This invention consists in an electric fuse, having a primer with wires or metallic bands extending from a chamber in the primer to the inside surface of the completed cap, and secured by means of a groove in the primer in such a manner that when the main wires of the fuse are passed through the sides of the cap, and the primer is fully introduced, metallic communication is made between the wires or metallic bands in the primer, and the main wires of the fuse.

CLOVER HULLING ATTACHMENT TO THRASHING MACHINE.—Jacob H. Golladay, New Lisbon, Ohio.—This invention relates to improved attachments to thrashing machines for hulling clover seed, and consists in the combination with the thrashing cylinder and the toothed concave attachment used in connection with it, of a perforated sheet-iron scouring or hulling plate placed around the cylinder at the discharging place, closing it, except at one end; also the combination of feeding apparatus, with the feed-board, whereby the seed chaff, and the like, previously thrashed and separated from the straw in the ordinary way is fed to the cylinder at the end where the discharge passage is closed, and worked between the cylinder and the said perforated sheet along to the opposite end, where it discharges, in a way to scour and hull the seed in a very efficient manner.

TABLE FOR BAKERS.—Alonzo S. Maxwell, Dixon, Ill.—This invention relates to improvements in tables for bakers' use, and consists in the application of a heat reflector and a holder below the top of the table, for holding and keeping warm the dough previous to baking, for "raising" the same, the table being so placed relatively to the fire that heat rays thrown out by it will be received at the reflectors; the holder is made with openings for the heat to rise up to the space above where the dough is placed. The invention also consists in inclosing the sides, or some of the sides, of the space above the holder with wire gauze or other reticulated substance, through which the air may circulate and arranging the reflectors' sides and bottom to fold up under the holder to exclude flies from the space above the holder in which baked articles may then be kept.

WEATHERBOARD BRACKET.—J. M. Milhollin, Champlin, Minn.—This invention relates to improvements in apparatus for spacing for weather-boards for nailing on and holding them, and consists in a bracket carrying a holding spring and a spike, the latter on a lever, and adapted for drawing into the last board nailed on at a gaged distance from the bottom to receive the lower edge of the one to be nailed on, and the spring is arranged to bear the side of the board against the studs, the lever being arranged to draw the spike out for moving the bracket.

RAILROAD TRACK.—J. N. Farrah Pepperell, Mass., and Jacob Stone, Belvidere, N. J.—This invention relates to a new manner of supporting railroad rails with a view of preventing accidents and economizing materials. The invention consists in supporting the rails upon longitudinal metal stringers or plates which may be flanged to form safety troughs to hold the cars in case they should run off the track.

SAWING MACHINERY.—George W. Lombard, Westminster, Mass.—This invention relates to a novel construction of saw blade and machine for operating the same, and has for its object to produce a constantly operating strong and reliable saw for cutting felloes and other light work.

SNOW PLOW.—Alexander Dunbar, New York city.—This invention relates to a new snow plow, which will not be forced into the snow like a wedge to throw it aside, but will surround and gradually elevate and throw aside the column of snow to be displaced.

LIFTING JACK.—L. D. Warren, Havana, Ill.—This invention relates to a new lifting jack which is of extremely simple construction, and on which no pawls, clamps, or screws are required.

FRICTION PULLEY FOR SPRING SPINDLE.—Warren D. Huse, Laconia, N. H.—This invention has for its object to make the spindle of family or machine spinning, twisting, or spooling machinery reversible at will, so that it may readily be operated in either direction.

DRILL AND HOLDER.—Ira McLaughlin, East Arlington, Vt.—This invention relates to a new drill for boring metallic or other articles, and has for its object to provide a simple and efficient feed mechanism and a reliable and adjustable holder for the article to be bored.

COMBINED MOP AND SCRUBBER HEAD.—William H. Kline, Jersey Shore, Pa.—This invention relates to a new and useful improvement in a head for holding a mop and scrubbing brush, by means of which the laborious operations of mopping and scrubbing are greatly facilitated.

COMBINED TOOL.—G. H. Miller, Dyersburg, Tenn.—This invention has for its object to furnish an improved tool, formed by the combination of various attachments with the shank of a screw driver, to adapt it for use for rious purposes.

GUARD BOLT.—Edward H. Kent, New York city.—This invention has for its object to furnish an improved guard bolt designed to be used in connection with an ordinary spring bolt to guard the door from being opened by anyone from the outside of the door who might have succeeded in forcing back the latch bolt.

SUBSOIL PLOW.—L. Carleton, Pomeroy, Ohio.—This invention has for its object to furnish a strong, durable, and effective subsoil plow, which shall be simple in construction, and easily and quickly adjusted to run at a greater or less depth in the ground, as may be desired.

MEAL CHEST OR BIN.—William B. Smith, Oskaloosa, Iowa.—This invention has for its object to furnish an improved chest or bin, for holding meal, sugar, etc., for household use, or for holding meal, sugar, spices, and other articles for store or grocery purposes, and which shall be especially serviceable where economy of space is an object.

HORSE-COLLAR FASTENINGS.—E. L. Welbourne, Union City, Ind.—This invention relates to improvements in fastenings for horse collars of the character of the fastenings for which a patent was granted to D. C. Westfall, Oct. 1, 1867, No. 69,520, and the invention consists in certain improvements in the construction and arrangement of the same.

FLUTING MACHINE.—Charles Dion, New York city.—This invention has for its object to furnish a simple and convenient machine for fluting, which shall be convenient in use and effective in operation, doing its work accurately and well.

GRAIN SEPARATOR.—William M. Redd, Hazel Green, Wis.—This invention has for its object to furnish a simple, convenient, effective, and reliable machine for separating the chaff, straw, oats, and other coarse or light substances, and fine seeds, from wheat.

Official List of Patents.

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FOR THE WEEK ENDING Oct. 18, 1870.

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MUNN & CO.,
Patent Solicitors, No. 37 Park Row, New York.

108,311.—GANG PLOW.—Carell Atwood, Lebanon, Ill.

108,312.—FEED DEVICE FOR POWER PRESS.—P. E. Austin (assignor to himself and Leander Buell), New Haven, Conn. Antedated October 11, 1870.

108,313.—DUMPING CAR.—Andrew J. Ballard, Cohoes, N. Y.

108,314.—FOLDING CHAIR.—Emil Bartels, New York city.

108,315.—COMBINED COLLAR AND CUFF BOX.—J. C. Bauer, New York city.

108,316.—DOME-TOP STOVE.—Philo D. Beckwith, Dowagiac, Mich.

108,317.—VIADUCT.—Charles Bender, Phœnixville, Pa.

108,318.—LIQUID COOLER FOR COOLING LIQUIDS UNDER PRESSURE.—Edmund Bigelow, Springfield, Mass.

108,319.—MACHINE FOR BOARDING LEATHER.—M. B. Bishop, Wittingham, Vt.

108,320.—COTTON PRESS.—Sinclair Booton, Seguin, Texas.

108,321.—BOX SCRAPER.—J. R. Brown, Cambridgeport, Mass. Antedated October 1, 1870.

108,322.—BOX OR CASE TO CONTAIN BACON, HAMS, SIDES, ETC.—M. W. Brown, New York city.

108,323.—ELASTIC SHAFTING.—Robert Brown, Detroit, Mich.

108,324.—ELECTRIC BLASTING FUSE.—C. A. Browne and I. S. Browne, North Adams, Mass.

108,325.—LATHE-DOG.—Charles Buss, Marlborough, N. H.

108,326.—TRIP-HAMMER.—J. C. Butterfield and James Hay, Chicago, Ill.

108,327.—ROTARY GRATE BARS.—David Byard, Sharon, Pa. Antedated October 4, 1870.

108,328.—SUPERHEATER FOR GAS WORKS, ETC.—M. L. Callender, Brooklyn, N. Y.

107,329.—SUBSOIL PLOW.—Leonard Carleton, Pomeroy, Ohio.

108,330.—WRENCH.—James F. Cass, L'Orgnal, Canada.

108,331.—FORMING CIGAR TIPS.—Seth L. Cole, Brooklyn, N. Y.—Antedated October 15, 1870.

108,332.—CONSTRUCTION OF WATCHES.—D. G. Currier, Waltham, Mass.

108,333.—SECTIONAL STEAM GENERATOR.—Byron Densmore, New York city. Antedated October 4, 1870.

108,334.—ROOFING FABRIC.—Drake W. Denton, Ithaca, N. Y.

108,335.—VISE.—Alexander Dick, Buffalo, N. Y.

108,336.—FLUTING MACHINE.—Charles Dion, New York city. Antedated October 15, 1870.

108,337.—FINISHING COPPER PLATES.—B. F. Dudley, Boston, Mass.

108,338.—SNOW PLOW.—Alexander Dunbar, New York city.

108,339.—LAMP.—John Dunn, New York city, assignor to Holmes, Booth & Haydens, Waterbury, Conn.

108,340.—MECHANICAL MOVEMENT.—Augustus Eckert, Trenton, Ohio.

108,341.—WHEELBARROW.—James Ennis, Columbus, Ga.

108,342.—RAILWAY TRACK.—J. N. Farrah, Pepperell, Mass., and Jacob Stone, Belvidere, N. J.

108,343.—SOCKET FOR LOCK-SPINDLE.—Owen Gallagher, Boston, Mass. Antedated October 15, 1870.

108,344.—WATER METER.—Othniel Gilmore, Raynham, Mass.

108,345.—SAFETY VALVE.—H. A. Goll, Chicago, Ill. Antedated October 5, 1870

108,346.—MATCH SAFE.—Charles Goldthwait, South Weymouth, Mass. Antedated October 8, 1870.

108,347.—CLOVER-HULLING ATTACHMENT TO THRASHING MACHINES.—Jacob H. Golladay, New Lisbon, Ohio, assignor to himself and J. W. Whidden, Rockford, Ill.

108,348.—WINDOW AND DOOR SCREEN.—David Goodwillie, Chicago, Ill.

108,349.—COTTON SEED AND GUANO DISTRIBUTER.—James Y. Graves, Wilson, N. C.

108,350.—CORPSE PRESERVER.—H. V. Griffith (assignor to himself, D. W. A. Bedford, and J. M. Hileman), Altoona, Pa.

108,351.—HAND-STAMP.—H. H. H. Grosskopf, Philadelphia, Pa.

108,352.—FIRE-ALARM THERMOMETER.—Augusta Guest, Brooklyn, N. Y.

108,353.—SELF-RELEASING DAVIT-RINGS.—Augustus Guild and W. H. Pierce, Middletown, Conn.

108,354.—COMBINED EAVES-TROUGH AND LIGHTNING-RODS.—J. W. Hankenson and Winslow Baker, Minneapolis, Minn.

108,355.—TOBACCO-CASING MACHINE.—Edward Holbrook, Jr., Louisville, Ky.

108,356.—SPINNING MACHINE.—Warren D. Huse, Gilford, N. H.

108,357.—WHIFFLETREE COUPLING.—James Ives, Mount Carmel, Conn.

108,358.—SELF-ADJUSTING ROTARY COTTON-CHOPPER.—S. A. Jefferson, Franklin, Tenn.

108,359.—GUN CHARGER.—Herman Kahn, Troy, N. Y.

108,360.—COMBINATION LOCK.—F. B. Kalkbrenner, Clinton, Mo.

108,361.—GUARD-BOLT FOR LATCHES.—E. H. Kent, New York city.

108,362.—STRIKING MOVEMENT OF CLOCK.—Friedrich Kienast, Ansonia, Conn.

108,363.—ALARM-LOCK FOR MONEY DRAWERS.—George Kimball, Cleveland, Ohio.

108,364.—MOP AND SCRUBBER-HEAD.—Wm. H. Kline, Jersey Shore, Pa.

108,365.—PUMP.—Adam Knecht, Ilchester, Md., assignor to Michael Knecht, Alleghany county, Md.

108,366.—BRAKE FOR LAND CONVEYANCE.—W. T. Kosinski Philadelphia, Pa.

108,367.—BORING TOOL.—Wm. P. Lathrop, West Winsted Conn.

108,368.—GATE.—Francis Livings, East Enterprise, assignor to himself and Peter Wycoff, Cross Plains, Ind.

108,369.—FERTILIZING COMPOUND.—J. W. Lowenstein, New Orleans, La.

108,370.—SAWING MACHINE.—G. W. Lombard, Westminster Mass.

108,371.—MEDICAL COMPOUND OR LINIMENT.—J. D. Love Harrisburgh, Oregon.

108,372.—TURBINE WATER WHEEL.—W. V. Martin, Waverly, Ohio.

108,373.—BAKERS' TABLE.—A. S. Maxwell, Dixon, Ill.

108,374.—DRILL AND HOLDER.—Ira McLaughlin, East Arlington, Vt.

108,375.—PRODUCING CASTINGS DIRECT FROM THE BLAST FURNACE.—John W. Middleton, Philadelphia, Pa. Antedated October 8, 1870.

108,376.—WEATHER-BOARD GAGE.—J. M. Milhollin, Champlin, Minn.

108,377.—COMBINED TOOL.—George H. Miller, Dyersburg, Tenn.

108,378.—WATER CLOSET.—David Morrison and J. D. Smith New York city.

108,379.—BELT SHIFTER.—J. E. Mutchler, Grand Rapids, Mich.

108,380.—PNEUMATIC STREET CAR.—David Myers, Chicago Ill.

108,381.—NUT FASTENING.—Frederick Myers, New York city.

108,382.—NUT FASTENING.—Frederick Myers, New York city.

108,383.—SCREWDRIVER.—Abner Newton, Darby Creek, Ohio.

108,384.—CULTIVATOR.—C. P. Norton, Prairie City, Iowa.

108,385.—COOKING UTENSIL.—E. L. Packard, Stoughton, assignor to L. H. Packard, Boston, Mass.

108,386.—REFRIGERATOR.—Augustus H. Phelps, Trenton, assignor to Phineas E. Saunders, and M. E. Phelps, same place, and Joseph Cook, Detroit, Mich.

108,387.—MACHINE FOR MAKING ROPE.—W. G. Pike, Philadelphia, Pa.

108,388.—AGING ALCOHOLIC LIQUORS.—Hiram Purdy, Burlington, Iowa.

108,389.—OVEN.—John Rainey, Brooklyn, N. Y.

108,390.—BALANCE PENDULUM FOR CLOCK.—R. R. Ramsdell and G. A. Whitcomb, Marlborough Depot, N. H.

108,391.—GRAIN SEPARATOR.—William M. Redd, Hazel Green, Wis.

108,392.—CULTIVATOR.—Thomas M. Reed, Germantown, Ohio.

108,393.—WASHING MACHINE.—Charles W. Reeder, Trenton, Mo.

108,394.—STEAM GENERATOR AND HOT-WATER APPARATUS.—Jas. Rigby and P. A. Palmer, Marietta, Ohio.

108,395.—APPARATUS FOR THE SUPPORT OF SKATERS.—P. J. Schopp, Louisville, Ky.

108,396.—EARTH CLOSET.—Hamilton Sherman, Waverly, Pa.

108,397.—TAMPING DEVICE FOR BLASTING PURPOSES.—John Shoemaker, Putneyville, Pa.

108,398.—CULTIVATOR.—H. M. Skinner, Rockford, Ill. Antedated Oct. 12, 1870.

108,399.—DESK, BUREAU, AND CHURN POWER.—J. J. Slater Nicholsville, Ohio. Antedated Oct. 1, 1870.

108,400.—DUMPING CAR.—E. C. Smeed, Lawrence, Kansas Antedated Oct. 1, 1870.

108,401.—GYMNASTIC APPARATUS.—John Smith, St. Paul Minn.

108,402.—RAILWAY CHAIR AND CLAMP.—L. J. Smith (assignor to himself and H. D. Blake), New York city.

108,403.—MEAL CHEST OR BIN.—Wm. B. Smith, Oskaloosa Iowa.

108,404.—CAR COUPLING.—Warren B. Snedaker, Phœnix, N. Y.

108,405.—HANGING MILL STONE.—H. P. Straub, Cincinnati Ohio.

108,406.—TABLE.—Joseph Taft, Rockville, Conn.

108,407.—MACHINE FOR WASHING AND CLEANING COFFEE.—Samuel Thompson, Baltimore, Md.

108,408.—CUTTING AND ENGRAVING STONE, METAL, GLASS, etc.—B. G. Tilghman, Philadelphia, Pa.

108,409.—SHUTTLE.—H. E. Towle, New York city. Antedated Oct. 12, 1870.

108,410.—COOKING STOVE.—Alvah Traver, Troy, N. Y.

108,411.—STRAW CUTTER.—Melzer Tuell (assignor to himself and Sylvester Bowers), Penn Yan, N. Y.

108,412.—ROTARY STEAM ENGINE.—W. P. Vickery, East Auburn, Me.

108,413.—HEATING TABLE FOR SILVERING GLASS.—H. B. Walker, New York city. Antedated Oct. 1, 1870.

108,414.—LIFTING JACK.—L. D. Warren, Havana, Ill.

108,415.—COTTON PLANTER AND FERTILIZER DISTRIBUTER.—B. H. Washington, Columbia county, Ga.

108,416.—SAFETY DEVICE FOR LAMP.—H. W. M. Washington, Green Plains, Va.

108,417.—FLOUR-BOLT FEEDER.—E. J. Weaver, Sterling, Ill.

108,418.—HORSE-COLLAR FASTENING.—E. L. Welbourn, Union City, Ind.

108,419.—WAGON.—J. W. West, Saylorville, Iowa. Antedated Oct. 8, 1870.

108,420.—PAINT BRUSH.—J. L. Whiting, Boston, Mass.

108,421.—THRASHING MACHINE.—Hazen Whittier, West Roxbury, Mass.

108,422.—MILLSTONE DRESS.—J. P. H. Wohlenberg, Lyons Iowa.

108,423.—BOILER FEEDER.—Augustus R. Young, Red Wing, Minn.

108,424.—STONE-CUTTING MACHINE.—Hugh Young, Middletown, Conn., and J. L. Young, New York city.

108,425.—TOOL FOR CUTTING STONE.—Hugh Young, Middletown, Conn., and James L. Young, New York city. Antedated Oct. 1870.

108,426.—STEAM ENGINE.—Hugh Young, Middletown, Conn. and J. L. Young, New York city. Antedated Oct. 8, 1870.

108,427.—TREADLE MOTION.—Arthur M. Allen, New York city.

108,428.—TRUSS.—H. R. Allen, Indianapolis, Ind.

108,429.—METHOD OF FORMING BIFURCATED END OF RAILWAY CROSSINGS.—Joseph Armstrong, Brinsworth, England.

108,430.—LANTERN.—C. S. S. Baron and A. L. Baron, Bell Air Ohio.

108,431.—CLOTHESLINE OPERATOR.—Chas. Barron, La Fayette, Ind.

108,432.—APPARATUS FOR CARBURETING AIR AND GASES.—Abraham Bartholf, New York city.

108,433.—TREATING THE ORES OF LEAD AND ZINC FOR THE MANUFACTURE OF PIGMENTS, ETC.—E. O. Bartlett, Birmingham, Pa.

108,434.—APPARATUS FOR LIGHTING AND EXTINGUISHING GAS BY ELECTRICITY.—Frank Bean, Somerville, assignor to E. C. Bean Boston, Mass.

108,435.—MACHINE FOR CUTTING SOLES, FOR BOOTS AND SHOES.—J. H. Bean, Marietta, Ohio.

108,436.—TURBINE WATER WHEEL.—E. R. Beardsley, Aroma, Ill. Antedated Oct. 15, 1870.

108,437.—MANUFACTURE OF OIL-CLOTH.—William Berri, Jr., Brooklyn, N. Y.

108,438.—SASH HOLDER.—G. W. Bishop, Saratoga Springs, N. Y.

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4,157.—Cooking Stove.—S. H. La Rue, Allentown, Pa.—Patent No. 103,204, dated May 17, 1870.
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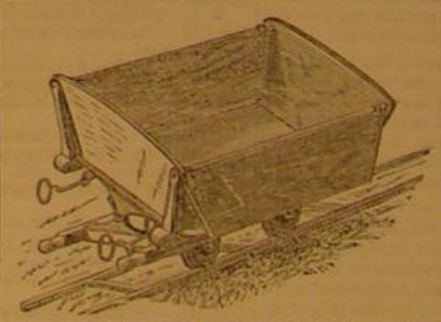
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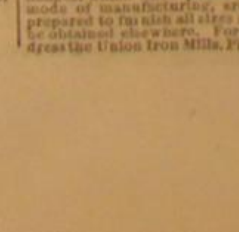
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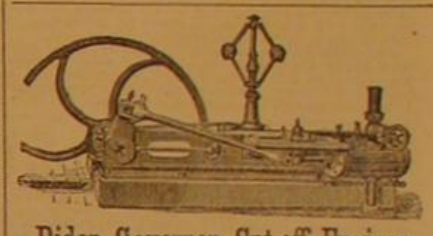
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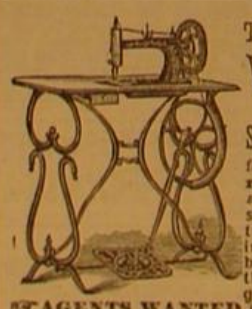
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SCIENTIFIC AMERICAN

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

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Steam Plow.

The accompanying illustration of Redmond's steam plow is an accurate copy of a photograph taken of the machine at work in the field, drawing six plows, turning furrows ten inches deep and twelve wide. The trial was made before the construction of the gang of plows which is designed to go with the engine, and which we are informed will require the attendance of only one man, who will also, in most cases, attend to firing the engine. This machine has, we are informed, been tried in stubble and in sod ground, in rough and rolling land, and, it is claimed, has shown itself fully capable of drawing the six or seven plows that can be attached behind it.

Many attempts at locomotive steam plowing have heretofore proved failures, from the simple fact that the hold of the traction engine on the ground was not equal to the resistance of the plows. In the machine here represented that hold on the ground is secured by the protrusion of a series of twelve anchors through the rim of each wheel, which penetrate the ground as the wheel advances, and their withdrawal again into the wheel soon after the next forward anchor receives the strain. The pressure of the weight of the engine on the soil around each anchor is relied upon to prevent slip. As these anchors may be made of any required width and length, the traction of this machine is theoretically limited only by the power of the engine. The anchors, as shown in the engraving, are fluke-shaped, five inches at the widest point and seven inches long. They are pressed into the ground by a cam over a friction roller on the stem of the anchor; the cam is held by a coil spring which gives if the anchor meets with any unusual obstruction. The draft comes immediately upon it when pushed into the ground, while another fixed cam withdraws the next anchor behind, which, by the peculiar motion given to it through its arm in the wheel, lifts away from the ground it has been pressing against, producing no back strain or tearing up of the earth. Whatever force it takes to push in the anchors is a lifting one on the wheels, acting measurably to prevent them from sinking into the soil.

The turning is accomplished by a clutch on either side, which reduces the revolutions of one of the intermediate gear wheels by a third. It may be constructed so as to reduce speed by any other fraction if it should be desired. A very slight turning can thus be given either way, or a full turn may be made in a circle of twenty feet diameter for the inside wheel.

The boiler, which is estimated at about twelve horse power, is placed directly between the two driving wheels, and is connected to the hind carriage or tender by reaches hinged both at its top and bottom, thus keeping the engine always in an upright and stable position, and allowing it to cramp either way like the forward wheels of a wagon. It is a tubular upright boiler, made, like all the other parts of the machine, as light as possible, the weight of the whole being less than five thousand pounds. This might be considerably reduced by the use of steel in the place of iron. Two upright cylinders attached to the boiler work intermediate gear wheels by which the revolution of the drive wheels is reduced as one to twenty. One hundred and sixty strokes a minute is equal to a speed of two miles an hour. Plowing a strip seven feet wide at that rate would make over an acre and a half an hour. As the fuel necessary to keep up steam in these tubular boilers is very little, probably not over six hundred pounds of best coal per day, and as only two or three men, with a horse and water cart would be required to run the engine with a gang of plows, the expense of plowing with it in the large fields of the West and South is estimated to be not far from fifty cents an acre.

The tender carries a tank holding two barrels of water. On it is the seat, from which the engineer can reach and manage all parts of the engine and the steering, and even the draft of the fire-box in front.

The machine represented above is five feet ten inches wide from outside to outside of wheels, and it is designed to attach six plows, turning fourteen inch furrows, in two gangs behind and underneath the tender, the first furrow to be thrown mostly outside of the track of the wheels, in order that the machine may travel altogether on unplowed ground. In large wheels and in soils where there are not many obstructions, it is claimed to be practicable to attach a cultivator and a drill or planter behind the plows, thus finishing a field with once going over.

This machine will plow up hill, the only increase of power necessary being that which is required to lift its own weight up the incline.

The English system of steam plowing, which is in successful operation, consists of an engine on each side of the field, drawing a gang of plows back and forth between them by means of wire ropes. The advantages which the Redmond steam plow is claimed to possess are that it does not cost nearly as much; that it requires less attendance and less expense in running; that it will plow closer to headlands, etc., and will plow on rolling and uneven surfaces. The Redmond machine is light, and takes up but little more space than a team of horses before a plow, and moves itself on the road or in the field, up hill or down. We are told that a pressure of twenty pounds of steam has been found sufficient for its own locomotion.

It can be adapted to the purpose of stationary farmwork, as thrashing, sawing, etc., or as the motive power for reaping and mowing.

The patents for the United States and foreign countries were obtained through the Scientific American Patent Agency, and are owned by C. C. Merriman and Owen Redmond, of Rochester, N. Y., to the former of whom communications of those wishing to interest themselves in manufacture or purchase may be addressed.



REDMOND'S STEAM PLOW.

On Improved Appliances for the Production of Heavy Forgings.

Abstract of a paper read by Lieut.-Colonel Clay, of the Birkenhead Forge before the British Association.

The forging of iron in large masses is a subject of so much importance to our engineering industry that it needs little apology for its introduction to the mechanical section of the British Association, and any improvement in the machinery or appliances for the more economical or rapid manufacture of large masses of wrought iron, or for any improvement in quality, must be of great interest to all manufacturers where such products are needed.

These improvements in the manufacture of large forgings I intend to class under three heads. I propose simply to mention a few prominent facts very briefly, but shall be glad to answer any inquiries that members may require further information about. 1. Improved heating by Siemens' regenerative gas furnace. 2. Facilities for handling and moving large masses of wrought iron from the furnace to the hammer, and for moving them under the hammer. 3. Improved hammers, with a clean, unfettered fall, and with such width of standards as to give the workman all the comfort and convenience possible in executing the necessary operations of shaping, forging, and cutting the material to the required form.

1st. Improved heating by Siemens' regenerative gas furnace. It is generally admitted that iron in large masses is greatly deteriorated by long exposure to high temperatures, and that a crystalline structure is developed in consequence of such a form and nature as to detract in a very great degree from the strength of the material. It must, therefore, be admitted that furnaces such as those of Siemens', which produce the most intense heat in the shortest possible time, must cause less deterioration to the product in hand than

those which are slower in operation; but a more important item in this consideration is that the facilities given for regulating the admission of gas and air in a neutral flame can be produced, and, in consequence, the iron may be preserved from that burning and oxidation which are the cause of the formation of those large facets or crystals which weaken many wrought iron structures of large size to such an immense extent.

Another improvement from these furnaces where the iron is prepared from the pig is that the gas furnaces do not bring over the large amounts of unconsumed ash or *debris* from the coal which is usually deposited on the body of the iron made in the ordinary puddling furnace, and, in consequence, the iron is more free from those specks and flaws which are so observable in ordinary iron, and which produce the heating and galling so common in large forgings, as heretofore made, and which cause the chief torment of the practical marine engineer.

Perhaps the greatest advantage which the Siemens furnace offers is in the manufacture of forgings of puddled steel, from the facility in which the flame of the furnace may be regulated, first, in the puddling process, and, secondly, in the heating of the puddled steel masses. In furnaces of ordinary construction a constant deterioration of the puddled steel must necessarily take place from the free oxygen present in the furnace; but in the Siemens furnace the gases may be so regulated that a neutral flame is produced, and consequently, the steel mass is heated without deterioration.

I will not now enter into the question of economy of fuel, as this has been often discussed at meetings of mechanical engineers; nor will it be necessary to enlarge upon the great advantage, especially in large towns, of the absence of smoke, which has been hitherto thought a necessary nuisance in all branches of the iron manufacture.

The second improvement which I would wish to mention is improved facilities for handling and moving these large masses of iron when heated as above described, which is effected by hydraulic cranes and machinery of sufficient power to move these large masses almost instantaneously either from the furnace to the hammer or *vice versa*, to raise and lower the load, or to increase or decrease the distance of the load from the center of the crane.

The truth of the old adage, of striking when the iron is hot, will prevent any necessity of dwelling upon the advantage of rapidity of movement in dealing with large heated masses of iron. After the pieces of iron have been heated in the manner described, and when the machinery shown has brought the forging to the hammer, it is necessary that the instrument should be of the most approved description to cope with the material under operation in the best and quickest manner, and with the greatest possible comfort to the workman employed at the work designated. Hammers that are described as suspended are employed; they are carried upon wrought iron girders, of twenty feet span, which gives the hammer-man such room for his operation and such freedom from any obstacle to his work as have seldom, if ever, been accorded before, and so much room to the rear is reserved that shafts fifty feet or sixty feet long could readily be made without any inconvenience.

THE LABOR MOVEMENT IN ENGLAND.

Lecture of Thomas Hughes, M.P., at the Cooper Institute, New York.

An immense and intelligent audience assembled in the hall of the Cooper Institute on the evening of the 21st October, to listen to a lecture from Thomas Hughes, M.P., on the Labor Movement in England. Mr. Hughes has long prominently identified himself with the interests of labor in England, and his address is the most able review of the subject we have ever met with. We therefore have deemed it eminently fitting, in order to give his views as wide a circulation as possible, to publish an abstract of his remarks, which were listened to with the most earnest attention, and which for soundness of conclusion, elegance of diction, and able presentation of fact, is worthy of most careful and earnest consideration on the part of the working men of this country.

LABOR MOVEMENT IN ENGLAND.

In England, said Mr. Hughes, the war between labor and capital has lasted, with occasional lulls, for upwards of five hundred years. Far back in those dim old Plantagenet times we find the traces of that war on the statute book, and in the pages of the chroniclers. The Statute of Laborers and other acts endeavored to fix the rate of wages, and the conditions under which handicraftsmen should be allowed to dispose of this labor. After the black death had devastated the southern and eastern counties, the most stringent laws were passed in the hope of checking the rise of wages which that fearful calamity had caused. Scarcely more than one smith or carpenter in four was left in some of the fairest and most populous of English districts; but king and baron, and bishop and merchant could see no reason why they should have to pay more for the skill of one survivor. The first great strike of which we have any record whatever, so far as I know, took place among the masons and other artificers employed in building Windsor Castle under William of Wickham.

They left their work and scattered over the neighboring counties; but the sheriffs of Berks, Bucks, and Surrey soon brought them back in obedience to the peremptory mandate of King Edward, and savage punishments—in one instance, if I rightly remember, the last penalty of death—were inflicted on the ringleaders.

And so the vicious system went on for centuries through the Tudor and Stuart and Hanoverian times. Now and then, as liberal counsels prevailed and wiser statesmen were at the head of affairs, we find attempts at legislation in the interests of labor to break the dull record of short-sighted selfishness. But not until our own age had come did it occur to our statesmen and people that the only wise thing for the country represented in its Legislature was to stand aside and allow the rate of wages and the condition of labor to be settled by those most interested. It was not a moment too soon. The great war of the Revolution had thrown nearly all the producing trade of Europe into the hands of England, and the rapid accumulation of wealth and the inventions in machinery had gathered the work people together in large factories.

Secret societies had sprung up all over the kingdom in defiance of the law, and when the bad years had followed the peace of 1815, and wages fell and fearful distress prevailed, violent outrages, arsons, even murder, arising out of trades' disputes, became fearfully common. At last in 1825 Parliament made a clean sweep of all the cruel, wicked, and foolish old laws, and declared that in future combinations of working people for the purpose of settling the rate of wages and the hours of labor should be no longer unlawful.

REPEAL OF THE COMBINATION LAWS.

From the repeal of the combination laws in 1825 the modern history of our labor movement dates. Beneficent as that legislation was, it was far from perfect. It has been described as "a solemn duelling code between capital and labor," and not without reason. We have had to supplement it in several directions. First, by protective legislation, such as our factory acts, which we have passed to prevent the over-working of women and children, of which it was confidently predicted that they would reduce wages and diminish production, while the workers would misuse the leisure provided for them. The exact contrary has happened. Wages and production have increased, and the people, on the whole, use their leisure admirably.

Again, we have had to supplement it by enabling legislation. After the bitter experience of more than a whole generation, we have fairly acknowledged that it is not sufficient to have combinations of employers or of work-people outside the law; to say you may combine, but the courts cannot recognize your combinations or protect your property. It is only within the last two years that England has come to this wiser mind, and has resolved to bring all unions resolutely within the pale of the law, to compel them to publicity, and to make them bodies legally recognized and legally responsible. To return, however, to 1825. The unions soon learned to make use of their new powers, and a local civil war broke out all over the country. The sad words of one of your ablest economists may be taken with scarcely a qualification as descriptive of that time:

"Capitalists may encroach on labor; laborers may, in their madness, destroy capital; such is the work of ignorance and evil passions. But, however far such strife may be carried, it can only result in mutual injuries, and health can only be restored by obtaining the recognition of the full rights and obligations of each. The condition of well-being is peace. A false philosophy has set the world at war for ages, proclaiming that what one nation gains another must lose. Such a philosophy has had its trial, extending over centuries of waste and terror, and it is now fortunately dishonored through the whole civilized world. Akin to it is the belief that hatred and retaliation are the normal conditions of capital and labor, and that mutual distrust and hurtfulness are inevitable in all the developments of industry. Such a belief blasphemes the harmonies of Providence, is sightless before the glorious order of man and nature. The cruel, shallow selfishness of capital has robbed labor by means of law. Labor, impoverished, ignorant, degraded, has often turned upon its tyrant, and laid in a common waste church and state, letters and wealth."

EVIL EFFECTS OF STRIKES.

It is needless to dwell upon a state of things which has passed away, or to endeavor to fix blame on either side in the long struggle. The frightful waste and misery inflicted on employers and work people by strikes and locks-out, the widespread ruin of families, the danger to our trade, as well as the heroism and self-sacrifice which not seldom lighted up those civil conflicts are now, I trust, matters of history. The war ended, as so few wars do end, without the complete discomfiture of either side, and how a better state of things has come about I must try and tell you in a few words.

After some twenty years of strike the work-people found that they were unable to contend with their employers in their isolated local unions, numbering a few hundred men. They determined to extend their organization so as, if possible, to embrace whole trades. The first experiment was made by the engineers and machinists. About the year 1849 these men, who are, of course, among the most able and skillful of our mechanics, formed a vast federation of societies, and called it the Amalgamated Society. In 1851 it numbered 12,000 members, scattered through branches all over the kingdom, and had a reserve fund of some £22,000. Then came the first, and, I am proud to say, the last, great trial of strength with the employers, so far as this society is concerned.

After four months of misery, in which, at the lowest calculation, the men lost £150,000 in wages, the struggle ended in their total defeat, and left the society without a penny of reserve fund, heavily in debt, and with the loss of more than a quarter of its members; and it was thought that trades'-unionism had received its death blow. Never was there a more vain calculation.

SUCCESS OF TRADES' UNIONS.

The Amalgamated Society recovered itself with marvelous rapidity, and has gone on increasing till the present time, when it numbers some 40,000 members, has more than 300 branches—some twenty of which are on this side the Atlantic—and a reserve fund of £100,000. The example of the engineers was followed in the building trades, the iron trade, the coal trade, and other of our leading industries. On the other hand, the employers in these trades also combined in large societies, extending often over whole districts. At last the two armies stood opposite one another, marshaled for battle on such a scale that every trade dispute threatened to carry ruin and misery into every corner of the kingdom. But while this state of things had been growing, better counsels had begun to prevail.

The wiser and more humane of the employers and of the leaders of the work-people, staggered at the magnitude of the interests involved, and the bitterness and woes of the struggle, had for years been advocating the establishment of courts of arbitration and conciliation for the peaceable settlement of all trade disputes. At length these wiser counsels took shape and bore good fruits.

The honor of establishing courts of arbitration and conciliation, first in his own trade at Nottingham, and afterwards in all parts of England, belongs in great measure to Mr. Mundella, the member for Sheffield, who is now in this country, and, I believe, in this city. I have no time to give you details about them. Suffice it to say that they are established in all the great industries of the kingdom, and that almost all the most powerful unions have inserted in their rules a positive prohibition of strikes until after the questions in dispute have been before an arbitrator and council of conciliation.

It may be too sanguine to say that great strikes are evils of the past, but every day shows that in the future they will be gross outrages on the moral sense of the community, and the offending parties will have all England against them.

You may be interested to hear how the courts are carried on. In January last I went down to hold one at Middleboro', the center of the north of England iron district. Trade had revived, and though some advance had been given, the men thought they were entitled to more. The dispute had become bitter. The interests involved amounted to millions. The court sat in the town hall; fourteen employers, the leading men of the district, on one side of a long table, fourteen men from the works of these employers on the other. We sat for two days. During the first day hard things were said, and blunt contradictions as to facts and figures flew about. On the second day the angles seemed to have been rubbed off, and both sides spoke quietly and fairly. At the end of the day the employers went into one room, the men into another. I carried proposals backwards and forwards for perhaps half an hour, and at the end of that time had the happiness of getting the signatures of both sides to an agreement which settled all questions in dispute, and bound employers and workmen for a whole year.

COURTS OF ARBITRATION.

But if matters rested here with us I should still be doubtful for the future of the labor question in England. At the best, courts of arbitration leave the standing armies untouched, and even involve the necessity of keeping them highly organized. While there are standing armies there must be always danger of war, whether between nations or classes; but I trust that we, in England, are on the sure road to getting rid of standing armies altogether, or, at any rate, in the industrial world.

It is by the co-operative movement that this blessing seems likely to be obtained, and to this I must now turn. It is a great subject, perhaps the greatest which the social reformer has to deal with. No one can be more conscious than I am of the utter inadequacy of any sketch I can give you in such a lecture as this, and there are many friends in this room who will remark the many gaps in what I have already said and what I have yet to say. However, I can but do my best, and hope that what I say may, perhaps, lead those most interested in these questions over here to study our industrial history of the last forty years more in detail.

CO-OPERATIVE SYSTEM

In the midst of the worst years of the great labor war which I have been speaking of, when masters were asserting their right to do what they would regardless of their men, and men were ready to starve if they could only injure or defeat their masters, the co-operative movement commenced, so far as the scope of this lecture is concerned. I leave on one side co-operation for purposes of distribution, which began somewhat earlier, although it has been, as yet, by far the most successful. Under it the working people throughout the whole of the north of England have established stores of their own, which supply them with pure and unadulterated articles at cost price (for all profits on purchases are divided periodically among the members). They have delivered themselves from the thraldom of debt to the small shopkeepers and publicans, and have restored tone to trade outside their own body.

The system of ready money payments is spreading widely wherever co-operative stores flourish. But it is association for production, a far harder reform to carry out, with which we are concerned, and this had scarcely any existence in England till after the French revolution of 1848. All of you who care for these questions probably remember the establishment of the workmen's associations in Paris at that time. The National Ateliers were founded on false principles, for political purposes, and failed grievously, but many other associations established by the *ouvriers* themselves flourished for years; indeed, some of them were still in great prosperity down to the breaking out of this sad war. Well, some Englishmen who had seen or knew about them, resolved to try the experiment at home, feeling sure that in this direction, however difficult the path might prove, lay the true solution

of the labor question. We formed in London a society for promoting workingmen's associations, and assisted a number of bodies of men in the building, tailoring, shoemaking, and other trades, to start in business for themselves, under rules which provided that all those employed in the work should share in the profits. The same thing was done in other parts of England, and in other branches of industry. I will not trouble you with details. Most of these associations failed, a few succeeded and remain to this day, but the experience gained was sufficient to convince all who took part in the movement, on the one hand of the truth and power of the principle, on the other hand of the exceeding difficulty of carrying it on to practical success without the aid of those who had grown up with the knowledge and experience of conducting manufactures and businesses. We had to admit with some sorrow and disappointment, that it would probably take a generation to educate men of the working class so as to fit them for the successful management of a productive association. If the reform was to come speedily, it must be by the help of the employers. But here the law again stood in our way. An employer could not give his work-people a share in profits without making them partners, and so giving them a right to take the accounts of the business, interfere in its management, and so jeopardize his whole fortune. The first thing to be done was to alter this law, but this was not effected till 1865. On the 5th of July in that year the act to amend the Law of Partnership was passed, and from that time it became possible for employers without legally risking their all to associate their workmen as sharers in the profits of their businesses. This act was not long in bearing fruit. In that same autumn the principle was adopted by employers in several trades. As the best way of showing you how the new system was adopted and worked out, I will confine myself to one experiment now widely known, and the most successful of all, so far as I know of, to the present time—the Methwood Collieries of Messrs. Briggs & Sons.

ITS SUCCESS.

Mr. Henry Briggs, the head of the firm, was a successful coal master, and owned large pits in the Yorkshire district. He was a resolute, upright Yorkshireman, kind and generous to all about him, but above all things determined and unflinching wherever he believed himself in the right. Such a man was sure to be in demand as a leader, and accordingly Henry Briggs had been for years the chairman of the Masters' Association of coal owners in his own district. This association had been uniformly successful in its contest with the coal-workers, and so bitter was the feeling there that "the coal owners are devils, and Briggs is chief of the devils," had passed into a proverb.

In 1864 and the beginning of 1865, things had come to such a pass that the Methwood and other collieries were standing still often for weeks together, and when in work, had to be protected by a large body of police. Mr. Briggs at last got thoroughly sick of living in a constant state of war with his poorer neighbors. Collieries were returning scarcely five per cent on capital. He proposed to his sons to sell the mines and invest their money in some other way which would bring them at least as large a return, and peace. Fortunately, as I believe for England, his sons had been attracted by the theories of co-operators, and proposed to their father to try what effect giving the work-people a share in profits under the new act would have on their business. Things could scarcely be worse, and persons who had been studying and preaching on the subject for years declared that they could be better. Mr. Briggs consented, and the first industrial partnership was accordingly formed at the Methwood Collieries.

The manner of its formation was as follows: The stock plant and other property were valued, nought being set down for the good will of the business. The valuation amounted to something over £80,000. The sum was divided into shares of £10 each, in order to place them within reach of any prudent workman. The first charge on all the earnings of the collieries, after payment of the current rate of wages of the district to the work-people, was a payment of ten per cent on the capital, that being the rate which, according to the best authorities, money invested in coal mines in England ought to bear. All surplus earnings, if any were made, were to be divided equally, half being paid as additional interest on capital, the other half being divided among the work-people as a bonus in proportion to the amount earned by each of them during the year. The articles of this Industrial Society were duly registered. The Messrs. Briggs kept the larger part of the shares in their own hands, and the rest was sold to friends of the movement and to the work-people, arrangements being made by means of share clubs to enable the latter to pay up their shares by small weekly installments. So great was the suspicion among the men, that although the matter was thoroughly talked over with them, and explained, scarcely one of them would take a share. Messrs. Briggs, for the sake of convenience, made it a condition of sharing in whatever bonus might be earned, that each workman should take out a penny book, in which the amount earned by him, and upon which, therefore, bonus should be payable, should be entered by the proper clerk at the end of each week. Only about one tenth of the nine hundred work-people employed took the trouble to take out this book. However, the leaders were determined to give the scheme a fair trial, and accordingly, though there were many threatenings, no strike took place during the first year. At the end of that time it was found that after putting aside a reserve fund of several thousand pounds, something more than thirteen per cent had been made on the whole capital, and there was accordingly a sum of more than fifteen hundred pounds to be divided among the holders of books as a bonus on their earnings. I went down to the meeting in the great room at the collieries where this announcement was made of the result of the first year's working, and I shall not easily forget the scene at the great tea-party, the hearty speeches predicting the good time coming, the importance and delight of hard-handed fellows carrying in their pockets more coin than they had ever seen before at one time, the blank looks and good resolutions of those who had neglected to take out books.

CONFIDENCE IN THE SYSTEM.

They all took out books next morning, and I came away with a very firm faith in the future of the first industrial partnership of Briggs & Co., limited. That confidence was well grounded. From that day to this the success has gone on increasing. A large proportion of the work-people now own shares. One of their number has been elected on the Board of Directors. The dividends have never fallen, and have in some years advanced largely. The economy in material, such as timber and oil, has been sufficient to pay a dividend of (I believe) more than 1 per cent. Above all, while there have been many disputes and stoppages of work in the district, the Methwood Collieries have never lost a day, and the feeling between the Messrs. Briggs and their work-people is as cordial as the strongest philanthropist could desire.

ENGLAND AND THE UNITED STATES—A CONTRAST.

I have now given you very imperfectly, but I believe faithfully as far as I have gone, an account of the great industrial movement in England. I am not sanguine enough to hope that all our troubles are over; but I do believe that all serious danger for us is past, and that if we lose the lead, which according to the latest returns, we still hold among the producing nations of the world, it will be because we are fairly beaten in invention or applied skill, or in that dogged persistency in work which has hitherto done so much for us, and not because our employers and work-people are engaged in the time-honored and world-old pastime of cutting each others' throats. Is it as well with you here, my friends? Have you nothing to learn from the old country in this matter? Well, it is exceedingly difficult for a stranger coming among you for a few months to judge, but, unless I am mistaken, I see the threatenings of trouble for you over this labor question. Labor and capital in the New World seem inclined to ignore or dispise all the lessons of the Old, and to fall together by the ears, instead of marching together hand in hand toward the grandest work the earth can offer just now—the subduing and development of this vast and magnificent continent of yours.

ADVICE TO WORKING MEN.

I have no right to offer counsel on either side, and may possibly be even regarded with suspicion by employers of labor over here, as I have been till lately by those of England But as I have helped the working men at home to fight their battles, and have had the happiness of earning their confidence, I trust their brethren here will take the few words I have to say to them in good part, and as those, at any rate, of a friend. Is it then the fact that you, the working men of the United States are running simply on the old tracks, and are furbishing up the old weapons of trades-unionism, which have so often run into the hands of those who wielded them? Are you really trying by your organizations to control the free will of those of your body who are not Unionists—to put restrictions and limitations on the hours of labor, the admission of apprentices, the use of machinery, the rate of wages, and to carry out your ideas by the old method of strikes? These things have been done often enough in England. If not wise even there, at least they had a justification which here is wholly wanting. Where the labor market is overstocked, and there are often two men waiting for one man's place, I can understand, and have often sympathized with and defended rules and practices intended to spread work evenly, and requiring self-sacrifice from the ablest workmen that all of fair capacity might earn a livelihood.

Where all the natural wealth of the country (if I may use the phrase) is already monopolized, where land, mines, waters—all the raw material out of which wealth is created—are in private hands, and there is the keenest competition for the use of them, as there is with us, one must not be too critical as to the methods by which the great body of producers have endeavored to secure their share of the products. But here you have well-paid employment waiting for every man who is ready to do an honest day's work. Here the natural wealth of the country is, for all practical purposes, unappropriated, and lying around you in almost unbounded profusion. You have nothing to do but to exercise a little thrift and foresight for a few short months, to spend for that time less than you earn, and there are the means in the hands of every one of you of obtaining house, land, whatever form of wealth you are most eager for, with only too great facility.

CAUTION TO TRADES-UNIONISTS.

On what possible plea of reason or justice or necessity, or even of hand-to-mouth policy can you undertake to control or limit the right to work on his own terms, in his own way, of any man, when there is ample room for twenty times your present numbers, and your land is crying out for all the work which every man among you can put into it? When the great trades' unions of England are becoming every day more peaceable and reasonable as they become more powerful, and are jealous of every expenditure which is not for some provident or benevolent purpose, are the unions and the working men of America going to pick up the old armor, instead of leaving it to rust where it lies, and to spend the earnings which belong to their wives and children as much as to them, in a crusade for preaching the gospel of idleness? I cannot believe it, for if there is one truth which this nation has hitherto preached faithfully to the rest of the world it is the gospel of work

The worth and nobleness of good hard work is the best outcome of your history, so far as I can read it, and the signs that the old belief is not dead, are among the most cheering memories which I shall carry back with me. I have the pleasure of knowing a senior classman at Harvard College who hired himself out as a laborer this last vacation, in order to learn the business of farming from the beginning, and earned $10 a week besides his keep At Cornell University the students who live by their own labor, in the printing house or on the farm, are precisely on the same footing as all the rest, and one rejoices to find that no one will lose caste there by the performance of honest work.

