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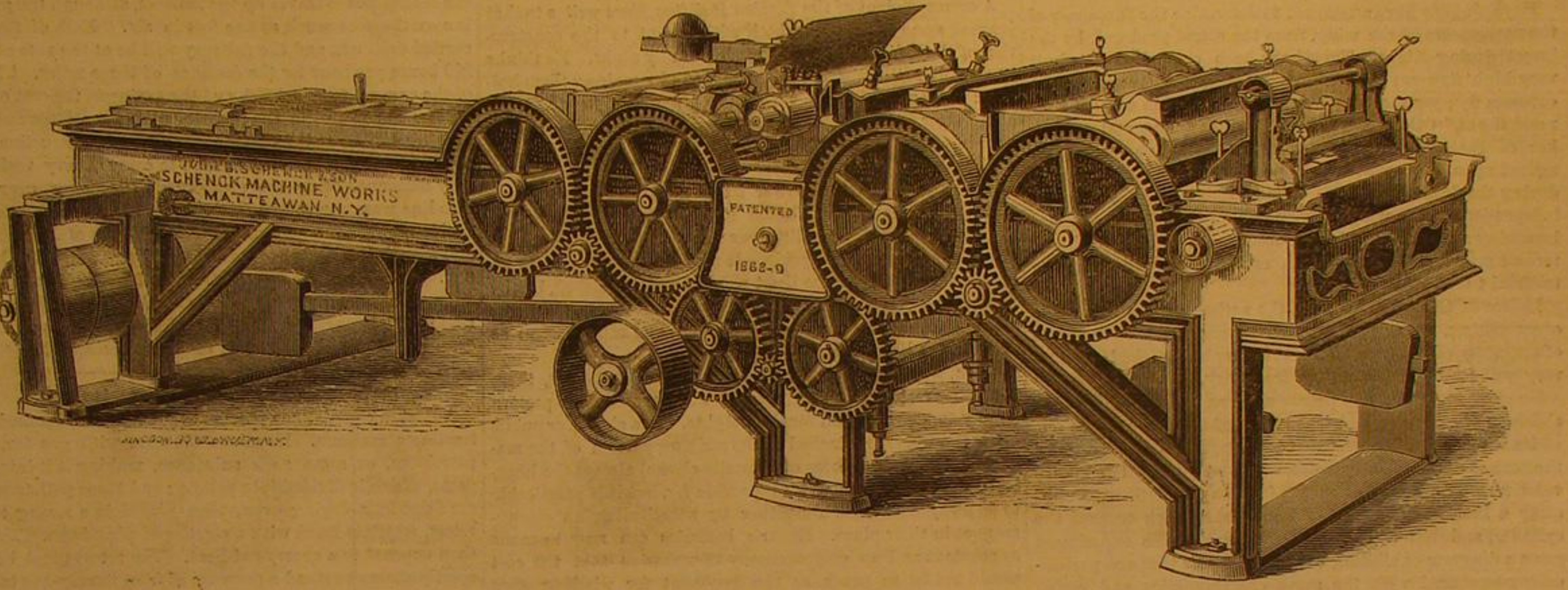
SCIENTIFIC AMERICAN

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

Vol. XX.---No. 16. [NEW SERIES.] NEW YORK, APRIL 17, 1869. $3 per Annum [IN ADVANCE.]

Improved Woodworth Planing Machine.

The Woodworth planer for nearly forty years has been known and used in this country, and has made a name for itself in others. The Woodworth planer occupies the foremost rank among the many labor-saving machines produced by the inventors of the last half century From the experience and skill it has developed, have sprung the molding and tenoning machines, so important among the labor-saving machines used in the building art.



THE IMPROVED SCHENCK-WOODWORTH PLANER.

The Schenck Machine Works, founded in 1832, were the first establishment which made the manufacturing of the Woodworth planer a specialty. The senior of the present proprietors, after an experience of many years in the construction of what has been so long known as the "Schenck-Woodworth planer," has made many valuable improvements in them, for which letters patent have been secured through the agency of the SCIENTIFIC AMERICAN.

The engraving represents their extra No. 1 planer, with eight feed rollers, and an under cutter, so that it planes both sides and matches both edges at one operation.

The improvements made by Mr. Schenck are as follows: A method of adjusting all the top feed rollers simultaneously, preserving their relative positions by means of one crank, by a very simple arrangement, requiring only one screw on each side of the machine; also adjusting the facing cylinder and the pressure bar on the delivering side, as well as the pressure roller on the entering side of it simultaneously, precluding the possibility of lowering the facing cylinder, so as to come in contact with the pressure bar and roller, or of raising the bar and roller so as to come in contact with the knives on the facing cylinder, thus rendering it perfectly safe to adjust the machine so as to receive stuff of any thickness desired while in operation, with no appreciable loss of time.

Another important improvement consists in making the lever which weights the introducing pressure roller adjustable, so that it may be placed (as it always should be) over the middle of the board being planed. This causes the roller to bear evenly on the surface of the board, and prevents it from canting. This pressure roller is raised by, and with the introducing feed roller, always being one-eighth of an inch below it, so that the board, in passing under it, raises it only the one-eighth of an inch, whether much or little is to be planed off. The advantages of this arrangement will be apparent to all in the operation of the planing machine. The most important improvement, however, is the arrangement by which the matching guides and matching head are adjustable across the machine, all being moved by one crank, or the shank of the matcher hanger screw shown in the engraving; the guides being moved by the horizontal shaft, which, by means of the bevel gears, revolves the screw which carries the end of the long introducing guide, and simultaneously adjusts the guides and matcher head, preserving their relative positions to any desired point across the machine. By this improvement, the whole length of the knives is used when narrow stuff is being planed on a wide machine, effecting a great saving of knives, also of time, as the change is made while the machine is running, and with no loss of time. The advantages of this improvement are apparent to every operator. It is very simple and durable, and accomplishes the objects for which it was designed, with great accuracy.

The Messrs. Schenck build a great variety of smaller planers—some for surfacing only—but all combining the same principles of simultaneous, adjustment, which are the leading characteristics of the improved Schenck-Woodworth planers. For descriptive circulars, address John B. Schenck & Son, Matteawan, N. Y.

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