But if you here have something to learn from England as to the best method of settling the old dispute between labor and capital, so as to secure the highest results, I am bound to admit that when these results are attained we have more to learn of you as to the way in which wealth should be spent, for you seem to me to have realized, more than any other people among whom I have been, that the produce of labor—the wealth which flows in upon your citizens in such full measure—should be held and used as a trust and benefit, not of themselves and their families only, but of the whole commonwealth, and in time of the whole human race. I have lately been staying with my friend Mr. Goldwin Smith, at Ithaca; he, as you all probably well know, is a professor in the Cornell University, and let me add that England could send you no better man to help on the work which is doing there.

Mr. Hughes closed his address with an eloquent tribute to the liberality of wealthy American citizens in contributing to public benefactions, alluded in feeling terms to the kindness with which he had been everywhere received in America, and closed with a farewell to his audience, announcing that he should sail for England on the 22d of October, the next day after the lecture.

CHLORALUM---A NEW ANTISEPTIC.

BY PROF. JOHN GAMGEE IN THE "CHEMIST AND DRUGGIST."

The hydrated chloride of aluminum is a salt, which, as a preservative of organic compounds, I have made the subject of numerous experiments for some months past, and the more I work with it the more am I surprised that it has not been used in medicine. That, in common with other aluminous salts, it has the power of arresting decomposition, may not be altogether unknown; and what I claim as the result of my researches is, the recognition of its extraordinary value as an antiseptic—indeed, as a substitute for the very poisonous solutions of chloride of zinc—the caustic carbolic acid, which, from its smell, cannot serve for many purposes; chloride of lime, which evolves the most unpleasant fumes when used in water closets or elsewhere; the permanganates, which stain; and sulphurous acid, which cannot be conveniently used in hospitals or in the sick chamber.

Two obstacles have presented themselves to its prompt introduction into general use. The first is the source of supply, and the second the name.

Since the chloride of aluminum has never been a commercial article, and it was important to secure large quantities at a moderate price, half a ton was first made to determine the best method of production. Supplies can now be insured at a cost not exceeding that of the poisonous chloride of zinc, and below that of carbolic acid—indeed, so far below carbolic acid that it must supersede this where disinfectants are used in abundance—to water streets, closets, alleys, etc., which are now often redolent of the tar acid odor, that by no means finds favor in every household.

Secondly, as to the name. An antiseptic and disinfectant of such a character as this non-poisonous chloride, cannot be too widely used. That a long scientific name is an objection in a commercial point of view, and attended with great inconvenience, every one will admit. Carbolic acid is usually termed "carbonic" acid by the people, and every chemist is called upon daily to check popular blunders in naming articles asked for across the counter. I recently heard a respectable youth ask a dispensing clerk for "evorescing," and I was astonished to see a bottle of effervescing citrate of magnesia opened to supply the demand. I have consulted several medical friends and chemists as to the best popular name for the hydrated chloride of aluminum, and after many fruitless efforts, have determined on calling it "chloralum." I am aware of the objections to be raised to this, but since I searched for a single word whereby to designate it, one that would, in some sense, indicate the nature of the compound, and at the same time be quite new, I have resolved to adhere to a name which, like telegram, may become popular in spite of classical objectors.

All this matter of business may seem irrelevant; but only those who have happened to introduce some novelty are aware of the insurmountable barriers which present themselves in commerce.

And now, referring to the more pleasant part of my revelations—the results of experiments—it is not unimportant to state, that in January last I had to pay from 12s. to 24s. per per pound for small quantities of the chloride to be found in the shops of manufacturing chemists in London. I did hear that the Messrs. Bell, of Newcastle, had supplied the anhydrous chloride to be mixed with size by Manchester cloth dressers; but, on application to this firm, I was told they had discontinued the manufacture of the metal, and, therefore, had none of the chloride. With the small quantities I could find, amounting in the whole to less than a couple of pounds, I made solutions of much greater strength than I have since found requisite, and immersed raw hide, meat, the feet of cattle cut off at the knee, rough fat, and other agents, for various periods, varying from a few minutes to twenty-four hours. The result was absolute preservation, and, what is more as-

tonishing, after keeping these specimens up to the present time, I find no insects attacking them, as in the case of other means of preservation, even with arseniates.

Meat dipped in solution of 1·030 to 1·040 specific gravity had a strong astringent flavor; but a retriever dog did not object to make a daily meal off flesh thus preserved, and thrived well on it. I knew from previous work that this chloride was non-poisonous; but I repeated my experiments to satisfy myself on the point, and then commenced preserving fish. I tried large quantities of plaice, soles, cod, whiting, mackerel, haddocks, mullet, and other kinds. Some were bought when far from fresh, and a dip purified them and arrested decomposition. A flabby cod, of suspicious appearance, became firm, and was good eating after a day's immersion. We had the least success with the mackerel and mullet, and, as a rule, none with the fish that had not been cleansed.

Mr. Frank Buckland aided me in procuring salmon from Thurso, Aberdeen, and Galway, dipped in the solution, when caught, and sent up to London without ice. All the fish arrived in good order, and kept several days. A sea trout was dipped in the solution in Aberdeen, exposed to 80° for thirty hours, and then sent up in a box. Mr. Buckland and Mr. Brudenell Carter tasted the fish, and coincided in the judgment formed of it in my household. The trout was firm and and of excellent flavor, and, in both respects, contrasted favorably with salmon that had been transported in ice. The result of these experiments was, that the fish would bear immersion for five or six days. The scales softened, and the flavor was somewhat affected by longer immersions. Slices of fish were apt to discolor and lose their flavor in a much shorter time than whole fish; but a salmon split in two would dry slowly and prove good eating many days after being caught. As an aid in the drying of cod on the Newfoundland coast and elsewhere, a mild solution of the chloride would be invaluable, since thousands of tuns of fish have to be thrown away, when caught in abundance, because they can not be dried fast enough.

The chloride of aluminum is a deliquescent salt; but it has a tendency to part with its chlorine, and thus no obstacle is offered to the drying of the fish. These experiments show how safe an agent chloralum is, and every medical man can appreciate the importance of having an inoffensive agent to be used in the sinks, dust-holes, and accumulations of filth and garbage in and around kitchens. A raid on the dust-holes and dust-pans is, probably, next in importance to the disposal and disinfection of sewage, and physicians have never had an antiseptic at their disposal which could safely be used in the dirtiest corners of most dwellings.

For ordinary disinfecting purposes, solutions varying from 1·006 to 1·010 specific gravity, are quite strong enough. Stronger solutions are usually unnecessary, and impart flavor to edible substances.

Any one who wishes to try a convincing experiment as to the value of chloralum, should drop some in strong sewage water. The solid matter is precipitated more rapidly than by the use of a persalt of iron, and the odor disappears. I am quite satisfied that it will aid those who are attempting to deal with the sewage of towns by combined mechanical and chemical means when irrigation is impracticable. It has one great virtue, which Dr. Budd, in a letter to myself, says must belong to "the antiseptic of the future," viz: that it is quite harmless to vegetation. The chlorine combines with ammonia and other bases, and alumina is deposited with the solid organic elements. In the dead house, the dissecting room, museum laboratory, chloralum will be found invaluable.

It is most important to increase the number of agents available for sanitary purposes. The destruction of animal poisons, so much neglected a few years since, marks an epoch in medical history which is in pleasant contrast to the days of long prescriptions and infallible cures. Cattle-plague times, fortunately, brought into fashion the stamping out of a malignant contagia, and, for this purpose, a good antiseptic, which cannot do harm, offend the most delicate nose, nor soil the finest linen, is a great desideratum.

I have striven to show, for years past, that we have a very distinct and destructive group of diseases in animals—the epizootics proper—propagated through time and space by contagion. Wherever these expizootics appear, antiseptics are of great value to destroy the virus as it is thrown off by the sick animals. All excreta should be disinfected, and all agents which are at all likely to be contaminated by the breath or discharges.

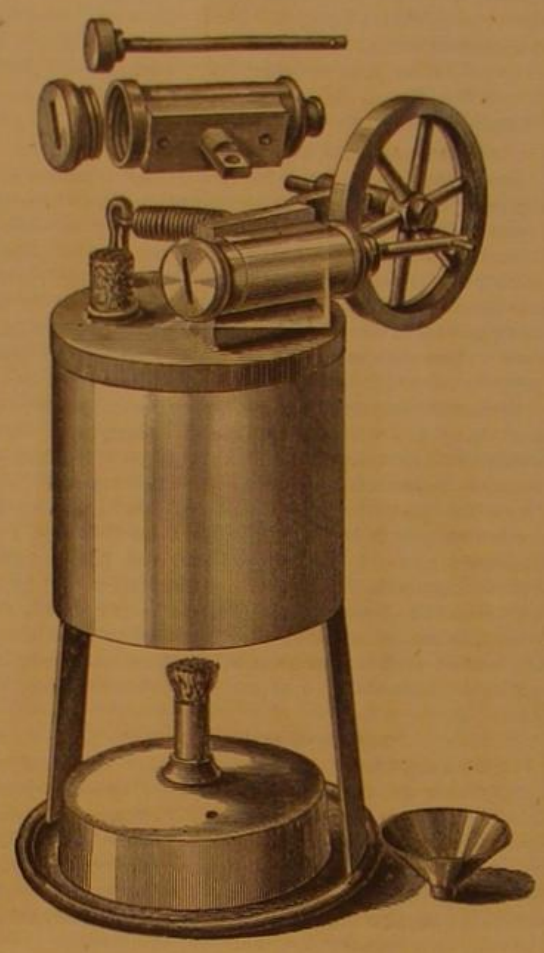
In the contagious pleuro-pneumonia I noted, some years since, that mild cases are controlled, and even cured, by astringent preparations, such as the sesquichloride of iron, and in the earliest stages of exudation, the internal use of chloralum would tend to limit the disease. It must be understood that I do not advocate treating cases of pleuro-pneumonia, except when special circumstances render it very desirable to do so. As a rule, the animals do best without medicine, but the early exudation occurs rapidly, much in the same way as hemorrhage and hemostatic properties of the chlorides of iron and aluminum render good service.

In the foot and mouth disease, which should never be permitted to reach our farms, a chloralum solution checks the discharge, destroys the virus, favors the cicatrization of ulcers, and may be regarded as the best remedy to be used.

In conclusion, I wish to direct the attention of surgeons to the use of the hydrated chloride of aluminum in the treatment of wounds, erysipelas, gangrene, and various contagious inflammatory diseases of the superficial parts, such as the contagious ophthalmia of children, soldiers, etc. In fever wards, and every sick chamber, gargles and lotions containing it will frequently be found of use, and linen can be dipped in solutions of it before removal from the sick chamber. It is a powerful styptic, and, in the treatment of chronic and acute discharges, hemorrhage, etc., it is of great value. It is sufficient to have drawn attention to this subject, to insure the multiplication of experiments; and the more the new compound is tried, the better will it be appreciated.

A DOLLAR STEAM ENGINE.

An article published some time ago in the Scientific American called for the invention of a cheap toy steam engine. In response to that suggestion several inventions have been made. Our engraving illustrates an engine of this kind, which is sold for one dollar. The parts are shown in detail, and any one at all familiar with steam engines will see at once the simplicity of its construction.



It is a reciprocating steam engine with cylinder, piston, fly-wheel, boiler, and patent safety valve, taking steam at both ends of the cylinder, with half inch stroke. All complete it weighs less than four ounces.

It is manufactured and sold by Colby Brothers & Co., 508 Broadway, New York, whom address for further information.

The Cable System of River Navigation in Germany.

The Frankfort correspondent of the Chicago *Republican* writes that the cable system of navigation is, at the present time, making rapid progress in Germany. This system prevails on the whole course of the Elbe through the kingdom of Saxony, and to some extent in the neighborhood of Magdeburg, and its extention into the interior of Bohemia on the one hand, and to Hamburg on the other, is projected, and is expected to be completed in a short time. On the Danube and its affluents the laying of a wire cable by the Danubian Steamship Navigation Company (Donau-Dampf-schiff farthgeselschaft) is being quickly and energetically prosecuted. The laying of one along the Rhine in Westphalia has already been completed. It is also intended to make this fresh invention available for the smaller streams of Germany, as, for instance, on the Saale and the Unstrut, for which the civil engineer, Opel, of Merseburg, a little while ago, recommended the laying of a wire cable instead of the proposed construction of a towing path. This system of cable navigation (either by ropes or chains) is likewise cheaper than the use of towing paths, and by this method, also, the possessors of land and other property on the banks of rivers are spared many inconveniences and unpleasantnesses, which are otherwise unavoidable. Opel has also shown the superiority which cable steamers possess over paddle-wheel steamers, since the former cause no ripple. This system has likewise an advantage in point of economy, since a steamer working on a chain or rope can make use of from ninety to ninety-four per cent of its steam power, while a paddle-wheel steamer can only use sixty per cent, and even, in case of a strong current, only thirty per cent. As a rule, says the *Bearbeiter*, the passenger boat with a forty-five horse-power engine must discontinue its voyage at high water, while a towing steamer with a fourteen horse-power engine holds the navigation open. The cable system of navigation can go on undisturbed in general so long as the sluices remain in good working order. While, on account of the inundation, etc., the towing path is inaccessible, such hindrances, on the contrary, form no obstacle to the steamer on the cable; or, at most, it only requires somewhat more coal, if the current be strong. The most important argument, however, in favor of the introduction of this system of navigation by means of a cable laid along the bed of the river lies in the fact that a certain plan can be held; the failure of navigation lies principally in this, that the condition of the weather, or the negligence of the captain, may cause an unpunctual arrival of the cargo at its place of destination. The journey from Magdeburg to Hamburg, by means of the cable system, can be accomplished in three days, while now often four weeks are required. Tremendous as the difference is, it is, nevertheless, given as a fact by the above named paper. There are two difficulties which present obstacles to the introduction of this system on some streams; for instance, on the Rhone and Saone, in France, this method of river navigation is not possible, because those rivers convey with them too great a quantity of sand, and thus clog up the cable. The other difficulty is the sharp bending of streams, as in the case of the Saale; but the impediment can be overcome to some extent by attaching fewer boats to the tugging steamer. The *Bearbeiter* makes the remark: "If we cannot succeed so far as to see thirty boats dragged one after the other on the Saale, as on the Seine, we must, for the present, be satisfied to transport three or four." On the Oder, also, this system is about to be adopted; but this river has, in one place, only a depth of fifteen inches; and it is, therefore, necessary to build the vessel according to the nature of the stream. On the Elbe, with from seventeen to eighteen inches of depth, it succeeds well, and the investment has realized from 9 to 12 per cent. In the Saale, at low water, there is a depth of twenty-eight inches, which, however, soon deepens to from thirty-six to forty inches, which is a circumstance much in favor of the above system.

Lattice Girders and Solid Plates.

The English magazines have of late been devoting much space to a discussion of the relative merits of solid plates and lattice girders, and though the question is certainly an important one, entailing, as it does, almost a revolution in the methods of construction, in case lattice girders possess all the advantages their advocates claim, yet the topic is still discussed, and the solution of this problem in mechanics seems nearly as far off as ever.

Those who rank among the more modern class of thinkers, who first theorize and then demonstrate, claim that the lattice will, for the same amount of material, sustain greater strains and endure shocks much better than a homogeneous plate, and the argument sustaining this claim is based chiefly upon the fact that iron will resist a greater force, applied in the direction of its fibers, than when across them, and it is claimed that mathematical analysis will render possible such an arrangement of the parts of the lattice that all, or nearly all, the strain will be in the direction of the grain or fiber of the iron.

Now, if we admit, what we certainly cannot prove to be false, that the engineer can, from pure theory and by the aid of mathematics, so place and arrange the parts of a girder that the strains will be in the direction of the fiber, and proportionate to the size of the pieces, we can draw a strong comparison in favor of open or lattice work.

No scientific man will deny the fact that a wire rope is both lighter and stronger than an iron rod of the same diameter or, if he claim the privilege of comparing the actual sectional area, taking the sum of the sectional areas of the individual wires, we can still claim greater strength for the rope upon the ground of more perfect structure, as proved by experiment—the weight, of course, being the same, or nearly the same, in either case. English bar-iron will resist about sixty thousand pounds tensile strain to the square inch, before parting, while wrought iron will resist over one hundred thousand pounds for the same actual area. Now, compare the lattice and plate in the same way. The plate corresponds to the solid bar and the lattice to the wire rope, and the openings to the space between the wire. Here we have undoubtedly so placed the direction of the strain that it is all with the fibers, and find that we have the proportion of ten to six in favor of the structure composed of several separate pieces.

Now, though this is perhaps an extreme case, and the argument only one by analogy, yet, while, perhaps, the same proportions would not exist between the degrees of resistance afforded by lattice girders and solid iron plates, as between the different qualities of iron, yet, from the superiority of construction obtained in the former, the reasoning will apply most forcibly. It will probably not be denied that the superiority of construction claimed really does exist, and this one argument is, therefore, taken alone, convincing.

But, after all, the matter of the relative strength of the material in different cases is really of less importance than is the apparently simple problem of fastening the parts together. If, after being properly arranged, the parts of the lattice can be so fastened together that each piece will do its entire duty without unduly straining its neighbor, there can exist no doubt that the lattice will be stronger than the iron plate girder, with its present form and arrangement; but, on the contrary, could the plate be placed in such a way as to be of equal strength at all points, without increasing the weight of the structure, the iron plate would certainly rival the weak forms of lattice as now constructed. Upon the ground that this perfect construction cannot be obtained in a solid plate, the advocates of the lattice girders rest their claim, and it would seem that their assertions cannot, as regards this point, be readily controverted.—*American Builder.*

Science and Labor.

Dr. Lyon Playfair, M. P., the new president of the Midland Institute, Birmingham, in succession to the late Mr. Charles Dickens—to whose merits as a man of noble sympathies and beliefs, and an effective social reformer he paid a feeling tribute—opened the session by an eloquent and thoughtful address on the union of science and labor. Ridiculing the idea that advances in science had been the result of accident, he pointed out that man's wants had led to the industrial arts, and the practice of these and long-continued experiences gave

birth to science. It was not promoted by a leisured aristocracy, but, as a rule, by men rising from the industrial classes. Stephenson was a collier, Davy and Dalton druggists, Faraday a bookbinder, Harrison a carpenter, Watt a philosophical instrument maker, and Arkwright a barber. Even statesmen, such as Cobden, Bright, and Gladstone, were being drawn from the same ranks. In a graphic sketch of the development of arts, Dr. Playfair showed how much science had contributed to their progress, and concluded by urging the vital necessity of education, that knowledge and labor might be joined. In a well-educated community, he observed, deaths by violence should be impossible, and yet in the last five years 82,853 persons perished by violence in England and Wales, and through disobedience to sanitary laws 110,000 were sacrificed every year.

Cutting Carnelians, Agates, Etc.

Carnelian is the substance that has been selected as the example of the mode of cutting and polishing stones of a medium degeee of hardness, the two other examples being alabaster for the softest stones, and sapphire for the hardest, excepting alone the diamond, which last is worked in a manner peculiar to itself, and is separately considered.

Carnelian, when operated upon by the lapidary, is first slit with the thin iron slicer, fed with diamond dust, and moistened with brick oil; secondly, it is rough ground on the lead mill, with coarse emery and water; and thirdly, it is smoothed either on the same lap rubbed down fine, or with a similar lap used with finer emery; thus far, the steps are precisely as explained with regard to alabaster.

Carnelian, and stones of similar or superior hardness, which are not smaller than about one third of an inch in diameter, are in almost all cases polished on a lead mill plentifully supplied with rotten stone and water; but this fine powder will scarcely adhere after the manner of the coarser and granular emery, or by simple pressure; and therefore, to expedite the process, the face of the polishing lap is *hacked*, or *jarred*, although in a manner quite different from that pursued by the cutler.

The lapidary employs the blade of an old table-knife, which he holds slenderly between the thumb and finger, placed near the middle of the blade, while the front part of the edge rests on the lap, not perpendicularly, but slanted a little forwards, so as to meet the lap edge foremost during its revolution. The unstable position of the knife causes it to jump, vibrate, or chatter on the lap, and at each jump it makes a very slight furrow; these fill the face of the mill with minute lines, or grooves, that serve for the lodgment of the finely powdered rotten stone. It is, however, to be observed that the wheel should be first made to revolve in the one direction and then in the opposite, that the marks of the hacking-knife may cross each other.

Smaller and harder stones are more commonly polished on a pewter than a lead lap, and for the smallest and hardest stones a copper lap is preferred; but all the polishing tools, of what metal soever they may be made, are hacked as above described, and used with rotten stone and water.

Rounded or convex stones, or those said to be cut *en cabochon*, whether of carnelian, or even several of the harder stones, are in many cases successively wrought by means of the wood mill with fine emery, the list mill with pumice-stone, and leather lap with putty powder. This is done on account of the greater elasticity of these apparatuses, which enables them to ply more conveniently to the globular forms of the works to be polished, and avoid wearing them in ridges or flat places.

Faceted works, on all stones and hard substances, are for the most part cut by the lapidary after one of three different modes. First, for pastes, or artificial stones, and many soft stones, as amber, carnelian jet, etc., the facets are usually cut on a lead wheel with emery, and polished on pewter with rotten stone. Secondly, for some of a harder kind, but inferior in hardness to sapphires, the succession of tools is a pewter lap and fine emery for the cutting, and a copper lap with rotten stone for the polishing. Thirdly, for sapphires, the chrysoberyl, and rarely for some few others likewise, a copper lap with diamond powder is used for cutting the facets, and a copper lap with rotten stone for polishing them. And fourthly, with the diamond, two stones are rubbed in a peculiar manner the one against the other to cut the facets, and they are polished by means of the *drop*, and an *iron* lap, or *skive*, fed with diamond powder.

From the comparatively small size of the stones and gems that are cut into facets, they cannot generally be held unassistedly in the fingers; the stone is consequently cemented centrally upon the end of a round stick of wood, nearly like a drawing pencil. The stick, when held *vertically*, gives the position for grinding the central facet or *table* of the stone; the stick is inclined to a certain angle for the eight, twelve, or more facets, contiguous to the table; of which facets, two, three, or four series are commonly required at different inclinations; and, lastly, the *horizontal* position of the stick serves in cutting the girdle or central band around the exterior edge of the stones.

The several inclinations of the stick on which the stone is cemented, are easily determined by placing the upper end of the stick into one of several holes in a vertical post, fixed alongside the lap, and this retains the inclination very accurately and simply.

The following substances are worked by the lapidary in nearly or exactly the same manner as carnelian; and descriptive articles are introduced in the catalogue, upon each of these particular substances, pointing out their principal external features, and also any peculiarities of method pursued either by the lapidary or other artisan, as the case may be, in working them.

Substances treated by the lapidary like carnelian:—Agate, amethyst, aquamarine, beryl, blood-stone, Brazilian topaz, carbuncle, cat's-eye, chalcedony, chrysolite, chrysoprase, crystal, elvans, emerald, feldspar, flint, fluor-spar, garnet, granite, heliotrope, jade, jasper, lapis lazuli, marble, mina nova, onyx, opal, pastes, peridot, plasma, porphyry, quartz, sard, sardonyx, serpentine, topazes.—*Handbook for the Artisan, Mechanic, and Engineer.*

IMPROVED ELEVATOR.

Our engraving illustrates a new method of constructing elevators for the use of mills, store-houses for grain, etc., and one for which it is claimed that it is particularly adapted to use in mines.

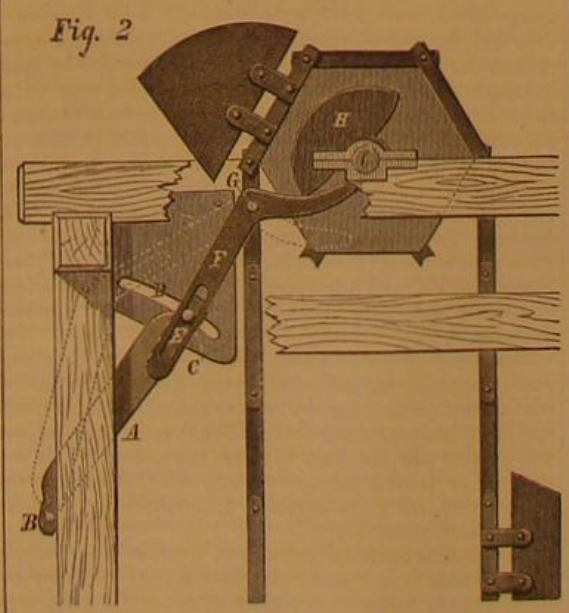
Fig 1



The improvement consists in arranging the spout or chute into which the substances elevated are dumped, so that the upper end will swing back under the bucket, thus insuring the receiving of all the contents of the bucket; and so also that it will, after receiving the contents of the bucket, swing out of the way, and not obstruct the downward motion of the bucket.

Fig. 1 is a perspective view of this improvement, and Fig. 2 is an enlarged detail, showing the way in which the motion of the spout above described is accomplished.

Fig. 2



The spout or chute, A, is jointed at the lower end, B, and the upper end is mounted on the bar or rod, C, the ends of which are arranged in curved guides, D. This rod passes through the slot, E, of a lever, F, pivoted at G, and projecting at the upper end into the path of a cam, H, keyed in the shaft, I, of the upper elevator drum.

The gravity of the spout, A, rod, C, and the lever, F, causes the spout to fall back at the upper end, under the buckets, so as to receive all the contents thereof, and the cam, H, is so arranged that just previous to the arrival of the bucket in the downward movement to the upper end of the spout, it will strike the upper end of the lever, F, and throw the spout up out of the way of the bucket. In this case, the buckets are so placed on the chain that one will pass over with each revolution of the cam; but it is evident that if more are applied, more cams may also be used to throw up the spout as often as a bucket passes.

This arrangement is claimed to save the loss due to the falling back of a part of the contents of the buckets, when the spouts are arranged in the ordinary way. It thus effects a saving in the power and time expended in elevating grain or any other material usually raised by such machines.

The inventor informs us that this elevator has been put to practical test for nearly two years in a coal mine, and that its operation has proved very satisfactory.

Patented, through the Scientific American Patent Agency, Sept. 27, 1870, by Theo. F. Rudiger, whom address for further information at Lawrence City, Kansas.

Correspondence.

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

The Monitor Life Boat.

MESSRS. EDITORS:—I hand you herewith an account of some valuable experiments made at Nantucket with a Monitor or Perry Raft, similar to the one which went to England in 1867, but of smaller size, having but two cylinders. In these days, when ships go down with nearly all hands, like the "Captain," and the "Oneida," it is well to call attention to all good vehicles for saving life and property.

The experiments made have fully established the utility of the raft as a surf-boat, and especially for a conveyance for passengers from a stranded vessel; and the trial of Friday, Sept. 23, must have satisfied the most skeptical that the raft is also a very valuable auxiliary for wrecking purposes. Although the surf was not heavy nor the wind strong, there was enough of both to show that no surf-boat could do what was done with perfect facility by the raft. By the help of a small derrick, easily carried by two men and an ordinary tackle, the crew of seven men placed an anchor weighing 1,036 pounds, without including the stock, which must have weighed at the least 200 pounds, on the stern or shore end, and by the help of a few of the spectators it was shoved off and the crew hauled it off by a whale line previously sent off with a small anchor. As no one doubted the facility of dropping the anchor and weighing it again so as to bring it near to the beach, that part of the process was omitted, and the anchor was landed again on the raft, the derrick lifting it off with great facility. After thus fully satisfying all present of the utility of the raft for carrying out an anchor, and for landing cargo of considerable weight and bulk, the crew, under the able management of Capt. J. A. Brown, of Barnegat, pulled to the westward, where the breakers ran in quite sharp, and performed various evolutions, such as turning short round on the very verge of the beach and on the breakers, pulling along shore in the trough of the rollers, and once, backing in until the steering oar could touch the shore, she was pulled off easily. In short, nothing could be more satisfactory. The crew, composed of experienced surf-men, one and all assured me that she could be got off when any boat could go, could be turned quicker, and that no boat on the island could have taken off the anchor on that occasion; all of which I was fully convinced of before, but it was very satisfactory to find my theory fully confirmed by the experienced seaman of Nantucket. Capt. Folger, agent for certain underwriters who own surf boats and wrecking appliances, said that he hoped I would condemn the raft for humane purposes in order that he might have it for wrecking.

I have only to add that I have no interest in the raft beyond that of calling the attention of all humane societies and all wreckers, all steamship and steamboat owners, all interested in vessels of war and passenger ships, to the great value of it for many purposes, involving the saving of life and property. It is not necessary to look back a great many years, in order to call to mind the terrible loss of life on the ocean for want of some such vehicle as the Monitor Raft. Take for an example the recent loss of the Captain with nearly five hundred souls. If she had been furnished with three Monitor Rafts of three cylinders each, ready on the hurricane deck, nearly all would have been saved. Not a year passes without great loss of life on our rivers and lakes, for want of some such thing as a Monitor Raft.

Boston, Oct. 17th, 1870. R. B. FORBES.

"Buzzing Up," Again.

MESSRS. EDITORS:—Your correspondent, L. U. Chapin, seems to be bothered to get the hang of this curious experiment, which is as easy as *flying*, when you once know how. Our way of doing the business when I was a Litchfield-county boy, was to place the buzzee extended, head and heels on two chairs. Then four of us buzzers, standing two on each side of him, placed our fore-fingers under shoulders, hips, thighs, and calves, bending so as to bring our heads over the center of the extended body. Then all (including buzzee) breathed three long, deeply inhaled and exhaled breaths in unison, and as the last breath was *going out*, all "willed," and lifted—what?—a feather's weight!

If the breathing was done simultaneously, and the "vacuum" (as we thought) well formed, up flew the buzzee, "as light as as a cork," and was often held on the tips of our fingers, as high as the arms could reach, for an appreciable space of time. If successful, Dame Nature's gravity was in a bad way; if we failed (and, *i' faith*, there was "no such word as fail") ours was upset, which made quite as much fun and rather increased our wonder.

Stockbridge, Mass. I. IVES PEASE.

Rubber Boot Soles.

MESSRS. EDITORS:—In the SCIENTIFIC AMERICAN of the 8th of October, N. A. H., of Cal., asks "how to put rubber on

the soles of boots." Some years ago I applied soles to a number of pairs of boots that wore entirely out without the rubber separating at any point.

Get some dissolved rubber; scrape the sole clean, and coat it with the dissolved rubber, and set it away to dry; the next day add another coat of rubber, and continue so to add until the rubber will remain on the surface like varnish. It will take three or four coats. In the meantime scrape or sandpaper the rubber sole, and give that one coat of the dissolved rubber, and allow it to stand a day or two; now give the sole of the boot a good coat and apply the rubber, having both sole and boot blood warm. Work the air all out with a round stick, in the same way that shoemakers finish the bottoms of boots. M. W.

Electrolytic Insulation.

MESSRS. EDITORS:—In your valuable paper, of Oct. 22, I read an article about electrolytic insulation, which said that "wires may be insulated from each other, under any given electromotive force by means of good conductors of electricity so arranged as to generate an electromotive force, which opposes the escape of the current, when the latter is transmitted in a particular direction;" or in other words, the wire is so situated between metals and electrolytes, that the difference of electric tension of the wire (or of the telegraph wire and the earth) is constant.

As I understand telegraphing, the transmitting of signals consists in making the telegraph wire alternative electric and non-electric, or, in other words, introduce a current and interrupt it again.

How can the wire, insulated as described, be rendered non-electric, as in its entire length this electrolytic insulation restores every instant the electric difference?

If the one end of the wire is connected with a battery, the other end will indicate a galvanic current, but when the battery at the one end is excluded, the current on the other end will not cease as the "electrolytic insulation" now entirely compensates the excluded battery on the other end, and the current will continue in spite of all attempts made on the one end to stop it. I wonder how electrical signals can be transmitted through such a telegraphic line.

Therefore, I think, it is quite impossible that, in the future history of this science-art, electrolytic insulation may be made to render good services.

The above is only my prejudicial opinion, and I would like to hear through your valuable paper, whether it agrees with the opinion of scientific men or not.

Philadelphia, Pa. HUGO BILGRAM.

"A Cheap and Efficient Low Water Detector."

MESSRS. EDITORS:—In a late issue of your paper, "Safety" informs the public how to apply a plug of common tinmen's solder, to indicate, when it melts, a low stage of water in the boiler. The use of such plugs is neither safe nor efficient. In the use of certain waters a scale will form over plugs exposed to the direct action of the water, and render them not only useless but dangerous, if relied upon as indicators of low water. Then again the melting of such a plug puts the fire out, and stops the works. Is this cheap? Would "Safety" recommend the use of such plugs in boilers of steamboats?

Boston, Mass. B. FRANKLIN.

[For the Scientific American.]

AUTOMATIC TELEGRAPHY.

BY GEORGE B. PRESCOTT

Ever since the introduction of the electric telegraph as a means of communicating intelligence rapidly, efforts have been made, both in this country and in Europe, to perfect a system of automatic telegraphy by which the number of dispatches transmitted over each wire could be increased. Even in the early days of the electric telegraph, Professor Morse sought to perfect this system, which was embodied in the first telegraphic instrument devised by him in 1832, as it was also in the first model by which the new art was demonstrated in 1835. At that early period the automatic was deemed to be the only practical, if not practicable, method of insuring a perfect record. The details of this process are to be found in the earliest specifications and descriptions of the Morse invention in the Patent Office at Washington, and the instrumentalities are very fully described and illustrated by diagrams in Vail's earliest work on the telegraph, published in 1845. In this system metallic types were employed, which formed the dots and dashes of the Morse alphabet by short or long projections. These types, arranged or set up as a message, were placed in a row in rules or composing sticks, and were carried by clock-work mechanism under a lever which opened and closed an electric circuit, in accordance with the projections or depressions of the types. Experience soon suggested, however, that manipulation by hand with a simple lever possesses the advantages of greater simplicity and economy, and it was the system adopted for practical use.

In 1848, Alexander Bain, of Edinburgh, endeavored to solve the problem of automatic telegraphy in a different manner. He prepared the messages by a hand punch, which cut longer or shorter rectangular holes in a paper band; and these holes reproduced the Morse characters by electro-chemical means, when they were drawn underneath a rubbing contact pressing on the paper. This plan also had no practical result, for on the one hand the preparation of the perforated paper band was too troublesome and slow—the time occupied in preparing the messages for transmission being many times greater than that required for sending by the Morse system—and on the other hand, the signals could not be legibly recorded, when transmitted rapidly over long lines, in consequence of the disturbing effects of static charge.

In 1854, Messrs. Siemens and Halske, of Berlin, endeavored to remedy the defects of Bain's apparatus by means of a punching apparatus constructed with three keys. The first key, when pressed down, punched a single hole in the paper band; the second, a double hole; while each key, on returning to its normal position, pushed the paper the necessary space forwards; the third key did not punch, but served only to produce spaces between letters and words. This system was introduced on the Warsaw & St. Petersburgh line, but did not long remain in use, for the preparation of the paper was still found to be inconvenient and expensive, and a very carefully and frequently adjusted relay arrangement was required for the production of good work.

In 1857, Mr. John P. Humaston, of Connecticut, invented an instrument for perforating the paper to be employed in the transmission of messages upon the Bain plan, which it was thought by some would bring the automatic system into general use; but this apparatus, although very ingenious in design, was found too complicated, as well as too slow, for practical use—its capacity for producing the Morse characters, when worked by an expert operator, being only about one third as great as that of the ordinary hand key.

In 1858, Professor Wheatstone took out a patent in England for an automatic telegraph. He employed Bain's punched paper band and a three-keyed puncher, modified by employing double holes for representing the dash of the Morse alphabet, not next to one another, but over and under a middle row of holes. This third line of holes was produced by a special third punch which came into action on the depression of each of the three keys.

For sending messages, Wheatstone employed a peculiar and very ingenious apparatus set in motion by the turning of a handle. It was provided with three needles lying in a vertical plane, and held up by light springs. These needles were elevated and pressed against the paper by the turning of the handle. The middle needle, in rising, always met a hole and passed through it, while the two side needles were held back by the paper, when there happened to be no hole immediately above them. The pieces carrying the side needles made battery contacts when the latter went through the paper band, while the middle needle was carried forward by a mechanical arrangement, and thereby advanced the paper a space corresponding to the distance between two of the center holes. Wheatstone at first used currents in one direction, but at a later date he employed alternate currents and polarized electro-magnets. His apparatus suffers, however, independently of technical defects, from the slowness and difficulty of preparing the messages by means of the three-keyed puncher.

In 1862, Dr. Siemens, of Berlin, again endeavored to solve the problem of successfully operating an autographic telegraph by the method first introduced by Professor Morse, employing for this purpose an electro-magnetic type transmitter, which, it is said, enabled messages to be sent with tolerable certainty over short lines with about seven times the speed of hand sending. The instrument required, however, to be worked with more than ordinary care to secure accurate results; and it was also found that the setting up of the type took too much time, and required too numerous a staff of operators to compete successfully with the hand systems.

Dr. Siemens subsequently went back to the employment of Bain's paper band, the endeavor to construct a machine for the rapid setting and distribution of metallic types having been attended with less success than he had anticipated; but he has not yet succeeded in making the system practically useful.

In 1869, Mr. George Little, of New Jersey, patented an apparatus for preparing messages for transmission by Bain's automatic system, and a wire has recently been put up between New York and Washington for the purpose of testing the value of the apparatus. The same difficulty, however, appears to be encountered by this as with all previous attempts to utilize automatic telegraphy—too much time and expense are required to prepare dispatches for transmission. This apparatus, instead of being an advance upon those which have preceded it, seems to be among the least efficient of all, and the success of automatic telegraphy is apparently as far from realization to-day as it was a quarter of a century ago.

The theory upon which most of the experimenters in automatic telegraphy have apparently proceeded is that electricity has a definite and practically instantaneous velocity, irrespective of the medium through which it is transmitted, and that all that was necessary to insure the success of the system was to provide an apparatus by which dispatches previously prepared could be rapidly transmitted and recorded by automatic machinery.

Experiments conducted upon short lines, or upon coils of wire intended to represent long lines, seemed to justify the conclusions to which the advocates of automatic telegraphy had arrived, but when attempts were made to transmit with great rapidity upon very long lines they were invariably attended with failure. Recent investigation has shown that electricity instead of possessing an instantaneous velocity under all circumstances, is limited in its movements like all other forces in nature; and that its speed depends upon certain absolute conditions, among the principal of which are the length, size, and quality of the conductor through which it is transmitted.

In a recent series of carefully conducted experiments with the automatic system in which chemically-prepared paper of a very sensitive nature was employed, I found that the highest rate of speed attainable through 500 miles of No. 8 iron wire did not exceed the ordinary rate of transmission by the Morse apparatus; and that the greatest speed which could be attained over a telegraph line of 250 miles in length composed of No. 8 iron wire was 100 words per minute. When the speed of the instrument was increased beyond this rate the signals were prolonged so as to run into each other and become unintelligible.

The speed of transmission increases with the square of the diameter of the wire, and diminishes with the square of its length. If a wire of the above length, but of a superior conductive capacity were employed, a proportionate increase in the rate of speed would be obtained. Thus, for example, on the compound steel and copper wire just put up between New York and Washington, which has a conductive capacity equal to a No. 5 iron wire, or about double that of a No. 9 iron wire, intelligible signals have been transmitted at the rate of 250 words per minute. By proportionately increasing, therefore, the conductive capacity of the wire, almost any degree of rapidity may be attained in the transmission of signals; but instantaneous velocity can only be attained by a conductor of infinite dimensions.

Supposing the claim was true, however, that there is no limit to the rate of speed at which dispatches can be transmitted by the automatic system over any of the lines now in use, what would be gained by its adoption? The value of the telegraph consists in its ability to furnish constant and instantaneous communication between all places in an accurate and reliable manner, and as the present systems are fully competent to meet all of these requirements, why is a change necessary or desirable? The fact that a much greater amount of matter may be transmitted in a given time, over the same number of wires, by the automatic than by the present system, offers in itself no conclusive argument in favor of a change, since there is no limit to the number of wires which may be strung between any two points in order to meet any possible increase in the traffic. The only reason, therefore, which can be adduced in favor of substituting the automatic for the hand systems is that a given amount of business may be transmitted by it at a saving in the cost of construction and maintenance of line. The superiority of the automatic system then, if it has any, consists in its greater economy. Let us see whether it is entitled to this credit.

If the expense of constructing and maintaining a sufficient number of wires to transmit a certain amount of telegraphic correspondence was the only essential element to be considered in estimating the cost of the service, then, of course, that system which could perform the service upon the smallest number of wires would be found the most economical in practice; but, unfortunately, the expense of constructing and maintaining the lines, although large, is not the greatest item in the expense of operating a telegraph, the annual expenditure for operators and clerks considerably exceeding it; and the problem, therefore, as to which system is the more economical cannot be properly solved, unless all the items of expenditure involved in the transmission of a dispatch are duly considered.

In transmitting messages by the systems now in use, no previous preparation of the dispatches is required. The copy as it is written by the customer, is placed upon the operator's table and transmitted by the Phelps printing instrument at from 2,500 to 3,000 words per hour, and simultaneously printed in plain Roman letters at the receiving station ready for delivery.

The automatic system, on the contrary, requires that the messages be previously prepared for transmission, either by a perforation of the characters representing the contents of the dispatches through a band of paper, or by setting them up in forms from movable metallic types; and after they have been thus prepared and transmitted, the record which is made at the receiving station in telegraphic characters or signals, must be subsequently translated and legibly copied upon suitable blanks before they are ready for delivery. All of this process, of course, requires time; and time is what the telegraph is especially designed to annihilate.

The best speed yet obtained during an entire day in preparing messages for transmission has never exceeded six hundred words per hour by any automatic apparatus ever devised; and as the average rate of transmission by the Phelps letter printing instrument, which is employed by the Western Union Telegraph Company between some of the principal commercial cities, is twenty-five hundred words per hour, it is evident that it would require four operators, at least, to prepare as much matter for transmission by the automatic apparatus, as one operator can send by the Phelps printing instrument; and as the messages will require translation as well as copying at the receiving station, at least as many operators would be required for this service as for the preparation of the messages, and in addition to these, one operator would be needed at each office to work the transmitting and receiving apparatus, so that no less than ten operators would be necessary to transmit as many messages per day by the automatic system as are now sent and received by two Phelps printing operators in the same time.

It is claimed by some of the advocates of automatic telegraphy that, although it requires a much larger number of persons to perform the same amount of work by that system, still as a less expensive kind of labor may be employed, the aggregate expense of each would still be in its favor; but this claim, I apprehend, is not well founded. It requires a certain amount of education and intelligence to operate any kind of a telegraphic apparatus, and, generally speaking, about as much to work one kind as another. Now, I do not doubt that girls and boys of ten or twelve years of age may be found who can prepare messages for transmission by the automatic system—as is claimed by the promoters of that enterprise—but the same prodigies could learn equally well to operate the other systems; but that all girls or boys of that age, or any considerable proportion of them, are qualified

to do either, is very improbable; and I scarcely think that any argument is necessary to convince a reasonably intelligent person that the telegraphic traffic of this country cannot be safely intrusted to, nor satisfactorily performed by, children of any age, however precocious they may be.

The operators employed to prepare messages for transmission by the automatic system must at least be qualified to read ordinary manuscript writing, else they could not render the messages handed in for transmission by the public into the telegraphic characters; while those who are employed to copy the messages after they have been transmitted must be competent to write a legible hand; and this is all the education necessary to learn any other system of telegraphy. In practice, therefore, the automatic operators would require to be just as competent, and would be entitled to receive as much pay for their labor, as those of any other system. In order, however, to present the automatic system in the most favorable light possible, and to give it every advantage which its promoters claim for it, however improbable, I have in the following estimates put the rate of compensation for the services of a printing operator at one hundred per cent above that of an automatic operator.

The cost of building a telegraph line depends, like that of any other structure, upon the value of the materials and labor employed in its construction, and differs materially in various sections of the country. But assuming that a telegraph line, with a single wire, may be built in this vicinity for three hundred dollars per mile, and additional wires put up on the same poles at one hundred dollars per mile, the following tables will show the cost of constructing and maintaining a line of telegraph between New York and Washington, together with the expense of the operators required for the transmission of a given amount of business by the automatic and the Phelps printing systems of telegraphy:

COST OF A TELEGRAPH LINE BETWEEN NEW YORK AND WASHINGTON.

1 wire, 228 miles, at	$300	per mile	$ 68,400
2 wires, " "	400	"	91,200
3 " " "	500	"	114,000
4 " " "	600	"	136,800
5 " " "	700	"	157,000

STATEMENT, SHOWING THE COMPARATIVE ECONOMY OF EMPLOYING THE AUTOMATIC AND PHELPS PRINTING TELEGRAPHS, UNDER THE SUPPOSITION THAT THE AUTOMATIC CAN TRANSMIT AS MUCH MATTER IN THE SAME TIME UPON ONE WIRE, AS THE PHELPS INSTRUMENT CAN SEND UPON TWO, THREE, FOUR, OR FIVE WIRES.

PHELPS' PRINTING SYSTEM.

TWO WIRES.

Interest on cost of line, $91,200 at 7 per cent	$ 6,384
Maintenance of line at 3 per cent on cost	2,736
Battery	235
Four operators at $1,200 per annum	4,800
Four grinders at $500 "	2,000
Expense per annum	$16,156

AUTOMATIC SYSTEM.

ONE WIRE.

Interest on cost of line, $68,400 at 7 per cent	$ 4,788
Maintenance of line at 3 per cent on cost	2,052
Battery	118
Ten operators to prepare messages for transmission at $600	6,000
Two operators to transmit and receive at $600	1,200
Ten operators to translate and copy at $600	6,000
Expense per annum	$20,158

PHELPS' PRINTING SYSTEM.

THREE WIRES.

Interest on cost of line, $114,000, at 7 per cent	$ 7,980
Maintenance of line per annum at 3 per cent	3,420
Battery	354
Six operators at $1,200 per annum	7,200
Six grinders at $500 per annum	3,000
Expense per annum	$21,954

AUTOMATIC SYSTEM.

ONE WIRE.

Interest on cost of line, $68,400 at 7 per cent	$ 4,788
Maintenance of line per annum at 3 per cent	2,052
Battery	118
Fifteen operators to prepare messages at $600	9,000
Two operators to transmit and receive at $600	1,200
Fifteen operators to translate and copy	9,000
Expense per annum	$26,158

PHELPS' PRINTING SYSTEM.

FOUR WIRES.

Interest on cost of line, $136,000 at 7 per cent	$ 9,520
Maintenance of line at 3 per cent on cost	4,080
Battery per annum	472
Eight operators at $1,200 per annum	9,600
Eight grinders at $500 per annum	4,000
Expense per annum	$27,672

AUTOMATIC SYSTEM.

ONE WIRE.

Interest on cost of line, $68,400, at 7 per cent	$ 4,788
Maintenance of line per annum at 3 per cent	2,052
Battery per annum	118
Twenty operators to prepare messages at $600	12,000
Two operators to transmit and receive at $600	1,200
Twenty operators to translate and copy at $600	12,000
Expense per annum	$32,158

PHELPS' PRINTING SYSTEM.

FIVE WIRES.

Interest on cost of line, $157,000, at 7 per cent	$10,990
Maintenance of line at 3 per cent	4,710
Battery per annum	590
Ten operators at $1200 per annum	12,000
Ten grinders at $500 per annum	5,000
Expense per annum	$33,290

AUTOMATIC SYSTEM.

ONE WIRE.

Interest on cost of line, $68,400, at 7 per cent	$ 4,788
Maintenance of line at 3 per cent on cost	2,052
Battery per annum	118
Twenty-five operators to prepare messages at $600	15,000
Two operators to transmit and receive at $600	1,200
Twenty-five operators to translate and copy at $600	15,000
Expense per annum	$38,158

The increase in the number of automatic operators is required to keep that system up to the working capacity of each additional Phelps wire.

Thus it will be seen that, even admitting the claim that there is no limit to the amount of matter which may be transmitted by the automatic system over a single wire to be true, and also allowing that operators may be employed to work it at one half the rate of compensation which is paid to the Phelps printing operators, there is still no economy in its use, since the extra labor required in the preparation of the dispatches for transmission, as well as in the subsequent translation and copying, far exceeds the gain in the cost of constructing and maintaining the wires; and a thorough and impartial examination of the subject shows that the more the automatic system can be shown to exceed the present system in the amount of matter which can be transmitted by it, the greater would be the loss incurred in its operation; thus establishing the singular paradox that when most successful it is the greatest failure.

In the preceding exhibit, I have given the automatic system the benefit of a higher rate of speed than has ever been practically attained in the preparation of messages for transmission, while messages have been transmitted by the Phelps instrument at over 3,300 words per hour. It cannot, therefore, be justly claimed that I have failed in any respect to make as favorable a showing for the automatic system as the case will admit of, while, on the contrary, I have conceded a good many advantages to which it is not entitled.

In order to attain the exceptionally high rate of speed which has been experimentally obtained upon the automatic line recently constructed between New York and Washington, the new company put up a steel and copper wire for which they paid more than three times the cost of a good iron wire suitable for the use of the systems in general use. It is evident, therefore, that even the claim for greater economy in the construction of their lines, which has been so frequently made by the advocates of that system, is not well founded.

But, leaving all other considerations out of the question, the automatic system fails in the first two great and indispensable requisites of a telegraph—continuous and instantaneous communication. Before a message can be prepared for transmission by the automatic process, it can be transmitted, copied, and placed in the messenger's hands for delivery by either of the systems now employed. No matter how good a telegraphic apparatus may be in other respects, if it fails to transmit messages promptly it is comparatively useless. The public does not care to know how many dispatches can be sent in an hour over one wire, after half a day has been consumed in preparing them for transmission. Instant and constant dispatch is what is required, and that system only will be employed which can effect it. These most essential elements of success in telegraphy are totally lacking in the automatic system, and it must, therefore, hereafter, as heretofore, prove an absolute failure for all practical purposes.

[For the Scientific American.]

THE SEA URCHIN.

BY J. E. GORDON.

The Echinus, or Sea Urchin, as it is commonly called, is a subject of the division Radiata, and class Echinodermata. It consists of a molluscous animal inclosed in a casing of a limy substance, resembling the shell of a hen's egg, but considerably thicker; hence, it has received the vulgar term of sea-egg, when deprived of a number of radiate spines with which the exterior is provided. The spines proceed from the shell in all directions, and taper, thus forming a number of points, and giving it a formidable appearance. These spines are jagged, and if allowed to penetrate the flesh of any animal, are withdrawn only by leaving portions rankling in the wounds made thereby, as they are very brittle. The sea-egg or limy case of the Echinus, on being dissected, presents a number of triangular and hexagonal plates. It is of a spherical form when integrate, considerably flattened, resembling in shape a portion of dough when prepared for the well-known American accompaniment to a breakfast table, biscuits. It is studded with a number of small, pearl-like protuberances. Sea-eggs are found varying in size from less than an inch, to above four inches in diameter, greatest measurement. The spines are in length proportionately from one to six inches, and are about as thick as an ordinary round bodkin.

The Echinus is found in tropical waters in profusion, where numbers may be observed rolling sluggishly along the bottom of the sea, upon the tips of their spines; partly propelled by their will, partly by the surge of the water. Upon being procured from the sea, they present a dingy appearance. There are two or three species, the most common are the black and the white; but when first taken from their ocean home, it is hardly possible to distinguish them except by the shortness of the spines of the white kind, for the latter are nearly as black as the former. After bleaching, however, the difference is perceptible in the shell, as the former retain an olive brown tinge, while the latter are perfectly white or assume a pink tinge. There is a slimy coating over the shell of the egg when procured from the water; this dries and falls off as do also the spines. Beneath each egg, there is a large opening in which is placed the mouth, and which is provided with a number of small teeth all converging towards their points. On the top of the egg, there is a small hole, large enough to admit a duck-shot. The entire case is porous, as may be seen when it is held up to the light.

The Echinus has been employed in many ways. The French and Spaniards prepare delicious dishes from it. The shells serve as ornaments on "what-nots," or they are arranged pyramidically in the conchologists' cabinets. Pin-cushions for ladies toilets, emery bags for their work-tables, and needle-cases for their work-boxes, can be made of them. The manner of preparing the eggs for these purposes is as follows: The eggs are procured, not by a drag-net or shell dredge, that would destroy them, but by a person who wades into the sea till about the middle of his waist in the water, where he finds them in regular reefs skirting the shore, and takes them up carefully with his hands. At stated times they are driven on shore in a perfect condition by the ocean's swell; then, they need not be sought in the depths of the sea, and besides it is preferable when they can thus be procured, as one is very apt to be severely pricked in attempting to lay hold of the black ones, even with the aid of two pieces of stick, the thorns of the white ones are, however, comparatively innocent, as they are so short. Next, they are placed in the sun on a white-plastered wall in a secluded spot. After several days' exposure to a scorching solar heat, the spines fall off, the shells begin to turn white, and this must be assisted by a daily wash with soap, brush, and cold water. The shell is allowed to dry thoroughly again, and the animal within further permitted to decompose, until it can be easily extracted by means of a piece of stick. When it is all ready for use, a quantity of saw-dust or emery, as the case may be, is procured and is inserted in a cushion within the egg. Thus we have a pin-cushion or emery cushion, according to the stuffing employed.

I have before asserted that the Echinus is found in numbers, skirting the shores. Woe to the unfortunate fellow who recklessly plunges into the sea, deeming himself free from harm! He rises cognizant of the fact that he has returned to the surface a little the worse of his fool-hardiness, and runs with all speed to the shore to sit in agony and extract, as best he can by means of his pocket-knife, such portions of the spines as have not sunk beneath his reach. To the native, not so unfortunate, there is a great consolation; for while the tryo is digging and cutting into the wound with his pen-knife; he, with less rapid pace, yet determined action, makes for his garments, which having donned, he proceeds to a friend's house and obtains a piece of tallow, lies flat on his stomach, turns the soles of his wounded feet up, and allows his friend to place a portion of the tallow on the wounds, while it is slightly cauterized with the flame of a lighted candle. A few hours transpire ere the points are extracted, but the pain is much alleviated by the process.

Once, I had frequently warned a stranger about his carelessness in bathing in the vicinity of a reef of the sea-urchin, but he heeded not my counsel until one day he came to me in intense agony, regretting that he had not taken my advice. After he had calmed a little, I told him that I would send a colored person who would render him immediate relief. After several excuses, he consented to undergo the process which I described to him; and, to his utmost satisfaction, he was all right again in a couple of hours after. He vowed that he would not bathe in a hurry again. I told him that he should have been more cautious, particularly as I had warned him of the danger.

Printing in the Chinese Language.

The editor of the New York *Observer* in "The Tour Around the World," gives the following description of the difficulties of book-making in China:

"One of the first places that I visited on reaching Shanghai, was the Mission Press of the Presbyterian Church of the United States—a wisely founded institution, which has been doing a great work. It is the most extensive printing establishment in China, and has been sending its light into Japan as well. The great work of Dr. Hepburn, of Yokohama—his quarto Japanese Dictionary—was printed at this press; and during the last year, the third edition, 2,400 copies, of another Japanese Dictionary, the first two editions of which were printed at Yeddo, has been printed. It is a type foundery as well as a printing house, and, with judicious and liberal management, it may be made an important engine for good in time to come as it has been in the past. During the year 1868, 25,000,000 pages were printed at this press; and in the present year the whole of the New Testament and of the Pilgrim's Progress has been admirably electrotyped. I have before me a copy of the Pilgrim's Progress in Chinese, illustrated with engravings drawn and executed there, and also a copy of the Peep of Day, in Chinese, from the same press.

"On entering this extensive printing establishment, I was confronted with a series of amphitheaters, in the interior of each of which stood a compositor; and I saw at a glance the immensity of the work which every one who learns to read or speak or print the Chinese language has to encounter. Each one of these amphitheatres was what printers call a case, containing, not twenty-six letters as in English printing offices, but more than six thousand different characters of types, and, with the combinations that are made, more than thirteen thousand. I do not much wonder that the Chinese adhere to their old method of engraving everything on wood that they print, for I should be very loth to attempt to hunt up many letters or words out of the six thousand boxes that I saw before me. And yet this mode of printing is a great improvement on the old."

Government Storm Signal Stations.

The following have been selected as the stations of observation and report, to be first occupied. The list will be improved as the facilities granted the office may permit:

Plaister Cove, N. S.; St. John, N. B.; Portland, Me.; Boston, Mass.; New Haven, Conn.; New York City, N. Y.; Philadelphia, Pa.; Baltimore, Md.; Washington, D. C.; Wilmington, N. C.; Charleston, S. C.; Augusta, Ga.; Savannah, Ga.; Lake City, Fla.; Key West, Fla.; Montgomery, Ala.; Mobile, Ala.; New Orleans, La.; Jackson, Miss.; Memphis, Tenn.; Nashville, Tenn.; Louisville, Ky.; Cincinnati, Ohio; Knoxville, Tenn.; Albany, N. Y.; Syracuse, N. Y.; Oswego; N. Y.; Rochester, N. Y.; Buffalo, N. Y.; Cleveland, Ohio; Toledo, Ohio; Detroit, Mich.; Chicago, Ill.; Indianapolis, Ind.; St. Louis, Mo.; Milwaukee, Wis.; St. Paul, Minn.; Duluth, Minn.; Omaha, Neb.; Cheyenne, Dak.; Corinne, Utah; Santa Fe, N. M.; Fort Benton, N. M.; San Francisco, Cal.

THICKNESS OF THE EARTH'S CRUST.—To enable the earth to resist the tide-generating force of the sun and moon, so as to leave the phenomena as they are actually found, Professor Thompson considers that its crust must have a thickness not less than two thousand or two thousand five hundred miles. Such a conclusion is of course quite inconsistent with the hypothesis that the earth is a mass of molten matter inclosed by a thin, solid shell.

Improved Treadle Motion or Foot Power.

Many devices calculated to relieve the monotony of motion, and thus divest the actuation of light machinery by the feet, of its wearisome and, in some cases, injurious character, have been from time to time devised, and some have met with considerable favor. Where the feet and lower limbs are chiefly involved in producing the motion, as is the case in sewing machines, the following requisites to a good treadle motion, may be enumerated:

The axis of oscillation should be placed directly under the ankle, that is, the foot pieces should be so placed that the shaft upon which they are fixed is directly under the ankle. This allows a quiet motion of the foot and calf, without moving the thighs, a thing which is impossible when the foot-pieces are placed in any other position. This avoids all excitement resulting from rubbing of the limbs, an evil which has been strongly condemned by physicians, as leading to disease and weakness, especially with females, by far the most numerous operatives on sewing machines. Isochronal movement of the feet, which has been recommended as a remedy for the evil specified, is open to the serious objection that it is far more wearisome than alternate motion. The irritation caused by devices employing alternate motion, is, we think, wholly the result of a faulty position of the pedals. If these be properly adjusted in accordance with the principle above enunciated, alternate is, in our opinion, much better than isochronal movement in devices of this class.

Our engraving shows a very simple method of obtaining continuous rotary motion with alternate motion of the pedals. There is no dead center common to both pedals, so that either one or the other will at any time start the machine. The machine may therefore be entirely controlled by the feet, and may be moved as slowly as desired, without danger of stoppage. The wheel may also be started from any point in its revolution.

The arrangement is so simple that we shall not need to refer to the parts, by letters of reference.

The left pedal is riveted to the shaft, while the right one plays freely on the same shaft. From the latter projects an arm, to the end of which is attached a pitman connecting it with the crank wrist. Another arm is keyed to the pedal shaft, at, or nearly at right angles with the other arm, and is connected by a pitman with the crank wrist, in the same way as the first.

This arrangement allows the feet to alternate in their movement and secures the advantages above named. The device can be used most advantageously in connection with a brake to prevent reverse motion.

Patented, August 30, 1870, by Geo. B. Safford, Burlington, Vt., whom address for further information.



SAFFORD'S IMPROVED TREADLE MOTION OR FOOT POWER.

Improved Miter Box.

Among the many and useful improvements that have been made in tools used by wood-working mechanics, we find few miter box improvements. The common miter box has many disadvantages to overcome which have been studied with no very decided success. To fit a miter box for general use as a tool, it should possess the attributes of simplicity, accuracy, durability, and cheapness. Mechanics cannot and will not use any device that is complicated, inaccurate in its workings, or expensive.

We give herewith an illustration of a recent improvement in miter boxes, that is claimed to overcome many of the objections heretofore met with in devices of this kind, with much saving of labor and accuracy in its working. It consists in an arrangement of adjustable stands and guides on a stationary bed, A, which may be made of either wood or metal, and of any desired length or breadth. To the opposite side edges of this bed are secured slotted cast metallic standards, B, which are made adjustable by means of the slot, C, and which work on the pivot, D. These standards have affixed to them strips of hard wood, between which the saw works in cutting miters, bevels, etc.

Fig. 1

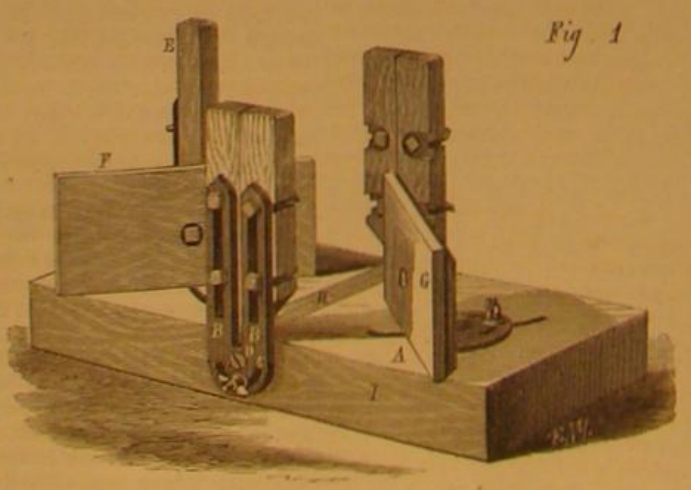
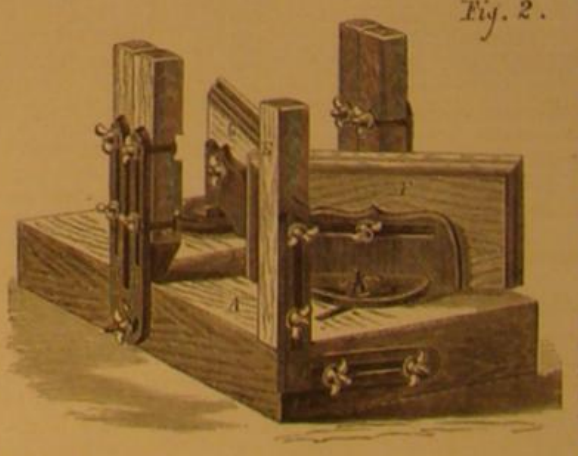


Fig. 2.



WILCOX'S MITER BOX.

E is an adjustable guide placed on the opposite left-hand corner from the work side of the box, and set at exactly right angles with the saw line. The purpose of this guide is to give a rest or guide for a piece like a casing for a window frame, when it is desired to cut it to the bevel of the sill.

Upon the top of the bed are placed two adjustable miter guides, F and G. These miter guides consist of castings having slots, to which are affixed woods, in such a manner that either of the guides may be placed at the saw line, or run back out of the way of the piece to be cut from the other guide. It will be seen that by setting the guides, F and G, on an exact miter with the saw line, H, and inclining in either direction the standards, B, a compound miter or bevel may be cut of any desired form.

I is the working side of the box. In working with this box, the saw, after having cut off a piece to any desired form, works down upon a strip of hard maple dovetailed across the bed. This strip can easily be taken out and replaced when it becomes worn. The strips of maple affixed to the standards, B, are adjustable to a saw of any thickness, and may be taken out, dressed up, and placed back again when necessary.

No parts of this box, except the saw guides and dovetail strip, are destructible by reason of wear. In traveling from one place to another, it can be taken apart and packed in a chest in as little space as a long-jointer would require.

This invention was patented, through the Scientific American Patent Agency, by Edward M. Wilcox, of Bloomer, Chippewa county, Wis., July 20, 1870. For further information apply to Wilcox & Pierce, No. 73 Dearborn street, Chicago, Ill.

Hand-made Cheese---A New Industry.

A German hand-cheese factory has been established in the southern section of Philadelphia, by Mende Brothers, which is now carried on with much success. The *Practical Farmer* says:

"It was to us an entirely new industry, illustrating what we have often had to remark, that if farmers would give their business more thought and study, it will be found to embrace many subdivisions, and much greater variety than the old stereotyped rotation of corn, oats, and wheat.

"The business which Mende Brothers have established is that of purchasing from the farmers of Chester and Delaware, Bucks and Montgomery counties, curdled milk, commonly known as cottage cheese—"smearcase." It is brought to them twice a week in cans, for which they pay about twenty cents per gallon, and by weight in winter three to three and a half cents per pound. They consume in this way the milk of about 2,000 cows annually. Their factory is a massive brick building, 40 by 100 feet, five stories high, with basement, and has a variety of very ingenious machinery, all of which is propelled by steam power, and is capable of making 50,000 of the hand cheeses per day of ten hours, or fifteen millions per year, and does the work of at least fifty hands. The curds, on being received at the factory, fresh from the dairy, are placed in bags holding perhaps a couple of bushels, and are allowed to drain entirely dry. They are then emptied into large wooden troughs, and manipulated with wooden shovels, a certain amount of salt and some caraway seed being mixed through the mass. It is then thoroughly ground up by machinery, before passing into their principal machine, which is a wonderful piece of mechanism. This molds and delivers the cheese on sliding shelves, in three straight rows, automatically pressed into the shape of small cakes, about two inches wide by half an inch thick, which is found the most convenient size and shape for sale and shipment. This is done with the regularity of clock-work, and continues six days in every week in the year, at all seasons.

"The after processes consist simply of these sliding shelves passing and repassing each other, through the hatchways up to the large and well-ventilated drying rooms above, where they are arranged on racks.

"The temperature of these rooms is accurately regulated by a thermometer; in cold weather, hot air or hot steam conveyed in iron pipes being used according to circumstances The whole process of making the "German hand cheese," from the time the curds are received till finally packed in boxes for shipment, occupies about twelve days. The most scrupulous cleanliness and neatness is observed about the establishment in every part, and to secure entirely against danger from dust and flies, the cakes before final shipment all go to the basement, where they are washed in great tubs of water, and again dried.

"The supply of curd comes in winter from Bucks and Montgomery, and in summer from Chester and Delaware counties, for the reason that farmers in the latter do not generally have winter dairies.

"Messrs. Mende Brothers commenced on a small scale six years ago, and the process by which they now manufacture the hand cheese is one of their own invention and improvement, for which they hold several patents. The main difference between theirs and the old mode of making this cheese is that they produce in twelve days an article which will keep and bear transportation all over the United States: whereas the old process requires two to three months, with very uncertain results, and even under the most favorable circumstances is hardly a merchantable article."

The Effect of Color upon Temperature.

Though a matter rarely taken into consideration when decorating the walls of rooms, there is little doubt, says a writer in the *American Builder*, that our health and comfort depend in no slight degree upon the color employed; not from the pleasing effect produced alone, but from the power existing in different colors to seriously affect, either by hightening or lowering the temperature of rooms, the health and comfort of their inmates. It has been conclusively proven that a ray of heat is identical in its character with a ray of light, and that certain surfaces resist and emit heat much more rapidly than others;that the power of reflection,other things being equal,depends in no slight degree upon the color of the object.

The result of a long series of scientific experiments has demonstrated the fact that white substances receive heat much more slowly than dark ones, and, having once become heated, emit the warmth with corresponding slowness. Black objects, on the contrary, heat quickly, and become cold with equal rapidity.

Old stage-drivers, though they may not comprehend the cause, know the extra warmth of a white coat, and afford a standing proof of its practical value.

Now this matter of color, though, as before stated, not often introduced among the considerations in the preparations for building, yet may by judicious management be made to play an important part in conducing both to economy and comfort.

Knowing all this, the natural conclusion arrived at is, that in rooms which require to be at a moderately high temperature the walls should be painted of such a color as will most conduce to the desired effect, and those apartments occupied for sleeping or for summer rooms, should be of such a color as to receive heat slowly, and radiate it with equal slowness. Our sleeping rooms, then, should be universally light in color, in order to prevent those sudden changes which produce such rapid and insidious effects upon sleepers; and our sitting rooms in winter, where a fire is kept constantly, should be of a dark color, to further the rapid heating of the room on cold mornings, from its great qualities of radiation.

Though dark, a room need not necessarily be gloomy in appearance—brilliant colors may be introduced to offset the somber effect and additional warmth produced in appearance as well as in act.

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To Advertisers.

The circulation of the SCIENTIFIC AMERICAN is from 25,000 to 30,000 copies per week larger than any other journal of the same class in the world. Indeed, there are but few papers whose weekly circulation equals that of the SCIENTIFIC AMERICAN, which establishes the fact now generally well known, that this journal is one of the very best advertising mediums of the country.

To Inventors.

For twenty-five years the proprietors of this journal have occupied the leading position of Solicitors of American and European Patents. Inventors who contemplate taking out patents should send for the new Pamphlet of Patent Law and Instructions, for 1870.

CHEMISTRY AT THE FAIR OF THE AMERICAN INSTITUTE.

The specimens of photography displayed this year are unusually fine. They exhibit not only an improvement in printing and toning, but also in the management of light. Our artists have evidently studied the effects of lights and shadows to good purpose, and are able to take better pictures than they were a few years ago. There are some fine stereoscopic views by Weil which attract considerable attention. Henry Merz understands the Rembrandt effects and produces pictures of true artistic value; his part of the gallery contains several gems of photographic art.

In Rockwood's section is an application of artificial light to the taking of pictures that must attract the notice of all chemists—it is the magnesium process ingeniously contrived and well executed. Magnesium ribbon is made to revolve around a reel by clockwork, and is fed into an alcohol flame by which it is ignited and kept in combustion; behind the flame is a reflector. A bright kerosene lamp on a side bracket near the sitter serves for focusing and no doubt aids in taking the picture. The particular kind of picture preferred is an ambrotype or ferrotype, as it can be finished in a few minutes. The use of magnesium wire for photography has long been predicted, but now that the price of the metal has been lowered, and its manufacture on a large scale apparently secured, it is probable that we shall have it for many optical experiments. The night pictures are popular and the operator appears to be doing a thriving business. The lamp used for the magnesium ribbon is the invention of G. K. Proctor, of Salem, Mass.

J. Loeffler, of Staten Island, has some fine photographs of dogs and children.

In this Fair is the first exhibition of Albertypes. This process yields prints that are as unfading as the best carbon ink, and possessing a sharpness and definition that cannot be excelled. The method employed by Albert, of Munich, is analogous to that invented by Woodbury, and recently described in this journal. One point of difference is the employment of a carbon ink by Albert, and of presses more like those used in lithography, while Woodbury uses a press constructed especially for manipulating gelatin ink. The Albertypes in the Fair are of great excellence, and excite the hope that the process may prove to be feasible.

Bogardus has an admirable enlarged photograph of Dr. Vinton, of Trinity Church, and other good pictures, and the display by Williamson, of Brooklyn, speaks well for the skill of his chemist and operator.

W. Kurtz exhibits numerous plain and retouched photographs. They bear evidence of having been selected from his stock just as they came, and can be repeated and duplicated at any time. This artist is worthy of the highest praise for the influence he has exerted in raising the standard of work that ought to be executed by photographers of the present day. He is particularly strong in the manipulation of the background and reflected light so as to produce what are called Rembrandt effects. His pictures afford admirable subjects for study and one in their way unexcelled by any that have ever been taken either in this country or Europe. We do not wonder that the judges are often puzzled to know how to classify photography—whether to call them works of art or chemical productions. Whether photography is a trade or an art, becomes every year more difficult to determine. Perhaps it would be as well to say that in the hands of some people it is a trade while with others it is raised to the dignity of an art.

Messrs. Walter & Baumgarten exhibit specimens of a disinfecting fluid which combines the results of experiments conducted by our Board of Health, and has been shown to accomplish its work better than any compounds hitherto recommended. It is compounded of the following constituents. sesquichloride of iron, chloride of manganese, carbolic acid, and chlorine. A small quantity of this liquid will disinfect sewers, sinks, out-houses, fever hospitals, and cesspools, better than any mixture that has hitherto been tried. It is a decided improvement on chloride of lime, copperas, sulphate of zinc, and other well known disinfectants, and ought to be more generally applied.

There are some specimens of artificial stone in the building, but whether they were made from soluble glass or on the plan of Sorel or Coignet, we could not tell. This branch of chemical technology is now receiving much attention, and we were sorry not to find a greater display of processes.

There was a fine sample of loaf sugar refined without blood, sent from Philadelphia. Whether the purification was accomplished by ozone, sulphites, or chemical means, was not indicated. In cases of this kind the public would be glad to have an explanation of the process.

Parlor matches without sulphur are much preferred as they obviate the suffocation produced by sulphurous acid, and the specimens from the New York Match Company were of an excellent quality. They appear to be made of red phosphorus. A few years ago there were no matches made in this country from the red phosphorus discovered by Professor Schrotter, and it was a great misfortune to the workmen, for phosphorus in this condition is far less poisonous than is the white variety. There has never been a proper supervision of the match manufactory in the United States, and cases of jaw diseases are far too common. Red phosphorus would obviate the evil and afford us equally good results. We therefore hope that the parlor match will meet with proper appreciation.

The carbureting of illuminating gas is exhibited by two parties, both of whom use essentially the same process. It is a curious commentary upon the impure quality of our illuminating gas that it should ever be thought necessary to add certain constituents to it which the manufacturers have failed to give it when first made. Instead of forcing the community to resort to all sorts of patents for overcoming the obstacles imposed by the company, the company ought to be compelled to furnish a gas of a sufficiently high illuminating power to satisfy all wants. The carbureters are certainly useful and practical under present circumstances and are much used in our city.

A new method of distilling whisky is exhibited by Harris. By exhausting the air from the still, it is possible to evaporate and distill at a very low temperature. In this way it is claimed that certain aromatic properties of the whisky are not burnt out, and the solid impurities are retained in the still and can be run out beneath. There was an appalling display of impurities that had been taken from whisky, of various shades of color and nastiness. Some specimens manifestly contained gluten, as something like a yeast fungus was found in the bottom of the bottle containing them. The filth and dirt extracted from whisky ought to deter many persons from indulging in its use, but such did not seem to be the horrifying effect of the display, as most of the passers by were not slow to accept the invitation of the gentlemanly exhibitor to test some of the samples in a wine-glass, that did not admit of being set down until its contents had been drained. The scientific principles upon which the purification of the whisky was accomplished appears to be correct, and if the practical part is equally well sustained, the method ought to find general favor.

There is quite a show of California wines and brandies—not that we would class these articles under the head of chemical products, but set them down as the pure juice of the grape. The port and sherry from the Pacific coast is a close imitation of European brands and quite as good. A wine to be above criticism must not be treated in any chemical way. It must have have its flavor and bouquet as the sunlight gave it. The moment sugar has to be added to neutralize the acid or to increase its alcohol, the wine becomes an artificial one, and ought to receive a name expressive of this fact. Until chemistry has less to do with American wines they can hardly expect to acquire a reputation equal to the famed vintage of Europe. Chemistry is a good thing in its way, but it cannot replace the sweetening influences of bright sunlight and skillful tillage.

The variety of nutritive preparations, condensed food, and medicinal extracts, is unusually large, and if one could believe all that the circulars claim for them we have discovered the elixir of life, and Paracelsus is outdone. There are often really valuable substances among these preparations, but the manner in which they are offered to the public is so suspicious as at once to destroy all faith in them. It is a pity that this should be so, as the introduction of really valuable discoveries is greatly retarded by it.

The chemical department of the Fair is not nearly so full as it ought to be. Many well-known manufacturing houses are not at all represented, and there are numerous inventions on exhibition on by-streets and in obscure offices in the city that ought to be brought out on occasions like this.

The managers are entitled to great credit for the admirable manner in which they have surmounted many difficulties, and have made the wretched building in which they are obliged to hold their Fair, tolerably comfortable.

THE TELLIER ICE MACHINE.

The manufacture of ice by artificial processes is steadily gaining ground and favor. During the last summer it has received a powerful impulse from the exorbitant prices asked and unwillingly paid for ice in this and Southern cities, in which this article has become so much a necessity that people will pay almost any price rather than be deprived of it. In this city its price reached two cents per pound before the close of summer, and in one Southern city we are informed by a correspondent it reached five cents per pound.

It is not probable that such exceptionable prices can be maintained during ensuing seasons, but even at the prices at which we may reasonably hope to purchase ice, or at least such prices as must be demanded for ice shipped to Southern towns, it is now demonstrated it can be produced artificially at large profits and in any required quantity.

Two machines have been brought prominently into public notice, each employing the same volatile material as an absorbent, conveyer, and radiator of heat, and being in some sort rivals in the effort to secure public favor. We allude to those known as the Carré and the Tellier ice machines. The volatile agent in both is generally ammonia, and, though differing widely in detail and cost of construction, they employ the same general principle in the conversion of water into ice.

To the general reader it may be well to state here that the fundamental principle upon which machines of this kind operate is the absorption of heat from surrounding bodies by an expanding substance, the conveying of this heat to some other absorbing body, into which the heat is caused to radiate by the condensation of the conveying substance by mechanical compression, the passing back of the conveying body to extract another modicum of heat from the body to be cooled or frozen, and so on till the desired degree of refrigeration is reached.

It is a physical law with which perhaps some of our readers are not familiar, that the capacity of any substance for heat, that is, its power to absorb heat, and hold it in the latent or insensible state, increases with its expansion and decreases with its condensation. A substance which at ordinary temperatures is a permanent gas, will, when compressed, become sensibly heated; the latent heat which it holds under ordinary circumstances being rendered sensible by condensation. If while in this state the sensible heat be taken up by some other substance and conveyed away, the gas in expanding will seize the heat from surrounding bodies, thus reducing their temperature. The gas on being again compressed will yield this heat to any substance having a lower temperature. The proportion of heat absorbed during expansion, and emitted under pressure, increases with the degree of alternate condensation and expansion.

Ammonia, which is a gas at ordinary temperatures, becomes a liquid under a pressure of from nine to thirteen atmospheres, according to the temperature of the surrounding air, emitting a large amount of heat in so doing, which amount must be restored to it before it can expand to its original volume. On this account it is admirably fitted for use in refrigerating apparatus.

The Tellier machine besides differing much from the Carré machine in matters of detail differs from it in its action, the condensation of the ammonia being in the latter effected entirely by mechanical compression, while in the former the strong affinity of ammonia for water is used in the collection of the gas, the latter being separated from the water again by distillation.

In the Tellier machine the liquefied ammonia is first received into a strong cylinder for convenience of transportation. This cylinder being attached to suitable pipes connected with the machine, the opening of certain cocks allows the ammonia to escape into a distributer or a cylinder connected by pipes with the congealer. The congealer is a square box divided into compartments by hollow metallic partitions, the compartments being filled with the water to be frozen, or they may be filled with a solution of chloride of calcium or salt water, in which are placed metallic molds containing the water to be frozen. The latter is most convenient when very large cakes are desired.

The ammonia passing from the distributer into the hollow metallic partitions of the congealer expands into a gas, absorbing in its expansion a large amount of heat from the fluid contained in the compartments. It is then drawn from the congealer by the pump and forced back again into the distributer in a condensed form. During the process of condensation it gives off its heat to water surrounding a coil through which the gas is passed on its way to the distributer, from which it again passes to the congealer, and so on, being used over and over without material loss.

It will be obvious that any other volatile liquid besides ammonia might be used in the same manner as a conveyor of heat. Methylic ether, etc., are and have been used with success.

It is further obvious that by replacing the hollow partitions of the congealer by a series of bent pipes, air might be cooled if forced through the series of pipes by a fan. This is precisely what is done with an apparatus made by the proprietors of the Tellier machine, the cooled air being supplied to vaults and rooms used for preserving fruits, packing meats, etc., and for purposes of ventilation in churches and public buildings in hot weather. There is, we are informed, no difficulty in reducing and maintaining the temperature to

any desired point down to 32° Fah., and the air being supplied in a dry state is much better adapted to keeping fruits and meats than when charged with vapor from its passage through ice.

From this brief description of the Teller ice machine our readers will be able to comprehend its operation. It is a beautiful application of one of the most important and fundamental laws of physics in a field of industry destined hereafter to be widely occupied, and to exercise an important influence on the health, comfort, and general welfare of mankind.

THE WAGES OF LABOR.

In the discussion of labor and the wages it obtains in modern times, it seems to us that money, which is only representative in character, or simply a medium of exchange, is too much regarded, and that what it obtains is too often made a secondary consideration, or not considered at all. The true way to regard money is simply as a medium for the transmission and transfer of the necessaries and luxuries of life; and the amount of the latter which can be obtained for a day's work is the proper wages of a day's work.

We often hear complaints of the high prices of various commodities. The purchasing power of a dollar has greatly diminished, yet upon close scrutiny we shall find that laborers of to-day can live better with a given amount of labor than they could have done fifty years ago. Their wages have therefore advanced, not because the laborer can get to-day $2·00 for work, which fifty years ago would have brought him only seventy-five cents, but because the two dollars will purchase to-day more than seventy-five cents would have done fifty years ago. It is not the number of dollars, but what the dollars will get that must be considered.

Twenty years ago a tun of coal would not have cost in this market, on the average, over five dollars at the outside; to-day it perhaps costs eight. Twenty years ago a common laborer could have got at the outside no more than one dollar per day for his work; he would therefore have had to work five days for a tun of coal. To-day he gets two dollars a day, and can get a tun of coal for four days' work.

Fifty years ago a man could travel in stage coaches, etc., say, twenty-five days, at an expense of, say, fifty dollars in money, and, say, eighteen dollars in time to a common laborer—in all, sixty-eight dollars. To-day he can travel the same distance by rail and steamer, in many parts of the country for thirty-six dollars, allowing four dollars a day for his meals and refreshments, and two dollars each night for sleeping accommodations, and two dollars a day as the value of his time; and he can do this with infinitely more comfort and luxury than he could perform the same distance fifty years ago. Fifty years ago he would have needed to work ninety odd days to defray the expense of a thousand miles of travel by coach; to-day he can travel one thousand miles by working eighteen days.

It is true that two dollars is a maximum for the wages of common laborers in cities, and the rate of travel upon which we have figured—two cents a mile—may be considered a minimum, but we should find a large gain if we took the minimum price of labor in rural districts, and the maximum rate of fare on railroads and steamers.

Passing in review the list of commodities and necessities of modern life, we find, in the aggregate, labor gets more comforts, by a given expenditure of muscular energy, than at any former period in its history. Nothing is gained to the cause of labor by ignoring this fact. An argument for a further increase, to be worth anything, must take the position that, although labor is better paid now than formerly, there is still too great disparity between the profits of labor and the profits of capital.

There is much to be said on both sides of this important question. We greatly doubt whether, in the nature of our present social organization, such a disparity is not a necessity. The question is one that will ultimately be settled by experiment, and every strike or demand for increase on the part of labor is a direct experiment bearing upon this vital point. Every concession to such demands on the part of capital is a virtual admission that the disparity of profits may be lessened, without driving capital out of the industry of the world. The limit will be reached when capitalists find that the direct employment of their money in manufacture is less advantageous than loaning it upon interest to co-operative organizations and to commercial men.

There are evidences that in many industries this extreme limit has been closely approximated, and that further demands will force capital out of the field.

What would be the result of such an event upon the working men? In our opinion it would be extremely disastrous. A co-operative establishment working upon borrowed money can rarely, if ever, be as successfully managed as by a single head powerfully interested by the risk of a large investment to do everything possible to promote success. Those who falsely conceive capital to be the natural enemy of labor had better think long and carefully before finally resolving to dissolve partnership with it.

A SINGULAR MONSTROSITY.

H. Besse, M.D., of Delaware, Ohio, sends us an account of a singular human monstrosity born in the vicinity of that town. It is a double child, consisting of two bodies until at the navel the heads being at opposite extremities. The drawing sent us shows the monstrosity to be of the female sex, the legs project at right angles from the body on each side. On one side they are separated, but on the other they are united into a double limb. The arms, busts, and heads are well formed and distinct; in short, the upper extremities are all well developed, and all the functions of nutrition are so well performed that the double child has survived ten days, and appears likely to live. Dr. Besse regards this as one of the wonders of the world, yet there are numerous instances of similar monstrosities on record. A considerable number of these are described in the transactions of the New York State Medical Society of 1866, in an extensive essay by G. J. Fisher, M.D. As a rule, however, such monstrous births are accompanied by inherent weakness of constitution which seems a merciful provision to secure the early death of these unfortunate creatures.

A SECOND ROGER BACON, AND A CENTURY OF INVENTIONS (ALMOST).

A correspondent has written us from Melbourne, Australia, recalling to our remembrance the fact that twenty years since he did some business at our office, and giving some account of his career as an author and inventor. He might add, we think, "traveler," since he seems to be one of those roving, restless men of which this country is so prolific.

He says, at the time he called on us in 1850, we were "a remarkably good-looking gentleman." If he could only see how twenty years of earnest work has developed the embryonic loveliness which captivated him at the time of which he speaks, what would he say? It would almost repay him for a pilgrimage from the land of nuggets to get a good square look at us.

But we did not intend to say anything about our personal beauty on this occasion, though it is a theme on which we delight to dwell. Our remarks on this head have somehow slipped in like the head of Charles I. into Mr. Dick's Memorial, in spite of ourselves. The reader will please pardon the digression.

Our correspondent says he is the author of "A Lyric for the Times," a patriotic song, dedicated to the editor of the New York *Times*. The "Icon Poems," he states, first published in the London Weekly *Times*, and somewhat extensively copied in American papers, were written by him. To American papers, he states, he has been an extensive contributor, citing as those indebted to his pen for political, practical, and other contributions, no less than seven prominent papers in the United States.

He states that he was once assistant editor of a prominent daily paper in Chicago, and that he himself published and edited a Western journal in 1852. He gives names and dates, but desires us to suppress them. He names as among his former friends and correspondents many prominent American citizens and authors.

The first false step our correspondent seems to have made was leaving this country for England, where he in less than three months found himself reduced to labor in an iron works at the wages of sixteen shillings per week. He says:

"While there your correspondent of London wrote to me without fee or reward a score of letters, for which their fees ought to have been $200. They took out for me afterwards patent No. 2,141, 1860, at London. They volunteered the use of their name as a reference and introduction. Charles May, F.R.S., F.R.A.S., C.E., told me that he had a fellow-feeling for me as an inventor, and that he would help me gratis. He wrote me a number of letters, for which his fees ought to have been at least $100, and was becoming much interested in my case, when he died suddenly. But for his sudden departure, I think I should never have been buried alive in the woods of Australia.

"While I was pushing a hand-cart about the streets of Wolverhampton for daily bread, I received a letter from the Earl of D., saying that if I would call upon him he would be glad to see me. Such an invitation was not to be slighted—he gave me a bank note—all honor to him—which indirectly enabled me to publish my book.

"At length finding that I could not invent any way to do without eating and drinking in London—I embarked for Queensland, Australia, December, 1861. The voyage cost me one shilling and twopence sterling—I thought it was lucky it did not cost any more! I sailed with a sad heart. I thought (and still think) that Australia is one of the last countries in the world for an inventor to go to. The idea of a Special Providence is irrational, unscientific, and untenable, but as the good of all mankind is always brought about by the one agency, general Providence is special Providence, and *vice versa*. It is then providential, or at least fortuitous, that I have lived an anchorite sort of life, in intense solitude, in the wilds of Australia. Seventy out of eighty of my inventions owe their origin to that isolation."

Our correspondent now, after eight years of Australian life, finds himself too poor to return to America, where he thinks his inventions might be turned to account. If anybody stands in need of an inventor, with eighty inventions ready made to hand, here is a chance to import one, who, to use his own words, "trembles at the idea of what he knows being lost to the world."

Only three of the inventions made by him are directly alluded to in his letter. One is a letter seal, which prevents a letter from being opened without defacing its contents, and thus betraying that it has been tampered with. Another is a grain binding machine, which will bind grain with straw, wire, or cord, at a rapid rate, and very cheaply, and the third invention, he says, previous to its description, "will make us open our eyes with astonishment." We did so, and shut them again without difficulty. Whether our readers will be able to do the same after reading what he says about it, we cannot say, but we will take the risk.

He calls this invention the "Silent Power," or "Fulcrum Sui Generis." Professor Fithian's "Vertical Multiplier" cannot hold a candle to it. Our correspondent thus describes it:

"You know well that a common fulcrum presses as much backwards as the lever presses forwards, or upwards as much as the lever downwards, or downwards as much as the lever upwards. The *Fulcrum sui generis* is a fulcrum which will not press backwards while the lever presses forwards till certain materials of which the fulcrum is made are crushed or torn in pieces. For illustration: By means of compressed leverage on board the *Great Eastern* steamship, I can lift 1,000 tuns of cargo, one end of the ark which contains the cargo being suspended from the stern, the other, the lightest end, being raised by the above-mentioned leverage at the bow. The weight raised by the common lever would fall backwards as much as forwards, but with Cooper's Silent Power, 90 per cent of the weight pulls forwards, 10 per cent downwards—NONE AT ALL BACKWARDS, 'tis all very easy! A carriage on wheels or a vessel in the water will rush forwards with incredible and constantly-increasing velocity as long as the center of gravity is suspended forwards. In order to understand this, take a small toy carriage well placed on four of the best wheels and axles that can be made. Erect a gallows—two uprights and a cross-beam—at the middle of the carriage, suspend a leaden plummet about half the weight of the carriage from the cross-beam (just as you or I might be suspended—just as many a man as good as either has been), place the carriage on the smooth top of your longest mahogany, hold the carriage with one hand and the plummet stretched horizontally forwards with the other hand, let go of both at the same moment, and the carriage will rush forwards at great and increasing velocity.

"In the very earliest stage of this invention a toy boat placed on a pond of water, and let go of, rushed across the pond at the rate of twenty miles an hour by force of the 'silent power.'

"On still water in a bayou of the Yarra, near Melbourne, I moved a boat twenty-four feet long, with myself and two boys in it, by the force of the silent power—that is to say, with nothing whatever projecting from the boat into the water—nothing whatever reaching from the boat to the shore or the bottom. I know as well as I know my own existence, that I can propel the *Great Eastern* steamship with great and increasing velocity by means of my silent power—that is to say, one man can propel that ship faster by far than all her steam engines can do. There is but one limit to speed by means of the silent power, and that is strength of materials. I can attain to any speed that is safe. I can do more; I could allow the rate to progress till the pressure of the water would collapse the bows of the strongest ship ever built."

Here is a power that is a power, ready and willing to be imported, and trembling lest it shall die and be buried in the wilds of Australia.

We should not have occupied so much space with this communication did it not serve to point a useful moral. Our correspondent is not the only specimen, though, as Josh Billings would say, a "loud" one of his class.

Evidently a man of more than average ability, we find him steadily going down from prosperity to poverty, and by lack of persistence in any one field of effort, losing all influence in any. His idea of the "Silent Power" is evidently the outgrowth of a morbid condition of mind, which, perhaps, has been from the outset of his career growing upon him, until he really thinks he can perform mechanical miracles.

Ah, these "rolling stones!" How one finds them scattered all along the pathway of life, their sides worn with the attrition of the currents that have drifted them; battered, bruised, and broken, and crumbling at last to dust without ever having subserved any important and useful purpose, except, perhaps, at brief intervals. Nothing perhaps is more pitiable than a life wasted in this way, yet it has its humorous features too. Let us smile at it when we must, pity it when we can, and avoid for ourselves the mistakes which so wreck men capable, if their efforts were concentrated, of achieving at least fair average success.

SCIENTIFIC INTELLIGENCE.

MAGNESIUM AS A REDUCING AGENT.

Metallic magnesium in the form of powder is a powerful reducing agent. A solution of chloride of platinum is instantly decomposed by it at ordinary temperature, and with strong evolution of hydrogen gas, the finest platinum sponge separates. Pure gold in powder can also be precipitated from the ter-chloride, and even chloride of zinc is decomposed and the metal separated by magnesium. This use of magnesium is destined to become a very important one.

COLD BY COMPRESSED AIR.

The principle of compressed air to produce cold, applied in Kirk's machine, has been adopted by Windhaus in a newly constructed apparatus, but the whole thing is declared by engineers to be impractical, in as much as the amount of heat that can be removed by mechanical means bears a very unfavorable proportion to the power applied.

By theoretical calculation it appears that with a compressed-air machine of one-horse power no more than 60 to 70 pounds of ice can be produced in ten hours. This makes the ice cost too much for practical purposes.

GREEN GLASS FOR THE DARK ROOM OF PHOTOGRAPHERS.

Mr. Gaffield, of Boston, has shown that while chemical rays to a slight degree will pass through yellow glass, they are perfectly excluded by green and red. This has suggested to photographers to substitute green glass for the yellow in the developing and fixing room. The yellow light is very trying to the eyes, while the green light is very agreeable.

Carey Lea recommends the green glass, after an experience in the preparation of hundreds of plates where it had been substituted for the yellow panes.

PHOTOGRAPHING SUN-FLAMES.

Professor Young, of Dartmouth College has succeeded in obtaining photographs of protuberances on the sun's limb, of which copies were exhibited at the Lyceum of Natural History. They were made by attaching a small camera to the eye-piece of the telescope, and opening the slit somewhat widely, and working through the hydrogen line, G. If this apparatus can be made to work we can obtain pictures without an eclipse.

[Our Special Correspondence.]

LETTERS FROM THE SOUTH.

Notes in the South—Alabama—Railroads and Mineral Resources—The famous Shelby Furnace—North-Western Georgia.

ROME, GA., S. R. & D. R. R., Sept. 26, 1870.

I came here *via* the Selma, Rome, & Dalton R. R., which though planned and partially built previous to the war, has since 1866 been completed and much improved by Northern capital. Among the parties so interested are many prominent names in New York. John Tucker, of Philadelphia, is now president, while Mr. M. Stanton, one of the superintendents, is from Boston.

The road passes through a fine farming region, and just skirts the largest deposits of iron in America, and one of the largest coal fields. Alabama may truly be called the Pennsylvania of the South, and, with a liberal policy upon the part of her railroad men, her mineral resources will eventually be a source of great wealth. She has over 4,500 square miles of available coal lands—bituminous, cannel, splint, and semi-bituminous, very much resembling Cumberland—and her iron beds and veins are hundreds of miles in length. One, 14 feet wide, is traceable on the surface for over 50 miles.

Limestone, marble, and excellent sandstone, are equally abundant. At Lime-kiln Station, at the junction of S. R. & D. R. R., and the new N. & S. R. R., a Northern man has a series of excellently constructed kilns, and is making money, supplying lime far and near, while his neat residence and beautiful farm are the admiration of every passenger. On the east of the middle of the State an abundance of fine granite is easily quarried. For the good of the State, as yet no gold has been found. Some copper, lead, and zinc, are said to exist; but there is no organized working of the mines at this time.

Manganese is also found, and there are traces of some other of the metallic minerals. The great mineral resources of the State are iron and coal, which, although most common, yet contribute most to the wealth of every country. Not least either is the immense wealth of her lands and forests. Alabama will probably average a higher grade of fertility than any other Southern State.

Previous to the war there were in the State of Alabama ten furnaces, which hardly made more than 3,000 tuns of pig iron a year, as many of them only ran in winter, the others irregularly. During the war these furnaces were increased in numbers and capacity. Amid the crash of contending armies nearly all were burned. To-day there are five—three new—and one of these produces as much iron, probably, as all did before the war. There are two more ten-tun furnaces now building, and still three more projected. All are now charcoal furnaces, but one for coke is talked of. At Brierfield there is a rolling-mill, but for some reason it is not very actively employed. When I was there they were engaged rolling cotton ties. A furnace is also there. Things seemed dull, want of capital was alleged as the cause. I was informed by others that charcoal was scarce and high, and that to work the furnace profitably it must be made fit for coke. Coal is near at hand. The other furnaces are: A small one near the Mississippi in N. U. Alabama; two near Round Mt., on the Coosa River, owned by Messrs. Noble of Rome, and the Shelby Co. Furnace.

Of this last I propose to speak specially. All on the railroad lines and in towns, wherever I talked of iron or iron works, I heard of the Shelby Furnace, which was making 30 tuns of iron a day, with 90 bushels of charcoal to the tun. As many of my readers are aware, this is a yield and a proportion unprecedented in the history of iron manufacture. Hence I determined to see if the statements I heard were true, and how it was done. The furnace is located six miles from the S. R. & D. R. R., at Columbiana—a branch road runs out to it, owned and worked by the Iron Company. The ore used is a porous brown hematite, sometimes massive, and changing to what is called by the miners needle ore; frequently occurring in hollow balls or hollows occurring in the masses, which are filled with a silicious substance resembling fine scoria, or pumice stone, or furnace cinder, of first grade. The furnace is well located in the side of the ore-hill. It was built during the war, burned by Gen. Wilson, and rebuilt about two years ago by a New York Company. Previous to the war there were two small furnaces there working irregularly. During the war a rolling mill was also burned, and is not yet rebuilt. The ore-bed is inexhaustible, and if it were not, there is abundance more in the neighborhood.

As originally built the furnace was 36 feet high, last spring it was run up, by Mr. Bailey, of Poughkeepsie, to 56 feet. It is now 36 feet from bottom of hearth to top, and 53 feet to charging point; has 12-feet boshes, and the furnace tapers three-eighths of an inch to the foot from the bosh to 6 feet of the top. The bosh is 4 feet high; the hearth 6 feet high; 4 feet × 3½ feet at the bottom, and 4 × 4 at top. The hearth lining at present is of sandstone, and is burned out in about six months. Fire-bricks were formerly used, and it is intended to go back to them again.

During the past six months (a week less at date of our visit) they have made over 3,800 tuns of iron with an average of 98½ bushels of charcoal to the tun They made on one day 31 tuns of iron with 93 bushels to the tun. When I visited the furnace they were making 16⅛ tuns with 104½ bushels to the tun, but the hearth was entirely gone, and they were only waiting the superintendent's arrival, to go out of blast. The furnace man told me that since increasing the hight of the furnace, it carried 875 to 900 pounds of ore on the same coal as it did 500 tuns before. From three weeks of their workings I extract the following:

Lime.	Ore.	Coal burned.	Yield.
58,800 lbs.	611,270 lbs.	16,170 bush.	149 tuns.
58,320	619,600	16,088	153
64,000	610,820	17,600	178

Their best week's work was 184½ tuns. Their best day's, run was: Lime, 10,080 lbs; ore, 113,400; coal, 2,772 bushels; yield, 71,050 pounds.

This is the simple truth of the workings of this Shelby Company Furnace. Walter Crafts, superintendent, was, I regret, absent during my visit. They state their iron as costing them $20 per tun. They pay 7½ cents per bushel for charcoal, $2 per tun for limestone, $1·12½ for the amount of ore used to make a tun of iron. I could not see where the $20 came from. Mr. Hazard, the Secretary, who, I may add, politely and freely gave me access to all their books, replied: "Well, by the time the charcoal is measured up with waste, etc., it costs fully 9½ cents, then you may safely put the ore at $1·50. Then say 100 bushels of coal, $9·50; ore, $1·50; then lime, 50 cents, and you have $11·50; put on $2·50 more for furnace, men, etc., and you have $14." "But you have $6 more." "Well, sir, this railroad we have to keep up costs us about that much on every tun, especially when you include salaries and repairs."

They make three grades of iron, and sell it, delivered at Columbiana, at from $35 to $40. Four fifths of their iron, is, however, A. No. 1. I have been thus full in giving details of this furnace because of the reputation it has acquired. In my opinion the great yield is due to the unusual hight of the furnace, and still more, perhaps, to the peculiar tractability of the ore. Hot blast is used, and the charcoal is made in ovens of capacity of 65 cords, and the yield is about 50 bushels to a cord.

Twenty miles from Rome a furnace is being put up by the Etna Iron Company. It is to be an iron stack, 45 feet high, with 10-foot boshes, cold blast; ore, brown hematite. At Oxford there was a large furnace during the war, and the ore deposit is one of the largest and most remarkable in the world. The erection of a furnace of about 10 tuns capacity is just being commenced.

At Cornwall, near Round Mount, there are two furnaces, one kept in blast all the time. These are thirty miles north of the S. R. & D. R. R., and three miles from navigable water on the Coosa. The Coosa Coal Field is within a few miles of the Etna Iron Company's works. The furnaces are of the same size, 8-foot bosh, 36 feet high, and they make about 60 tuns a week. They use cold blast, and consume about 175 bushels of coal to the tun. The ore is the red fossiliferous, and as seems strange, their iron is almost entirely free from phosphorus. A large deposit of this ore extends along the Coosa for many miles.

These last furnaces are owned chiefly by Wm. Noble & Sons, of Rome, Ga.; they use the iron in great measure, in their rolling-mill and car-wheel works. These I visited. They make about 200 car wheels a week, which go all over the West and South. Their rolling mill has a capacity of about 15 tuns per day, and they were just putting up a complete set of nail machines. They also forge car axles. Mr. Noble, Sr., is an Englishman, who came to Rome a poor man. He has not only accumulated a large fortune, but has immensely benefited that section.

Rome is eligibly located for manufacturing purposes, just at the junction of the Etowah and Oostenaula. These streams form the Coosa, which is navigable far down into Alabama. Steamboats run regularly on it. Agriculturally it is a fine region, and almost any but a strictly tropical crop may be raised. The soil is limestone, and all cereals grow finely. The people are waking up to new ideas, and had on October 10th and 11th one of the best district fairs in the South. It is a section where I could recommend a Northern man to settle.

Historically, the place is noted as the great central town of the Georgia Cherokees, the home of Ross, and the place where McIntosh was murdered. The scenery around the town is very fine, the mountain air healthy and invigorating. A railroad thence to Decatur, Ala., and one to Chatanooga, are expected to add new life to the town.

Allow me to tender my thanks to Col. Dwinell, of the Rome *Courier*, for many kind attentions during my stay there.

H. E. C.

THE VALUE OF THE HONEY BEE IN AGRICULTURE.

Honey and wax have ever been two most useful articles in domestic economy, and, from the earliest times, the honey bee has been the companion of man. What an addition to a farmer's house is a beehive, nestling among the apple trees with its hundreds of busy inhabitants, some settling about the door, or flying lightly above the roof, others darting off in quest of new supplies of food, and still others returning on laboring wings laden down with their "baskets" filled with crude pollen. What a scene of industry and system is bee life! This is an every-day picture. But honey and wax are not indispensable. The hunting of the sperm whale and the discovery of petroleum have done away with the need of wax, and the sugar cane and beets give us sweets in new and more convenient forms. What use then, is the bee? our reader will ask. The answer will recur to but a few. The grand use in nature of the bee is the securing to the farmer or fruit raiser a good crop and the permanence of the best varieties of fruit.

Gardeners have always known that bees fertilize squash, melon, and cucumber flowers by conveying the pollen from one plant to another, thus insuring not only the complete fertilization of the seed by the male pollen and thus improving the fruit, but actually causing the production of more squashes, melons, and cucumbers by causing certain flowers to set that otherwise would have dropped to the ground sterile and useless. This has been proved by fertilizing the flowers by hand; a very large, indeed an unnaturally abundant crop being thus obtained. It has been noticed by a few, though the many have not appreciated the fact, that fruit trees are more productive when a swarm of bees is placed among them, for when the bees have been removed by disease or other means, fruit crop has diminished.

On this subject I wrote as follows to a correspondent in the pages of the *American Naturalist*, a monthly illustrated magazine of natural history published by the Peabody Academy of Science, at Salem, Mass.

"In answer to the question by J. J. Gould, Wenham, Mass., whether bees are in any way injurious to fruit or lessen the quality or quantity, I would reply, that all the evidence given by botanists and zoologists, who have specially studied this subject, shows that bees improve the quality and tend to increase the quantity of the fruit. They aid in the fertilization of flowers, thus preventing the occurrence of sterile flowers, and by more thoroughly fertilizing flowers already perfect, render the production of sound and well developed fruit more sure. Many botanists think if it were not for bees and other insects [such as certain two-winged flies, moths, wasps, etc.], many plants would not fruit at all. This whole subject of the great office bees and other insects perform in the fertilization of plants has been fully discussed in the May, July, and October (1867) numbers of the *American Naturalist*, and by Professor Asa Gray, in the *American Agriculturist*, beginning in May, 1866. "It is alleged that bees do injury in some way by extracting the honey from flowers. What is the use in nature of honey? The best observers will tell you that it is secreted by the plant for the very purpose of attracting bees to the flower, otherwise, it is of no use to the flower or fruit."

This was written before Mr. Samuel Wagner printed an article on the same subject in his well-kown and useful *American Bee Journal*. His testimony so well confirms my statement, made above, and is so important to fruit raisers, that I reproduce it in part.

"In 1774 Count Anthony, of Torrings, Seefield, in Bavaria, President of the Academy of Science, at Munich, striving to re-introduce bee culture on his patrimonial estate, found in this generally prevalent prejudice (*i. e.*, that the bee injures the fruit by its visits to the flowers) the chief obstacle to success. To overcome it, he labored assiduously to show that bees, far from being injurious, were directly beneficial in the fructification of blossoms—causing the fruit to set, by conveying the fertilizing pollen from tree to tree and from flower to flower. He proved moreover, by official family records, that a century earlier, when bees were kept by every tenant on the estate, fruit was abundant; whereas, then, when only seven kept bees, and none of these had more than three colonies, fruit was scarcer than ever among the tenantry.

"At the Apiarian General Convention, held at Stuttgard, Wirtemburg, in September, 1858, the subject of honey-yielding crops being under discussion, the celebrated pomologist, Professor Lucas, one of the directors of the Hohenhein Institute, alluding to the prejudice, went on to say: 'Of more importance, however, is the improved management of our fruit trees. Here the interests of the horticulturist and the bee-keeper combine and run parallel. A judicious pruning of our fruit trees will cause them to blossom more freely, and yield honey more plentifully. I would urge attention to this on those particularly who are both fruit growers and bee-keepers. A careful and observant bee-keeper at Potsdam writes to me that his trees yield decidedly larger crops since he has established an apiary in his orchard, and the annual crop is now more certain and regular than before, though his trees had always received due attention.'

"Some years ago a wealthy lady in Germany established a green house, at considerable cost, and stocked it with a great variety of choice native and exotic fruit trees—expecting in in due time to have remunerating crops. Time passed, and annually there was a superabundance of blossoms, with only very little fruit. Various plans were devised and adopted to bring the trees to bearing, but without success, till it was suggested that the blossoms needed fertilization, and that, by means of bees, the needed work could be effected.' A hive of busy honey gatherers was introduced next season; the remedy was effectual—there was no longer any difficulty in producing crops there. The bees distributed the pollen, and the setting of the fruit followed naturally."

From these convincing facts we learn the value of the honey bee to agriculture. Blot them out and we must go almost entirely without fruit and vegetables. Besides being a source of profit for their honey and wax, the bee actually brings to our doors loads of fruits and vegetables and other products of the farm.—*Annals of Bee Culture*, 1870.

Respiratory Surface of Human Lungs.

According to Hopley's "Lectures on the Education of Man," the number of air-cells in the human lungs "amount to no less than six hundred millions." According to Dr. Hales, the diameter of each of these may be reckoned at the 100th of an inch; while according to the more recent researches of Professor Weber, the diameters vary between the 70th and the 200th of an inch. Now, estimating the internal surface of a single cell as about equal to that of a hollow globule of equal

internal diameter, then, by adopting the measurement of Hales, we find that 600 million such cells would possess collectively a surface of no less than 145 square yards; but by basing our calculations on the opinions of Weber—opinions, remember, which the scientific world receives as facts—we arrive at the still more astounding conclusion, that the human lungs possess upwards of 166 square yards of respiratory surface, every single point of which is in constant and immediate contact with the atmosphere inspired. It will be useful, then, to imprint on the memory, that, whether we breathe pure or putrid air, the air inspired is ever in immediate contact with an extent of vital surface ample enough for the erection of a large house.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections for the month of September, 1870:

During the month, 334 visits of inspection have been made and 703 boilers examined—633 externally and 200 internally, while 89 have been tested by hydraulic pressure. Number of defects in all discovered, 374, of which 45 were regarded as dangerous. These defects in detail are as follows:

Furnaces out of shape, 11—1 dangerous; fractures, in all, 20—3 dangerous; burned plates, 25—6 dangerous; blistered plates, 32—4 dangerous; cases of sediment and deposit, 73—2 dangerous; cases of external corrosion, 22—3 dangerous; cases of incrustation and scale, 42—3 dangerous; cases of internal corrosion, 10—1 dangerous; cases of internal grooving, 4; water gages out of order, 26—2 dangerous; blow-out apparatus out of order, 4—1 dangerous; safety valves overloaded, 17—7 dangerous; pressure gages of order, 59—4 dangerous; boilers without gages, 2; cases of deficiency of water, 5—1 dangerous; broken braces and stays, 24—7 dangerous; boilers condemned, 4.

Among the pressure gages out of order were several in very bad condition, varying from +10 to −20. We have so often commented on this difficulty, pointing out the cause and the remedy, that there is little more to be said. But we will say, whenever for any reason a steam gage is suspected of being in bad condition, have it at once compared with a gage known to be correct. There are many cases of sediment, deposit, incrustation, and scale. If these are not attended to, the boiler is liable to be injured from the plates around the fire being burned. Every boiler should have hand holes in abundance, and in suitable places. In those of horizontal tubular type this is very important. Hand holes should be provided at each end, and the boilers should be so set that easy access to them may be had.

Bee Stings.

The fear of being stung deters many from bee-keeping. This is excusable in those whose peculiar physical organization is such that much pain and inflammation result; but such are in the minority. The danger of being stung is not so great as is generally supposed. The bees seem to know the timid, while those who approach and handle them with courage, carelessness, and confidence, can go among them without annoyance. It may be an annoyance to the novice to be stung, from the pain and swelling, but in a few seasons the system will become so accustomed to the poison that but slight swelling and no pain will result. The pain is more in the imagination than reality, and the sooner the beginner becomes so self-possessed as to receive the sting of a bee as he would the scratch of a brier, the sooner he will succeed as an apiculturalist, for if he is forever in terror of his bees he will not give them the attention they need, and will never attain the best results.

No outward application can have any effect in curing the sting of a bee, although everybody has some remedy that, you will be told, is instantaneous relief. You can not go amiss should you apply in every instance the first thing you lay your hands on. A list of remedies we have heard of would fill the "Annals of Bee Culture" and should you try them all you would find all of them equally efficient. All that can be done when you are stung is to carefully extract the sting, which should not be done by taking hold of it with the fingers, as the poison sack at the root of the sting would thus be discharged into the wound.

It is better to remove it with the edge of a knife, or if none is convenient then with the finger nail. The swelling may be partially prevented or even nearly removed after it takes place by rubbing with the hand, being careful to rub in the direction of the heart, as by that means the poison may be thrown into the circulation and distributed through the system without injury.

Melting Steel Plates and Other Material.

The committee appointed by the Secretary of the Treasury, recently witnessed the melting in a blast furnace, at the navy yard, Washington, of a number of plates and other materials captured from counterfeiters, and which had been used by them in counterfeiting money and stamps; also, the plates, dies, etc., of the fifty-cent fractional currency note of the ourth issue, first series. The committee at the same time witnessed the destruction in the same manner of the face and back plates, dies, bed, piers, rolls, etc., of the five-dollar notes of forty-nine national banks which have failed or given notice of liquidation, which plates were engraved by the Continental Bank Note Company. The amount of steel plates, dies, tools, etc., melted in the presence of the committee was between three and four tuns.

The standard of our gold and silver coin is one part alloy, and nine parts pure metal.

It is reported that Commissioner Fisher will resign his office on the first of next January. At the instance of Secretary Cox, Col. Fisher gave up a lucrative patent-law practice to accept the office of Commissioner of Patents. He has discharged his duties with marked ability, and has introduced many wholesome reforms. We shall regret to hear of his final determination to vacate a position which he has so ably filled.

Corrections.—In our notice of emery grinders manufactured by the Union Stone Company, on exhibition at the Fair of the American Institute, published on page 265, current volume, the Union Stone Company was named as the exhibitor. The exhibitor of the goods in question was the American Twist Drill Company, whose address is Woonsocket, R. I. The name of the inventor of the traction engine described on page 246 is James K. Lake, instead of D. J. Lake, as there stated.

Answers to Correspondents.

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

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

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

F. L. V. H., of N. J.—Carbolic acid may be obtained by collecting separately in the distillation those portions of the oil of coal tar which boil between 300° and 400° Fah. These portions are then mixed with a hot saturated solution of caustic potash, with the addition of a quantity of powdered hydrate of potassa. A copious white crystalline substance will immediately separate on addition of the potassa, and the remaining liquid is removed by decantation. The white substance is then dissolved in water. The solution as it becomes quiet separates into two layers. The bottom layer is a solution of carbolate of potassa. This is separated from the upper layer, and treated with hydrochloric acid till the potassa is neutralized. The carbolic acid is thus freed from its combination with the potassa, and rises to the surface. It is then digested with chloride of calcium to remove the water which it contains, and afterwards distilled and exposed to a gradually lowering temperature, when it crystallizes in long colorless needles. This is Laurent's method. There are other modes of procedure, but this will probably answer your purpose.—The gum used on postage stamps is not poisonous. It is simply gum dextrine made from starch. There is nothing added to give the sweet taste which properly belongs to the gum itself.

J. L., of N. Y., has been trying to construct a poultry fountain, on the ollowing plan, taken from an English work called the "Poultry Book." A common flower pot with the hole in the bottom tightly corked, has a hole bored from half an inch to an inch from its upper edge. It is then filled with water up to the hole thus bored. The saucer is then put over the top like a cover, and the whole apparatus inverted. The water then flows out under the edge of the pot, and air enters the hole near the edge, until the water rises around the pot in the saucer sufficiently to cover the hole. As the admission of air is then stopped the water ceases to flow out until either by evaporation or by the fowls drinking the water from the saucer the level therein is lowered so that air again enters the hole. The water is thus gradually fed into the saucer as wanted. Our correspondent has tried to make such a fountain of galvanized iron, and failed. He now inquires whether the principle of it is correct. We answer that it is, and that he has either not followed the directions in the construction, or some leak admits air above the level of the water in the saucer.

J. W. H., of ——, wants a gas stove, and says he has seen but one, which was a very ungainly looking article. There are plenty of elegant devices of this kind in market, and if our correspondent will take a look through the stove stores of any large city, he will, we think find no trouble in suiting himself with a stove which will do minor cooking very well. There is, however, room for profitable improvement in this field. The baking power of most devices of this kind is very inferior.

A. M., of Ill.—The gloss produced on shirt bosoms by manufacturers, is obtained through the addition of a small proportion of spermaceti or white wax to the starch while boiling. We do not know the exact proportions, but a little experiment will soon enable you to fix upon them.

D. D. K., of ——.—Your question in its present form is entirely unanswerable. The number of pounds of coal necessary to generate a pound pressure in a boiler, depends upon a great many circumstances, and probably no two boilers could be constructed that would be uniform in this respect.

J. D. W., of Mo.—If you wish to increase the velocity of the discharge from a force pump over that of the flow through the induction pipe, it is necessary to make the sectional area of the discharge pipe, at the point of discharge less than that of the induction pipe.

J. R. L., of La., wishes a recipe for welding cast steel. Hard cast-steel, rich in carbon, according to the best authorities, cannot be welded to steel, but it may be to iron. What can our practical steel forgers say on this subject?

J. S. R., of Ohio.—To tin iron, first clean the surface by the use of acids or other means, so that it is uniformly bright. Then dip in a bath of melted tin, upon the surface of which there is kept a quantity of melted tallow free from salt.

J. P. L., of Ohio.—Whalebone of commerce is taken from the mouth of the whale, where it exists in layers on the inner side of the jaw. It splits very easily, and is thus separated into pieces of convenient size for handling.

J. S. P., of N. Y.—The motion of the clock-work regulating equatorial telescopes does not vary in any material respect from that of the ordinary clock. The pendulum is the regulator, and as the motion of the escapement is intermittent, so is the motion of the instrument.

D. T., of Md.—It is impossible to say what is the matter with your engine at this distance, and from the description you give. It needs personal examination by an expert.

R. C. P., of ——, is in difficulty with his brass castings. They will not run solid, but come out honey-combed and porous. Can any of our correspondents give him the cause and the remedy.

W. H. B., of ——.—We see no radical defect in the method of making balloons, proposed by you, but think you will meet with practical difficulties you do not now anticipate.

G. N. L., of ——.—The red color of the Aurora Borealis, is a phenomenon quite familiar to meteorologists. Its cause has often been speculated upon, but never determined.

J. J. H., of Md.—A line in our "Business and Personal" column, will probably secure you the information you seek.

A. D. L., of Ill., wishes to know how steel watch chains, keys, etc., are polished.

Business and Personal.

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

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4·00 a year. Advertisements 10c. a line.

Manufacturers and Patentees.—Agencies for the Pacific Coast wanted by Nathan Joseph & Co., 619 Washington st., San Francisco, who are already acting for several firms in the United States and Europe, to whom they can give references.

Self-testing Steam Gage. The only reliable Steam Gage. Send for circular. E. H. Ashcroft, Boston, Mass.

"507 Mechanical Movements."—This Book embraces all departments of mechanics. Each movement finely illustrated and fully described. To mechanics and inventors it is invaluable for references and study. Price $1. By mail $1·12. Address Theo. Tusch, 37 Park Row, N. Y.

An Optical Wonder.—The Craig Microscope, which is indorsed by scientific men, the press, and the public as an instrument of the highest power, simplicity, and cheapness. Price $2·75, prepaid. Send stamp for illustrated circular. Address Theo. Tusch, 37 Park Row, New York.

Jacob Miller, Aurora, Oregon, wants the manufacturers of lathes and tools for wood and metal turning to send him priced circulars

Pemberton, Center & Brighton, Designers, Draftsmen, and Engravers on Wood. First-class engravings of mechanical work a specialty Room 16, 178 Broadway, New York.

Those in want of Telegraph Instruments, Galvanic Batteries, Wire, Magnets, etc., send to C. Williams, Jr., 109 Court st., Boston.

For Sale.—Three thousand(3,000) first-quality Springfield Musket Locks. Address H. B. Metcalf & Co., Providence, R. I. Oct. 28, 1870.

Combined Boring and Mortising Machine—Bores and mortises at one operation. In constant use for several years, at our own works. Satisfaction guaranteed. Price $150. The Allen works, cor. Jay and Plymouth sts., Brooklyn, N. Y. Send for circulars.

Peck's patent drop press. For circulars, address the sole manufacturers, Milo Peck & Co., New Haven, Ct.

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

Low Prices—No Risk—Full Guarantee.—For Price List of Genuine Waltham Watches, which can be sent by express to any part of the country, write to Howard & Co., 785 Broadway, New York, stating you saw this in the Scientific American.

Japanese Paper-ware Spittoons, Wash Basins, Bowls, Pails, Milk Pans, Slop Jars, Chamber Pails, Trays. Perfectly water-proof. Will not break or rust. Send for circulars. Jennings Brothers, 352 Pearl st., N. Y.

Agents Wanted to sell the Star Bevel. It is destined to supersede entirely the old style. R. Hallett & Co., West Meriden, Conn.

Of Washing Machines, there is nothing to be compared with Doty's.—Weekly Tribune, Dec. 15, 1869.

Belting that is Belting.—Always send for the Best Philadelphia Oak-Tanned, to C. W. Arny, Manufacturer, 301 Cherry st., Phil'a.

For Fruit-Can Tools, Presses, Dies for all Metals, apply to Mays & Bliss, 118, 120, and 122 Plymouth st., Brooklyn, N. Y. Send for circular.

Practical Treatise on Soluble or Water Glass, just published. Price $3 20, mailed free, by L. & J. W. Feuchtwanger, Chemists and Drug Importers, 55 Cedar st., New York.

Practical and Scientific Books for Mechanics, Manufacturers, Chemists, and others. Henry Carey Baird, Industrial Publisher, 406 Walnut st., Philadelphia. Catalogues by mail, free of postage.

Lubricating Packing, for spindles and journal-box bearings, No oil required. Address The Manhattan Packing Manufact'g Co., 1,360 Broadway, New York.

Parties in need of small Grey Iron Castings please address Enterprise Manufacturing Co., Philadelphia.

Excelsior Stump Puller & Rock Lifter. T. W. Fay, Camden, N. J

For Sale—One half the interest in McGee's Patent Self-boring Faucet. Address T. Nugent, Morristown, N. J.

Pictures for the Drawing Room.—Prang's "Lake George," "West Point," "Joy of Autumn," "Prairie Flowers." Just issued. Sold in all Art Stores. "Three Tom Boys." "Bethoven," large and small.

Building Felt (no tar) for inside & out. C. J. Fay, Camden, N. J.

Blind Stile Mortising and Boring Machine, for Car or House Blinds, fixed or rolling slats. Martin Buck, Agent, Lebanon, N. H.

Best Boiler-tube cleaner—A. H. & M. Morse, Franklin, Mass.

"Your $50 Foot Lathes are worth $75." Good news for all. At your door. Catalogues Free. N. H. Baldwin, Laconia, N. H.

The Best Hand Shears and Punches for metal work, as well as the latest improved lathes, and other machinists tools, from entirely new patterns, are manufactured by L. W. Pond, Worcester, Mass. Office 98 Liberty st., New York.

One 60-Horse Locomotive Boiler, used 5 mos., $1,200. Machinery from two 500-ton propellers, and two Martin boilers very low. Wm. D. Andrews & Bro., 414 Water st., New York.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Keuffel & Esser, 116 Fulton st., N. Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves.

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventive. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

Incrustations prevented by Winans' Boiler Powder (11 Wall st. New York,) 15 years in use. Beware of frauds.

To ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's manufacturing news of the United States Terms $4·00 a year.

City Subscribers. — The Scientific American will be delivered in every part of the city at $2·50 a year. Single copies for sale at all the News Stands in this city, Brooklyn, Jersey City, and Williamsburgh, and by most of the News Dealers in the United States.

Inventions Examined at the Patent Office.—Inventors can have a careful search made at the Patent Office into the novelty of their inventions, and receive a report in writing as to the probable success of the application. Send sketch and description by mail, inclosing fee of $5. Address MUNN & CO., 37 Park Row, New York.

After Giving Doty's Clothes Washer

And the Universal Wringer a fair trial, we are prepared to say that they are truly indispensable in any family.—Indianapolis (Ind.) Housewife.

Nearly Every Advertiser

Who makes Advertising pay, contracts through a responsible Agency. Experience having taught them to avail themselves of the services of those who have made the business a study. The Agency of Geo. P. Rowell & Co., No. 40 Park Row, New York, is the most competent in the country, and many of the largest advertisers make all their contracts through them.

Recent American and Foreign Patents.

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

MEDICAL COMPOUND.—J. D. Love, Oregon City, Oregon.—The object of his invention is to provide a remedy for rheumatism and all kindred diseases.

SPRING BED BOTTOM.—Philip Stovall, Newman, Georgia.—This invention relates to a new and useful improvement in spring bed bottoms whereby they are made cheaper, more elastic, and more durable than they have hitherto been.

WRITING CASE OR DESK.—Ernest Scheel, New York city.—This invention relates to a new writing case which is provided with a flexible slat cover that is moved into the case for opening the same. The invention consists in connecting the said cover with a drawer in such manner that by opening the said drawer the cover will be concealed.

SKATE.—Corydon Wheat, Geneva, N. Y.—This invention relates to a new manner of constructing the runner of a skate, securing the bearings to the same and the straps to the latter.

KNIFE.—Peter Houseman and C. C. Campbell, Rural Retreat, Va.—This invention has for its object to provide knives for cutting tobacco and other purposes, with broad thumb-rests for protecting the thumbs and preventing their being worked sore on the backs of the knives.

LAMP WICK TAG.—P. J. Skinner, Oswego, N. Y.—The object of this invention is to provide convenient means for introducing the wicks of lamps into the wick tubes, and it consists in attaching a tag formed of pasteboard or paper or some equivalent substance to one end of the wick, so that the same shall be more rigid than the wick, and be readily introduced into the tube.

MOSQUITO BAR.—Theophile Masac, Good Hope Plantation, Parish of St. Charles, La.—This invention relates to a new bedstead attachment for supporting mosquito nets. The object of the invention is to do away with the cumbersome posts, fixtures, and bedskies which are at present required for supporting mosquito nets, and which are all great impediments in moving, and crowd the bedroom beyond measure.

STEAM ENGINE.—Philip Estes, Leavenworth, Kansas.—This invention relates to a new and useful improvement in steam engines, whereby they are endered more effective, useful, and economical than they have hitherto been, and the invention consists in constructing and arranging the valves and their seats in such a manner that the exhaust ports remain open during the entire stroke of the piston, while the valves are balanced and consequently made to work without friction.

CIDER MILL.—J. K. P. Smith, Jeffersonville, Ind.—This invention relates to a new and useful improvement in mills for grinding apples in the process of making cider, which mill may be used for crushing or grinding other fruits or substances preparatory to expressing the juice therefrom.

ASPHALT PAVEMENT.—A. C. Campbell, New York city.—This invention relates to a new and improved mode of mixing asphaltum or any asphaltic preparation with mineral matter or with rocks crushed or pulverized, or with any pulverulent earth, as clay, marl, etc., with the object of bringing about a more thorough union of the materials, and thereby forming a more suitable product for paving streets, sidewalks, etc., and for flooring and other purposes.

HAY AND COTTON PRESS.—J. H. Johnson, Griffin, Ga.—This invention consists in attaching the platen to a rack which is elevated and depressed by a pinion secured to a shaft that is operated by a ratchet wheel and pawl; also in the use of a pendulum-lever in connection with the aforenamed device; also in a brake and lever of peculiar construction attached to the press, and arranged in such a manner that they can be operated by the foot, so as to hold the ratchet wheel, and thereby the shaft to which it is attached, while the pawl, levers, etc., are being removed to permit the rack and platen to be raised from the bale of cotton or hay.

PUTTING UP SOAP.—W. F. George, New York city.—This invention has for its object to so put up soap into cakes or balls that it can be entirely used up, and consists in placing a piece of wood in each cake.

GATE.—C. D. Reed, Polo, Ill.—This invention relates to a new farmers' gate, which is pivoted to swing vertically, and connected with weighted levers, whereby it can be raised and lowered at will.

CORN PLANTER.—G. B. Vaughan, Marshall, Mo.—This invention relates to new corn planter, which is so constructed as to operate automatically, depositing the seed and marking the hills at the proper distances apart.

RAILWAY GATE.—Edwin Woodbury, Sharon, Pa.—This invention has for its object to furnish an improved railway gate, simple in construction and effective in operation, opening and closing automatically upon the passage of the trains.

TONGUE BRACE AND BALANCE FOR WAGONS AND OTHER VEHICLES.—A. J. Mapes, Independence, Mo.—The object of this invention is to provide a brace or support for the poles or tongues of wagons, carriages, buggies, leighs, and other vehicles, so as to hold the same in the required horizontal position, and remove their absolute weight from the animals holding them suspended.

CAR COUPLING.—G. W. Irish, Memphis, N. Y.—This invention has for its object to furnish a simple, convenient, and reliable car coupling, which shall be so constructed and arranged as to couple the cars automatically when they are run together, and which shall not be liable to become uncoupled accidentally.

CARPET BEATER.—W. H. Hankinson, New York city.—This invention relates to a new machine for beating and cleaning carpets and other fabrics and consists in a new mechanism for operating the elastic wire beaters or whips, and more particularly in a new arrangement of double-acting springs by which the strokes of the beaters are made elastic and properly yielding. The carpet is thereby prevented from injury during the beating process.

COMBINED STEAM AND GAS ENGINE.—J. A. H. Ellis, Springfield, Vt.—The chief object of this invention is to utilize the heat of the exhaust steam and that of the escaping products of combustion in a steam boiler, or either, for vaporizing gasoline, or other hydrocarbon or volatile liquid, so that the vapor thus produced may be employed for operating an engine, or otherwise generating power.

ORE PULVERIZER.—F. C. Morse, Buckskin Col. Ter.—This invention relates to a new construction of machinery for pulverizing metalliferous ores, and for scouring and burnishing the metals which pass through it for amalgamation. The invention consists in making the lower of each pair of stones or pulverizers conical, and the lower surface of the upper rotary grinder concave, to fit the lower cone. The requisite outward feed is thereby obtained.

SHIRTS.—W. H. Carroll, Columbus, Miss.—This invention relates to improvements in shirts, and consists in the application to the front and top, around the neck, or partly around it, of ribbed elastic knit goods, which, without having the slit or opening at the top, commonly employed for opening, to let the head through, in putting the shirt on and off, will yield or stretch for the purpose, thereby avoiding the necessity for having the said slits or openings, which are objectionable in point of healthfulness and labor of buttoning and repairs.

COMBINED GANG PLOW, PLANTER, GUANO DISTRIBUTER, CULTIVATOR AND CHOPPER.—A. G. W. Foster Franklin, Ga.—This invention has for its object to furnish an improved machine for preparing the ground, putting in the crop, and cultivating it, and which shall at the same time be simple in construction, effective in operation, and easily and conveniently adjusted for its various uses.

COTTON SEED PLANTER.—A. C. Smith, Roaring Falls, Tenn.—This invention has for its object to furnish an improved machine for planting cotton seed, corn, peas, and other seeds conveniently and accurately, and which shall at the same time be simple in construction, and easily and conveniently operated.

TUBULAR BRIDGES.—George H. White, New York city.—This invention relates to a new and useful improvement in the mode of construction of tubular bridges, whereby the material employed is so distributed and arranged that the maximum of strength is secured to any given weight of metal or wood.

SKATE FASTENING.—Bernard Gallagher, St. John, New Brunswick.—This invention relates to a new and improved method of fastening skates to the foot, and consists in an arrangement of clamps, and an adjustable jaw and connecting bar, operated by means of a lever, whereby the skate is fastened to the sole and heel of the boot in the most secure manner.

STEAM GENERATOR.—Truckson S. La France, Elmira, N. Y.—This invention has for its object to furnish an extended heating surface and perfect circulation in steam boilers.

TAR CEMENT.—Henry M. Westman, East Boston, Mass.—The nature of this invention consists in mixing ingredients for forming a cement for coating wood, metal, and other substances, for protecting such substances from injury from the effects of the weather, water, insects, worms, etc.

PISTON PACKING.—Lawrence Turner, New Orleans, La.—This invention relates to a new packing for the pistons of steam cylinders, and has for its object to facilitate the adjustment of the rings, and prevent the straining of parts by the greater or less inclination of the machinery. The invention is chiefly applicable to marine engines, in which the rolling of the ships frequently produces a straining of the machinery and leakage in the piston.

DUMPING CAR.—William Riley, Jr., Terra Haute, Ind.—This invention relates to a new and useful improvement in cars for dumping coal, wood, or other substances or materials, whereby much time and labor is saved.

HAT POUNCING MACHINE.—James B. Brown, Danbury, Ct.—This invention relates to improvements in hat-pouncing machines, and consists in a novel and simple arrangement with two vertical mandrels, and the forms thereon, for holding and revolving the hat bodies, of a driving and shifting gear, by which the time lost in shifting from one to the other may be greatly economized.

PUMP SIPHON.—T. J. Trapp, Williamsport, Pa.—This invention consists of a pump and siphon combined, and has for its object to enable an operator, by working the pump for a few strokes, to start a flow of liquid in the siphon, after which the pump mechanism is removed from its barrel, and the liquid continues to run through the siphon without intermission until it is exhausted, or the siphon removed.

AWNING.—Louis G. Sert and Christian L. Schurr, Baltimore, Md.—This invention relates to that class of devices in which "lazy tongs" are employed to raise and lower an awning, and it consists, first, in lazy tongs, placed at an inclination in order that, after having been drawn together, they may, when released from restraint, extend themselves by their own gravity, and thus lower the awning; second, in an arrangement of devices whereby the awning, after having been lowered, may be raised by winding a stud with a key, and after having been raised may be lowered by releasing a pawl from a ratchet.

Official List of Patents.

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Full information, as to price of drawings, in each case, may be had by addressing
MUNN & CO.,
Patent Solicitors, No. 37 Park Row, New York.

108,551.—HORSE HAY FORK.—Charles N. Baldwin, Wilmington, Conn.
108,552.—BORING MACHINE.—Charles N. Baldwin, Wilmington, Conn.
108,553.—METALLIC FISH NETS, ETC.—Wm. Beck, New York city. Antedated Oct. 12, 1870.
108,554.—STEAM PUMP.—G. F. Blake, Boston, Mass. Antedated Oct. 20, 1870.
108,555.—COMPASS FOR MINING.—Johan Blomgren, New York city.
108,556.—FLASK FOR CASTING STAMP SHOES FOR CRUSHING MILLS.—Henry Bolthoff, Central City, Colorado Territory.
108,557.—WINDOW BLIND.—J. P. Boyd (assignor to himself and A. H. Miller), La Porte, Ind.
108,558.—APPARATUS FOR DEODORIZING AND IMPROVING ALCOHOLIC AND VINOUS LIQUORS.—Leverett Bradley, Jersey City, N. J.
108,559.—HORSE COLLAR FASTENINGS.—August Bratnober, Webster county, Iowa.
108,560.—MELODEON.—Thomas Brett, Geneva, Ohio.
108,561.—PERMUTATION LOCK.—Edward W. Brettell, Elizabeth, N. J.
108,562.—HAT-POUNCING MACHINE.—J. B. Brown, Danbury, Conn.
108,563.—OIL-CLOTH PRINTING MACHINERY.—Alexander Fordyce Buchanan, East Newark, N. J.
108,564.—LINK FOR ENDLESS CHAIN HORSE-POWER.—G. E. Burt, Harvard, Mass.
108,565.—SNOW PLOW.—A. M. Butts, Waterbury, Conn.
108,566.—ASPHALT PAVEMENT.—Alonzo C. Campbell, New York city.
108,567.—SHIRT.—W. H. Carroll, Columbus, Miss.
108,568.—FAUCET.—Wm. F. Class and L. W. Sapp, Cleveland, Ohio.
108,569.—WORK HOLDER.—Nicholas Clute, Schenectady, N. Y., and O. W. Marshall, Hartford, Conn.
108,570.—STAMP BATTERY.—Geo. D. Crocker, Virginia City, Nevada.
108,571.—MANUFACTURE OF WHITE LEAD.—C. W. Dwelle, St. Louis, Mo.
108,572.—DEVICE FOR OPERATING SKYLIGHT.—Wm. Dyatt, New York city.
108,573.—PENCIL HOLDER.—C. A. Eaton (assignor to himself and G. F. Bolles), Minneapolis, Minn.
108,574.—COMBINED STEAM AND GAS ENGINE.—J. A. H. Ellis, Springfield, Vt.
108,575.—CLOTHES DRYER.—John Emmert, Dunleith, Ill.
108,576.—STEAM ENGINE.—Philip Estes, Leavenworth, Kansas.
108,577.—GRAIN SEPARATOR.—John G. Evans, Orrville Ohio.
108,578.—JEWELRY PIN.—Israel Farjeon, New York city, and W. H. Horton, Jersey City, N. J.
108,579.—GAS BURNER.—C. S. Ford (assignor to Chas. Young), Philadelphia, Pa.
108,580.—COTTON PLANTER.—Abraam G. W. Foster, Franklin, Ga.
108,581.—SKATE FASTENING.—Bernard Gallagher, St. John, New Brunswick.
108,582.—WOOD PAVEMENT.—Carol Gaytes, Chicago, Ill.
108,583.—GAS HEATER.—Richard George, Kilburn, England
108,584.—PUTTING UP SOAP.—W. F. George, New York city Antedated Oct. 8, 1870.
108,585.—PREVENTING THE DEVIATION OF SHIP'S COMPASS.—J. W. Girdlestone, 37 Norfolk st., Strand, England.
108,586.—PLANE.—W. B. Glover, Boston, Mass.
108,587.—GAME.—D. F. Hale, Chicopee, Mass.
108,588.—FASTENING ARTIFICIAL TEETH TO METALLIC PLATE.—H. B. Hale, Rockford, Ill. Antedated Oct. 21, 1870.
108,589.—CARPET BEATER.—William H. Hankinson, New York city.
108,590.—EXTENSION HAT RACK.—Nathan Hayden, Chicago, Ill. Antedated Oct. 11, 1870.
108,591.—POTATO PLANTER.—Theodore Herbert, Philadelphia, Pa.
108,592.—FLOWER CASKET.—John M. Hess, Philadelphia Pa.
108,593.—WIND WHEEL.—J. O. Heyworth and H. E. Fessel Chicago, Ill. Antedated Oct. 8, 1870.
108,594.—MACHINE FOR SECURING HEADS TO METALLIC KEGS.—Wm. Hill, Pottsville, Pa.
108,595.—THREAD SPOOL.—I. L. Hoard, Bristol, R. I.
108,596.—POCKET CUTLERY.—D. R. Hundley, Mountain Home Ala.
108,597.—REIN HOLDER.—Davis Hurd, Lockport, N. Y.
108,598.—CAR COUPLING.—G. W. Irish, Memphis, N. Y.
108,599.—HAY AND COTTON PRESS.—J. H. Johnson, Griffin Ga.
108,600.—COTTON BALE TIE.—E. P. Jones, Sun Flower county Miss.
108,601.—KNIFE HOLDER AND GUIDER FOR HEEL-CUTTING MACHINE.—Samuel Keen, East Bridgewater, Mass. Antedated October 15, 1870.
108,602.—GALVANIC BATTERY.—Jerome Kidder, New York city.
108,603.—MEDICAL COMPOUND FOR FOWLS.—J. H. Kipp, Millerstown, Pa.
108,604.—STEAM GENERATOR.—Truckson S. La France, Elmira, N. Y.
108,605.—MACHINE FOR CUTTING HEELS OF BOOTS AND SHOES.—R. C. Lambart, South Abington, assignor to David Whittemore, North Bridgewater, Mass.
108,606.—METHOD OF COOLING BEER WORTS, ETC.—O. P Lewis, Cincinnati, Ohio.
108,607.—WAGON AXLE.—William A. Lewis, Joilet, Ill.
108,608.—WAGON AXLE.—W. A. Lewis, Joliet, Ill.
108,609.—WAGON AXLE.—W. A. Lewis, Joliet, Ill.
108,610.—TONGUE BRACE AND BALANCE FOR WAGONS.—A. J Mapes, Independence, Mo.
108,611.—MOSQUITO BAR.—Theophile Masac, Good Hope Plantation, La.
108,612.—HUB FOR CARRIAGE.—James A. Maynard, Newtonville, Mass.
108,613.—NUT LOCK.—H. W. McAuley, Sterling, Wis.
108,614.—CART SADDLE.—William B. McClure, Alexandria, Va.
108,615.—COPYING INK FOR PRINTING.—Charles McIlvaine Philadelphia, Pa.
108,616.—DRYER.—C. A. Moffatt, Indianapolis, Ind.
108,617.—ORE PULVERIZER.—F. C. Morse, Buckskin, Colorado Territory.
108,618.—LOW-WATER INDICATOR.—A. F. W. Neynaber, Philadelphia, Pa. Antedated Oct. 29, 1870.
108,619.—CANCELING STAMP.—George G. Noyes, Worcester, Mass.
108,620.—CLOTHES WRINGER.—Abiel O'Dell, Napanee, Canada.
108,621.—CHAIN LINK AND BAR.—D. A. Peloubet, Hudson City, N. J., assignor to Warren Spadone & Co., New York city.
108,622.—BED AND BED BOTTOM.—J. W. C. Peters and W. A. Le Row, Chicago, Ill.
108,623.—PAPER FILE.—S. E. Pettee and C. A. Wolle, Bethlehem, Pa.
108,624.—MACHINE FOR DRIVING NAILS.—Samuel W. Phelps, Sandusky, Ohio.
108,625.—MAP STAND.—William F. Phelps, Winona, Minn. Antedated Oct. 13, 1870.
108,626.—PADDLE WHEEL.—John W. Post, Castile, Pa Antedated Oct. 11, 1870.
108,627.—REMOVING SOLUBLE SALTS FROM ARTIFICIAL STONE.—E. L. Ransome, Greenwich, England.
108,628.—GATE.—C. D. Reed, Polo, Ill.
108,629.—CIGAR MACHINE.—John O. Reilley, Baltimore, Md., assignor to himself, Wm. W. Perkins, and C. C. Chaffee. Antedated October 15, 1870.
108,630.—INKING APPARATUS FOR COLOR PRINTING.—Israel L. G. Rice, Cambridge, Mass.
108,631.—CHURN.—J. C. Richardson, Prairie Du Chien, and Lemuel Taylor, Jordan, Wis. Antedated Sept. 30, 1870.
108,632.—DUMPING CAR.—William Riley, Jr., Terre Haute Ind.
108,633.—ELECTRO-MAGNETIC RAILROAD SIGNAL.—William Robinson, Brooklyn, N. Y.
108,634.—TIRE MACHINE.—Samuel Roe, Jr., Booneville, Mo.
108,635.—WRITING DESK.—Ernest Scheel, New York city.
108,636.—SPRING.—John M. Schmidt, New Albany, Ind.
108,637.—AUTOMATIC FAN.—John Schnell and Peter Schmitt Waterloo, Ill.
108,638.—REIN HOLDER.—F. B. Scott, Lancaster, N. Y., assignor to himself and C. S. S. Lennox, Townsend, Mass.
108,639.—AWNING.—L. G. Sert and C. L. Schurr, Baltimore, Md.
108,640.—CALIPERS.—W. A. Sharpe, Syracuse, N. Y.
108,641.—PLATES AND BARS FOR CONSTUCTION OF PLOWS CULTIVATOR TEETH, ETC.—W. H. Singer, Pittsburgh, Pa.
108,642.—SASH HOLDER.—Emerson D. Slater, Greenville N. Y.
108,643.—COTTON-SEED PLANTER.—A. C. Smith, Roaring Falls, Tenn.
108,644.—LAND MARKER FOR CORN PLANTING.—A. C. Smith, Joyner's Depot, N. C.
108,645.—CIDER MILL.—J. K. P. Smith (assignor to himself and L. S. Shuler), Jeffersonville, Ind.
108,646.—WASHING MACHINE.—S. M. Smith, Canal Dover Ohio.
108,647.—MOLDING PIPE.—William Smith, Pittsburgh, Pa.
108,648.—MACHINE FOR SHAVING THE HEADS OF SCREW BLANKS.—James F. Starrett, New York city. Antedated October 15 1870.
108,649.—CARRIAGE SPRING.—Sidney Steward, Trenton N. J.
108,650.—SPRING BED BOTTOM.—Philip Stovall, Newman Ga.
108,651.—CARPET CLEANER.—Robert Terry, and F. W. Hafkemeyer, Chicago, Ill.
108,652.—PUMP SIPHON.—Thomas J. Trapp, Williamsport, Pa.
108,653.—PISTON PACKING.—Lawrence Turner, New Orleans, La.
108,654.—SCALE BEAM.—J. H. Usher (assignor to "The Buffalo and Niagara Scale Works Company"), Buffalo, N. Y.
108,655.—MACHINE FOR ASSORTING POTATOES.—Benjamin D. Vanderveer, David A. Vanderveer, and Tunis Denise, Freehold, N. J.
108,656.—CORN PLANTER.—George B. Vaughan, Marshall, Mo.
108,657.—PRESS FOR REMOVING LIQUID MATTER FROM VARIOUS SUBSTANCES.—Jason Waters, West Sutton, Mass.
108,658.—HYDRAULIC MINING APPARATUS.—Thos. Watson, Nevada City, Cal.
108,659.—PRESERVING WOOD.—Ezra Webb, New York city

108,660.—DIE FOR MOLDING BUTTONS.—Wm. M. Welling, New York city.

108,661.—CEMENT FOR COATING AND PROTECTING WOOD.—H. M. Westman, East Boston, Mass.

108,662.—SKATE.—Corydon Wheat, Geneva, N. Y.

108,663.—TUBULAR BRIDGE.—George H. White, New York city.

108,664.—UTILIZING SEWAGE.—George W. Wigner, London, England.

108,665.—SAW MILL.—William M. Wilkin, Kalamazoo, Mich.

108,666.—ROOFING CEMENT.—Jas. T. Wilkinson, Lockport, N. Y. Antedated Oct. 8, 1870.

108,667.—LAMP BURNER.—Lamuel R. Wilmot, Bridgeport, Conn.

108,668.—BARK-SHAVING MACHINE.—Martin Winger, Ephrata, Pa.

108,669.—MANUFACTURE OF QUERCITRON BARK.—Martin Winger, Ephrata, Pa.

108,670.—RAILWAY GATE.—Edwin Woodbury, Sharon, Pa.

108,671.—PLOW HANDLE.—W. E. Wyche, Brookville, N. C. Antedated Oct. 7, 1870.

108,672.—PLANTING AND FERTILIZING MACHINE.—S. L. Allen, Cinnaminson, N. J.

108,673.—LUBRICATING DEVICE FOR BOLT-THREADING MACHINES.—William Armstrong, Kent, Ohio, assignor to himself and Ezra Miller, New York city.

108,674.—WRINGING MACHINE.—E. G. W. Bartlett, Providence, R. I.

108,675.—MACHINE FOR FELLING TREES.—H. J. Beard, New Sharon, Me., assignor to himself and James Hawes, Jr.

108,676.—PAPER CUFF.—S. A. Bemis, A. E. Forth, and J. W. Goodrich, Springfield, Mass.

108,677.—MACHINE FOR HEELING BOOTS AND SHOES.—H. H. Bigelow, Worcester, Mass.

108,678.—MACHINE FOR FINISHING HEELS ON BOOTS AND SHOES.—H. H. Bigelow, Worcester, Mass.

108,679.—DETACHABLY-TIPPED WHIP.—Pardon Boyden, Amsterdam, N. Y.

108,680.—REELING MACHINE.—John Briggs, Higganum, Conn.

108,681.—FAN.—Otto Brueck, New York city.

108,682.—PISTON.—I. D. Buck, Conshohocken, Pa.

108,683.—BRACELET.—Henry Carlisle, Jr., Philadelphia, Pa.

108,684.—HORSE SHOE.—J. K. Christopher, Dayton, Ohio.

108,685.—COUPLING ATTACHMENT FOR PIANO.—John Clark (assignor to himself and Alfred Adamson), Philadelphia, Pa.

108,686.—CUTTING APPARATUS FOR HARVESTERS.—T. J. Clark and O. M. Clark, Higganum, Conn.

108,687.—MACHINE FOR SKIVING LEATHER.—J. P. Crooks, Hopkinton, assignor to G. E. Franklin (assignor to Leonard Morris), Natick, Mass.

108,688.—SELF-ACTING MULES FOR SPINNING.—John Cumnock, Salmon Falls, N. H.

108,689.—WASHING MACHINE.—Ezra Davis, Keokuk, Iowa.

108,690.—HARROW.—James Dawson, Greenwood, Ill.

108,691.—COOKING RANGE.—R. E. Deane, New York city.

108,692.—ROTARY DISINTEGRATOR.—Henry Ducsh, Baltimore, Md.

108,693.—CONCRETE FOR PAVEMENT, ETC.—G. H. S. Duffus, Baltimore, Md., assignor to himself and H. J. Davison, New York city.

108,694.—HOLLOW WICK LAMP-BURNER.—J. W. Emerson, Milbury, Mass.

108,695.—RETORT FURNACE.—A. F. Du Faur, Newark, N. J., assignor to himself and Edward Balbach, Jr.

108,696.—PAVEMENT.—L. S. Filbert, Philadelphia, Pa.

108,697.—WOOD PAVEMENT.—L. T. Follansbee (assignor to himself and G. W. Linville), Washington, D. C.

108,698.—RAILWAY CAR COUPLER AND BUFFER.—P. G. Gardiner, New York city.

108,699.—PLOW.—M. L. Gibbs, Canton, Ohio.

108,700.—WOODEN BOX.—William Gilbert, Catskill, N. Y., assignor to N. K. Fairbank, Chicago, Ill.

108,701.—EVAPORATING APPARATUS.—S. D. Gilson, Syracuse, N. Y.

108,702.—RAILROAD CAR HEATER.—Pierre Grandjean, Paris, France.

108,703.—SECTIONAL STEAM GENERATER.—John Griffith and G. W. Wundram, New York city.

108,704.—BALANCE SLIDE VALVE.—T. J. Hamer and Martin Walls, Sunbury, Pa.

108,705.—PUMP.—George Hibberd, Wheeling, West Va.

108,706.—SQUARE SAIL FOR FORE-AND-AFT VESSEL.—A. A. Holling, Pulteyville, N. Y.

108,707.—COOLING BUILDINGS.—Theodore Krausch, New York city.

108,708.—DOOR AND ALARM BELL.—G. O. Lackey, Akron Ohio.

108,709.—DRAWING AND TWISTING HEAD FOR SPINNING MACHINE.—S. W. Lawrence, Philo Walden, and J. W. Huntoon, West Eaton, N. Y.

108,710.—STEAM ATOMIZER.—I. P. Leete, Philadelphia, Pa.

108,711.—VAPOR BURNER.—Daniel Leonard, Chicago, Ill.

108,712.—COMBINED STALK AND WEED CUTTER AND LAND ROLLER.—William Leslie, Fort Madison, Iowa. Antedated October 15, 1870.

108,713.—APPARATUS FOR PREPARING LAKES AND COLORS.—John Lucas, Philadelphia, Pa.

108,714.—STOP VALVE.—H. G. Ludlow, Troy, and Jabez Stone, Waterford, N. Y., assignors to H. G. Ludlow.

108,715.—MACHINE FOR SIZING AND FELTING HAT BODIES.—G. A. Mandeville (assignor to himself and A. C. Wheaton), Newark, N. J.

108,716.—HARVESTER.—W. T. Miller, New Geneva, Pa.

108,717.—CORN COVERER.—I. N. Monroe, Bridgeport, Ill.

108,718.—STEAM ENGINE.—James Montgomery, New York city.

108,719.—PEG BOX FOR PEGGING MACHINE.—A. W. Moore, East Brimfield, Mass.

108,720.—CARRIAGE CLIP.—F. B. Morse (assignor to himself and H. D. Smith & Co.), Plantsville, Conn.

108,721.—MACHINE FOR CUTTING AND SMOOTHING THE ENDS OF PENCILS.—T. M. Muller and H. C. Benson (assignors to Joseph Reckendorfer), New York city.

108,722.—MATERIAL FOR JOURNALS AND BEARINGS.—E. D. Murfey (assignor to the Manhattan Packing Manufacturing Company), New York city.

108,723.—EARTH EXCAVATOR.—J. W. Myers, Lyons, Iowa.

108,724.—GANG PLOW.—William Newlin, Attica, Ind.

108,725.—ROSETTE FOR BRIDLE.—James O'Brien, Cedar Rapids, Iowa.

108,726.—FLUE CLEANER FOR COOKING STOVES.—H. L. Palmer, Stillwater, N. Y.

108,727.—DRAFT EQUALIZER.—W. M. Perkins and T. F. Vandegrift, La Fontain, Ind.

108,728.—PORTABLE PRIVY.—W. H. Pulver, Schuylersville, N. Y.

108,729.—BEDSTEAD.—H. B. Ramsey, Rockville, Ind.

108,730.—PLOW.—G. W. Ream, Canton, Ohio.

108,731.—MACHINE FOR BUNDLING WOOD.—John Rushworth, New York city.

108,732.—REFINING SUGAR BY STEAM.—Francis Schleifer, San Francisco, Cal.

108,733.—HOT AIR FURNACE.—S. B. Sexton and G. W. Beard, Baltimore, Md.

108,734.—CURTAIN FIXTURE.—W. E. Scranton, New Haven, Conn.

108,735.—MACHINE FOR MAKING STAPLES.—James C. Stead, Jersey City, N. J.

108,736.—COOKING RANGE.—David Stuart and Lewis Bridge (assignors to Stuart, Peterson & Co.) Philadelphia, Pa.

108,737.—NEEDLE.—Hannah G. Suplee, San Francisco, Cal. Antedated October 15, 1870.

108,738.—WRENCH.—G. C. Taft, Worcester, Mass.

108,739.—HARNESS HOOK.—Wm. H. Taylor, Baldwinsville, N. Y.

108,740.—HANDLE OF TABLE KNIFE.—J. A. White, Philadelphia, Pa.

108,741.—HORSE-HOE.—J. T. Whitlock, Bridport, Vt., administrator of Cyrus Whitlock, deceased.

108,742.—MACHINE FOR MAKING UMBRELLA CONNECTIONS.—Edwin Wight, Philadelphia, Pa.

108,743.—ELECTRO-MAGNET ALARM-GONG.—Chas. Williams, Jr., Somerville, and Jerome Redding, Charlestown, Mass.

108,744.—HORSE HAY RAKE.—James E. Wisner, Friendship, N. Y.

108,745.—SPRING FOR VEHICLES.—H. E. Wolcott (assignor to himself and R. B. Wheeler), Elbridge, and E. B. Hoyt, Skaneateles, N. Y.

108,746.—PAPER FILE.—William L. Woods, Washington, D. C.

108,747.—WRENCH.—E. J. Worcester, Worcester, Mass.

108,748.—SHINGLING-BRACKET.—E. J. Worcester, Worcester, Mass.

REISSUES.

4,160.—METHOD OF ORNAMENTING TIN, ETC.—Louis Fitzmaier, New York city, assignor to Atwater, Benham & Company.—Patent No. 67,184, dated July 30, 1867.

4,161.—WATER-RESERVOIR FOR COOKING STOVES.—C. O. Green, Troy, N. Y.—Patent No. 23,160, dated March 23, 1859.

4,162.—Division A.—HOLDER FOR NECKTIES.—Wm. H. Hart, Jr., Philadelphia, Pa.—Patent No. 76,196, dated March 31, 1868.

4,163.—Division B.—BOX FOR PACKING NECKTIES.—W. H. Hart, Jr., Philadelphia, Pa.—Patent No. 76,186, dated March 31, 1868.

4,164.—CHAIR-SEAT.—O. A. Bingham, Ashburnham, Mass., assignor to G. C. Winchester.—Patent No. 91,253, dated September 7, 1869 reissue No. 3,890, dated March 22, 1870.

4,165.—Division A.—RESERVOIR FOR WELLS.—R. H. Dewey and E. N. Tillotson, Chicago, Ill., assignor to E. N. Tillotson and W. E. Tillotson.—Patent No. 53,384, dated April 3, 1866.

4,166.—PRINTING TELEGRAPH.—T. A. Edison, Newark, N. J., assignor, by mesne assignments, to the Gold and Stock Telegraph Co.—Patent No. 91,577, dated June 22, 1869.

4,167.—WATER-SUPPLYING APPARATUS.—John C. Hagan, Nashville, Tenn., assignor of one-half interest to James Walker, Isaiah D. Walker, and Ivan S. Walker.—Patent No. 104,069, dated June 7, 1870.

4,168.—MANUFACTURE OF GAS FROM HYDROCARBONS.—Joshua Kidd, New York city.—Patent No. 106,099, dated August 23, 1870; patented in England January 5, 1864.

4,169.—SELF-REGULATING WINDMILL.—The Continental Windmill Company, New York city, assignees of A. P. Brown.—Patent No. 13,456, dated July 3, 1855.

DESIGNS.

4,428.—MATCH-SAFE.—F. W. Brocksieper (assignor to Sargent & Co.), New Haven, Conn.

4,429.—KEEPER FOR DOOR-LOCKS.—H. H. Elwell, South Norwalk, Conn.

4,430 and 4,431.—FACE PLATE FOR LOCKS.—H. H. Ellwell, South Norwalk, Conn. Two patents.

4,432.—KEEPER FOR DOOR LOCKS.—Henry H. Elwell, South Norwalk, Conn.

4,433.—COOKING STOVE.—William Hailes, Albany, N. Y.

4,434.—PARLOR STOVE.—William Hailes, Albany, N. Y.

4,435.—CARRIAGE-BED.—Henry Killam, New Haven, Conn.

4,436.—HEAD-BAND.—W. S. Mingis, New York city.

4,437.—TABLE CASTER.—Wm. Parkin (assignor to Reed & Barton), Taunton, Mass.

4,438.—CASTER BOTTLE.—Wm. Parkin (assignor to Reed & Barton), Taunton, Mass.

4,439.—DRILLING MACHINE.—Francis A. Pratt (assignor to the Pratt & Whitney Company), Hartford, Conn.

4,440.—FRUIT STAND.—Herman Vasseur (assignor to Simpson, Hall, Miller & Co), Wallingford, Conn.

4,441.—TEA SET.—Herman Vasseur (assignor to Simpson, Hall, Miller & Co.), Hartford, Conn.

4,442.—GROUP OF TOOLS, MACHINERY, ETC.—E. A. Ellsworth, Washington, D. C.

4,443.—DRESS TRIMMING.—Martin Landenoerger, Philadelphia, Pa.

4,444.—FLOOR OIL-CLOTH PATTERN.—Jeremiah Meyer, Kearney, N. J., assignor to John Jewett & Sons, New York city.

4,445.—TOY CARRIAGE.—Frederick W. Porter, Springfield, Vt.

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EXTENSIONS.

PAPER-FOLDING MACHINE.—Cyrus Chambers, Jr., of Philadelphia, Pa.—Letters Patent No. 15,842, dated October 7, 1856; reissue No. 4,079, dated July 26, 1870.

MAKING AX-POLLS.—D. P. Estep, Pittsburgh, Pa.—Letters Patent No. 15,880, dated October 14 1856.

MANUFACTURE OF CAUSTIC ALKALI.—George Thompson, of Philadelphia, Pa.—Division A.—Letters Patent No. 15,957, dated October 21, 1856; reissue No. 654, dated February 1, 1859; reissue No. 2,569, dated April 16, 1867.

PROCESS OF PUTTING UP CAUSTIC ALKALI.—George Thompson, of Philadelphia, Pa.—Division B.—Letters Patent No. 15,957, dated October 21, 1856; reissue No. 654, dated February 1, 1859; reissue No. 2,570, dated April 16, 1867.

MANUFACTURE OF CAUSTIC ALKALIES.—George Thompson, of Philadelphia, Pa.—Division C.—Letters Patent No. 15,951, dated October 21, 1856; reissue No. 654, dated February 1, 1859; reissue No. 2,571, dated April 16, 1867.

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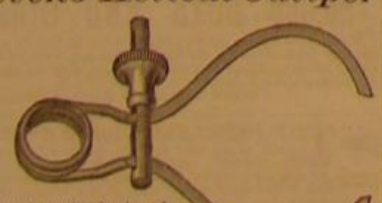
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SCIENTIFIC AMERICAN

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

Vol. XXIII.—No. 20. [NEW SERIES.] NEW YORK, NOVEMBER 12, 1870. $3 per Annum, [IN ADVANCE.]

Automatic Damper Regulator.

A simple and reliable damper regulator for steam boilers, sensitive to slight variations of pressure, and durable in all its parts, has long been sought. Various devices have been introduced at different periods since the invention of the steam engine for the purpose of controlling and regulating the draft of the fires, which have failed to effect the desired purpose on account of friction, rigidity of parts, etc. The rubber diaphragm answered the purpose in all respects, except that the protection of the rubber diaphragm, in its changes of form and motion, offered difficulties which it is claimed the invention herewith illustrated has fully obviated.

We are assured that it has been fully tested, both as a constant economizer of fuel and a positive security against explosions or damage from excess of pressure, and that for both these purposes its operation is satisfactory.

It is simple in construction, apparently not liable to derangement, practically frictionless in all its parts, and entirely protected from the obstructive effects of dust and dirt. The operation of the machine is as simple as its construction.

The rubber diaphragm, B, Fig. 1, being protected by triangular flat metal plates, C, hung on knife-edges communicating motion to the lever by the same means as shown in in Fig. 1 at D and E, makes the machine sensitive to the slightest variation of pressure, and at the same time the diaphragm is relieved from any undue strain whatever through its extremes of motion. The lever, F, with its counter poise, H, has a knife-edged bearing, shown at G. Steam is admitted under the diaphragm at A.

When the machine is attached to the boiler, and connections made with the damper-rod, the weight on the lever is placed at the point that will balance the required pressure, the position of the damper in the pipe being partially closed.

Any additional pressure will of course close the damper entirely, thereby shutting off the draft and preventing the heat from escaping out of the smoke pipe, until the steam pressure decreasing the weight gradually descends, and opens the damper, admitting sufficient draft to the fire to keep the steam at the required pressure.

Thus whatever the irregularities of demand upon the boiler, this automatic damper regulator would, without doubt, control the consumption of fuel more perfectly than even a careful engineer could do it, acting independently of steam gage or safety valve, and, at the same time, adding to the economy in the use of steam, and safety from explosions.

Patented, October 4, 1870, by James H. Murrill, assignor to himself and Lewis B. Keizer. Address, for further particulars, Murrill & Keizer, 44 Holliday street, Baltimore, Md.

Fig. 1

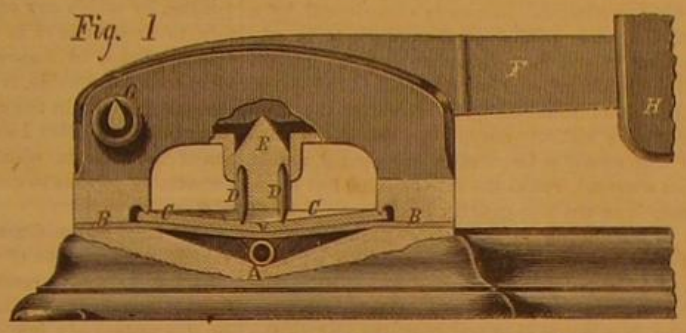
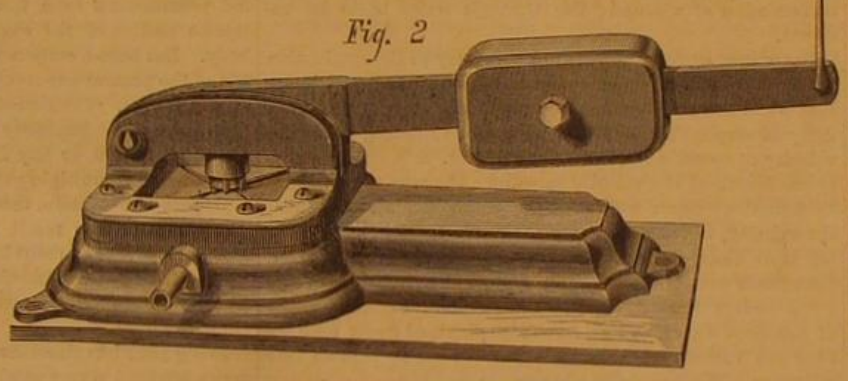


Fig. 2



MURRILL'S AUTOMATIC DAMPER REGULATOR.

Important Patent Decision.

The case of Whitely *vs.* the Commissioner of Patents, recently decided by the Supreme Court of the District of Columbia, is of general interest.

One Bethea made application for a reissued patent, which was duly allowed and issued; when, after the patent had gone out, Whitely appeared and produced an assignment of he invention to him, executed before the issue of the patent to Bethea, but not recorded until afterward, and demanded that a second patent should issue to him as assignee. The Commissioner of Patents refused, and Whitely appealed to a Judge of the Supreme Court, who ordered the Commissioner to issue the second patent as prayed, antedated to the date of surrender. The Commissioner refused to obey the order, and Whitely brought suit against him for $50,000 damages. Upon full hearing by all the Judges, it was decided:

1. That the patent could not be issued or antedated as prayed for.

2. That the jury had no jurisdiction of the question upon appeal, and that his order to the Commissioner was null and void, and

3. That the Commissioner could not be sued for refusing to issue a patent, as he was not the issuing officer under the law. Even if a cause of action existed it was not against him, but against the Secretary of the Interior.

This disposes of a similar suit brought by the same party, under the same circumstances, against the Commissioner, in which the damages are laid at one million dollars.

Ague Poison.

M. P. Bolestra has communicated to the French Academy some observations on ague poison. He says, that in examining marsh water he always finds, in proportion to its degree of putrefaction, a granular microphyte, somewhat resembling in form the *Cactus Peruvianus*. It is always accompanied by a considerable quantity of small spores $\frac{1}{1000}$ of a millimeter in diameter, greenish yellow and transparent, and also by sporangia or vesicles containing spores from $\frac{2}{100}$ to $\frac{2}{300}$ of a millimeter in diameter, and of very characteristic form. This plant grows on the surface of the water; when young, it is rainbow-like in tints, and looks like spots of oil. At the low temperature of cellars and in water containing no vegetation, it develops slowly, but in contact with air and exposed to solar rays, it grows fast, disengaging small gas bubbles. A few drops of arsenious acid, sulphite of soda, or, still better, neutral sulphate of quinine, stops its vegetation at the surface of the water, the spores become thin and transparent, and the sporangia alter so that they would not be recognized. These changes may be seen under the microscope. M. Bolestra states that these spores can be found in marsh air. He caught agues twice during his researches—once after having been exposed to air from water in fermentation covered with fresh algæ in full vegetation, mixed with an extraordinary quantity of spores. He thinks these spores constitute the ague poison.

TRIPLER'S RAILROAD TIE.

The railroad interests of this country have assumed such colossal proportions that any improvement relative thereto is looked upon with interest. One of the most important features in the construction of a railroad is the cross-tie, upon the quality of which depends much of the speed and safety of travel.

The accompanying engraving represents a new feature in the construction of ties, known as the "Tripler" tie, which introduces, so far as we are aware, a novel form of construction, for which the inventor claims many advantages.

Fig. 1

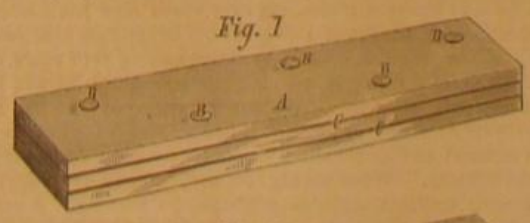


Fig. 2

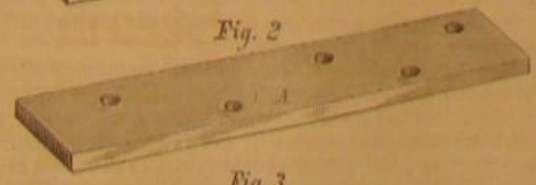
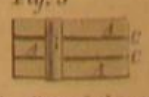


Fig. 3



This tie is constructed in sections or slabs, A, fastened together with dowel pins, B. Each slab is coated with a vulcanite antiseptic compound, making, when united, antiseptic division walls, C, between each slab, rendering it indestructible. It presents a perfectly even surface for the rail. The antiseptics used are claimed to prevent the rust of the rail as well as the spike, while the dowel pins, being also coated with the antiseptic, the tie is claimed to be as compact as a solid one.

The tie being in sections, gives an elasticity which lessens the jar on locomotives and carriages, reducing wear and tear of the rolling stock, besides giving greater comfort to the traveler.

It is claimed that in an economical point of view these ties, on account of the durability alone, are worthy of general adoption. There are now in use one hundred and eighty millions of cross-ties, which have to be replaced every six to ten years, at a cost of $90,000,000. The claims for durability in the Tripler tie is, therefore, if substantiated, a matter of great importance, especially as it is claimed that the expense of construction is but little over those now in use. Each tie is made to the exact measure, requiring no fitting or dressing to receive the rail, and can be laid in a much shorter time than is required for the ordinary hewn tie, thus making a saving, it is claimed, of more than their additional cost.

The Tripler tie is now manufactured in the South, and we are informed that a number of roads are adopting the improvement.

This invention is protected by patents in the United States and foreign countries. For further information address Upperman & Johnson, Washington, D. C., S. Marx, New Orleans, La., or F. B. Kenner, Philadelphia, Pa.

Importance of Patenting Trade-Marks.

Watches manufactured in the United States bear certain trade-marks known to the trade, and having a definite value protected by statute laws, the infringement of which is severely punished. Imported watches, however, may still be brought in with these trade-marks, the law which severely punishes the native forger being powerless against the foreign offender. Our people are thus largely swindled by cunning inferior imitations of American watches by foreign manufacturers.—*N. Y. Tribune.*

There is a remedy against such infringers in the Statute on Trade-marks, enacted July 8, 1870, which manufacturers of all kinds would do well to heed. Letters patent for trade-marks are now issued for thirty years, and may be extended thirty years more, on expiration of the first term, at a small expense A few patent-medicine compounders and others, have already availed themselves of the privilege extended them under the new law, and obtained patents on the name, vignette, or emblem used to distinguish their manufactures from those of others. But large manufacturers of fabrics familiar to the trade, like "New York Mills" and "Wamsutta Shirtings," "Merrimack Prints," etc., seem slow to avail themselves of the advantages of the protection offered them under the new law. Full particulars in writing, and copies of the law on trade-marks, may be had gratuitously on application to this office.—Eds.

The Surrender of Metz together with the army of Bazaine amounting to 173,000 men, has left the French without an organized army. Paris is so closely besieged that no supplies can reach its inhabitants, and the cry of distress is already heard. The case of France is utterly hopeless, yet, notwithstanding all this, Gambetta and his associates, who are unable to stay anywhere very long for fear of being caught by the Prussians, are urging the people to rise *en masse* to expel the invaders; but when asked for arms these crazy leaders are obliged to confess that they have none. Such folly and madness the world has not often witnessed.

Knots and Splices.—A correspondent says: "The issue of this week of your paper, containing the drawing of various knots, is worth the yearly subscription price. Will you, or some of your readers, favor us with the different kinds of useful splices. The subject is equally interesting."

The universe never loses material nor energy.

SCIENTIFIC USE OF THE IMAGINATION.

John Tyndall, LL.D., F.R.S., before the British Association.

I carried with me to the Alps this year the heavy burden of this evening's work. In the way of new investigation I had nothing complete enough to be brought before you; so all that remained to me was to fall back upon such residues as I could find in the depths of consciousness, and out of them to spin the fiber and weave the web of this discourse. Save from memory I had no direct aid upon the mountains; but to spur up the emotions, on which so much depends, as well as to nourish indirectly the intellect and will, I took with me two volumes of poetry, Goethe's "Farbenlehre," and the work on "Logic" recently published by Mr. Alexander Bain. The spur, I am sorry to say, was no match for the integument of dullness it had to pierce.

In Goethe, so glorious otherwise, I chiefly noticed the self-inflicted hurts of genius, as it broke itself in vain against the philosophy of Newton. For a time Mr. Bain became my principal companion. I found him learned and practical, shining generally with a dry light, but exhibiting at times a flush of emotional strength, which proved that even logicians share the common fire of humanity. He interested me most when he became the mirror of my own condition. Neither intellectually nor socially is it good for man to be alone, and the griefs of thought are more patiently borne when we find that they have been experienced by another. From certain passages in his book I could infer that Mr. Bain was no stranger to such sorrows. Take this passage as an illustration. Speaking of the ebb of intellectual force which we all from time to time experience, Mr. Bain says: "The uncertainty where to look for the next opening of discovery brings the pain of conflict and the debility of indecision." These words have in them the true ring of personal experience.

The action of the investigator is periodic. He grapples with a subject of inquiry, wrestles with it, overcomes it, exhausts, it may be, both himself and it for the time being. He breathes a space, and then renews the struggle in another field. Now this period of halting between two investigations is not always one of pure repose. It is often a period of doubt and discomfort, of gloom and ennui. "The uncertainty where to look for the next opening of discovery brings the pain of conflict and the debility of indecision." Such was my precise condition in the Alps this year; in a score of words Mr. Bain has here sketched my mental diagnosis; and it was under these evil circumstances that I had to equip myself for the hour and the ordeal that are now come.

Gladly, however, as I should have seen this duty in other hands, I could by no means shrink from it. Disloyalty would have been worse than failure. In some fashion or other—feebly or strongly, meanly or manfully, on the higher levels of thought, or on the flats of commonplace—the task had to be accomplished. I looked in various directions for help and furtherance; but without me for a time I saw only "antres vast," and within me "deserts idle." My case resembled that of a sick doctor who had forgotten his art, and sorely needed the prescription of a friend. Mr. Bain wrote one for me. He said: "Your present knowledge must forge the links of connection between what has been already achieved and what is now required."

In these words he admonished me to review the past and recover from it the broken ends of former investigations. I tried to do so. Previous to going to Switzerland I had been thinking much of light and heat, of magnetism and electricity, of organic germs, atoms, molecules, spontaneous generation, comets, and skies. With one or another of these I now sought to re-form an alliance, and finally succeeded in establishing a kind of cohesion between thought and light. The wish grew within me to trace, and to enable you to trace, some of the more occult operations of this agent. I wished, if possible, to take you behind the drop-scene of the senses, and to show you the hidden mechanism of optical action. For I take it to be well worth the while of the scientific teacher to take some pains, and even great pains, to make those whom he addresses copartners of his thoughts. To clear his own mind in the first place from all haze and vagueness, and then to project into language which shall leave no mistake as to his meaning—which shall leave even his errors naked—the definite ideas he has shaped.

A great deal is, I think, possible to scientific exposition conducted in this way. It is possible, I believe, even before an audience like the present, to uncover to some extent the unseen things of nature, and thus to give, not only to professed students, but to others with the necessary bias, industry, and capacity an intelligent interest in the operations of science. Time and labor are necessary to this result, but science is the gainer from the public sympathy thus created.

How then are those hidden things to be revealed? How, for example, are we to lay hold of the physical basis of light, since, like that of life itself, it lies entirely without the domain of the senses? Now, philosophers may be right in affirming that we cannot transcend experience. But we can, at all events, carry it a long way from its origin. We can also magnify, diminish, qualify, and combine experiences, so as to render them fit for purposes entirely new. We are gifted with the power of imagination, combining what the Germans called *Anschauungsgabe* and *Einbildungskraft*, and by this power we can lighten the darkness which surrounds the world of the senses.

There are tories even in science who regard imagination as a faculty to be feared and avoided rather than employed. They had observed its action in weak vessels and were unduly impressed by its disasters. But they might with equal justice point to exploded boilers as an argument against the use of steam. Bounded and conditioned by co-operant reason, imagination becomes the mightiest instrument of the physical discoverer. Newton's passage from a falling apple to a falling moon was a leap of the imagination. When William Thomson tries to place the ultimate particles of matter between his compass points, and to apply to them a scale of millimeters, it is an exercise of the imagination. And in much that has been recently said about protoplasm and life we have the outgoings of the imagination guided and controlled by the known analogies of science. In fact, without this power our knowledge of nature would be a mere tabulation of co-existences and sequences. We should still believe in the succession of day and night, of summer and winter; but the soul of force would be dislodged from our universe; casual relations would disappear, and with them that science which is now binding the parts of nature to an organic whole.

I should like to illustrate by a few simple instances the use that scientific men have already made of this power of imagination, and to indicate afterwards some of the further uses that they are likely to make of it. Let us begin with the rudimentary experiences. Observe the falling of heavy rain drops into a tranquil pond. Each drop as it strikes the water becomes a center of disturbance, from which a series of ring ripples expands outwards. Gravity and inertia are the agents by which this wave motion is produced, and a rough experiment will suffice to show that the rate of propagation does not amount to a foot a second.

A series of slight mechanical shocks is experienced by a body plunged in the water as the wavelets reach it in succession. But a finer motion is at the same time set up and propagated. If the head and ears be immersed in the water, as in an experiment of Franklin's, the shock of the drop is communicated to the auditory nerve—the *tick* of the drop is heard. Now this sonorous impulse is propagated, not at the rate of a foot a second, but at the rate of 4,700 feet a second. In this case it is not the gravity but the *elasticity* of the water that is the urging force. Every liquid particle pushed against its neighbor delivers up its motion with extreme rapidity, and the pulse is propagated as a thrill. The incompressibility of water, as illustrated by the famous Florentine experiment, is a measure of its elasticity, and to the possession of this property in so high a degree the rapid transmission of a sound-pulse through water is to be ascribed.

But water, as you know, is not necessary to the conduction of sound; air is its most common vehicle. And you know that when the air possesses the particular density and elasticity corresponding to the temperature of freezing water the velocity of sound in it is 1,090 feet a second. It is almost exactly one fourth of the velocity in water; the reason being that though the greater weight of the water tends to diminish the velocity, the enormous molecular elasticity of the liquid far more than atones for the disadvantage due to weight. By various contrivances we can compel the vibrations of the air to declare themselves; we know the length and frequency of sonorous waves, and we have also obtained great mastery over the various methods by which the air is thrown into vibration. We know the phenomena and laws of vibrating rods, of organ pipes, strings, membranes, plates, and bells. We can abolish one sound by another. We know the physical meaning of music and noise, of harmony and discord. In short, as regards sound we have a very clear notion of the external physical processes which correspond to our sensations.

In these phenomena of sound we travel a very little way from downright sensible experience. Still the imagination is to some extent exercised. The bodily eye, for example, cannot see the condensations and rarefactions of the waves of sound. We construct them in thought, and we believe as firmly in their existence as in that of the air itself. But now our experience has to be carried into a new region, where a new use is to be made of it.

Having mastered the cause and mechanism of sound, we desire to know the cause and mechanism of light. We wish to extend our inquiries from the auditory nerve to the optic nerve. Now there is in the human intellect a power of expansion—I might almost call it a power of creation—which is brought into play by the simple brooding upon facts. The legend of the Spirit brooding over chaos may have originated in a knowledge of this power. In the case now before us it has manifested itself by transplanting into space, for the purposes of light, an adequately modified form of the mechanism of sound. We know intimately whereon the velocity of sound depends. When we lessen the density of a medium and preserve its elasticity constant we augment the velocity. When we lighten the elasticity and keep the density constant we also augment the velocity. A small density, therefore, and a great elasticity are the two things necessary to rapid propagation.

Now light is known to move with the astounding velocity of 185,000 miles a second. How is such a velocity to be obtained? By boldly diffusing in space a medium of the requisite tenuity and elasticity. Let us make such a medium our starting point, endowing it with one or two other necessary qualities; let us handle it in accordance with strict mechanical laws; give to every step of our deduction the surety of the syllogism; carry it thus forth from the world of imagination to the world of sense, and see whether the final outcrop of the deduction be not the very phenomena of light which ordinary knowledge and skilled experiment reveal. If in all the multiplied varieties of these phenomena, including those of the most remote and entangled description, this fundamental conception always brings us face to face with the truth; if no contradiction to our deductions from it be found in external nature; if, moreover, it has actually forced upon our attention phenomena which no eye had previously seen, and which no mind had previously imagined; if by it we are gifted with a power of prescience which has never failed when brought to an experimental test; such a conception, which never disappoints us, but always lands us on the solid shores of fact, must, we think, be something more than a mere figment of the scientific fancy. In forming it that composite and creative unity in which reason and imagination are together blent, has, we believe, led us into a world not less real than that of the senses, and of which the world of sense itself is the suggestion and justification.

Far be it from me, however, to wish to fix you immovably in this or in any other theoretic conception. With all our belief of it, it will be well to keep the theory plastic and capable of change. You may, moreover, urge that although the phenomena occur *as if* the medium existed, the absolute demonstration of its existence is still wanting. Far be it from me to deny to this reasoning such validity as it may fairly claim. Let us endeavor by means of analogy to form a fair estimate of its force.

You believe that in society you are surrounded by reasonable beings like yourself. You are perhaps as firmly convinced of this as of anything. What is your warrant for this conviction? Simply and solely this, your fellow-creatures behave as if they were reasonable; the hypothesis, for it is nothing more, accounts for the facts. To take an eminent example, you believe that our president is a reasonable being. Why? There is no known method of superposition by which any one of us can apply himself intellectually to another so as to demonstrate coincidence as regards the possession of reason. If, therefore, you hold our president to be reasonable, it is because he behaves *as if* he were reasonable. As in the case of the ether, beyond the "*as if*" you cannot go. Nay I should not wonder if a close comparison of the data on which both inferences rest caused many respectable persons to conclude that the ether had the best of it.

This universal medium, this light-ether as it is called, is a vehicle, not an origin of wave motion. It receives and transmits, but it does not create. Whence does it derive the motions it conveys? For the most part from luminous bodies. By this motion of a luminous body I do not mean its sensible motion, such as the flicker of a candle, or the shooting out of red prominences from the limb of the sun. I mean an intestine motion of the atoms or molecules of the luminous body. But here a certain reserve is necessary. Many chemists of the present day refuse to speak of atoms and molecules as real things. Their caution leads them to stop short of the clear, sharp, mechanically intelligible atomic theory enunciated by Dalton, or any form of that theory, and to make the doctrine of multiple proportions their intellectual bourne. I respect the caution, though I think it is here misplaced. The chemists who recoil from these notions of atoms and molecules accept without hesitation the undulatory theory of light. Like you and me they one and all believe in an ether and its light-producing waves. Let us consider what this belief involves.

Bring your imaginations once more into play and figure a series of sound waves passing through air. Follow them up to their origin, and what do you there find? A definite, tangible, vibrating body. It may be the vocal chords of a human being, it may be an organ-pipe, or it may be a stretched string. Follow in the same manner a train of ether waves to their source, remembering at the same time that your ether is matter, dense, elastic, and capable of motions subject to and determined by mechanical laws. What then do you expect to find as the source of a series of ether waves? Ask your imagination if it will accept a vibrating multiple proportion—a numerical ratio in a state of oscillation? I do not think it will. You cannot crown the edifice by this abstraction. The scientific imagination, which is here authoritative, demands as the origin and cause of a series of ether waves a particle of vibrating matter quite as definite, though it may be excessively minute, as that which gives origin to a musical sound. Such a particle we name an atom or a molecule. I think the imagination when focused so as to give definition without penumbral haze is sure to realize this image at last.

To preserve thought continuous throughout this discourse, to prevent either lack of knowledge or failure of memory from producing any rent in our picture, I here propose to run rapidly over a bit of ground which is probably familiar to most of you, but which I am anxious to make familiar to you all.

The waves generated in the ether by the swinging atoms of luminous bodies are of different lengths and amplitudes. The amplitude is the width of swing of the individual particles of the wave. In water waves it is the hight of the crest above the trough, while the length of the wave is the distance between two consecutive crests. The aggregate of waves emitted by the sun may be broadly divided into two classes, the one class competent, the other incompetent, to excite vision.

But the light-producing waves differ markedly among themselves in size, form, and force. The length of the largest of these waves is about twice that of the smallest, but the amplitude of the largest is probably a hundred times that of the smallest. Now the force or energy of the wave, which, expressed with reference to sensation, means the intensity of the light, is proportional to the square of the amplitude. Hence the amplitude being one hundred-fold, the energy of the largest light-giving waves would be ten thousand-fold that of the smallest. This is not improbable. I use these figures, not with a view to numerical accuracy, but to give you definite ideas of the differences that probably exist among the light-giving waves. And if we take the whole range of solar radiation into account—its non-visual as well as its visual waves—I think it

probable that the force or energy of the largest wave is a million times that of the smallest.

Turned into their equivalents of sensation, the different light waves produce different colors. Red, for example, is produced by the largest waves, violet by the smallest, while green is produced by a wave of intermediate length and amplitude. On entering from air into more highly refracting substances, such as glass or water or the sulphide of carbon all the waves are retarded, but the smallest ones most. This furnishes a means of separating the different classes of waves from each other—in other words, of analyzing the light. Sent through a refracting prism, the waves of the sun are turned aside in different degrees from their direct course, the red least, the violet most. They are virtually pulled asunder, and they paint upon a white screen placed to receive them "the solar spectrum."

Strictly speaking, the spectrum embraces an infinity of colors, but the limits of language and of our powers of distinction cause it to be divided into seven segments: Red, orange, yellow, green, blue, indigo, violet. These are the seven primary or prismatic colors. Separately, or mixed in various proportions, the solar waves yield all the colors observed in nature and employed in art. Collectively they give us the impression of whiteness. Pure unsifted solar light is white; and if all the wave constituents of such light be reduced in the same proportion, the light, though diminished in intensity, will still be white. The whiteness of Alpine snow with the sun shining upon it is barely tolerable to the eye. The same snow under an overcast firmament is still white. Such a firmament enfeebles the light by reflection, and when we lift ourselves above a cloud-field—to an Alpine summit, for instance, or to the top of Snowdon—and see, in the proper direction, the sun shining on the clouds, they appear dazzlingly white. Ordinary clouds, in fact, divide the solar light impinging on them into two parts—a reflected part and a transmitted part, in each of which the proportions of wave motion which produce the impression of whiteness are sensibly preserved.

It will be understood that the conditions of whiteness would fail if all the waves were diminished *equally*, or by the same absolute quantity. They must be reduced *proportionately* instead of equally. If by the act of reflection the waves of red light are split into exact halves, then, to preserve the light white, the waves of yellow, orange, green, and blue must also be split into exact halves. In short, the reduction must take place, not by absolutely equal quantities, but by equal fractional parts. In white light the preponderance as regards energy of the larger over the smaller waves must always be immense. Were the case otherwise, the physiological correlative, *blue*, of the smaller waves would have the upper hand in our sensations.

My wish to render our mental images complete causes me to dwell briefly upon these known points, and the same wish will cause me to linger a little longer among others. But here I am disturbed by my reflections. When I consider the effect of dinner upon the nervous system, and the relation of that system to the intellectual powers I am now invoking; when I remember that the universal experience of mankind has fixed upon certain definite elements of perfection in an after dinner speech, and when I think how conspicuous by their absence these elements are on the present occasion, the thought is not comforting to a man who wishes to stand well with his fellow creatures in general, and with the members of the British Association in particular. My condition might well resemble that of the ether, which is scientifically defined as an assemblage of vibrations. And the worst of it is that unless you reverse the general verdict regarding the effect of dinner, and prove in your own persons that a uniform experience need not continue uniform—which will be a great point gained for some people—these tremors of mine are likely to become more and more painful. But I call to mind the comforting words of an inspired though uncanonical writer, who admonishes us in the Apocrypha that fear is a bad counsellor. Let me then cast him out, and let me trustfully assume that you will one and all postpone that balmy sleep, of which dinner might, under the circumstances, be regarded as the indissoluble antecedent, and that you will manfully and womanfully prolong your investigations of the ether and its waves into regions which have been hitherto crossed by the pioneers of science alone.

(To be continued.)

THE POWER OF MODERN SKILL IN THE MECHANIC ARTS.

The great camp of Chalons had just been completed, a whole city of soldiers spread over the rolling plain of Mourmelon, and all Paris, ever thirsting after "something new," was full of anxiety to enjoy the brilliant spectacle. The military authorities at the capital deplored the distance that separated them from the army; the contractors were often behind in their supplies, and the committees sent down to examine many important questions were seriously hampered by the remoteness of the camp from their books and their colleagues. The Emperor, aware of these inconveniences, determined to connect the camp with Paris by a railway, and never was imperial order executed more promptly and triumphantly.

Fortunately, the Great Eastern Company, which had a line of railways running from Paris to Strasbourg, and approached the camp at the station of Chalons within a distance of about sixteen miles, was one of the richest and best-organized companies of France. It owned already then (in 1860) more than five hundred locomotives and twenty thousand cars, and the central administration in Paris, which had spent over one hundred million dollars on the road, could well afford to gratify the Emperor when he expressed a wish to have a branch railway built not only in a short time, but more quickly than the like had ever been known before. The directors at a glance perceived the advantage that would accrue to them from such an addition to their great work; and although the Emperor allowed them only ten days for surveys and preparatory labors, they at once assumed the contract.

The difficulties were by no means trifling, although the railway was so short. It had to cross the valley of the Marne at a considerable hight above its level, then the river itself and a canal running parallel to it, and, after several very short curves, to span once more a deep valley in which the Vesle flows, till it reached in a straight line of about two miles the camp itself. All this involved necessarily very heavy works, three bridges, and high enbankments.

On the 10th of July, in the evening, the representatives of the company laid before the Emperor—who took a great personal interest in the matter—the complete plans for the work. They expected, of course, that not much time would be allowed them for the execution, but they were not a little taken aback when Napoleon asked them if they would undertake to have the railway ready in two months. They consulted a few minutes with each other, during which they were left alone, but soon the Emperor returned and demanded their answer. They claimed that the difficulties were very great and the time too short; nevertheless they engaged to do the Emperor's will, if he, on his part, would order the authorities, from the Minister of Public Works down to the district officials, to dispense with all but the most necessary formalities.

The promise was given, and on the very next day, early in the morning, they received the contract duly authenticated, thus giving an earnest on the part of the Government that everything should be done to aid them in their remarkable enterprise. At noon a meeting of the directors took place, at which matters were generally arranged, and when the sun set that evening the first spade had been struck in the ground near Chalons.

The first trouble—for troubles there were, many and grievous—was the want of laborers. The best and most experienced hands were sent for by telegraph from all the different works of the Great Eastern Company; they appeared in every express train from Loraine, Burgundy, and Alsatia—others were imported from Belgium, Westphalia, and Prussia; they received the highest wages, but were also required to do full work and in the best manner. Thus a force of twenty-four hundred first-class workmen was gathered in a few days around the first mile.

Next, all the powerful engines and machinery of the whole line were put into requisition; steam-rams, track-engines, circular saws set to work along the line, and torches, bonfires, and electric lights supplied the light of day during the short summer nights, so that relays of laborers could succeed each other without interruption. The company, moreover, provided for their food in the most careful manner. A famous Paris restaurateur, Chevet, was engaged to furnish cooked provisions for the little army of workmen, and a couple of days after the beginning of the marvelous work, his movable kitchens were seen along the line, furnishing a supply of excellent dinners, from six francs for the higher employés down to ten cents for the workmen.

All these interesting features—the almost magic rise of a railway in a heavy chalk soil, the wonderful activity of thousands of skillful laborers on so short a distance, and the almost fairy-like illumination at night—attracted immense numbers of Parisians, who came by day and by night to witness the strange sight, and brought a rich reward at once to the enterprising company.

High and large enbankments were of course out of the question under such circumstances, and the company adopted, therefore, our own system of trestle-work instead, planting immense piles by means of hundreds of steam-rams, which went to work at one and the same time, strengthening them simultaneously by heavy cross timbers, and laying the track without delay on the solid structure. One such trestle bridge, two thousand feet long, crossed the valley of the Marne, a second, of only five hundred feet, that of the Vesle, and a third, of six hundred feet, the lowlands of a smaller stream. When the whole line was completed, these trestle-works were filled up with earth, and at leisure changed into huge embankments. The principal bridge, however, was from the first placed upon solid béton foundations.

The construction began, of course, at Chalons, so as to remain constantly in direct communication with Paris, from which all the material and the supplies had to be obtained. An electric telegraph line was likewise erected along the route, with a station at every thousand yards, so that not a moment was lost by the sending of messages and orders, and directions could be issued at once to every part of the line. The track spun out like a ribbon, with all the necessary additions of crossings, turnouts, barriers, fencing on both sides, station buildings; in fact, everything that belongs to the most complete outfit of a first-class railway; and as soon as the rails were laid down, locomotives came up cautiously with new material and supplies for the workmen. The country through which the new line passed was fortunately not very rich, and hence the owners of land, struck by this unheard-of display of energy and capital combined, willingly ceded their rights and offered their assistance in every available shape.

It was said then, and it has since been confirmed by the Emperor's own admission, that he suggested this exploit in no wanton desire to prove his power and to excite wonder and admiration, but with a view to ascertaining what could be done under similar circumstances in time of war by the aid of the absolute power of a commanding general. He attained his end in the most satisfactory manner. On the fifty-sixth day after the first blow had been struck, the locomotive passed over the whole line from the station at Chalons to the terminus in the center of the camp; during the next five days the station buildings, restaurants, and waiting rooms were completely finished, and on the sixty-first day the Emperor opened the new railway in person, expressing his high satisfaction at the unexpected success in the most impressive words, and bestowing brilliant rewards upon the chief agents in the great enterprise.—*Lippincott's Magazine.*

Iron Plated Steamer "Captain."

The Naval Court appointed to investigate the causes which led to the loss of the iron-plated ship *Captain*, noticed on page 186 of this volume, have concluded their labors, and have returned a satisfactory verdict.

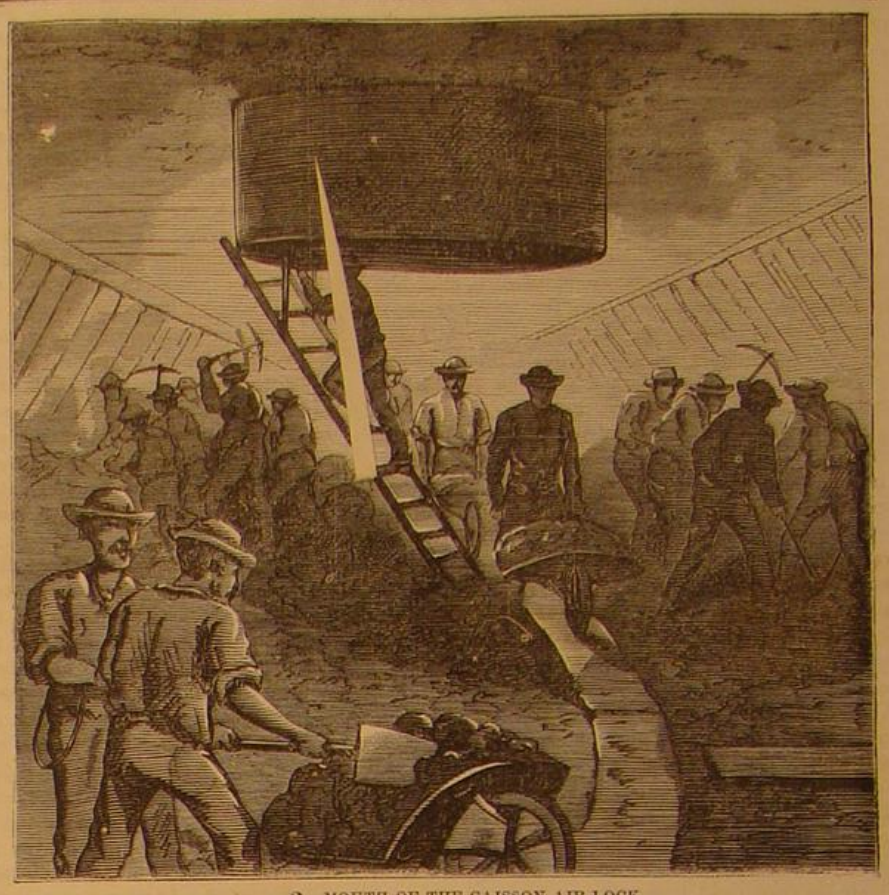
We, says *Engineering*, expressed plainly our opinion that the calamity which befel the *Captain* arose purely from the want of stability inherent in vessels of her particular class, while we further stated that the vessel "was built in opposition to all scientific principles, and in deference to a newspaper outcry, of which the loudest notes were uttered in the *Times*; and these views are fully corroborated by the verdict just returned, and by the evidence laid before the Court. Briefly stated, the plain facts of the case appear to have been these: Captain Coles advocated the construction of a sea-going turret ship, with a low freeboard, and he complained that in the *Monarch* and other turret ships built under the direction of the Admiralty, his plans had been by no means fairly carried out. Meeting with advocates of his plans in some members of Parliament, and in the conductors of certain newspapers, he was enabled, at length, to bring such an amount of pressure to bear upon the Admiralty that, in direct opposition to the advice of Mr. Reed and his department, an order was given for the construction of the *Captain* in strict accordance with Captain Cole's design. The contract for the construction of the *Captain* was taken by Messrs. Laird, and it appears to us to be proved, beyond all doubt, by the evidence offered at the court-martial, that on Messrs. Laird and Captain Coles, jointly, the entire responsibility of the non-success of the *Captain* rests. In saying this we have no desire to affirm that either Messrs. Laird or the late Captain Coles are alone responsible for the fearful loss of life to which the construction of the *Captain* has led. This responsibility we consider to have been shared by those under whose orders the ship was placed in commission. The *Captain* was acknowledged, on all hands, to be a purely experimental vessel, and, considering that she was built in direct opposition to the strongly-expressed opinions of Mr. Reed and his department, it would only have been reasonable to suppose that, before sending her on a cruise, experiments should have been made to determine what her stability really was, and, in fact, every practicable means taken to ascertain, as far as possible, what her performance at sea might be expected to be.

It has been hinted in some quarters that Mr. Reed was to blame in not having himself taken means to prove experimentally the unseaworthiness of the *Captain*, and in not having caused official information of her presumed want of stability to be conveyed to Captain Burgoyne. In this view we cannot agree. Mr. Reed opposed the construction of the *Captain* both publicly and privately, and when, in spite of his opposition, and that of Sir Spencer Robinson, it was resolved that the vessel should be built, he and the Controller considered that they ceased to be responsible. In fact Mr. Reed said in evidence, "so strongly did I feel that we were clear of all responsibility, that I forbade my assistants to ever use the word 'approved' even for the most minor details, and directed them never to use a stronger phrase, even with regard to the smallest details, than 'that no objection would be offered.'" Moreover, although Mr. Reed had many objections to the *Captain*, he does not appear to have apprehended any imminent danger from the vessel being sent to sea. To quote his own words, he thought "she would have the highest possible reports to begin with; that she would be very carefully nursed through her early career, admissions of her deficiencies being slowly made; and that before she got through her commission she would be utterly condemned as unfit for the naval service." His evident opinion was that the defects of the vessel would have been discovered by those in charge of her, before any danger resulted from them, and having freely expressed his opinions of her unseaworthiness, he felt that he could do nothing until the correctness of his opinions was acknowledged. Unfortunately the eyes of those under whose auspices the *Captain* was called into existence only became opened by the sad story of her having foundered; and thus in place of the nation having to sustain a mere monetary loss, as would have been the case had the Captain been condemned as unseaworthy, it has, in addition to this loss, to mourn the death of Captain Burgoyne and his gallant crew. The fate of the *Captain* conveys a lesson which we trust that the Admiralty will take to heart, and this lesson is that it is dangerous to disregard warnings founded on scientific knowledge. It is a false system which places the man on whom the whole responsibility of the designing of the vessels of our navy presumably rests in a position subservient to those who, however great their administrative powers may be, possess no knowledge whatever of naval construction; and we trust that some day a reform may be effected.

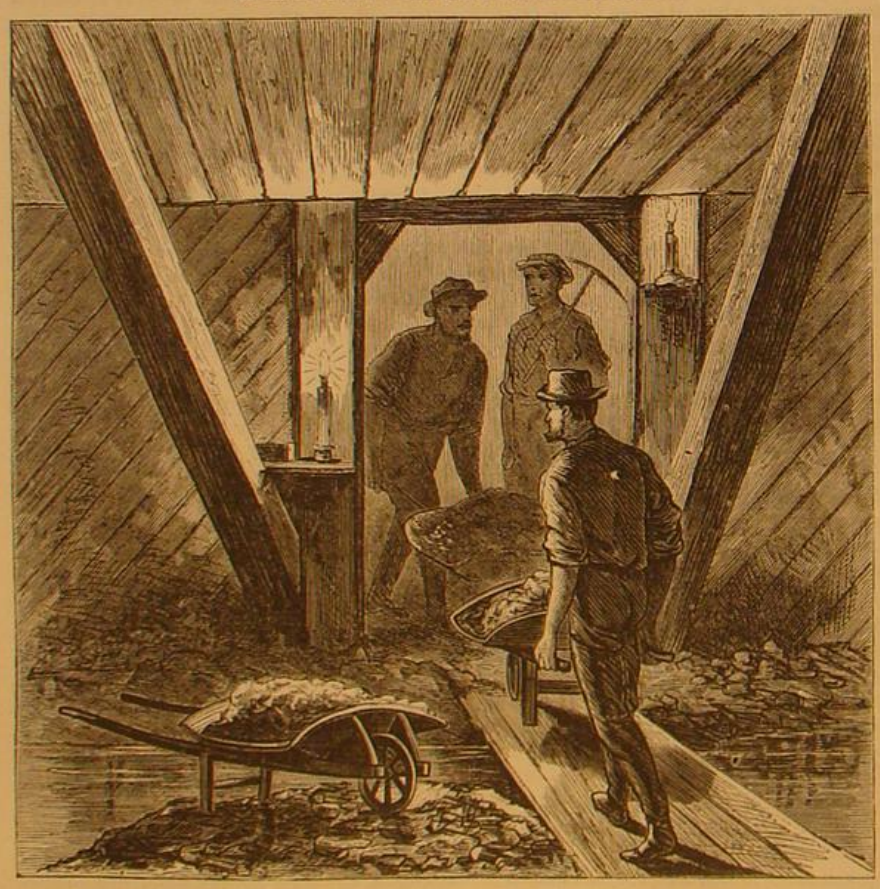
IRON for ships is rapidly superseding wood in English ship yards. In 1865 there were 806 wooden ships built in England. In 1869 but 334. In 1868 the tunnage of iron ships built was 235,937, against 66,977 wooden, and 24,121 of composite. Iron ships are more durable, require less repairs and stand heavier storms than those of wood, and it will not be long till the latter must be entirely superseded.



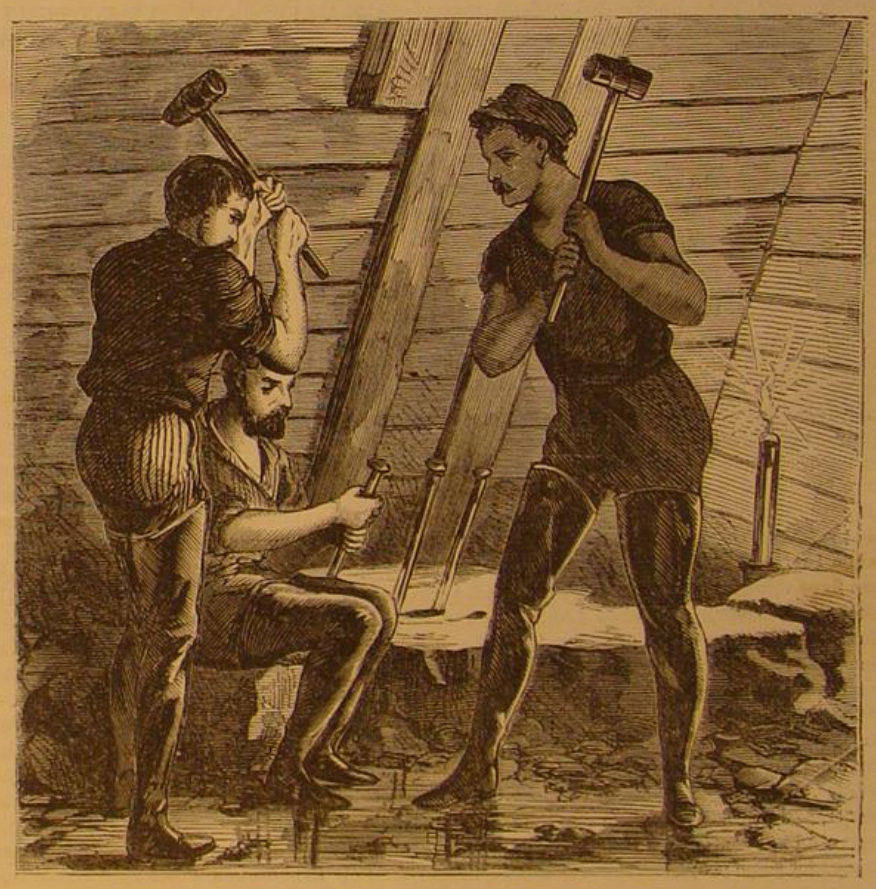
1.—ENTRANCE TO THE AIR LOCK OF THE CAISSON.



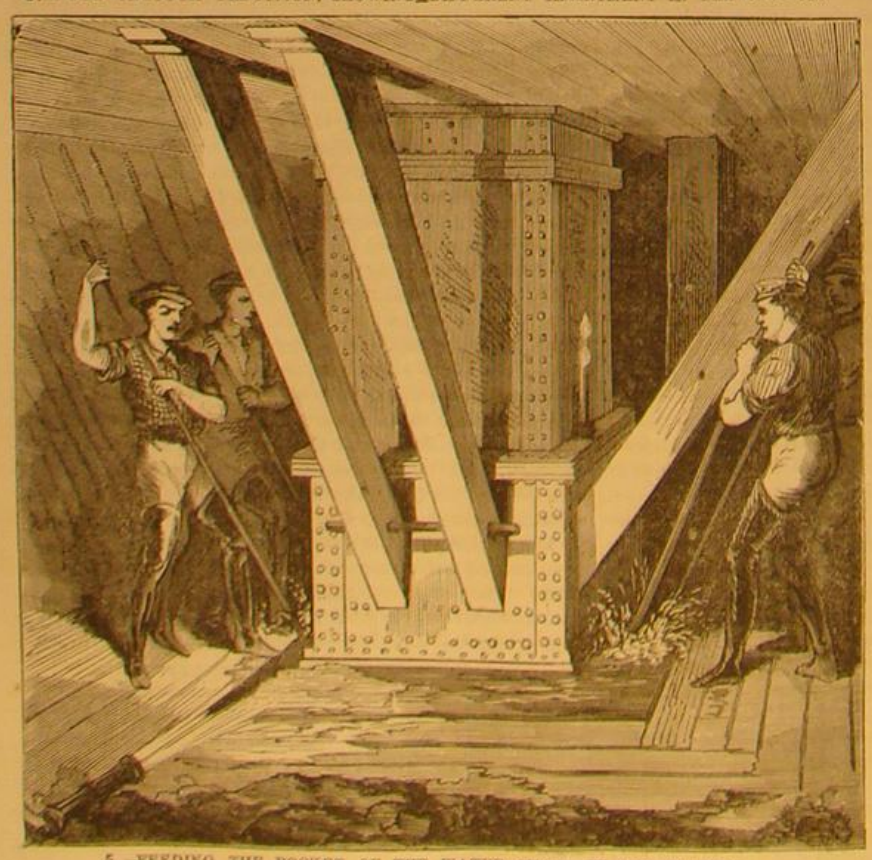
2.—MOUTH OF THE CAISSON AIR LOCK.



3.—DOOR THROUGH PARTITION, SHOWING A DIFFERENT APARTMENT IN THE CAISSON.



4.—DRILLING THE ROCK AT THE SHOE OF THE CAISSON.



5.—FEEDING THE POCKET OF THE WATER SHAFT IN THE CAISSON.



6.—WORKMEN SAWING TIMBER FOR WEDGES.

INSIDE VIEWS OF THE EAST RIVER BRIDGE CAISSON, BROOKLYN. N. Y

THE GREAT SUSPENSION BRIDGE BETWEEN NEW YORK AND BROOKLYN---PROGRESS OF THE WORK ---ITS PRESENT CONDITION---SOME ACCOUNT OF THE METHOD OF PROCEDURE.

We give herewith some engravings, showing various operations in the interior of the caisson at the Brooklyn terminus of the East River Bridge.

This caisson is now only nine feet from its permanent bed, and the sinking is progressing at the rate of about one foot per week. The interior is lighted by the oxyhydrogen light, or rather a light produced by the burning of jets of oxygen, and common illuminating gas in contact with pencils of magnesia.

Col. W. A. Roebling, the Engineer-in-Chief, informs us that these lights are almost absolutely essential to the rapid progress of the work, as they emit neither smoke nor odor, and the air in the caisson is in consequence kept pure and wholesome.

Three gangs of men—one hundred in each gang—and working eight hours each, are employed in the caisson, and the work proceeds without intermission night and day.

It will be just one year on the 1st of January since the first ground was broken, and the rapidity with which the work has proceeded is evidence that it is conducted by a man who is fully competent to conduct this greatest engineering feat of modern times to a successful issue. It is hoped that before the extreme cold weather of mid winter the caisson will have been sunk as low as necessary.

The caisson for the new York side is about one third done, and will be placed in position as soon as possible after completion.

Our readers have already been made acquainted with the nature and use of the caisson. It may be said to be a huge diving-bell from which the water is excluded by forcing into it air from a series of powerful air pumps worked by steam.

In this bell the men work in safety and comfort, excavating and blasting, and sending the broken and excavated material to the surface in a manner hereinafter to be described.

Fig. 1 represents the entrance to the caisson. It is a hollow iron shaft, having a vestibule or chamber communicating with the external air through a hatchway. Upon entering this vestibule the hatchway is closed, and the air from the caisson admitted through a hatchway in the floor of the chamber. To those unaccustomed to it, the pressure produces a series of very disagreeable sensations, which diminish somewhat after remaining a short time within the caisson. The lower end of the entrance shaft or "air lock," as it is technically called, is shown in Fig. 2.

The caisson in its descent requires the removal of a hard yellow clay in which are embedded large boulders which have to be broken up by blasting. Fig. 3 shows the workmen drilling one of these boulders situated under the shoe of the caisson. It not unfrequently happens that these boulders project some distance beyond the external edge of the shoe, and necessitate the passing out of workmen beyond this edge. This is done without danger, as the superimposed earth is of sufficient thickness to sustain the water resting upon it, the shoe of the caisson being now a considerable depth below the bottom of the river.

Our readers have been informed in previous articles, and in the report of Col. Roebling published in this journal in our issue of July 2, 1870, that the interior of the caisson is separated by partitions into chambers, from either of which the water may be expelled independently of the others.

Fig. 4 represents the interior of one of these chambers and the door which leads from it to an adjoining chamber of similar character. Through these doors the broken stone and soil are wheeled over plank-ways to the mouth of the water shaft at the bottom, shown in Fig. 5.

This shaft extends to, and below the general level of the bottom, a hole or "pocket" being dug out around and beneath it, and filled with water by hose. The pressure of air in the caisson causes the water to rise in the shaft, and the dredges are lowered through this water to clutch and scoop up the material to be removed, the clay, broken stone, and earth being dumped from the barrows into the pocket, and shoved under the foot of the water shaft by men with iron bars, as shown in Fig. 5.

The caisson with its load of masonry, now weighing upwards of 20,000 tuns, does not rest upon its shoe, and is only in part sustained by its floating power. The greater portion of the weight is sustained by timber frames, the uprights of which are sustained by blocks and wedges. To lower the caisson the wedges are driven partly out, and as the impact of the enormous weight in its descent often crushes the blocks and wedges, it is necessary to supply their place by new ones. This necessitates the use of considerable timber, which is sawn by hand in the interior of the caisson, as shown in Fig. 6.

The interior of the structure, with its manifold operations, all progressing with the utmost regularity, the whole illuminated by the brilliant oxyhydrogen light, forms a scene which, once seen, will not soon be forgotten.

Extraction of the Perfume of Hyacinths.

At a meeting of the Polytechnic Society of Berlin it was mentioned that the extraction of perfume from the flowers of southern France was at the present time only rarely effected by means of rectified bisulphide of carbon, and then only in the case of very fine perfumes, as in that of hyacinths, which cannot be extracted in any other way.

In all others the old process is still in use. Large plates of felt saturated with olive oil are put one above the other and covered every morning with the flowers, while the oil absorbing the perfume drops into a vessel below, the strength or the concentration of the perfume depending on the time during which the oil had been exposed to the flowers. It is strange that until now no perfume could be extracted from the flowers of mignonette.

Correspondence.

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

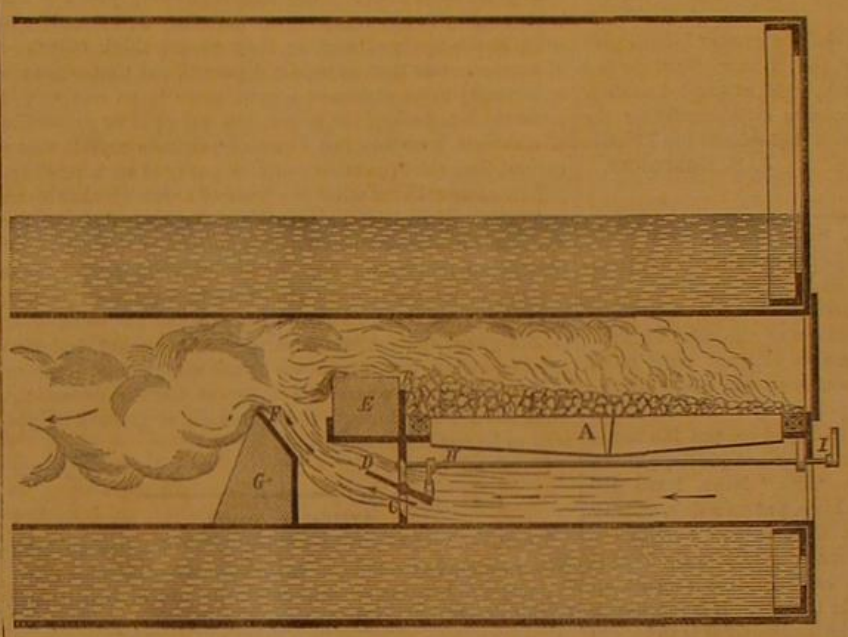
Smoke Consumption.

MESSRS. EDITORS:—In No. 17 of your paper you refer to the importance of a cheap and simple device for preventing smoke in furnaces and for the consumption of the same.

The accompanying sketch shows a simple and effective apparatus for this purpose, which I personally attached to a great number of boilers in Lancashire and Yorkshire (Eng.) a few years ago with perfect success.

The main feature of this smoke consumer is the admittance of warm air behind the fire-bridge, and at an angle to the smoke that comes from the fuel, when combustion of the smoke and gases takes place, and a colorless gas passes from the top of the chimney.

The following is a description of the drawing: A is the grate, the bars resting at each end on bearers. In the rear of the grate bars is secured a cast-iron plate, B, having an



opening, C, in its lower part. A movable damper, D, turns around a central pivot, by which arrangement fresh, warm air gets access to the space behind the fire-bridge, E.

Behind the bridge, E, is another cast-iron plate, F, the upper part of which is inclined so as to throw the fresh, warm air from C, suddenly into intimate contact with the smoke and gases from the fireplace. The combustion of the smoke and gases takes place immediately after the contact with the warm air, the result being an almost colorless gas.

By means of a simple lever arrangement, H and I, the damper, D, is connected to the hinge pin on the fire-door in such a manner that when the door is opened for the purpose of stoking up the fire or throwing in additional fuel, then is also the damper, D, opened automatically, and closed gradually, as it is found that a greater amount of air is necessary when fuel is added than what is needed when the coals are thoroughly ignited.

With this simple contrivance I have cured some of the worst smoking chimneys in Liverpool and Manchester (Eng.) from emitting black smoke, thus preventing a grievous nuisance besides saving from 10 to 15 per cent of fuel. Two men can easily fit an old flue with this apparatus in six hours.

ALBAN ANDREN, Constructing Engineer.

Boston, Mass.

Deflection of Beams.

MESSRS. EDITORS;—On page 230 of the current volume of the SCIENTIFIC AMERICAN, is a quotation from the *Builder*, in which the writer says that "Beams or girders of any kind, are acted upon by weights placed on them at stated places, inversely as the *squares* of the distances of such places to the supports."

Now every educated engineer in Christendom knows that the strain on beams and girders, resulting from a weight laid on them, at different points, varies as the *rectangle* of the segments into which the weight divides the length of the beam.

[By the former proposition, the strain on a beam, resulting from a weight at one fourth of the length of the beam from one of the supports, would be to that of the same weight on the middle of the beam as *one* to *four*; while modern engineers would tell us the strain at the two points would be as *three* to *four*, which makes a wide difference.

Again, in the next paragraph the *Builder* gives us to understand that the *strength* of beams varies inversely as the *square* of the length, while all writers and experimenters on stress and strength of materials, concur in telling us that the *strength* of beams varies (the other dimensions remaining the same and alike) as the *length*, inversely—not as the square of the length. By the *Builder*, a beam ten times the length of another, of the same size in other respects, would have but $\frac{1}{100}$ of the strength of the shorter one; whereas by the principle now unanimously recognized by all educated engineers, and which are as thoroughly established by experiment and analysis as are any of the truths of experimental philosophy, the strength of the longer beam would be $\frac{1}{10}$ that of the shorter one.

Can the *Builder* explain his anomalous statements?

Ferrysburg, Mich. H. C. PEARSONS.

[The criticisms of our correspondent on the statements made in the article from which he quotes, are just, and anticipate some remarks we intended to make on the subject, but which by mistake were not published in connection with the article referred to at the time of its publication. As Mr. Pearsons has covered the ground fully, we recommend a careful comparison of his statements with the false teaching of the *Builder*.—EDS.

Auroral and Magnetic Periods.

MESSRS. EDITORS:—In the SCIENTIFIC AMERICAN of Oct. 22, you quote from Prof. Langley the statement, that the magnetic needle moves responsive to the great changes that transpire in the sun; and that our winter sky is lit up by auroras more frequently when the solar action is most violent. The fact, he says, is certain, though the cause is still wholly unknown to science. That is, we have Prof. Langley for authority, that the scientific world regard the fact as established, that auroras depend upon, or are, in some way, influenced by physical disturbances in the sun, and that the magnetic needle is, also, directly or indirectly influenced by the same cause. But how this influence is produced, he says, is as yet wholly unknown to science. It may not be amiss, therefore, to attempt a possible explanation or answer to the question.

How do physical changes in the sun produce auroras, and influence the magnetic needle on the earth?

Light and heat are now universally admitted to be sensations produced by vibratory motion of a material body, the luminiferous ether; and, from the known phenomena of light and heat, we infer that this body, the ether, possesses elasticity and inertia, but not gravity. (See "Brande's Encyc., Art. "Light.")

We may assume, therefore, that infinite space is pervaded by an inert, but non-gravitating, elastic fluid; and that it is through the medium of this fluid that all our knowledge of the universe, outside the little world we inhabit, is derived; and, also, a very large portion of the knowledge of our immediate surroundings. The ether being inert, elastic, and non-gravitating, will, necessarily, be less dense within and immediately around revolving bodies, than at a distance from them; for, being inert, it will, from centrifugal force, recede from the center of rotation; there will, therefore, be a continual tendency to the formation of an ethereal vacuum along the axis of rotation, and an equilibrium along the center of rotation can only be sustained by an in-flowing current of ether from the polar regions of the revolving body. We have, therefore, of necessity, within and about all revolving bodies, not only the phenomena of light and heat, from ethereal vibrations, but, also, an ethereal motion of translation, and this motion of translation will always be outward about the equator and middle latitudes, and inward about the poles. We might, *a priori*, be led to expect some tangible indication of this ethereal motion of translation about the earth, as the earth has a tolerably rapid rotary motion. Have we any such indications? I answer, we have in the phenomena of magnetism and the auroras.

Science has hitherto failed to assign any rational cause for the phenomena of magnetism. In order that we may understand how a motion of translation of the ether may produce the phenomena of magnetism, we must assume that, though the vibratory motion of the ether is arrested or reflected by all opaque bodies, yet, in its motion of translation, it passes freely through most bodies, but the molecules of a few bodies, such as iron and steel, may be so arranged as to be impervious to the ether in one direction, and yet transmit it freely in a direction at right angles with the impervious axis. Let such a body be balanced on a pivot, and, like a vane, it would indicate the direction of an ethereal current by the impervious axis assuming a direction at right angles with such current. We have here, obviously, a possible physical explanation of magnetism.

When the atmosphere flows through a forest of trees, we hear an audible sound, which is the result of vibratory motion of the air produced by interference with the trees. So in the upper regions of the atmosphere, an ethereal current might encounter sufficient interference from the molecules of the atmosphere to produce vibratory motion of the ether of sufficient intensity to be recognized by the eye as the auroras.

Let it be granted, now, that we have assigned the true cause of magnetism and the auroras, should we expect these phenomena to indicate any great physical movements in the sun?

In attempting to answer this question, I will have to assume as a fact an hypothesis that I have heretofore announced (see *Boston Journal of Chemistry* for Sept., 1869), but which is, as yet, unsupported by any positive facts. The hypothesis, however, is plausible, and as it does not conflict with any department of science, I will not attempt to argue it here, but will simply assume that ether is the primary or ultimate state or condition of ponderable matter. I have elsewhere attempted to show that the phenomena of attraction, or ponderability, would necessarily result from the action of the ether upon aggregated forms of matter (see *Iowa S. Journal* for Oct., 1868), and that it is, therefore,convertible into ponderable matter.

In the stupendnous chemical changes which take place in the sun, and which are indicated by the immense cyclones that are visible, even to the naked eye, at the distance of 95,000,000 miles, I assume that a vast amount of ether is absorbed by the sun; that is, converted into ponderable matter; the result of which would be a motion of translation of the ether in the surrounding space toward the sun; and as the elastic force of the ether about the earth was just in equilibrium with its centrifugal force, this increased current toward the sun would necessarily diminish the elastic force, and the centrifugal force would, for a time, and until the equilibrium is restored, increase the tendency to a vacuum about the axis, and, consequently, increase the polar currents, and we should have the phenomena of auroras and increased magnetic force.

As this article has already run out to a greater length than I had intended, I will merely add, that I have elsewhere (see *Boston Journal of Chemistry* for Dec., 1868), attempted to show that this etherial hypothesis accounts satisfactorily for the zodiacal light, another phenomenon that science has hitherto utterly failed to explain. J. E. HENDRICKS.

Des Moines, Iowa.

Balancing Cylinders, Saw Gates, etc.

MESSRS. EDITORS:—If the subject is not already overdone, I would add a few hints on balancing.

In the case of thrasher cylinders see that the staves, if of wood, are of uniform thickness and out of the same batch of timber. Turning the heads and staves will not assist much in balancing, and in the case of some cast-iron heads turning is rendered impossible by their polygonal form. After the shaft is turned, the heads bored and keyed on, and the bands drilled and bored for the teeth, and in their places, put the cylinder into the centers of an "iron" lathe, leave the binding screw of the tail center loose, put on a dog, and set the lathe on quick speed. Fix a sharp-pointed tool in the tool post, and with the screw advance it cautiously until it touches the shaft near the tail center. If it touches all round that end of the cylinder is in balance. If it touches on one side, that will indicate that the counterpoise is to be put in opposite the scratch. Turn the cylinder end for end, and repeat the process. Having brought the cylinder to balance, see that the teeth are of uniform dimensions, nuts the same size and thickness, put them in, and repeat the balancing by putting more or less washers under the nuts.

In the field, where a lathe cannot be had, loosen the caps, set the machine going until it "shakes," throw the belt off, and hold a sharp-pointed file or scratch-awl, so as to mark the heavy side on the shaft at both ends and apply the balance opposite.

The above means of testing, answer well for planing-machine cylinders, the balancing to be done by drilling out the metal on the heavy side.

In the case of saw mills and steam engines no attempt should be made to balance such reciprocating parts, as the piston with its rod, cross-head, and portion of connecting rod in engines, or the saw, gate, etc., and a portion of the pitman in saw mills.

All attempts to balance these parts by adding counterpoise to the crank or fly wheel will make matters worse for the crank shaft and its boxes. The only admissible counterpoise on the crank is what will balance the crank, crank-pin, and that portion of the rod or pitman which enters into the rotary motion and adds to the centrifugal force around the crank shaft.

The exact amount of counterbalance may be formed by placing the rod or pitman in a horizontal position with the cross-head or noddle-pin end resting upon a knife-edge support exactly at the center, and the other end resting upon the crank-pin also at the center, place the crank and shaft bearings on parallel bars and add just so much counterbalance as will hold the crank in a horizontal position in line with the rod or pitman. "Only this, and nothing more."

Syracuse, N. Y. BENJAMIN F. WILSON.

Shoemakers' Measure.

MESSRS. EDITORS:—"No. 1 is 4⅓ inches in length, and every additional number ⅓ of an inch."

Thought I, on reading the above on page 259 of your paper, that is worth preserving, and I copied it at once into a book I keep for transcribing any valuable information I find in your and other papers. But after a little reflection I thought I would test your rule. My shoe is a No. 10; its outside length is 11⅓ inches. If No. 1 is 4⅓ inches and each additional number is ⅓ of an inch, my foot should be just 7⅓ inches long. As it is 4⅓ inches longer than that, please explain whence the discrepancy arises.

CONSTANT READER.

[The item referred to was copied from a book professing to give accurate information, and was not as critically examined as our correspondent seems to have done with it. If it be incorrect, will some one state what is the true "shoemakers measure."—EDS.

Popular Errors Regarding the Watch.

MESSRS. EDITORS:—Stealing jewels is an elephantine hobby on which many people ride a tilt against defenseless watch-makers. They say, "some villainous tinker has stolen some of the most valuable jewels from my watch;" this accusation comes oftenest from those who seem to know others better than they know themselves; and is one of the popular prejudices born of ignorance and suspicion, which is no more akin to truth, than an ignis fatuus is to fire. The fact is that the jewels in watches are valuable only in the good office they subserve in ministering largely to the correct performance and durability of the watch, and their cost is wholly made up of the labor bestowed on their construction; out of their place in the watch to which they are individually fitted, they are of comparatively no value. Piano-tuners might with quite as much reason, be accused of stealing the steel strings from a piano, and substituting iron, as to accuse a watch-maker of pilfering jewels which he must replace with something, or the watch will never make another tick. He must substitute metal holes at an expense of at least a one day's hard labor, in place of the jewels removed, and for his pains he would only get what he could have bought for a few shillings, and to make them of any value to him he must spend another half day fitting them to some watch which happens to need such as he may have stolen; also, he must wait months, or perhaps years, for an opportunity to use the fruit of his dishonesty. Many people are very prone to suspect rascality in any transaction where they are conscious of being at the mercy of another, they cannot think otherwise of human nature than as totally depraved, and that when the opportunity to be dishonest occurs, there is no one able to resist the temptation. Of course, the trade has its proportion of dishonest members, but I cannot persuade myself that a natural born thief (no other could be guilty of such profitless pilfering) would ever select the trade of a watch-maker for an occupation; if he did, he would soon abandon it, for the stealings are fearfully costly. The patrons of the craft need have no apprehension of their jewels being stolen, so long as it is much easier and more profitable to steal their money, not directly, or course, but indirectly; what the community should guard against, is the fearful loss of money, and damage to watches, which it suffers by the employment of incompetent workmen; where one dollar is lost by dishonesty, hundreds are lost through the ignorance of those who pretend to be watch-makers

Cleveland, Ohio. R. COWLES.

Artificial Stone.

MESSRS. EDITORS:—Under this heading I notice an interesting article in the SCIENTIFIC AMERICAN of October 22.

I desire to give my experience in the use of grindstones, manufactured from sand, under the Ransome process, and also to throw out some suggestions which may be of use to those engaged in that particular manufacture, which I believe to be yet in its infancy.

In the locality where I was using large quantities of grindstones a company was engaged in manufacturing stone under the Ransome process. I became satisfied that grind stones could be made under that process, and ordered a few for trial. They were made, and proved fully up to my expectations as a trial, yet lacked uniformity in hardness. Another lot was made, and proved somewhat better, so that I was encouraged to still continue the trial.

The first stones were about 40 inches in diameter, and 4 to 6 inches in thickness. Others 5 feet in diameter and 7 inches thick were made, and some of each lot were superior stones, being hard clear through, and doing excellent service. Others were hard on the outside, and gradually softened towards the center. Others had spots where the sand never united, but fell out loose. This lack of uniformity existed throughout the entire lot, both large and small. I found some of them very hard, so that I satisfied myself that they could not be made too hard for use, and that the kind of sand used made all the difference in the quality of grit.

One kind of work that I was doing required a fast-cutting stone for grinding on the flat surface of tempered steel (saw plates), this required a stone that would not glaze. I procured hard white sand, and a soft bank-sand. I made a stone of each. The hard sand would glaze, and the soft bank-sand had a dead cut, and wore away too fast.

I then combined the two sands mixing half and half, and made a few stones with astonishing results. My theory proved in practice all that I expected. The softer sand kept worn down below the harder, allowing the corners of the hard sand to protrude, so that the stone never wore to a smooth surface. I have used every kind of grindstone in the market, having worn out thousands of tuns, and never used any natural stone that the cutting quality would compare with these artificial stones when we got one that was hard enough. But here was the great trouble—not one in five was hard enough for use, and even when half a dozen stones were made on the same day, of the same sand, and with the same material, there was the same lack of uniformity. Neither did the length of time that they were kept after being made seem to make any difference; they neither seemed to harden nor soften by age. Some of the centers of worn-down stone I submitted to freezing and thawing, and they stood the test perfectly well, better even than some natural stones. From the experiments made I became perfectly satisfied that grindstones could be successfully manufactured of every grade desired, and that nearly every locality possesses sand suitable for the purpose. Whoever can devise a cheap and efficient means by which grindstones can be manufactured at our large works using them; such as for grinding edge tools, saws, springs, etc, etc., will find an abundant field to work in.

In the trial that I made, I was obliged to abandon their use on account of the great lack of uniformity; and the company failed even to make stone for other purposes for the same reason. J. E. E.

A Water Cooler.

MESSRS. EDITORS:—A Natchez correspondent in a late number, calls upon one of the thousands of American inventors to perfect a machine whereby families can supply themselves with cold water without the use of ice.

The following is the manner in which I rendered myself independent of the ice dealers, and secured a constant and abundant supply of Croton as pure and cold as spring water. The plan can be adopted in any city or town having public water works. Having procured an iron tank holding 40 gallons, similar in shape to the boilers used in our kitchens (any size or shape will do), I tapped a half-inch hole on the top for the inlet pipe, and another 12 inches from the bottom for the outlet pipe; then having dug a hole 12 feet deep in the subcellar of the house (making 22 feet deep from the surface of the street), the tank was lowered to the bottom, and the connections with the Croton pipe made. The hole was then filled up and paved, and the job was done, and being well done will probably last for 30 years.

During the hottest part of last summer we drew water from the tank at a temperature of 53 degrees, while that drawn from other parts of the house indicated 82 degrees, and in connection with a filter attached to the faucet, we enjoyed the luxury of drinking cold Croton without the impurities which much of the ice supplied to our citizens imparts to the water.

Generally a depth of 15 to 18 feet will be sufficient to produce an agreeable coldness in the water.

New York city. A. T.

Balancing Saws.

MESSRS. EDITORS:—I give you the result of years of thought and practice (twenty years engaged in saw milling) which is this:

A balance equal in weight to the pitman, gate or sash, saw, etc., placed equally distant from center of shaft to center of crank pin, would be and is a perfect balance only at the two perpendicular points in the circle described by the crank. But at the two points on the horizontal line, you would have this balance make the same centrifugal pounding which the sash or gate originally caused on the perpendicular line, less the centrifugal force of the lower end of the pitman. Hence my formula for balancing is to lessen the centrifugal force by dividing it at the different points, viz:

To the total weight of pitman, sash or gate, saw, etc., add the weight of the end of the pitman attached to the crank, divide the sum by two, which gives the weight, the center of gravity of which placed the same distance from the center of shaft as the crank pin is, will make the truest balance practicable. EDW. SHIPPEN.

The Health Habits of Young Men.

A very curious and interesting table might be made by a thoughtful physiologist and hygienist, showing each person where his strength goes; and I am not sure that a young man could do a better service for himself than to seek the counsel of some wise physiologist, tell him frankly all his habits, and have such a table prepared, not only to guard him against excess, but to show him his weak places, and point out where he will be most likely to fail. Some of these tables would, no doubt, read very much as follows:

Spent in digesting a big dinner, which the body did not need, sufficient force to raise thirty tuns of matter one foot.

Spent in getting rid of several drinks of wine and brandy, force sufficient to raise twenty tuns one foot high.

Spent in smoking six cigars, force sufficient to raise ten tuns one foot high.

Spent in keeping awake all night at a spree, force sufficient to raise twenty tuns one foot high.

Spent in breathing bad air force sufficient to raise fifteen tuns one foot high.

Spent in cheating a neighbor out of $30 in a business transaction force sufficient to raise fifteen tuns one foot high.

Spent in reading worthless books and newspapers force sufficient to raise five tuns one foot high.

Spent in hesitation, doubt, and uncertainty, force sufficient to raise five tuns one foot high.

Total—120 tuns one foot high.

Left for practical and useful labor only enough to raise fifty-five tuns one foot high, or to do less than one third of a day's work.

Sometimes there would be a draft on the original capital of considerable force, so there would not be enough to keep the body warm, or the food well digested, or the muscles plump and full, or the hearing acute, or the eyes keen and bright, or the brain thoughtful and active.

Very often a single debauch would use up the entire available power of the whole system for a whole week or month.

There is no end to the multitudinous ways in which we not only spend our working capital, but draw on the original stock, that ought never to be touched, and the result is imperfect lives, rickety bodies, no ability to transmit to our children good health and long life, much physical suffering and premature decay, with all the ends of life unaccomplished. How sad is all this! How terrible to be born into this world and leave it without adding something to its wealth, its virtue, and its progress.—*Herald of Health.*

IN front of Krupp's establishment, shells of the largest caliber are to be seen lying. They are in the form of a pointed cylinder, and are 3 feet long and 14 inches in diameter. When filled with the charges (76 lbs. of powder) they weigh 739 lb. A hundred of these explosive projectiles have been ordered to be forwarded to Paris as speedily as possible.

BLACKBOARDS.

We have been quite often lately questioned as to the best plan for constructing school blackboards in rural districts. We find these queries fully answered in the following, condensed from the *Minnesota Teacher:*

HOW TO MAKE A BLACKBOARD.

Select seasoned pine lumber of the first quality and good width. Plane it well, joint nicely, and glue a sufficient number of boards together to make the required blackboard four feet in breadth. For end pieces use scantling which will dress two by three inches; saw them a few inches longer than the proposed width of the board; cut a slot through the pieces on the flat side so as to admit the ends of the board, with an inch to spare at the top; into this spare space insert a key, and drive home. To hold the end pieces in position the board may be dovetailed at its lower edge. Form a chalk trough by nailing a strip of half-inch stuff, five inches wide, to the lower edge of the board, and nailing to this strip, on its outer edge, a similar one two and one half inches wide. Bevel or round off the inner edges of the end pieces in a workmanlike manner, and smooth the surface of the board with fine sand paper before painting. The board may be supported by leather straps attached to the top. No nails or screws are used, because they compel the forming of cracks whenever there is shrinkage, by holding the several boards apart; by leaving the whole free to slide in the slot, and following up all shrinkage with a key, occasionally tightened, a perfect surface is secured.

DIRECTIONS AND RECIPES FOR PAINTING.

No paint in which there is oil should be used. Holbrook's, Sherwood's, and "Eureka" liquid slatings are first-class paints. They come in pint, quart, and gallon cans, and are ready to use at any moment, and can be kept for years if tightly corked. One gallon will paint 250 square feet, and costs $10 to $12. Any school-furnishing house will fill orders.

The following is taken from Wickersham's "School Economy":

"To make one gallon of paint take 10 ounces pulverized pumice stone, 6 ounces pulverized rotten stone, ¾ pound of lamp-black, and mix with alcohol enough to make a thick paste. Grind the mixture thoroughly, and then dissolve 14 ounces of shellac in the remainder of the gallon of alcohol. Stir the whole together and the paint is ready for use."

The composition named below has been tried upon old boards and new with excellent success. Dissolve gum shellac in alcohol, and mix with it lamp-black and flour-of-emery. No more lamp-black and flour-of-emery should be used than is necessary to give the required black and abrading surface, and sufficient gum to hold the materials together, and confine the composition to the board. The thinner the mixture the better. The lamp-black should first be ground with a small quantity of alcohol to free it from lumps. Apply with a common painter's brush, and when dry smooth with pumice stone.

A still cheaper preparation, though hardly as durable, may be made and applied by any school-teacher before nine o'clock on a summer morning, and used in a half hour thereafter. For fifty square feet of board take 4 ounces of common glue, 3 ounces flour-of-emery, and just lamp-black enough to give an inky color to the preparation. Dissolve the glue in ¼ of a quart of warm water, put in the lamp-black and emery, and stir until there are no lumps, then apply to the board with a woolen rag smoothly rolled. Put on two or three coats, evenly, and you have a nice surface at a cost of about thirty cents for material. You may call this the "Poor District's Paint."

Caution. No pupil should be allowed to erase with his hand, or a wet eraser, from this or any other board.

PLASTER BLACK WALL.

Nearly or quite all black walls in this portion of the State, made within wooden buildings, have failed to stand. The mortar seems of poor quality, and the lath constantly springing beneath the pressure of the hand while marking, causes the plastering to crack and fall in a very short time. To prevent this the room should be sheeted inside the studding, furred and lathed on that, and the first coat of plastering pressed in against the sheeting with great care. A very firm wall is thus secured. The black belt should be four feet wide, and come within 2½ feet of the floor. It should surround the room. A chalk trough should extend its entire length, and it should be bounded at its upper edge by a simple molding.

Quoting again from Wickersham: "A cheap and serviceable black surface may be made by the following recipe: 4 pecks of white finish or white coating; 4 pecks of fine sharp sand; 4 pecks of ground plaster; 4 pounds of lamp black; 4 gallons of alcohol or good whisky. This quantity will make a mixture sufficient to cover twenty square yards. A little flour-of-emery will prevent the mixture from "setting" immediately, thus giving time to put it on the wall with the necessary care. If emery be not used, only a small quantity of the mixture can be put on at a time, and this is, perhaps, the better way.

The wall which is intended to be covered with the black surface should be plastered like the rest of the room, with the exception that the black mixture takes the place of the white coating, and is put on in the same manner. After the black surface is on the wall it must be carefully dampened and rubbed in order to fill up the pores, and make the surface hard and smooth. If the old surface be well moistened, a new surface, composed of the same mixture, may be applied. It must be remembered that the black surface requires much more working with the smoothing trowel than the white finish.

PAPER BLACK SURFACE.

When care has been taken to secure a good wall, strong Manilla paper, which is manufactured for the purpose, may be smoothly pasted on "hard finish," and then painted with liquid slating. It has proved durable in some instances, its durability depending, however, very largely on a smooth surface beneath.

Saturn.

Saturn, which is next to Jupiter in distance from the sun, is also next to it in size, having a volume nearly one thousand times that of the earth. Its day is not half so long as ours, but it is 29½ of our years in making one complete revolution in its orbit.

Saturn, which is belted like Jupiter, is surrounded not only by eight moons, but by a series of rings, the innermost one of which is transparent. Seven of the moons were known for sixty years before the eighth was discovered. The equator of Saturn, unlike that of Jupiter, is greatly inclined to the ecliptic; transits, eclipses, and occulations of the satellites, the orbits of which for the most part lie in the plane of the planet's equator and rings, happen but rarely.

It is to the rings that most of the interest of this planet attaches. We may imagine how sorely puzzled the earlier observers, with their very imperfect telescopes, were, by these strange appendages. The planet at first was supposed to resemble a vase; hence the name *Ansæ*, or handles, given to the rings in certain positions of the planet. It was next supposed to consist of three bodies, the largest in the middle. The true nature of the rings was discovered by Huyghens in 1655, who announced it in this curious form:

"aaaaaaa ccccc d eeeee g h iiiiii llll
mm nnnnnnnnn oooo pp q rr
s ttttt uuuuu."

These letters, placed in their proper order, read: "*Annulo cingitur tenui plano, nusquam cohærente, ad eclipticam inclinato.*"—"It is surrounded by a thin, flat ring, nowhere attached to its surface, inclined to the ecliptic."

There is nothing more encouraging in the history of astronomy than the way in which eye and mind have bridged over the tremendous gap that separates us from this planet. By degrees the fact that the appearance was due to a ring was determined; then a separation was noticed, dividing the ring into two; the extreme thinness of the ring came out next, when Sir William Herschel observed the satellites "like pearls strung on a silver thread;" then an American astronomer, Bond, discovered that the number of rings must be multiplied we know not how many fold. The transparent ring was next made out by Dawes and Bond, in 1852; then the transparent ring was discovered to be divided as the whole system had once been thought to be; last of all comes evidence that the smaller divisions in the various rings are subject to change, and that the ring-system itself is probably increasing in breadth, and approaching the planet.

The ring-system is situated in the plane of the planet's equator, and its dimensions are as follows:

	Miles.
Outside diameter of outer ring	166,920
Inside " "	147,670
Distance from outer to inner ring	1,680
Outside diameter of inner ring	144,310
Inside " "	109,100
Inside " dark ring	91,780
Distance from dark ring to planet	9,760
Equatorial diameter of planet	72,250

So that the breadths of the three principal rings, and of the entire system, are as follows:

Outer bright ring	9,625
Inner bright ring	17,605
Dark ring	8,660
Entire system	37,570

In spite of this enormous breadth, the thickness of the rings is not supposed to exceed one hundred miles.

Of what, then, are these rings composed? There is great reason for believing that they are neither solid nor liquid. The idea now generally accepted is that they are composed of myriads of little satellites, moving independently, each in its own orbit, round the planet; giving rise to the appearance of a bright ring when they are closely packed together, and a very dim one when they are most scattered. In this way we may account for the varying brightness of the different parts, and for the haziness on both sides of the ring near the planet, which is supposed to be due to some of the satellites being drawn out of the ring by the attraction of the planet.

Although Saturn appears to resemble Jupiter in its atmospheric conditions, its year, unlike that planet's, and like our earth's owing to the great inclination of its axis, is sharply divided into seasons. Saturn's seasons, however, are marked by something else than a change of temperature; we refer to the effects produced by the presence of its ring appendage. To understand these effects, its appearance from the body of the planet must first be considered. As the planet of the ring-system lies in the plane of the planet's equator, an observer at the equator will only see its edge, and the rings will therefore look like a band of light passing through the east and west points and the zenith. As the observer, however, increases his latitude either north or south, the surface of the ring-system will begin to be seen, and will gradually increase in width. As it widens, it will also recede from the zenith until in latitude 63 degrees it is lost below the horizon; and between this latitude and the poles it is altogether invisible.

Now, the plane of the rings always remains parallel to itself, and twice in Saturn's year—that is, in two opposite points of the planet's orbit—it passes through the sun. It follows, therefore, that during one half of the revolution of the planet one surface of the rings is lit up, and during the remaining period the other surface. At night, in the one case, the ring-system will be seen as an illuminated arch, with the shadow of the planet passing over it, like the hour-hand over a dial; and in the other, if it be not lit up by the light reflected from the planet, its position will be indicated only by the entire absence of stars.

But if the rings eclipse the stars at night, they can also eclipse the sun by day. In latitude 40 degrees we have morning and evening eclipses for more than a year, gradually extending until the sun is eclipsed during the whole day—that is, when its apparent path lies entirely in the region covered by the rings. These total eclipses continue for nearly seven years, and eclipses of one kind or another take place for 8 years 292 days. This will give us an idea how largely the apparent phenomena of the heavens, and the actual conditions as to climates and seasons, are influenced by the presence of the rings.

As the year of Saturn equals 29½ of our years, it follows that each surface of the rings is in turn deprived of the light of the sun for nearly 15 years.—*Lockyer's Astronomy.*

Water Cisterns---How to Make them.

In many parts of the country where good water cannot be had from wells, or where such springs are remote from the house and farm buildings, resort is had to cisterns, which receive and retain the rain water that is caught from the roofs of the dwelling and out-houses. It is soft and healthy to drink, especially when pure, or made so in the way presently described. There are, indeed, many places where such cisterns would be found advantageous even though the supply of water from springs and wells may be sufficient for the ordinary uses of the family and the stock in the farm. Sometimes, for instance, the supply is intermittent, varying greatly with the season, and occasionally cut off altogether by a protracted drought. At other times it may be so strongly impregnated with lime or other substances as to render it, especially to some constitutions, injurious to health. But wherever a cistern is needed the first consideration is as to how it ought to be made so as to combine permanency with cheapness. The *Maryland Farmer* gives the following practical directions on this important subject:

"Where the soil is loose and friable the sides of the cistern should be built up of stone or brick. If these are not to be had, a concrete may be made of gravel and cement, or very coarse sand and cement molded into blocks, like the *béton* now so frequently used in France for the construction of walls and bridges. In molding these blocks, a thin layer of the soft concrete is put into the mold and rammed carefully, another layer of a few inches thick is then put in the mold and rammed in the same manner, then another and another, until the mold is full. The concrete block is then turned out on a clear open space and left for several weeks to dry and harden. But where stone is to be had, no matter of what kind, this trouble is avoided. All such stone should, however, be carefully laid in cement, and when the work is done the whole of the inside of the cistern should also be plastered with cement, and, as it soon hardens, it can at once be put to use. But it often happens that underlying even very light sandy soils there is a stiff clay; and when this turns out to be the case the building of an excellent cistern is very easily and cheaply accomplished. It is only necessary, under such circumstances, to slope the side walls like an inverted cone, cut off squarely at the bottom. The slope need not be more than one foot in three; or, in other words, just sufficient to allow the cement to adhere to it while in the process of hardening. The cement is applied directly to the surface of the slope, and if stopped short of the point at which frost descends into the soil, will hold water admirably. Over this cistern there should be a cover resting on the clay, the surface soil of sand being removed for that distance on purpose to receive it, and care should be taken to guard against the surrounding sand being washed into the cistern during heavy rains.

"One part of cement to three parts of clear coarse sand are the proper proportions for making the cement mixture with which the walls of the cistern are to be plastered.

"But the best cistern of all is one to which a filter is attached. This is formed very simply. It is only necessary to divide the cistern by a partition across it into two unequal parts—the filter occupying, say, one fourth of the space. The partition may either be made of stone or concrete—composed of gravel and cement or broken brick and cement, and the bottom of the filter should be about a foot above the bottom of the cistern proper, and the sides of the filter next the cistern, and nearly at the bottom of the filter, should be pierced with holes filled with coarse sponge, through the water percolates into the cistern—or, in a rougher way, minute holes may be made in the lower side of the filter and the sponges dispensed with. Now lay at the bottom of the filter a foot or more of coarse clean sand, and over this again a layer of pounded charcoal two feet in thickness, and over this again a layer of small pebbles or very coarse sand to prevent the charcoal from being stirred up as the water, during rains, comes pouring in. Thus formed, the filtering apparatus is complete, but access must be had to the filter by means of a close-fitting trap, for the materials of which the filter is composed will require to be taken out occasionally and cleansed, as the suspended impurities are left behind on the charcoal and commingled with the upper stratum of sand or gravel; but this cleansing process will not be required more than once or twice in a season. Every one who requires pure drinking water, bright, sparkling, and healthy, should, by all means, if a cistern is used, make provision also for a filter."

R. J. GATLING, inventor of the Gatling gun, has returned home. It is understood that the English Government will adopt his gun.

Autographic Printing Press.

The annexed engraving represents a new printing press, designed to take the place of the lithographic press, and, through certain improvements described below, claimed to be adapted to common as well as the finest work.

The lithographic press now in use has two strong side frames, which sustain all the working parts of the machine, namely: The box for the scraper, the long pressure-screw, a strong iron bed running on twelve iron rollers, a tympan, a long lever, and a very strong iron roller giving motion to the iron bed on which the lithographic stone rests. These attachments make the press very heavy, and its management requires experience and skill.

The press herewith illustrated consists of a wood or iron frame (according to its size), a weight of five pounds acting on a combination of two levers, two connecting rods, a printing cylinder, and a curved stone.

It will be seen that the old flat stone is replaced on this press by the curved stone, on which it is claimed the finest work is obtained with great facility by unskilled attendants, as well as by a practiced hand. It is also claimed that the difficulty arising from the liability of the stones to break on the old press, is entirely obviated in this press whatever may be the pressure to which the stone is submitted.

The reasons assigned for this are that the ordinary presses give an unyielding pressure. The scraper must pass, or the stone will be broken; while with the new press the pieces are not so rigid, all the parts are mobile and flexible, and the levers raise or fall, adapting themselves to all irregularities in the stone although the pressure remains constant on all points. Practical printers will at once understand the nature and value of the advantage thus secured.

The absence of a tympan results in a saving of seven motions required for an impression out of the eight motions required for the same on the old-style press, and it is claimed that a young boy can take off with it one hundred and fifty impressions per hour, without difficulty.

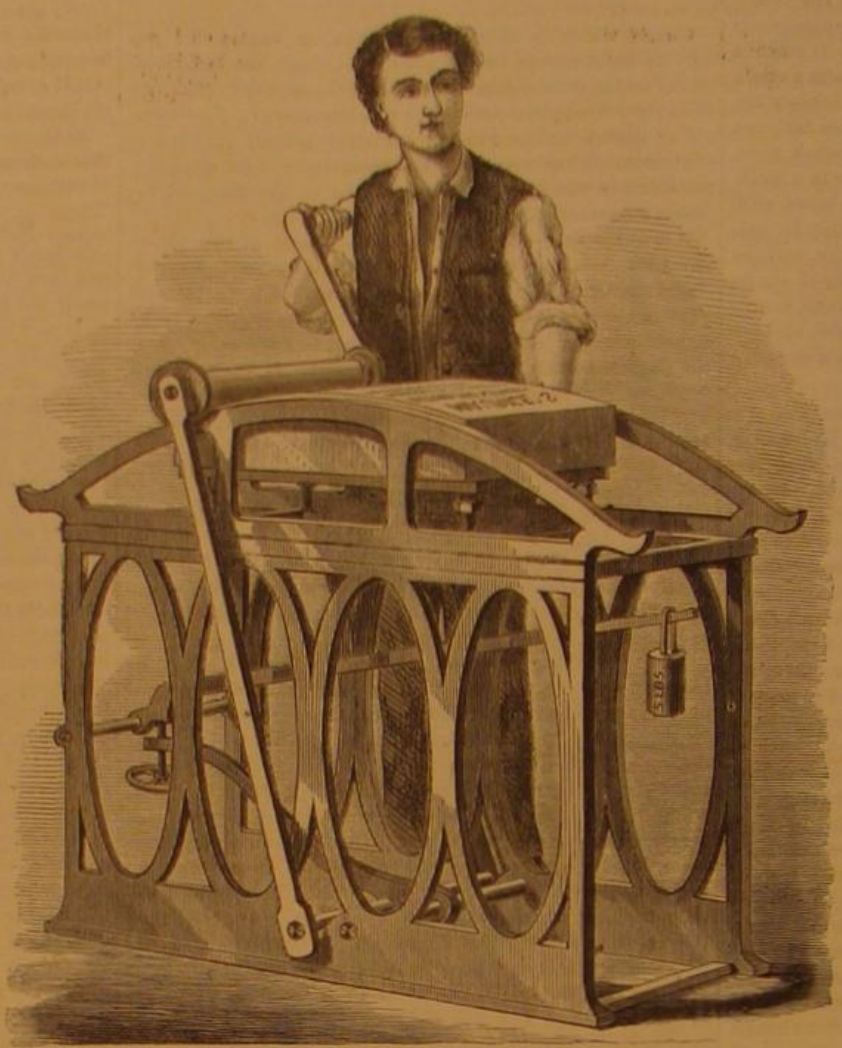
In the use of the old press the regulation of the pressure on the stone is a source of great perplexity and trouble, as a slight mistake in this regard may break a stone on which a costly work is prepared. This difficulty is not encountered with the press under consideration. All the attendant has to do is to push forward or backward the five-pound weight of the first lever to a point which will give the pressure required.

This press may be shipped in a condition to use immediately on its arrival at its destination, thus obviating expense and trouble in setting it up. It weighs only one fourth as much as the ordinary press designed to do the same work, and it can be run by either hand or by steam power—a thing impracticable with the old press.

In consequence of the peculiarities of construction described the stone can be about the length of the press, say for a No. 1 press about twenty-four inches by twelve inches.

It is claimed that the simplicity of this press and the fine work it is capable of performing adapt it particularly for office use by companies, architects, lawyers, schools, copyists, artists, clergymen, and business men generally, who often want a number of fac-similes of circulars, letters, price lists, music, drawings, plans, and documents.

The invention is covered by two patents obtained through the Scientific American Patent Agency, bearing date respectively February 28, 1868, and May 24, 1870, by C. Maurice, whom address for further information, at 160 William street, N. Y.



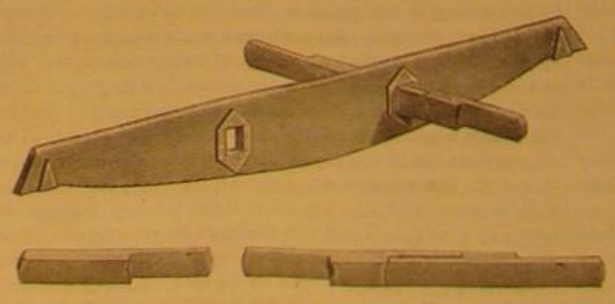
MAURICE'S AUTOGRAPHIC PRINTING PRESS.

Barometric Prediction of Weather.

The barometer corresponds by no means with the tumultuous changes of the weather, but with those of its average quality. What, then, is the period of time for which the averages should be taken to obtain results corresponding most closely with those of the barometer? Numerous trials showed that period to be about twelve hours, and the correspondence of a curve drawn on that principle with the barogram was fairly satisfactory. The flexures of the two curves are, on the whole, simultaneous, since neither curve habitually anticipates the other, but they are seldom absolutely simultaneous. They correspond in the extreme positions as closely as in near ones, proving that it is not the absolute hight of the barometer but the variation in its successive hights which indicates change in weather. The superior influence of the wind upon the barometer over both temperature and damp was remarkably apparent. Lastly, the influence of temperature and damp were shown to conform to the already described period of twelve-hour averages. A simple formula of prediction was constructed on these data. It included (1) the difference between the first and second of two barometric readings, six hours apart; (2) that between the average velocity of the wind during two periods, which we may call *c* and *a*, of six hours each, *c* succeeding the last barometric reading, and *a* preceding the first reading, the intermediate period *b* necessarily disappearing from the formula; (3) half the difference between the average temperatures during *a* and *c*; (4) the same as regards vapor tensions. Then it was shown that (1) was equal to the sum of the remainder, when the barometer and vapor tensions are reckoned in hundredths of an inch, the velocity in miles per hour, and the temperature in degrees Fah. The reason why the barometer is influenced by the weather in a twelve-hour period of average, and why it may predict coming weather, was illustrated by supposing a similar instrument to be plunged into troubled water, in which case its movements would not sympathize with each ripple that passed above it, but with the mean level of a considerable area, and therefore it would feel the influence of an approaching wave as soon as it had reached the area in question whenever the wave was one of exceptionable magnitude. A calculation was made with the above formula to determine the average velocity of the wind for a large number of six-hour periods, and the predictions were compared with facts. It was found that the average error of the predictions was one-third larger than if the observer had simply guessed that the average wind velocity would continue unaltered for the next six hours. The reason why the errors are so large is, first, that correctness in the result depends upon the correctness of all the elements of the formula, but the values of these are only true on the average, while in each particular, and in each case, there will be more or less deviation from that average; secondly, any error in the expectation of the twelve hours' average is, on the whole, doubled in the six hours' prediction, because the difference between what is expected of the whole, and what was fulfilled in the first half of it is heaped on to the second half, which has therefore to bear an additional burden of error equal to what rightly belongs to it. The fame of the barometer is due to its success in predicting a type of storm very rarely met with in the British Isles, but frequently in hurricane latitudes, where the fall of the mercury far outstrips the increasing severity of the weather. In ordinary gales, and much more in ordinary weather, the author considered the barometer to be absolutely useless as a guide when it is consulted without a knowledge of what is occurring at adjacent stations—in short, without such information as is supplied by the daily weather report.

HUTCHINSON'S LOCKING GRATE BAR.

Our engraving illustrates an improved form of grate bars,



which are kept in their relative positions to each other and prevented from warping by one or more sectional rods or bars passing through the grate bars crosswise of the furnace, thus locking all the grate bars together, and keeping the upper edges of the same all on a common level. This constantly maintained level surface facilitates the cleaning and slicing of fires, which can only be done imperfectly on an uneven grate.

The bars are made thin and rounded at the top to secure the greatest amount of air space possible. Thin bars, properly supported, do not suffer so much from heat as thick ones, as they are more rapidly cooled by the air currents.

By this arrangement it is possible to change the air spaces between the bars for burning different sizes of coal. This is done placing between the bars slotted pieces of metal, corresponding in shape to the lugs upon the sides of the grate bars. These pieces rest upon and partly embrace the cross bars, and adjust the grate bars to the proper width of space These bars can be put in any common furnace without alteration.

Patented, Sept. 27, 1870, by R. A. Hutchinson, Nos. 95 and 97 Liberty street, New York. Whom founderymen and others desiring State, county, or shop rights may address for further information.

Mahogany Cutting in Honduras.

Mr. E. G. Squier, in his "Honduras Descriptive, Historical, and Statistical," says:

"Of all occupations known to man, that of the mahogany cutter is perhaps the wildest in its nature, and yet among the most systematic in its arrangements. When the cutter has fixed upon the valley of some river as the field of his operations, he makes a depot for storing provisions, and for securing and embarking the wood. Here he maintains a little fleet of pitpans for carrying supplies and keeping up relations with the "works", proper, the sites of which are determined chiefly by the abundance of trees, their accessibility, and the means that exist for feeding the cattle which it is necessary to use in "trucking" the wood. To these points it is often necessary to drive the oxen through thick and untracked forests, and to carry the chains and trucks, by means of small boats, against strong currents, or over shallows and rapids, which are only surmounted with infinite labor. The site once definitely fixed upon, the next step is to erect temporary dwellings for the men—a task of no great difficulty, as the only requisite is protection from the sun and rains, which is effected by a roof thatched with long grass from the swamps, or with "cahoon" leaves, or the branches of the thatch-palm. A hammock swung between two posts, two stones to support his kettle, and the hut of the cutter is both finished and furnished!

"The mahogany season, which last some months, commences in August of each year, it being the opinion of cutters that the wood is not then so apt to split in falling, nor so likely to 'check' in seasoning, as when cut from April to August, in what is called 'the spring.' Furthermore, by commencing at this period, the cutter is enabled to get down his wood, and prepare it for trucking by the setting in of the dry season.

"The laborers are divided into gangs or companies of from twenty to fifty each, under the direction of a leader styled 'a captain,' who directs the men in his company, assigns them their daily tasks, and adds to or deducts from their wages in proportion as they accomplish more or less than what is supposed to be a just day's work. Each gang has also one person connected with it, who is called a hunter, whose duty it is to search the 'bush' for trees proper to be cut. His work, therefore, commences somewhat earlier than that of the others, and as it involves activity and intelligence, he is paid much higher wages than the mere cutters. His first movement is to cut his way through the thickest of the woods to some elevated situation, where he climbs the tallest trees he finds, from which he minutely surveys the surrounding country.

"Around Belize the mahogany-cutters are chiefly negroes, descendants of the slaves who were formerly employed there. But in Honduras they are principally Caribs, who, in activity and strength, are said to excel the negroes; they are also more intelligent, and require less care and superintendence. Many of them go annually to Belize, and hire themselves for the season, returning to their homes at its close."

Tempering Carriage Springs.

A correspondent of the *Coach-Makers' International Journal* writes: In setting up old springs where they are inclined to settle, I first take the bed leaf and bring it into shape; then heat it about two feet in the center, plump to a cherry red; then cool it off in cold water, as quick as possible. This will give the steel such a degree of hardness, as to be liable to break, if let fall on the floor. To draw the temper, hold it over the blaze, carrying backwards and forwards through the fire, until it becomes so hot that it will sparkle when the hammer handle is drawn across the edge; then cool off, or not, just as you please.

Another mode, I use sometimes, is to harden the steel, as before stated, and draw the temper with oil or tallow: tallow is the best. Say, take a candle, carry the spring as before, through the fire, and occasionally draw the tallow the length hardened, until the tallow will burn off in a blaze, then cool.

I have no difficulty in making springs stand up. Every leaf is served alike.

LINSEED OIL only should be used in drilling carriage work

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To Advertisers.

The circulation of the SCIENTIFIC AMERICAN is from 25,000 to 30,000 copies per week larger than any other journal of the same class in the world. Indeed, there are but few papers whose weekly circulation equals that of the SCIENTIFIC AMERICAN, which establishes the fact now generally well known, that this journal is one of the very best advertising mediums of the country.

To Inventors.

For twenty-five years the proprietors of this journal have occupied the leading position of Solicitors of American and European Patents. Inventors who contemplate taking out patents should send for the new Pamphlet of Patent Law and Instructions, for 1870.

RATING STEAM ENGINES.

It scarcely needs any argument to convince an intelligent mind that all statements of fact are valuable only as they are definite. The present system of rating steam engines by horse-power is, however, as indefinite as can well be conceived. When a manufacturer rates an engine at eight horses' power or ten horses' power, he generally has in his mind some general average of pressure in the boiler, and some regular speed of piston, but as both these factors are variable, his rating may be below or above what the engine will do in practice. Care is generally taken to rate engines below their capacity.

The old term, nominal horse-power, is still adhered to, particularly in rating marine engines, and though this gives some idea of the dimensions of the parts of a steam engine, it gives no idea of its real power.

Of a surety this indefiniteness is a disgrace to so accurate a science as that of steam engineering, in which everything else is now reduced to the finest possible measurement; and there is not the slightest valid reason why it should exist a day longer. There need not, it seems to us, be any difficulty in agreeing upon some standard pressure and number of revolutions, or, what is the same thing, speed of piston per minute, at which the power should be computed. This would at once remove the uncertainty of which we complain, as the power for higher or lower speeds and pressures would then be easily determinable.

We suggest as a convenient standard of initial pressure in the cylinder sixty pounds, and one hundred as a standard number of revolutions per minute. Engines could be then rated as to the number of revolutions above standard they could be run, and this, with the pressure the boiler can safely carry, would enable the purchaser to at once calculate the maximum power available with an engine of a given rating.

There is also no necessity for adherence to the horse-power as a unit. The foot-pound is the adopted unit of work in all modern treatises on physics, and the expression of the power of engines in foot-pounds saves one division in the computation. We think it is time that "nominal horse-power" and "actual horse-power" should become obsolete terms. For all scientific and practical purposes the foot-pound is by far the most convenient.

These standards of measurement being once generally adopted, purchasers would have something tangible to guide them. There need be no mistakes made, as is now often the case, such as purchasing an engine of too great capacity for the steam producing power of the boiler designed to supply it, or the buying of engines of insufficient capacity to do the work desired. On the contrary, accurate guarantees of power might be demanded and given.

POWER OF PRIME MOTORS.

Perhaps in no department of mechanical practice are blunders more frequent than in the calculation of the power of prime movers necessary to perform the work of driving machinery. In our experience we have met with many such mistakes, and although these mistakes are not made by expert engineers, and though the proper method of procedure on the part of inexpert persons in erecting mills is to employ experts to make the proper calculations, an unwise parsimony, or an ill-founded self-confidence, often leads such people to rely on themselves and the rule of thumb, in selecting engines and water wheels, only to find in the end, that a larger expense is necessary to rectify their mistakes, than would have been necessary to avoid them.

To determine the power necessary to drive a given number and variety of machines, it is first necessary to ascertain the power requisite to drive each to its maximum speed. Happily here we have a large amount of recorded experience to guide us with reference to those machines which have been much used; but it often happens that machinery of an entirely new pattern is to be driven, and then books of reference fail us, and resort must be had to experiment.

The dynamometer is the instrument relied upon for such experiments, and as there are several in market which answer the purpose sufficiently well, we shall not refer to any one in particular, but confine ourselves solely to a brief discussion of the principles upon which they, as a class, act to determine the two things they may be instrumental in determining; namely, the power transmitted by rigid or flexible connectors to different machines or sets of machines driven from a common shaft, and also the power required to drive any machine or set of machinery.

Let it be remembered that the dynamometer only can measure power transmitted. Hence it cannot directly determine the power of a prime motor. It may do so, however, indirectly, when such a motor is running at a regular speed, and transmitting its maximum of power through the dynamometer to shafting or other machinery, or exhausting this power in overcoming the friction of a brake. The latter is an instance of transmission of power and the conversion of work into heat.

The dynamometer, of whatever style or construction, only indicates static pressure, and the power transmitted through the instrument is estimated by multiplying this pressure in pounds by the number of feet through which it is overcome per minute. The product will be in the denomination of foot-pounds per minute, which is reduced to horse power in dividing by 33,000.

Mistakes are often made by those not accustomed to the use of dynamometers in confounding mere pressure with power. It is only a short time since we had quite a long argument with an intelligent mechanic who asserted that a dynamometer whose pointer indicated a heavy pressure on a slowly moving shaft, was driving more than one on a rapidly revolving shaft, the indication of which was much less. It was only by the application of the above rule, and a *resumé* of the subject of mechanical power that we succeeded in convincing him that the rapidly revolving shaft was transmitting the greater power, notwithstanding the lesser indication of the dynamometer. There seems to be a difficulty in the minds of some in making and maintaining a clear distinction between pressure and power, and many make this error in thought who never make it in actual practice, their calculations being made from prescribed rules and formulæ, which they use without mental analysis, and the full force of which they therefore fail to apprehend.

Brakes are merely instruments for taking off power from motors that it may be measured. The measurement is accomplished by a lever and a weight, on the principle of the steelyard. The brakes gripping the shaft or pulley, as the case may be, are tightened till their resistance is sufficient to absorb the power so that the motor shall run at the required speed. The weighted lever is used to hold the brakes, the weight suspended therefrom being of sufficient magnitude to keep the brakes from turning with the shaft. The weight in pounds multiplied into the leverage gives the number of pressure to which the shaft is submitted. This multiplied into the distance in feet through which the pressure is overcome per minute, is the number of foot-pounds the motor will raise per minute, which, divided by 33,000, is its horse-power.

The measurement of power rests upon these few and simple principles. It nevertheless requires skill and experience to apply them in such a way as to secure accuracy, and it is consequently advisable for those who lack skill or experience to employ competent engineers for such work.

We have been led to these remarks from frequent queries which cannot well be answered in our column devoted to correspondence of this kind. We trust we have now met these inquiries by as full a response as is possible without going into details, which would be a mere compilation from standard authorities on this subject.

THE PEOPLE WHO ATTEND FAIRS.

We know of no place where men—and women—do congregate in which one may study human nature to better advantage, or see more phases of many sided individuality than at mechanical fairs. To make such a study both profitable and amusing, however, one must have a broad sympathy for the feelings, and charity for the foibles of others, and a keen sense of the humorous, as well as power of philosophical analysis.

To enter one of these shows is to enter among a set of men who have, most of them, given birth to something which, in their opinion, is of great importance to mankind.

Some of them have good and sufficient grounds for this belief. Such a belief is the parent of an enthusiasm which shows itself, in the features of each exhibitor, in his gestures, in the adjustment of his dress, and in his speech. Enthusiasm born of conviction is a hard ghost to lay, and so, though cavillers may object to this, or throw cold water on that, the exhibitor, nothing daunted, rises superior to the occasion, and soars to the sublime hights of triumph at the first breath of praise.

See him as he stands waiting for the approach of some one who wishes to examine his device. Watch his eye kindle at the query, "How does it work?" With what expert haste he sets wheels and levers in motion and points out the action of each. Listen while he expatiates upon the advantages secured. See his lip curl in pitying contempt at the ignorance which seems to doubt that any detail may prove insufficient. Hear the outburst of eloquence with which weak objectors are utterly vanquished and driven ignominiously from the field. Surely if you please you may find something here which will reward your observation.

Then there is the man who objects to everything, whether good, bad, or indifferent, and who always looks on the bad side. He is the dread of the exhibitors. In the middle of their most successful harangues, when credulous minds are just on the verge of full belief, and old women have had their feelings wrought up to the "du tell" point, this objector elbows himself into the crowd, and with a word brings down the enthusiasm of orator and audience to zero. A hot discussion results. Out comes the exhibitor's pocket-book, and Mr. Objector is asked to name the extent to which he will back his statement, an invitation he rejects with much dignity. He is not a betting man. He objects to betting on principle, just as he objects to everything else, but he has spoiled the play, and the crowd disperses to other attractions.

Then there is the large family of meddlers always to be found in all places, but who always gather in force at fairs. They must smell every flower, touch all the fruit, turn at least once every winch belonging to churn or washing machine, pull every rope—in short, apply inquisitive—we are sorry to say sometimes acquisitive hands, to everything movable or immovable within the reach of their digits. The face of a marble statuette must feel their caressing and besmirching touch. Beauties in paintings are pointed out by the ends of their perspiring fingers. Nothing is sacred from their profane handling, and wherever they pass, irate looks and impatient words of annoyance follow them. Yet their faces are full of sweetness. They admire equally all things; and fancy they are doing their utmost to make all things as lovely and pleasant as possible.

Then, here and there, you shall note the aimless wanderer, always of the male gender, with melancholy eyes and pendant, overhanging eyebrows, thin, sallow, and dyspeptic, who, with hands in pockets, strides slowly up and down, looking at nothing, and almost unconscious of any external existence. What ever induced him to go to a fair? Give it up? So have we. It is a conundrum too deep for our solving.

And the sewing machine exhibitors. Ah! those men who send them here are shrewd old chaps, and know well enough that a sewing machine never looks so well as when a pretty and intelligent woman sits behind it, eloquent in looks, in nimble fingers, in tidy and tasteful dress, as well as in words. It is astonishing, indeed, how many young and even old men are interested in sewing machines. One finds out this singular fact at fairs, who else might forever remain ignorant of it. And the pretty exhibitors are certainly the instruments for the elucidation of this fact, for it is never apparent in the vicinity of a machine exhibited by a man. Being, therefore, instruments for the discovery of fact, they ought not to be excluded from notice in a review of a fair for a scientific journal. Far be it from us to exclude them. As an attractive feature of a well-conducted fair they are as important as brass bands or an opening speech from Mr. Greeley. We regard the men who employ them as public benefactors, deserving the gratitude and veneration of all who delight in fairs.

So we might go on, picking out and classifying character *ad libitum*, for whatever is lovely or hateful in human nature, conciliating or aggressive, high or low; whatever is opposite and extreme; whatever goes to make up the great current of humanity floating on towards the sea which will ultimately engulf all, you shall find it at one of these fairs if you seek it. Try it once, dear reader, after you have gone the rounds of the machinery and the various other displays, and find yourself with an hour to spare that you can fill in this way. Take our word for it, it will pay.

THE WORLD'S WORK, AND ITS MORAL NECESSITY.

"In the sweat of thy brow shalt thou eat thy bread," was a curse pronounced upon mankind for the original sin, if we are to accept the common orthodox interpretation of the mystic history of Adam's fall. We have, however, a modern saying no less true, but the sentiment of which somewhat conflicts with the popular idea that the sentence of work was designed to be a curse, the import of which is, that the devil employs the idle. The evil of idleness is, however, a trite subject which we do not mean to discuss.

The present age is emphatically the working age. In no other period recorded in the history of man, was there ever any approach to the amount of work now in progress. Not only is mankind throughout the civilized world exerting all its powers of mind and muscle in work, but the stored up brute forces of nature are harnessed to the chariot of progress, to an extent never before known. That there is a moral necessity for just the state of things which exists, is easily demonstrable.

The moral necessity for work is perhaps most strongly indi-

ated by the fact, that notwithstanding man struggles by his inventions to shift the burden upon the brute forces, still the world's work grows and accumulates. Man constructs labor-saving machines, which, while they lessen the labor required to produce individual articles, always increase the aggregate demand for its class, in a far greater ratio than the labor on each article is diminished, and so the aggregate work of the world is swelled by each mechanical improvement. The efforts of mankind to emancipate the race from the necessity of labor, are, therefore, or at least have been as yet utterly futile. The most that has been accomplished, has been to remove some of the heavier and more disgusting features of labor, and redeem toil in some measure from its original severity.

That such efforts will continue futile in spite of the predictions of optimists who dream of a time to come, when at least the toil of man shall become altogether directory and supervisory in character, is in our opinion a fact based upon the very nature of man.

The desire to appropriate to personal use anything which renders life more luxurious or desirable, will always prevent men from contenting themselves with the minimum of labor necessary to merely afford comfortable subsistence. There is in mankind a hunger for other and higher enjoyments than are found in the simple satisfaction of the desires for simple food, drink, clothing, and shelter, and out of the desire to appease this hunger, has sprung all civilization. The production and the use of articles decorated by art, the refinements of cookery, the ornaments of person and residence by which taste is cultivated and gratified, are among the most conspicuous of the external marks of civilization.

The moral necessity for these things is the result of this natural craving. The rudest savage manifests in some rough way the existence of this taste, the cultivation of which starts him at once from barbarism on the road toward civilization.

The world's work now consists mainly in the supply of the necessities of taste. The proposition may at first seem startling, but its truth will become apparent upon a comparison of the personal effects and requirements of savages, with those of civilized people. We say necessities of taste. That is always a necessity, which, being attainable, cannot be dispensed with, except by the sacrifice of an enjoyment, more to be preferred than the saving of money or effort requisite to its attainment. For such an object there is as positive a force compelling man to attempt its procurement as hunger, thirst, or sexual desire. It presses men on into a hard struggle for the acquisition of wealth, that through wealth they may secure the gratification of their tastes. Not one man in a thousand seeks money for money's own sake. Misers are morbid outgrowths—exceptions which *only* establish the general rule.

And this mental and physical appetite, for all the appetites are mental as well as physical, is no more permanently satisfied by enjoyment than any other. It has often been asserted in derogation of the grosser appetites and passions, that it is impossible ever to attain their full and permanent satisfaction; but instead of this being any reason why the gratification of any natural and healthy appetite should be held in contempt, it is to be regarded as a beneficent provision for the perpetuation of enjoyment. Did we once cease to desire, we should cease to enjoy. All enjoyment is the temporary fulfillment of desire. Absolute content is neither desirable nor attainable.

In all this we see clearly indicated, the moral necessity of work. Could every luxury now enjoyed by the most wealthy and refined, be placed, without any exertion on the part of the recipient, within the reach of every man, woman, and child on the face of the globe, they would still yearn for more, and work to get it.

DEATH OF THREE DISTINGUISHED CHEMISTS.

DR. AUGUSTUS MATTHIESSEN.

One of the youngest and at the same time most ardent and successful of chemists has just cut short his career by taking poison. Augustus Matthiessen was born in London, January 2, 1831. He early went to Germany, and became a favorite pupil of Professor Bunsen, whom he greatly aided in the preparation of the rare metals of the alkalies and alkaline earths, by electrolysis. His first paper on this subject, in 1856, was one of the most important contributions to our knowledge of the rare metals that has ever appeared; and the research begun in Bunsen's laboratory was continued long after his return to England.

Dr. Matthiessen has greatly enriched our knowledge of the electric conductivity of the metals, and the laws he has deduced are now in constant use by practical electricians. He had so many wires running through his laboratory that they closely resembled an immense spider's web. He was a man of great sensitiveness, and of unquestionable purity of character, and his conscientiousness gave to his scientific statements peculiar value.

He was accused of false pretenses in reference to some of the rare metals, and intimations were expressed that they were not what they purported to be. This and other charges trumped up against him, seem to have unsettled his mind.

He was found dead in his room, having taken poison "while in a state of temporary insanity."

In a note referring to the false charges, he says: "Although I am innocent, it blights all my future prospects, and I have therefore resolved to resign all."

WILLIAM ALLEN MILLER.

We recently noticed the death of this distinguished man, and recur to the subject again for the purpose of adding some details of his life.

Since the time of Faraday there is no man whose loss will be so much mourned and regretted. He was born at Ipswich, in Suffolk, on the 17th of December, 1817, and died of apoplexy at Liverpool, on the 30th of September, 1870.

About a year ago he lost his wife, to whom he had been tenderly attached. This so affected his mind that he never fairly recovered from the blow. He left London on the 13th of September, to attend the meeting of the British Association, and was taken ill on the journey. His family, consisting of a son and daughter, were sent for, and every effort was made to restore him to health. The first attack was brain fever, which terminated in apoplexy, and suddenly cut short his life.

Professor Miller, like nearly all of the scientific men of England, had sprung from moderate circumstances. He was reared among the Society of Friends, and the impressions of his early youth were retained throughout his subsequent career, for we have rarely met with a man of greater urbanity, kindliness of manner, tender sympathies, greater cheerfulness of disposition, and unselfishness. He was ever ready to lend a helping hand to young students, and his loss will be keenly felt by this class.

The early contributions of Professor Miller were in the direction of the electrolysis of compounds. Subsequently he took up the study of spectrum analysis, and was one of the first to give us the composition of the light proceeding from the stars. His text-book on chemistry will be an enduring monument to his fame. There is nothing equal to it in the English language.

ALEXANDER POMPEJUS BOLLEY.

Professor Bolley died in Zurich, on the 3d of August, 1870, at the age of fifty-eight. He was a native of Heidelberg, and graduated at that University, and became the assistant to the celebrated Gmelin. In consequence of his sentiments in favor of a united Germany, he was obliged to quit his home and seek refuge in Switzerland, where he received an appointment at one of the Canton schools, and finally became the Director of the Polytechnic School, at Zurich.

In the department of technology Professor Bolley has had no superior. His text-books are the best we have on that subject. As a man and teacher he resembled Faraday and Miller. Full of life, of humor, of enthusiasm, of kindness, of organization, of originality, he was the great favorite of professors and pupils, and the influence he was able to exert was of the most beneficent character in the circle where he lived.

On the morning of August 3d, he lectured as usual to his class. Being somewhat fatigued, he rested for half an hour in his study, and then started for a little exercise. It was his last walk, for he was attacked with disease of the heart, and dropped dead in the street.

Thus have passed away three of the most distinguished of our chemists, whose places can with difficulty be filled.

TRANSPORTATION OF FRESH MEATS AND FRUITS, ETC., THROUGH LONG DISTANCES---THE DAVIS REFRIGERATOR CAR.

As our readers are aware, we have taken a deep interest in the solution of the great problem of how to transport all sorts of commodities, perishable when exposed to the action of air at ordinary temperatures, from places where such commodities are cheap and plentiful to where they are scarce and dear. The satisfactory solution of this problem would result in inestimable benefit to the human race, enabling those remote from a market to realize profits on what is now comparatively of little value, and cheapening the necessaries of life in densely populated centers of civilization.

The subject of refrigeration is therefore at the present time compelling the most earnest attention of practical and scientific men, and is second in importance to none other with which inventive genius is at present grappling.

Our attention has been called several times of late to paragraphs from Western papers relative to what is called the "Davis Refrigerator Car," which is claimed to be able to convey meats and fruits in a perfectly fresh unchanged condition over any distance, and for any reasonable or required length of time. These statements, however, were so vague and indefinite in details of construction that we preferred to await the time when it was announced that the car would itself be in New York with a freight of fruit brought from California, and to base what we might say upon personal examination.

Having learned on the 29th October that the car had arrived, we visited the Hudson River Railroad Depot and examined both the car and its contents, and found, so far as we could judge, that its load of grapes, peaches, and pears was in as good a condition as when shipped. The fruit certainly exhibited neither mold nor decay to any noticeable extent. The packages were perfectly dry; there was no odor of decay or any other indication that the fruit—which we were informed had been twenty-four days in the car—would not keep for as many days longer.

Several packages selected at random were opened in our presence, and appeared in uniformly good condition, and was found of good full flavor when tasted.

Our readers will be interested in the construction of this car, which, though strictly in accordance with scientific principles, is extremely simple.

The shell of the car consists exteriorly of the ordinary wood casing. A second wooden shell is made smaller than the first, and placed within it, so as to leave an air space or chamber entirely around the top, bottom, and sides of the car. Within this second shell is placed a layer of hair, about two inches in thickness, and this again is lined with an interior wooden shell. This construction makes a non-radiating and non-conducting compound shell or case, of great power to resist the action of external heat, and renders the expenditure of ice quite small to maintain the required depression of temperature, after the interior of the car and its contents have been cooled down to the proper point, say from 34° to 38° Fah.

The refrigeration is accomplished in the following manner: Along the sides of the car are placed sheet-metal tanks shaped like the frustra of very gradually tapering wedges. They extend from the top to the bottom of the car, and are about five inches thick at the top and two and one half inches at the bottom. These tanks communicate at the top with the exterior of the car through funnel or hopper shaped openings, and at the bottom through drip-pipes which convey away the moisture. The funnel-shaped openings at the top are used for putting in the refrigerating mixture consisting of broken ice and salt, and are provided with air-tight covers. The car is entered through a hatchway at the top through which its freight is also introduced. This hatchway is also provided with a tight-fitting cover, made non-radiating and non-conducting like the sides of the car.

The store of ice and salt for the trip is contained in a separate department in one end of the car, so that its contents can be reached, and the refrigerating tanks supplied without opening the freight room.

The freight is placed in the car on strips of board, strips of board also preventing its coming in contact with the walls of the refrigerating tanks. The packages are also so placed as to leave interspaces through, between, and around each. During the process of refrigeration the air circulates around the packages and along the sides of the tanks like water in a steam boiler the colder air falling, and the warmer air rising to the top, becoming chilled in its passage along the sides of the tanks, and depositing its moisture on the tanks till their sides are covered with a thick stratum of congealed water or hoar frost. Thus the air is not only cooled but dried, no accession of moisture being derived from the external air or from the ice in the tanks, with either of which the interior of the car has no communication so long as the car is kept closed.

The two essentials for the preservation of substances liable to ferment, namely, absence of heat and of moisture, are thus secured in a very perfect manner, and the arrangement of the tanks is such that the space within the car for the storage of freight is not materially reduced. Some addition to the refrigerative mixture in the tanks is made each day, and the temperature is easily regulated and kept at the desired point by the addition of more or less salt in proportion to the charge of ice.

The proprietors express the utmost confidence that they can ship meat or fruit from any part of the continent to any other place, no matter how remote, and not only have it in good condition when taken from the car, but in a state which will guarantee its keeping after removal therefrom as long as it would have done previous to its shipment, under the same conditions. Certainly what we have seen goes far to warrant this confidence, and for the sake of humanity at large, we sincerely trust future experiments will prove as successful as the one we have described, and as others, which we have not seen, are represented to have been.

CHEMISTRY AT THE FAIR OF THE AMERICAN INSTITUTE.

In a large show case we saw some billiard balls, rings brooches, knife handles, and other objects resembling ivory, which, upon close inspection, proved to be made of gun-cotton. Here was the application of Schönbein's discovery that the original inventor could never have anticipated. The solubility of gun-cotton in a mixture of alcohol and ether has long been known, but that a tincture of camphor would produce the same effect has not been suspected until recently. It now appears that moist camphor and cotton pulp are mixed together, and put under an hydraulic press, when the mass so closely resembles ivory that it can be made into billiard balls, buttons, and, in fact, everything for which ivory is employed. The cotton can be colored without injury to its texture. It is a curious fact that the vapor of camphor decomposes gun-cotton with evolution of red fumes—in fact, the cotton is decomposed explosively. What the action of the camphor is on the gun-cotton has not been explained. It would appear as though the nitrogen of the pyroxyline was expelled by it in the form of binoxide, and this in turn took oxygen from the air and became nitrous acid. The matter is worthy of investigation, as perhaps offering important applications in the arts.

By the side of this show-case was a modest display of silvered glass, equal to the best productions in this line of industry that we have ever seen. From the card attached to these articles, it appears that they are manufactured by an improved process patented by H. Balen Walker, in 1869. The inventor claims that his method is an improvement on Liebig's, as it does not require to be backed by varnish or copper. There are many reasons why silver mirrors ought to be substituted for the mercury glasses so long in vogue. We will state a few of them. The silver reflects nearly 90 per cent of the light that falls upon it, and it also gives back a true image, whereas the ordinary quicksilver absorbs half of the light, and throws back a yellow and imperfect image. Silver is incomparably superior to mercury.

Another advantage possessed by silver is a sanitary one—it is perfectly safe and harmless to the workmen, while quicksilver is the occasion of much disease and suffering to those who are obliged to live in its fumes. In some parts of Germany, especially near Nuremberg, a large proportion of the population are engaged in making toy mirrors. They are furnished by dealers with the requisite tin foil and mercury, and actually manufacture millions of the small glasses required for toys. It was in consequence of witnessing the

disease and suffering from poison among these people that Liebig was first induced to turn his attention to a silvering process.

In a visit which we paid to him in 1859, he exhibited some remarkably fine specimens, and gave us some that have retained their brilliancy to the present day. He informed us at the time that the toy dealers were prepared to adopt the new process. The unfortunate war in this country so affected the trade in toys as to lead to a suspension of the manufacture in many places, and thus the new method of silvering mirrors was never adopted. For use in optical instruments there is an extensive demand for silvered mirrors, and if the American process can overcome many of the difficulties hitherto encountered, it ought to prove to be valuable to the inventor.

The specimens of nickel plating are exceedingly interesting. It is only recently that attention has been called to this new industry, but the success that has attended its introduction is most gratifying. If, as is claimed by the company, nickel can be deposited so much cheaper than silver, we see no reason why it should not be generally adopted. As it does not oxidize or rust, or become tarnished by fumes of sulphur, and is hard and will wear for a long time, it would find favor even if the cost were the same as that of silver. The company claim that "the cost of nickel plating is from twenty to thirty per cent cheaper than silver, presents a more stable and uniform brilliancy, and lasts four times as long as silver plating of like thickness." We should suppose that nickelizing would be advantageously employed as a substitute for galvanizing for metals used on board ships; it can also be used to advantage on guns, harness, carriage trimmings, surgical and philosophical instruments, reflectors, knives, forks, machinery of all kinds, and all models that require to be protected from the oxidizing or corroding action of the air or water. As nickel is a magnetic metal it cannot be used about the ship's compass, but on the state-room doors and ornamental hinges and knobs it can have no bad effect.

We should have been pleased to see specimens of the new alloy of manganese and copper that has been made in considerable quantity [in] Connecticut, but did not discover any specimens at the Fair. This alloy closely resembles German silver, and could be substituted for it in many instances.

Sufficient attention has not been paid in this country to the uses to which papier maché can be applied. There are some articles on exhibition, but very few persons can understand what are their merits. For pails and vessels to hold acids, alkalies, chemicals of all sorts, for moldings, copies of casts, ceilings, statuary, artificial wood, and all kinds of utensils, there is a great use of papier maché. If the material were to be extracted with paraffine it could be made impervious to the action of most liquids, and its durability would be greater than that of wood. We are surprised that more use is not made of this composition.

Gelatin in the form of glue for household use has hitherto been put up in liquid form under the name of mucilage. We now have it ground or comminuted ready for immediate use. Glue in this form is easily acted upon by water, and retains its adhesive strength, as it is kept by until required, and consequently is not liable to decomposition. The specimens at the Fair were exhibited by Milligan & Higgins.

We were gratified to find at the Fair this year a fine display of leather. This is a result of chemical knowledge that is of the greatest importance. The chief progress in the tanning of leather has been in the application of sumac, in the use of chemicals to hasten the process, in the extraction of tannin under pressure, and incidentally in the invention of a grate for burning the wet tan bark. Messrs. Rutter & Simmons show a considerable variety of leather for carriage makers, furniture covering, and dress purposes, that is finely colored. If the coloring matter employed is permanent, these specimens must reflect great credit upon the firm that exhibits them. In the dyeing of leather there has been great improvement of late years, but the permanency of the colors has not been in proportion to the increase in the variety and beauty. It is a serious drawback to aniline colors that they are apt to fade, and we are aware that some of them are used in dyeing leather.

The extracts of beef at the Fair are of various kinds. We have the beef itself partially cooked in Texas, and afterwards hermetically sealed in cans. It is said to remain fresh for years. There is nothing new in this process. We obtained some cans of meat put up in this way at the Paris Exhibition of 1855, and on opening one of them fifteen years afterwards found that it had remained perfectly fresh and good. But notwithstanding this testimony there appears to be a prejudice against using such articles of food, and it is only on shipboard or long journeys that a demand is created for it.

The other form of condensed meat is the beef extract of Liebig. We have had frequent occasion to speak of the merits of this article. It is one of the most valuable inventions ever made by chemists. No family would be without a jar of this concentrated food if they understood and appreciated its merits. The specimens at the Fair are exhibited by E. Fougera in the same case with numerous nutritive preparations, about the value of which we are not prepared to speak with the same certainty as we are in the case of the Liebig extract.

Several forms of the earth closet are on exhibition, one of which is remarkably simple and costs from six to ten dollars. An earth-closet commode is an article indispensable to every household, and in the country there ought to be a law compelling everybody to use this system of disinfection. The amount of disease and suffering engendered by the traditional out-house and open privy in the country cannot be estimated. It is the very nursery of fevers, pestilence, cholera, and malaria. Modern science has shown that there is nothing so dangerous as decomposing fecal matter, and the same science has taught us that dry earth and loam are the best disinfectants that could be employed. We are sure that nothing but ignorance stands in the way of the universal adoption of the earth-closet system, and we have not failed to contribute our part towards the dissemination of correct knowledge on the subject. The display of chemicals made by L. and J. W. Feuchtwanger in a modest little case was overlooked by us the other day. The peroxide of manganese is evidently nearly pure, and the silicate of soda, in solid and liquid form, placed side by side with chloride of calcium and chloride of magnesium, suggests the admirable cements that it is possible to make from these articles. The magnesium cement has especial interest, and has been recently described in this journal.

DIAMOND MINING IN SOUTH AFRICA.

A California miner who emigrated to the Cape of Good Hope in August last, writes a letter to the *Alta California* from the diamond fields of South Africa, in which he relates the following experience: "We left Colesburg on the 1st of July, and arrived at the headquarters of the diamond fields on the 5th—200 miles. We found plenty of grass and bush for the animals, but water was scarce, and at several farms we had to pay one shilling for water for ourselves and stock; this water had been collected in a kind of hole formed by damming up a ravine or depression in the plain; the dams are filled during the rainy season, and last through the dry season. The road is excellent all the way from Colesburg to the diamond fields.

AT THE MINES.

"Arrived at the diamond fields, a Californian scene of early days presented itself. The river was lined with rockers, tents, and miners of all kinds, color, sex, and size, for a mile on both sides. At least 800 miners were at work, whole families, men, women, and children, having left their homes, either in the Transvaal Republic, Orange Tree State, or Cape Colony. The men were picking, shoveling, and washing the dirt, while the women and children were sitting around tables, and sorting the pebbles that have been washed, for diamonds. Before crossing the Vaal River, we applied to Mr. Kallenburg, the missionary, for permission to dig on the Pruel Farm, but he refused, as we were strangers to him. He only allows those whom he knows to mine on the estate, and he makes them give him one fourth of the proceeds of their finds. There were about 200 people on the estate when we arrived, and they had found, on an average, about twenty-five diamonds a day of from ¼ to 5 carats each; no large diamonds had been found on this estate up to the time of our arrival, but several have been found since—one of 10 carats, one of 17 carats, and one of 43 carats.

SELECTING CLAIMS.

"We crossed the river on the 5th of July, and camped for the night near the head-quarters tent. On the 6th we signed the Minors' Rules and picked out our claims—twenty feet square for each partner. We took a claim on the third capie, or hill, down the river; the first capie is where the Vaal and King Williamstown parties took out 172 diamonds from a triangular space of about fifty paces in circumference, and from six inches to twenty-four inches in depth. Other parties had taken at least 150 diamonds from near this triangle on the same capie. The second capie had proved rich since, and about 100 diamonds had been taken from it. The third capie had just been opened, and about twenty diamonds had been taken from it up to the time of our arrival. At the first capie the diamonds were from ¼ to 10, 30, and 40 carats; at the second from ¼ to 9, 17, 29, and 63 carats, and from the third from ¼ to 6, 10, and 18 carats. I saw 90 diamonds belonging to the King Williamstown party from ¼ to 3, 5, 9, and 30½ carats, the lot valued at £6,000. The Natal party have a 40-carat diamond worth £9,500. They obtained 52 in all, but larger than the other parties, and the value of the lot is about £20,000. We found about 600 miners on this side; they had elected a commandant (Mr. Parker, who was formerly a trader) and a Committee of Safety, consisting of twelve miners. The ownership of the country was in dispute between the Transvaal Republic, Orange Tree State, and several native chiefs, but the miners do not recognize either of these parties, and they speak strongly of erecting a 'Diamond Republic' of their own.

HOW THE DIAMOND MINERS WORK.

"Most of the miners work in this manner: They first dig the gravel to the bed or to clay (generally from six inches to three feet in depth), then with a meal sifter they sift the dirt and throw out all large stones. The middling dirt, or pebbles, they cart to the Vaal River, about, on an average, 500 yards from the mine, and there wash it in a California gold cradle; they then lay the washed pebbles on a table, and carefully sort a handful at a time with a scraper; by this means they get through about two cart-loads of sifted 'cascalho' a day. Some carry the water up to the mine, and after the dry sifting of the dirt, they dip the sieve in the water and wash the pebbles.

THE CALIFORNIAN IMPROVEMENT.

"A few days after our arrival, I invented a shaking table for dry sifting, the top sieve of ¼-inch holes, and the bottom sieve of $\frac{3}{16}$-inch holes; the top sieve is inclined one way about twenty-five degrees, so that all the large stones will fall off by the shaking. The bottom sieve is longer than the top one, and inclined twenty-five degrees in the opposite direction; the dirt and gravel that pass through the top sieve fall on the second one, and the dirt passes through and the gravel to wash passes out at the end, and is carted to the river for washing. I could put through sixty cart-loads a day with this medium, and concentrate it to twenty cart-loads of gravel—but two men can only sort out four cartloads of gravel in ten hours after it has been washed, and we do not put more than twelve cartloads through in a day in consequence of this. We are now teaching some of our negroes to 'sort,' and we will put more ground through presently.

WHAT THE ROUGH DIAMOND LOOKS LIKE.

"We find that the blacker the negro is the more honest he is; whenever they get a little white blood in them they will steal; we try them by dropping a piece of cut alum into the machine, and it exactly resembles a rough diamond. We can tell who is honest and who is not by the return or non-return of it on the tables. On the first day of our washing we obtained a 1¾-carat diamond, slightly off-colored, but good shaped and nearly round, valued at £8. We worked this claim out and got nothing more. We tried our several other claims on that side of the river with no success, although diamonds were found all around us. We worked three on that side of the river without further success, and then having obtained permission from Mr. K., the missionary, to mine on the Pruel farm, we moved over here, and the first day's washing we found two beauties of ¾ and ¼ carats. I also discovered a secret in diamond mining on this side of the river, that I shall divulge only to the company that is being raised in New York to work a certain diamond farm by a wholesale system. I am quite satisfied with this side of the river and the claim that I have. All that I need now is a 'sorting machine,' that will 'sort' as fast as I can put the 'cascalho' through the washer."

The Lumber Pile on the Roof.

We watched with painful interest last summer, the erection of the Mansard roof on the Grand Central Hotel, recently erected on Broadway between Bleecker and Amity streets. It is an immense pile of combustible material, and should it ever take fire, it will burn like tinder. Apropos of this and other similar errors in building which are constantly committed, we find the following forcible remarks in *Major and Knapp's Illustrated Monthly*, which we commend to the attention of architects, real estate owners, and underwriters:

At the recent conflagration in Chicago, which destroyed the Farwell block of buildings, the chief of the fire department is said to have exclaimed, as the flames burst forth from the immense Mansard roof, "Great God! when will the people of Chicago stop putting such lumber piles on the top of their fine buildings!" The flames had possession of the most combustible as well as least accessible part of the building. From the foundation to the cornice, the walls were of incombustible material. Above the cornice the "lumber pile" of ornamental roof was furiously blazing.

Investigation into the construction of this building and the reasons for it, revealed the fact that the suggestion had been made to the architect to run the walls up to the top of the roof, instead of putting on the uppermost story of "Mansard." But he and the people for whom he was designing the edifice, agreed that it would not look so well in that way. Accordingly the combustible arrangement was decided on, erected, and eventually consumed.

There are hundreds of fine looking buildings in great cities which are in this respect nothing but tinder boxes. The foundations are deep, the walls are solid, of stone, brick, or iron, and in many cases with costly and elaborate decorations of carving, casting, or sculpture. But, surmounting all this elegant and substantial pile, is a timber roof after the Mansard pattern, stretching up into the air to the extent of one or two stories, sometimes capped with an observatorial tower or turret. Lightly framed, covered with weather-boarding, and veneered with pieces of slate beautifully arranged in squares, crescents, stars, or other devices, the external appearance of such a roof is graceful, and gives appearance of incombustibility. But it has proved the destruction of many a building which it has ornamented.

If people must have Mansard roofs, why should they not be of incombustible material? Instead of being framed on light timber, let the frame work be of iron. Instead of using weather-boarding, covered with shingles, slate, or tin, let large slabs of slate be attached to the iron frame work. This would give the requisite strength, solidity, and beauty. Such a roof would be somewhat more costly than one of the objectionable tinder box kind, but would be worth something. The tinder box sort is not only worthless, but is an element of danger to the building of which it is a part, and of the surrounding buildings.

Situated as the roofs of our high buildings are, out of reach of most of the streams of water which can be thrown in case of fire, it is of the first importance that they should be constructed of absolutely incombustible materials.

The same is true of cornices. A stone cornice is both heavy and expensive. A substantial stone building is often finished with a wooden cornice, nicely painted to match the stone it is intended to imitate. The counterfeit escapes detection when viewed from the street; but in case of fire the hollow thing is soon in flames, sometimes carrying destruction far beyond the building in which the fire has originated, and involving the combustion of a whole block of buildings, where the flames might otherwise have been stayed with the destruction of one.

Fire insurance companies cannot be too careful about taking risks on buildings which have these incendiary roofs and cornices. To avoid them altogether would exercise a wholesome influence on builders. Galvanized iron furnishes such a practical and inexpensive substitute for a wooden cornice, and slate makes such a good roof, that there is no apology for surmounting our high building, or indeed any building, with tinder boxes which, in case of fire, are sure to deal out death and destruction to all who are near them.

How to Make Good Butter in Winter.

We find in the *Prairie Farmer* the following directions for making good butter in winter, an operation which is seldom performed in the country.

The month of June, says that journal, all things considered, is regarded as the best month in the year for manufacturing butter. This is due to a combination of circumstances. Drought seldom commences that early in the season; accordingly, both feed and water are abundant. The grasses, which are the natural food of cattle, are then in a state to furnish, not only the most food, but that of the best quality for producing rich milk. The insects which are so troublesome later in the season have not made their appearance in large numbers. The air is not tainted with bad odors, as it is later in the season. The temperature is very favorable to the rising of cream; neither so warm as to cause the milk to sour quickly, nor so cold as to prevent the separation of the oil globules.

Another season very favorable to the production of good butter is the early fall. At this season we ordinarily have rains that bring up the grasses to something like the plenteousness they gave us in the spring. Many of the insects so plenty in mid-summer have disappeared, and the temperature throughout the day is more uniform. When winter arrives, however, the quantity of the butter is greatly lessened, and in quality much inferior. In truth the chemical composition of the butter is considerably changed. The ingredients are different, not in kind, but in quantity. Olein, which is the softer fat in butter, is much more plentiful in summer butter than in that made in winter. The color of winter butter is also different from that made in summer. The former is almost white, while the latter is golden.

The unfavorable condition and appearance of winter butter are partly owing to causes that we cannot control and partly to causes that we can, in a measure, obviate. Dry food will produce less olein than fresh green food. We, however, can prevent a very great diminution of this fat, by cutting our grasses earlier and curing them so that they will retain all their natural juices and their aromatic qualities. We can prevent the lessening of the quantity of milk to the extent that usually happens by keeping our cows as well supplied with food and drink as they are in summer when they can feed at will, and can procure water whenever they wish. Giving cows food and drink only after long intervals of fasting have a most injurious effect on the secretion of milk.

The cause of butter being light colored in winter is, doubtless, due to two causes. The olein is of darker color than the other ingredients of the butter, and the more scanty it is, the paler will be the color. The chief cause, however, of winter butter being so light colored is due to the cream becoming bleached before the butter is churned. Cream has its richest color when it first rises to the surface, and if it is churned in that condition the butter will be yellow. If it remains, however, exposed to the light, particularly if the temperature changes, the rich yellow color disappears, until it will be found to be impossible to produce golden butter from white cream. Let any one try the experiment of taking some yellow cream with a little milk below, and let this remain for two days more in a glass vessel, and mark the changes that take place in the color. At first the line between the cream and milk is very distinctly marked; but after a little the cream has become bleached to such an extent that it cannot be distinguished from the milk in color. Winter butter is white, then, because the cream is ordinarily kept too long before it is churned. It is very hard to obviate this difficulty in small dairies, particularly when the cows are so poorly provided for that their milk becomes very scanty. It is, doubtless, better even if the supply of cream be small, to churn as often as we do in summer, using a churn proportionately smaller.

Winter butter has a poorer flavor than grass butter from a variety of causes. The food the cows eat is devoid of the agreeable taste common to the grasses while growing or in blossom. Besides this, the milk is too often kept in a room the atmosphere of which is foul from the odors arising from cooking. The milk, at such times, acts the parts of a disinfectant, and carries the stench of the kitchen into the cream pot, and from thence to the butter jar.

Good butter can be, and often is, made in winter; but it is only done by having all the circumstances surrounding the cows—the milk-room and churning—as nearly as possible like those in summer. The cows must be fed on food rich in sugar, and never be stinted in amount. The milk must be set in a room, the air of which is pure, and the temperature of which does not greatly vary. And lastly, the cream should be churned when it is not above twenty-four hours old.

The Tupper Grate Bar—A Correction.—The grate bar favorably noticed on page 265, current volume, was exhibited at the Fair of the American Institute, not by *Wm. W. Tupper*, as therein stated, but by *L. B. Tupper*, of 120 West street, New York. This bar has been used at the Cincinnati Industrial Exposition, which before its introduction could not get steam to properly drive the machinery on exhibition, but afterwards had more than was required. The exhibitor was, in virtue of this successful trial, awarded a silver medal.

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Inventions Examined at the Patent Office.—Inventors can have a careful search made at the Patent Office into the novelty of their inventions, and receive a report in writing as to the probable success of the application. Send sketch and description by mail, inclosing fee of $5 Address MUNN & CO. 37 Park Row New York.

Business and Personal.

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

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Wanted—The Address of parties manufacturing small articles in sheet or white metal. J. W. Durham, Ripley, Tenn.

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Wanted to purchase—A new or second-hand Steam Calliope. Address Vanduzen & Tift, Cincinnati, O.

For Sale—The Best Bung-cutting Machine in the World. Address N. J. Templeton, Cincinnati, Ohio.

Boring Bit.—For sale, a half-interest in the Patent, or the right to manufacture on Royalty. For description, see Scientific American for July 16, 1870. For particulars address Daniel Kelly, Muskegon, Mich.

To Cure a Cough, Cold, or Sore Throat, use Brown's Bronchial Troches.

Crampton's Imperial Laundry Soap, washes in hard or salt water, removes paint, tar, and grease spots, and, containing a large percentage of vegetable oil, is as agreeable as Castile soap for washing hands. "Grocers keep it." Office 84 Front st., New York.

Dickinson's Patent Shaped Carbon Points and adjustable holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24th, and Nov. 20, 1869. 64 Nassau st., New York.

Peck's patent drop press. Milo Peck & Co., New Haven, Ct.

Peteler Portable R. R. Co., contractors, graders. See adv'ment.

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Low Prices—No Risk—Full Guarantee.—For Price List of Genuine Waltham Watches, which can be sent by express to any part of the country, write to Howard & Co., 785 Broadway, New York, stating you saw this in the Scientific American.

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Practical Treatise on Soluble or Water Glass, just published. Price $1 20, mailed free, by L. & J. W. Feuchtwanger, Chemists and Drug Importers, 55 Cedar st., New York.

Parties in need of small Grey Iron Castings please address Enterprise Manufacturing Co., Philadelphia.

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For Sale—One half the interest in McGee's Patent Self-boring Faucet. Address T. Nugent, Morristown, N. J.

Pictures for the Drawing Room.—Prang's "Lake George," "West Point," "Joy of Autumn," "Prairie Flowers." Just issued. Sold in all Art Stores. "Three Tom Boys." "Bethoven," large and small.

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For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

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To ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's manufacturing news of the United States Terms $4·00 a year.

Facts for the Ladies.

After using my Wheeler & Wilson Sewing Machine for ten years, I feel that I cannot say enough in its praise. I have found it everything you represented it to be. I have never spent one cent for repairs, and now recommend it cheerfully as the best machine patented. S. A. SMITH.
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Answers to Correspondents.

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

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

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

J. S. K., of Ala.—The horse power of boilers, all other things being properly proportioned, depends upon the area of fire surface. The horse power of engines is determined by multiplying the mean effective pressure, per square inch, in the cylinder in pounds, by the area of the piston in square inches, multiplying the product by the speed of the piston per minute in feet, and dividing the last product by 33,000. You will now see that your question in its present form cannot be answered.

W. H. B., of Mass.—Everything else being equal, the power of a screw driver will not be increased by making the bit forked, and separating the two prongs to as wide a distance as the heads of the screws to be inserted will permit. No advantage of any kind will be gained by such a construction, while the positive disadvantages of lessened strength of bit, and smaller bearing on the head of the screws, will be sustained.

F. M. W., of Ala.—We have discussed the subject of kerosene lamp explosions over and over in these columns, and no regular reader of this journal for the last two years need have any justification for ignorance on this subject. We have also given time and time again tests for adulterated and dangerous oils, and do not think it necessary to repeat what we have said at present.

A. M. T., of Mass.—Your reasoning is correct, the pressure of the atmosphere upon the surface of the earth is not equal to its entire weight, but is equal to the weight of a column of air, having one square inch of base, and extending to the outside limit of the atmosphere, multiplied into the entire area of the earth's surface in square inches.

B. K., of Pa.—The fly-wheel gives no increase of mechanical power to any machine, on the contrary it subtracts power by the friction of its bearings. It is simply a reservoir storing up power where there is a surplus over that needed to perform the useful work, and imparting the power again when needed, thus giving adaptibility but not mechanical power to machines.

J. B., Jr., of Ohio.—Carrier pigeons are not trained to carry messages. Their instinct guides them unerringly to the place where they were reared. They are taken from their wonted abodes to the places from which they are desired to carry messages, and the message being tied to their bodies in such a way as not to obstruct their flight they are released. As soon as released they rise high in the air, fly around in a circle, and at last strike off in the direction of their former homes which they generally reach.

F. S. H., of Mass.—You can make cloth waterproof by varnishing it with linseed oil, or coating with solution of rubber in naphtha. You can keep steel and iron from rusting on exposure to salt air, by coating them with mercurial ointment.

N. P. A., of N. Y.—We do not think your invention would prove valuable. Sulphurous acid is used for many other bleaching operations besides bleaching woolens, and is of special value in bleaching straw goods.

F. T., of La.—You will find the information you seek in regard to screw-cutting lathe gear, in "Campin's Practical Treatise on Mechanical Engineering," published by Henry Carey Baird, 406 Walnut Street, Philadelphia, Pa., 1870.

J. G. T., of Texas, has a shot gun which scatters too much, for which he seeks a remedy. He also wants to know whether large shot scatter more than fine, and what is the most approved length for a shot gun.

J. E. D., of N. Y.—We think the improvement in stove-pipes, suggested by you, would be useful and patentable. It would be well, however, to test it by practical experiment before expending much money upon it.

F. S. P., of Ga.—"Bourne's Catechism of the Steam Engine," published by D. Appleton & Co., of New York, is a good work for a beginner.

J. H. M., of N. Y., wishes counsel from practical forgers, which will enable him to temper articles of thin sheet steel without their warping.

W. A. M., of Pa., wishes to know how eyelets, etc., for shoes, are colored black, in large quantity, and cheaply.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

Sewing Machine.—William R. Landfear, Hartford, Conn., has petitioned for the extension of the above patent. Day of hearing Dec. 7, 1870.

Arrangement of Railroad Platform Scales.—Samuel G. Lewis, Philadelphia, Pa., executor of Lea Pusey, deceased, has petitioned for an extension of the above patent. Day of hearing Dec. 7, 1870.

Cultivator Teeth.—James P. Cramer, Schuylerville, has applied for an extension of the above patent. Day of hearing Dec. 21, 1870.

Milking Shields.—Orwell H. Needham, New York city, has petitioned for an extension of the above patent. Day of hearing Dec. 21, 1870.

Operating Slide Valves of Steam Engines.—Robert H. Fletcher, Brooklyn, N. Y., has petitioned for the extension of the above patent. Day of hearing Dec. 21, 1870.

Cribs for Horses.—Henry Eddy, North Bridgewater, Mass., has petitioned for an extension of the above patent. Day of hearing Dec. 21, 1870.

Mode of Lathing and Plastering.—John G. Vaughan, Middleborough, Mass., has applied for an extension of the above patent. Day of hearng Dec. 28, 1870.

Machine for Paring and Slicing Apples.—D. H. Whittemore, Worcester, Mass., has petitioned for an extension of the above patent. Day of hearing Dec. 28, 1870.

Sewing Machines.—Albert F. Johnson, Parkville, N. Y., has applied for an extension of the above patent. Day of hearing Dec. 28, 1870.

Recent American and Foreign Patents.

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

CORN PLOW.—John A. Walter and Eli Bushman, White House, Pa.—The object of this invention is to improve the construction of corn plows so that they can the more conveniently be adjusted for the different operations required of them. To this end the shovel standards are provided with a joint which makes the lower end of the same to be turned back out of the way when it is desirable to use only one or two shovels.

FAUCET.—Abel Putnam, Jr., Saratoga Springs, N. Y.—This invention relates to that class of faucets used in connection with vessels containing beer, soda water, and other liquids, and compressed air, carbonic acid gas, or other expansive gas, and it particularly relates to the class of such faucets in which a plug containing a passage for the fluid, a valve to close it, and an air vent, is inserted into the barrel or vessel, and is operated in connection with a detachable spigot. The invention consists in the means for readily effecting a communication between the air vent of the plug and that of the spigot when the latter is in use, and the combination therewith of the spring valve and other parts of the plug.

SMOKE STACK.—Eugene Fontaine, Fort Wayne, Ind.—This invention consists in securing a cylinder with or without an outside flange to the pipe within the head of the stack, and arranging it in combination with an inverted flanged cone, in such a manner that the sparks from the fire-box are carried up through the said cylinder by the steam from the exhaust pipes of the engine and striking the cone are thrown down the outside of the cylinder upon the converging bottom of the head of the smoke stack so as to come beneath an opening between the cylinder and the inside pipe, where it is again carried up through the cylinder until it strikes the cone, and is thrown down in the same manner, this operation being repeated until the sparks are extinguished by the steam, and beaten to dust, after which the portion not consumed is finally ejected through the bonnet.

SHELVING FOR STORES.—Richard Murdoch, Baltimore, Md.—This invention has for its object to enable salesmen to lay hold of the goods placed in the higher shelves of stores out of easy reach, without climbing to the same, in order that the surfaces of the walls may be utilized for shelving clear to the ceilings.

CARRIAGE-TOP FIXTURES.—Nathan B. Richardson, Somerville, N. J.—This invention has for its object to improve the construction of carriage tops so as to make them more convenient in use and manufacture, and at the same time, more durable and less liable to injure the cover at the top.

WAGON BRAKES.—Daniel J. Rundell, South Westerlo, N. Y.—This invention has for its object to furnish an improved brake, which shall be simple in construction and effective in operation, being so constructed as to apply the brake shoes to both the front and rear sides of the wheels at the same time and by the same operation.

LAND MARKER.—Arthur C. Smith, Joyner's Depot, N. C.—This invention has for its object to furnish an improved marker for attachment to plows to mark the land for the next row so that the rows may be at an equal distance apart throughout their whole length.

SELF-ACTING SIGNALING APPARATUS.—John Garner Johnson, Coombe Fields, England.—This invention relates to improvements in signaling apparatus for railways, tramways, etc., and consists in improved self-acting apparatus, wherein the signal is thrown up to indicate the passage of a train by a weight let fall by the action of the wheels of the train on a lever and tripping catch when passing the signal, and the said signal is re set by a clock mechanism.

BRIDLE BIT.—F. B. Kalkbrenner, Clinton, Mo.—This invention relates to improvements in bridle bits, and consists in making the part which goes through the mouth in two parts, and joining each part with a pair of lines or check pieces, to one of which it is connected at each end, the said pieces of lines being jointed together, and one pair for the check rein being so arranged that when the said check reins are pulled the devided bit will be separated in such a way as to force the animal's mouth open and prevent him from seizing the bit between the teeth.

GATES.—William C. Hooker, Abington, Ill.—This invention relates to improvements in gate-operating devices such as are intended for opening and closing the gates without dismounting from the horse or carriage, and is similar in some respects to the gate operating apparatus patented, June 3, 1868, No 78,452.

WATER METER.—G. B. Massey, New York city.—The object of this invention is to provide efficient means for measuring water so that the quantity discharged from a service or other pipe may be accurately ascertained and registered, and it consists in operating in a cylindrical chamber, by the pressure of the water, a radial arm or wing, and in opening and closing induction and discharge valve ports, by means of a falling weight, which is raised by the arm or wing, and also in the mode of actuating the register.

GLOVES.—Wm. S. Tooker, Kingsboro', N. Y.—This invention relates to improvements in gloves, and it consists in making the back part for the hand, and wrist and arm of a gauntlet, in one piece of peculiar form, the front of the arm piece, part of the wrist, and the back of the thumb in another piece, and in the manner of combining them with the palm piece for the hand, and the piece for the inner side of the thumb.

GLOVES.—Wm. S. Tooker, Kingsboro' N. Y.—This invention relates to improvements in the manufacture of gloves, such as are made of buckskins, or similar skins, or partly of the same and cloth, and it consists in the form and manner of combining the several parts for economizing the material and labor, and producing neatly fitting gloves.

COMBINED COLLAR AND CUFF BOX.—Jacob C. Bauer, New York city.—This invention has for its object to furnish an improved paper box, designed more especially for containing paper collars and cuffs, but equally applicable for containing collars and cuffs made of other materials, and which shall be so constructed as to contain the collars and cuffs in such a way that they may be conveniently removed when required for use.

HOT-AIR FURNACE.—William James and William James, Jr., Montreal, Canada.—This invention has for its object to improve the construction of hot-air furnaces, so as to obtain a greater amount of heat from the same amount of fuel than is possible with furnaces constructed in the ordinary manner.

PRINTERS' CHASE.—Thomas A. Clements, Little Rock, Ark.—This invention has for its object to so improve printers' chases that the same can be fully adjusted to the types, with the use of the regular square metal furniture, without the use of beveled furniture, quoins, shooting-sticks, or mallets, thereby saving time and labor.

VISE.—H. S. Hildreth, South Adams, Mass.—The object of this invention is to produce a powerful vise of simple construction, which can be used for securely holding articles of suitable shape in any desired position.

LOOM.—Joseph F. Randall, Warren, Ohio.—This invention relates to a new and useful improvement in looms for weaving textile fabrics, but more especially designed for looms used in weaving bagging for baling cotton, and for similar purposes, and it consists in a cylinder for increasing the tension of the thread, as the latter is drawn into the loom, and for affording a continuous motion to the loom, in the process of weaving.

CARRIAGE WHEEL.—Thomas M. Jones and Charles W. Fillmore, Chicago, Ill.—This invention relates to a new and useful improvement in wheels for carriages and wagons, and all wheeled vehicles, whereby the wheels are made stronger and more durable than wheels of ordinary construction.

BLEACHING TOBACCO.—Hugh Mearns, South Fork, Ky.—This invention relates to a new and improved process for the treatment of tobacco, for bleaching it, and consists in, first, sprinkling the tobacco until moist; second, hanging it up in a tight room, and, third, subjecting it immediately while damp to the action of sulphurous acid gas generated in any approved way and admitted to the said room.

OIL CAKE ENVELOPES OR HAIRS.—Cyrus Eskrett and Henry Searle, Kingston-upon-Hull, England.—The inventors construct the envelopes or hairs by fitting together strips or pieces of wood so as to form a corrugated plate or board of a form similar to the face of the hair now in general use for seed crushing and oil-cake making purposes. Each corrugation should be made out of a separate piece of wood placed transversely, and as many such pieces should be put together as may be required to make up the proper length for the size of cake required to be produced by the use of the hairs.

PRINTER'S CHASE.—T. A. Clements, Little Rock, Ark.—This invention consists in constructing the chases in sections, which are connected to each other by means of right and left screws, so that by turning said screws the size of the chases can be adjusted at will.

LEATHER SCOURING MACHINE.—H. C. Havemeyer and D. P. Burdon, New York city.—This invention relates to a new manner of arranging a self-adjusting bed or table under the rotary scouring cylinder of a leather-dressing apparatus, and to a novel method of securing the scouring stones and brushes in alternate rows to the said cylinder.

BARK MILL.—Charles Korn, Wurtsboro, N. Y.—This invention relates to certain additions to the ordinary bark mills now in use, whereby the grinding of the bark to the requisite degree of fineness is facilitated.

WATER WHEEL.—W. V. Martin, Waverly, Ohio.—This invention relates to improvements in water wheels, and consists in an improved arrangement, with the buckets, of the wheel and the bottom of the scroll case, of a vertical ringer band and a horizontal flange for maintaining a tight joint and the case, and confining the water upon the buckets.

APPARATUS FOR DRYING AND PRESSING LARD SCRAPS.—A. K. Howe, New York city.—This invention relates to a new machine for treating the scraps of lard, with a view of extracting from the same all the oily or fatty substances which they may yet contain.

HOE SCRAPER.—R. R. Spedden and H. T. Spedden, Astoria, Oregon.—This invention relates to a new and useful improvement in a scraper for hoes and other such implements or tools, whereby the blades of such implements (more especially the hoe) may be kept clean and in proper condition for use.

SEWING MACHINE TABLE.—E. L. Morgan, Riversville, West Va.—This invention has for its object to provide an attachment to sewing machine tables whereby the same may be properly steadied on uneven floors to prevent the rattle of machinery, the consequent inconvenience of operation, and wearing loose of parts.

LEATHER SCOURING MACHINE.—H. C. Havemeyer and D. C. Burdon, New York city.—This invention relates to a new machine for dressing and scouring leather, and consists in the employment of a hinged scouring bed held by means of uprights against the rotating scouring tool, which is hung in a fixed frame.

FIRE-ARMS.—Peter Schuler, Morris, Ind.—This invention relates to certain new improvements in breech-loading fire-arms and cartridge shells, and has for its object to simplify the construction of the breech-ends of barrels, and economize cartridge shells.

UMBRELLA.—Hugh Keenan, Worcester, Mass.—This invention has for its object to provide a drop-catch on umbrellas, so that the same, when wet, may be taken into church, theater, hall, or parlor, without danger of wetting the floors or carpets.

MACHINE FOR GRINDING SAW BLADES.—Charles J. Gardner, Philadelphia, Pa.—This invention relates to a new machine for grinding the blades of hand or circular saws, of all kinds and sizes, and for grinding the handsaws thin on the back to give them the requisite degree of elasticity.

TYPE SETTING AND DISTRIBUTING MACHINE.—Wm. T. Morgans, Youngsville, N. Y.—The object of this invention is to construct a machine by means of which types or dies for printing can be set up in rows in the requisite succession, by means of pivoted keys, and on which provision is made for instantly and simultaneously redistributing all the characters to their proper places.

NEW MODE OF SHIPPING AND UNSHIPPING SCREW PROPELLERS.—Geo. Leach, Leeds, England.—The object of this invention is to facilitate the shipping and unshipping of the auxiliary screw propellers used with sailing ships for the purpose of assisting them in calms, and on other occasions when their sailing gear is either useless or insufficient.

GATE.—John S. Covell, Salt River, Mich.—This invention has for its object to furnish an improved gate, which shall be so constructed that it may be conveniently raised without unlatching it, to allow it to swing over snow or other obstructions, or to allow small stock to pass beneath it, while preventing the passage of larger animals.

SEWING-MACHINE ATTACHMENT.—W. A. Rayer and W. S. Lincoln, Boston Mass.—This invention has for its object to provide a machine on which goods can be sewed together in a continuous operation, as required in cotton mills, hosiery, and bag manufactories, printing mills, etc. The invention consists chiefly in providing a circular or annular, and, therefore endless rotating guide for and support of the fabric to be sewed. The pieces can be placed against each other on the said endless guide, without interrupting the sewing.

COMPOUND FOR TREATING WOOL.—H. H. Capamagian, Pittsburgh, Pa.—The object of this invention is to provide a simple, cheap, and efficient substitute for the oil now used for preparing wool for picking, carding, spinning, and the other operations to which it is subjected in working into cloth, the oil being objectionable, on account of the difficulty of expelling it from the yarn previous to coloring, or, in case the color is applied to the wool previous to carding and spinning, the liability of removing or damaging the color in expelling the oil.

RECLINING CHAIR.—Emil Bartels, New York city.—This invention relates to improvements in reclining chairs, and consists in a combination with the back, which is hinged to the back part of the seat, and strong posts rising from the front of the seat, of extension arms, pivoted to the posts and the back, and made in two parts, one of which is a notched bar, sliding in and out of the other part, which is provided with a spring catch to engage the notched bar and hold it in the required position, and, in combination with the above, springs are employed to raise the back or throw it forward.

STORE SHELVING.—Robert Pool, New Providence, Tenn.—This invention relates to improvements in shelving for stores, and the like, and consists in an arrangement of the same above the drawers and counters commonly employed at the lower part, so that the upper part of the shelves, above the counter may fold down against the lower part thereof, and be locked or otherwise fastened, to inclose the goods completely, those in the upper part being prevented from falling out by wire cloth, buttoned or otherwise fastened in front, or straps of any kind may be used, and the back part of the shelves being cased up.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

2,491.—ELECTRO-PLATING THE INTERIOR OF LEAD AND OTHER METAL PIPES.—H. E. Towle, New York city. September 15, 1870.

2,531.—VAPOR OR GAS BURNERS.—J. C. Love, Philadelphia, Pa. Sept. 19, 1870.

2,535.—MACHINERY FOR SKIVING AND CUTTING LEATHER.—C. Brown and W. Childs, Montreal, Canada. September 21, 1870.

2,536.—MACHINE FOR HEELING BOOTS AND SHOES.—H. H. Bigelow, Worcer, Mass. September 21, 1870.

2,537.—ROLLING MILLS.—D. I. Jones, Newburg, Ohio. September 21, 1870.

2,557.—STEAM BOILER AND OTHER FURNACES AND STOVES.—J. T. Rich, Philadelphia, Pa. September 23, 1870.

2,571.—WATER GAGES FOR STEAM BOILERS.—L. L. Lee, Milwaukee, Wis. September 26, 1870.

2,580.—REFINING CRUDE CAST IRON FOR FOUNDERY AND OTHER PURPOSES.—James Henderson, New York city. September 29, 1870.

2,602.—SIGNALS AND SIGNALING.—James Gordon, San Francisco, Cal. September 30, 1870.

2,633.—COMBINED LIFTING AND FORCE PUMPS.—I. H. Guston, Middletown, Ind. October 4, 1870.

Official List of Patents.

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

108,749.—FRICTION PULLEY.—Edwin F. Allen (assignor to himself, Charles Campbell, and Elmer A. Beaman), Providence, R. I.

108,750.—RECLINING CHAIR.—Emil Bartels, New York city.

108,751.—COMBINED HYDRANT AND FIRE PLUG.—Frederick Banschtiiker, Washington, D. C., assignor to himself and F. Gentner, Philadelphia, Pa.

108,752.—CURTAIN FIXTURE.—Richard Beal, Commerce, Mich.

108,753.—CHEESE PRESS.—G. B. Boomer, T. G. Morse, and Rufus E. Boschert, Phœnix, N. Y.

108,754.—HOT AIR FURNACE.—Royal F. Brown, Chicago, Ill.

108,755.—MUFF, COLLAR, AND CUFF BOX.—John C. Budd, New York city.

108,756.—COMPOUND FOR TREATING WOOL.—Hagop H. Capamagian, Pittsburgh, Pa.

108,757.—WATER WHEEL.—Joel T. Case, New Hartford, Conn.

108,758.—THREAD-WINDING MACHINE.—Dwight M. Church, Holyoke, Mass.

108,759.—PRINTERS' CHASE.—T. A. Clements, Little Rock, Arkansas.

108,760.—PRINTERS' CHASE.—T. A. Clements, Little Rock, Arkansas.

108,761.—CURTAIN FIXTURE.—Wm. C. Clover (assignor to Henry E. Clover), Brooklyn, N. Y.

108,762.—TINSMITHS' FURNACE.—Michael Conner, Plymouth, Mich.

108,763.—SLIDING DOOR.—L. A. Cook, Concord, Mich.

108,764.—GATE.—John S. Covell, Salt River, Mich.

108,765.—SOAP DISH AND BRUSH RACK.—Archibald Crawford, Albany, N. Y.

108,766.—LINE AND WIRE TIGHTENER.—Theophilus Crosby, Manchester, Iowa.

108,767.—LOCK FOR SLIDING DOOR.—John Davidson, Albany, N. Y.

108,768.—BROILER.—Alexander Dick, Buffalo, N. Y.

108,769.—MACHINE FOR BREAKING STONE.—Andrew Dietz, New York city.

108,770.—LOCK.—C. D. Dickerman, Boston, Mass. Antedated Oct. 28, 1870.

108,771.—PLOW JOINTER.—Daniel Dillenback, Galesburg, Mich.

108,772.—BALING PRESS.—George Duncan, San Francisco, Cal., assignor to himself and William Blackmore.

108,773.—FERMENTING ALCOHOLIC LIQUORS FROM GRAIN.—Joshua Ellingwood, Owensborough, Ky.

108,774.—OIL-CAKE ENVELOPE.—Cyrus Eskrett and Henry Searle, Hull, England.

108,775.—MACHINE FOR GRINDING SAW BLADES.—Charles J. Gardner, Philadelphia, Pa.

108,776.—CLOTHES-LINE HOOK.—James Garvey and Matthew H. Kimball, San Francisco, Cal.

108,777.—SPRING SEAT FOR RAILWAY CARS.—T. J. Gifford Salem, Mass.

108,778.—SASH FASTENER.—William Gorman, New Britain, Conn., assignor to Russell and Erwin Manufacturing Co.

108,779.—MACHINE FOR MOLDING EARTHENWARE.—Thomas G. Green, Church Gresley Pottery, England.

108,780.—MILK WAGON.—Benjamin B. Gudge, Chicago, Ill.

108,781.—TESSELATED FLOOR.—Lavinas B. Hamilton, Boston, Mass.

108,782.—LEATHER-SCOURING MACHINE.—H. C. Havemeyer and D. P. Burdon, New York city.

108,783.—LEATHER-SCOURING MACHINE.—H. C. Havemeyer and D. P. Burdon, New York city.

108,784.—VISE.—R. S. Hildreth, South Adams, Mass.

108,785.—PRINTING PRESS.—R. M. Hoe and S. D. Tucker, New York city.

108,786.—GATE.—W. C. Hooker, Abington, Ill.

108,787.—RUFFLER FOR SEWING MACHINE.—C. W. Howard, Philadelphia, Pa.

108,788.—APPARATUS FOR DRYING AND PRESSING LARD SCRAPS.—A. K. Howe (assignor to himself, H. E. Donor, and E. Purdy) New York city.

108,789.—RAILWAY CAR AXLE LUBRICATOR.—Charles Hyatt (assignor for two thirds of his right to J. N. Milehan and E. Schlenker), Buffalo, N. Y.

108,790.—HOT AIR FURNACE.—William James and William James, Jr., Montreal, Canada.

108,791.—STREET AND STATION INDICATOR.—Geo. A. Jenks and John J. Fawcett (assignors to themselves and Joseph Hampson) Chicago, Ill.

108,792.—TIME SIGNALING APPARATUS FOR RAILROAD.—J. G. Johnson, Coombe Fields, England.

108,793.—APPARATUS FOR EVAPORATING AND CONCENTRATING BARK EXTRACTS, ETC.—T. W. Johnson, Jr., and A. W. Goodell New York city.

108,794.—CARRIAGE WHEEL.—T. M. Jones and C. W. Fillmore, Chicago, Ill.

108,795.—BRIDLE BIT.—Frederick B. Kalkbrenner, Clinton, Mo.

108,796.—GRATE BAR AND BEARER.—William Kearney, Belleville, assignor to himself and A. D. Graham, Newark, N. Y.

108,797.—SAWING MACHINE.—George W. Kearns, Lilleyville, Pa.

108,798.—DRIP CATCH FOR UMBRELLA.—Hugh Keenan, Worcester, Mass.

108,799.—DIVIDER AND CALIPERS.—G. W. Lane (assignor to E. R. Newell), Plantsville, Conn.

108,800.—SHIPPING AND UNSHIPPING SCREW PROPELLER.—George Leach, Leeds, England.

108,801.—PLANING MACHINE.—Thomas Llewellyn, London, England.

108,802.—FIX FOR PUDDLING FURNACE.—Charles S. Lynch, Boston, Mass.

108,803.—MACHINE FOR JOINTING STAIR RAILS.—John B. Margeson, Lynn, Mass. Antedated Oct. 29, 1870.

108,804.—LIQUID METER.—Gideon B. Massey, New York city.

108,805.—APPARATUS FOR GIVING FORM TO WOOD.—G. R. Mather, Wellingborough, England.

108,806.—MANUFACTURE OF GOLD FOIL FOR DENTAL PURPOSES.—Urial R. Mayo, Boston, Mass.

108,807.—WEIGHING SCALE.—Wm. H. McCormick (assignor himself and John T. Williams), Muncie, Ind.

108,808.—BLEACHING TOBACCO.—Hugh Mearns, North Fork Ky.

108,809.—MEAT CHOPPER.—G. H. Mellen, New York city.

108,810.—DUMPING CAR.—William Merrington and Nathan Kirkwood, McKeesport, Pa.

108,811.—MEDICINE OR PAIN REMEDY.—J. J. Mills and William Perry, Frederick's Hall, Va.

108,812.—SEWING MACHINE TABLE.—E. L. Morgan, Riversville, West Va.
108,813.—MACHINE FOR PREPARING STEREOTYPE MATRICES.—W. T. Morgans, Youngsville, assignor to himself and Isaac Anderson, Jeffersonville, N. Y.
108,814.—PILE FOR ENGINEERING PURPOSES.—T. W. H. Moseley, Boston, Mass.
108,815.—SCREW-CUTTING DIE.—Nels Nelson, Galesburg, Ill.
108,816.—MANUFACTURE OF ICE.—S. J. Newsham, Mont Clair, and W. H. Haines, and W. S. Henson, Newark, N. J.
108,817.—CLUTCH GEARING.—Ezra Nicholson, Cleveland, Ohio. Antedated October 26, 1870.
108,818.—CLOTHES DRYER.—Abiel O'Dell, Napanee, Canada.
108,819.—FOLDING WINDOW BLIND.—F. R. Osgood, Grand Rapids, Mich.
108,820.—MACHINE FOR DRESSING HOOPS.—Joseph Penney, Rochester, N. Y.
108,821.—PREPARING COTTON WASTE FOR CLEANING MACHINERY.—Anthony Peple, Billerica, Mass.
108,822.—MACHINE FOR GRINDING AND POLISHING METAL.—J. H. Pitkin and J. S. Lane, Akron, Ohio.
108,823.—STORE SHELVING.—Robert Poole, New Providence, Tenn.
108,824.—FAUCET.—Abel Putnam, Jr., Saratoga Springs, N. Y.
108,825.—CAR WHEEL.—John Raddin, Lynn, Mass. Antedated October 19, 1870.
108,826.—WARP-TENSION MECHANISM FOR LOOMS.—J. F. Randall, Warren, Ohio.
108,827.—SEWING MACHINE.—W. A. Rayer and W. S. Lincoln (assignors to themselves and A. B. Lincoln), Boston, Mass.
108,828.—LOW-WATER INDICATOR.—Frederick Raynsford (assignor to himself and C. L. Bouchard), Grand Rapids, Mich.
108,829.—TRANSPARENT VARNISH.—John Restle, Boston, Mass.
108,830.—RAILWAY CAR BRAKE.—I. L. G. Rice, Cambridge, Mass.
108,831.—CARRIAGE-TOP FIXTURE.—N. B. Richardson, Somerville, N. J.
108,832.—TENT AND UMBRELLA.—John Ritchie and George Ritchie, London, England.
108,833.—COMBINED CULTIVATOR AND SEEDER.—R. I. Robeson and William Nash, Oskaloosa, Iowa.
108,834.—SHOVEL PLOW AND CULTIVATOR.—E. G. Rowell, A. D. Rowell, J. R. Rice, and S. M. Seeley, Hartford, Wis.
108,835.—WAGON BRAKE.—D. J. Rundell, South Westerlo, N. Y.
108,836.—BREECH-LOADING FIRE-ARM.—Peter Schuler, Morris, Ind.
108,837.—COUNTERSINK.—W. B. Shedd, East Boston, Mass.
108,838.—TABLE CASTER.—Daniel Sherwood (assignor to himself, E. P. Woods, and C. H. Latham), Lowell, Mass.
108,839.—HARVESTER RAKE.—D. B. Shirk, Brunnerville, Pa.
108,840.—VISE.—J. E. Sinclair, Worcester, Mass.
108,841.—SUSPENDER.—J. W. Smith, Boston, Mass.
108,842.—LIQUID METER.—W. E. Snediker, New York city. Antedated October 29, 1870.
108,843.—CLEANSING ATTACHMENT FOR HOES.—R. R. Spedden and H. T. Spedden, Astoria, Oregon.
108,844.—CARBURETING ATTACHMENT FOR GAS-BURNERS.—J. H. Steiner, Reading, assignor to himself and Christian Sharps, Philadelphia, Pa.
108,845.—COMPOUND FOR CLEANSING AND PRESERVING THE TEETH AND GUMS.—W. M. Tandy, Carrollton, Ky.
108,846.—FINISHING AND BLEACHING HANDLES, ETC.—D. H. Taylor, Westfield, N. Y.
108,847.—WATCH CASE.—C. L. Thiery, Boston, Mass.
108,848.—GOVERNOR.—J. L. Todd, Newburg, N. Y.
108,849.—GLOVE.—W. S. Tooker (assignor to himself and Elliot Thomas), Kingsborough, N. Y.
108,850.—GLOVE.—W. S. Tooker (assignor to himself and Elliot Thomas), Kingsborough, N. Y.
108,851.—MANUFACTURE OF ICE.—P. H. Vander Weyde, New York city.
108,852.—COOKING STOVE.—G. W. Walker, Malden, Mass.
108,853.—EXPELLING VOLATILE MATTERS FROM PEAT.—T. G. Walker, New York city.
108,854.—PLAITING DEVICE.—William Walker, Brooklyn, N. Y., assignor to G. H. Wooster, New York city.
108,855.—PLATING DEVICE.—William Walker, Brooklyn, N. Y., assignor to G. H. Wooster, New York city.
108,856.—WARPING MACHINE.—James Walmsley and Thomas Walmsley, Blackburn, Great Britain.
108,857.—CORN PLOW.—J. A. Walter and Eli Bushman, White House, Pa.
108,858.—TOILET BOX.—S. W. H. Ward, New York city.
108,859.—MACHINE FOR MAKING WOODEN PINS.—R. H. Watson, Lapeer, Mich.
108,860.—PLOW.—J. W. Webb, Cotton Valley, Ala.
108,861.—MANUFACTURE OF SUGAR.—Arnold Weichert, New York city.
108,862.—METALLURGIC AND OTHER FURNACES.—Theodor Weiss, Dresden, Saxony.
108,863.—HEATING APPARATUS FOR LAMPS.—W. N. White, Winchendon, Mass.
108,864.—BRICK MACHINE.—M. D. Williams, Dakota, Iowa.
108,865.—CORN PLANTER.—Charles Wisdom, Flat Rock, Mich.
108,866.—APPARATUS FOR MAKING CHEESE.—E. L. Yancy, Batavia, and C. E. Dorman, Pembroke, N. Y. Antedated October 29, 1870.
108,867.—PRINTING TELEGRAPH.—G. L. Anders, Boston, assignor to himself and E. B. Welch, Cambridge, Mass.
108,868.—APPARATUS FOR THE MANUFACTURE OF ICE.—Silvester Bennett, Jefferson Parish, La., assignor to M. J. Bujac, New York city.
108,869.—BREECH-LOADING FIRE-ARMS.—Hiram Berdan (assignor to the Berdan Fire-Arms Manufacturing Company), New York city.
108,870.—HEEL FOR BOOTS AND SHOES.—H. H. Bigelow, Worcester, Mass.
108,871.—MEASURING APPARATUS FOR LOOMS, ETC.—John A. Bradshaw and S. L. Crockett, Lowell, Mass., assignor to S. L. Crockett. Antedated October 21, 1870.
108,872.—BUSTLE.—John Broughton, Brooklyn, N. Y.
108,873.—BUSTLE.—John Broughton, Brooklyn, N. Y.
108,874.—AUTOMATIC FURNITURE LOCK.—J. T. Brown and Isaac Hurd, Cincinnati, Ohio.
108,875.—TRY-SQUARE AND LEVEL.—Henry L. Buckwalter Limerick township, Pa.
108,876.—MOUSE TRAP.—John N. Bunnell, Unionville, Conn.
108,877.—WATCHMAKERS' VISE.—Arthur W. Bush, St. Cloud, Minn.
108,878.—DINING TABLE.—Russel C. Case, Guilderland, N. Y.
108,879.—STEREOTYPING.—Alonzo Chace (assignor of one half his right to Ezra Cornell), Ithaca, N. Y.
108,880.—BRICK MACHINE.—Cyrus Chambers, Jr., Philadelphia, Pa.
108,881.—COW-MILKER.—Leighton O. Colvin, Humphreyville, Pa.
108,882.—BREAST PUMP.—Leighton O. Colvin, Newark, N. J.
108,883.—WOOD-SPLITTING MACHINE.—Edward Coogan, Washington, assignor to himself and Joseph L. Simons, Georgetown, D. C.
108,884.—BRIM OF SOFT HAT.—James W. Corey, Newark, N. J.
108,885.—EARTH CLOSET.—Rensselaer A. Cowell, Cleveland, Ohio.
108,886.—SEWING MACHINE.—J. H. Curell (assignor to himself and J. E. Morrisey), St. Louis, Mo.
108,887.—CARD RACK.—John F. Curtis, Chicago, Ill.
108,888.—GAS HEATER.—S. G. Dare, New York city.
108,889.—HAY PRESS.—J. Ham. Davison and T. J. Sasher, Mound Station, Ill.
108,890.—BORING MACHINE.—W. H. Deatrick, Heidlersburg, Pa.
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REISSUES.

4,170.—HASP FOR TRUNK LOCK.—Samuel Croft and John C. Schuellermann, Philadelphia, Pa., executors of Conrad Liebrich, deceased.—Patent No. 10,862, dated May 2, 1854; extended seven years.
4,171.—MACHINE FOR ROLLING CORNICES.—Asa Johnson, Cairo, N. Y., for himself and W. H. Johnson, assignee of Asa Johnson.—Patent No. 18,906, dated December 22, 1857.
4,172.—CORRUGATED IRON BRIDGE.—Richard Montgomery, New York city.—Patent No. 25,210, dated Aug. 23, 1859.
4,173.—FABRIC FOR THE MANUFACTURE OF SHOES, ETC.—E. Waite, Franklin, Mass., assignor of one half-interest to S. M. Weld.—Patent No. 107,642, dated Sept. 20, 1870.

DESIGNS.

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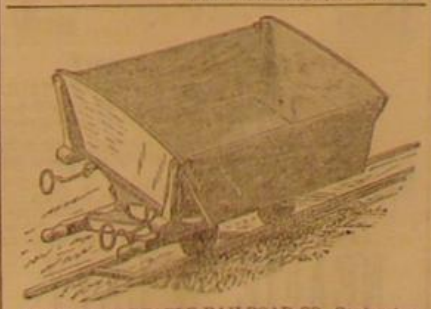
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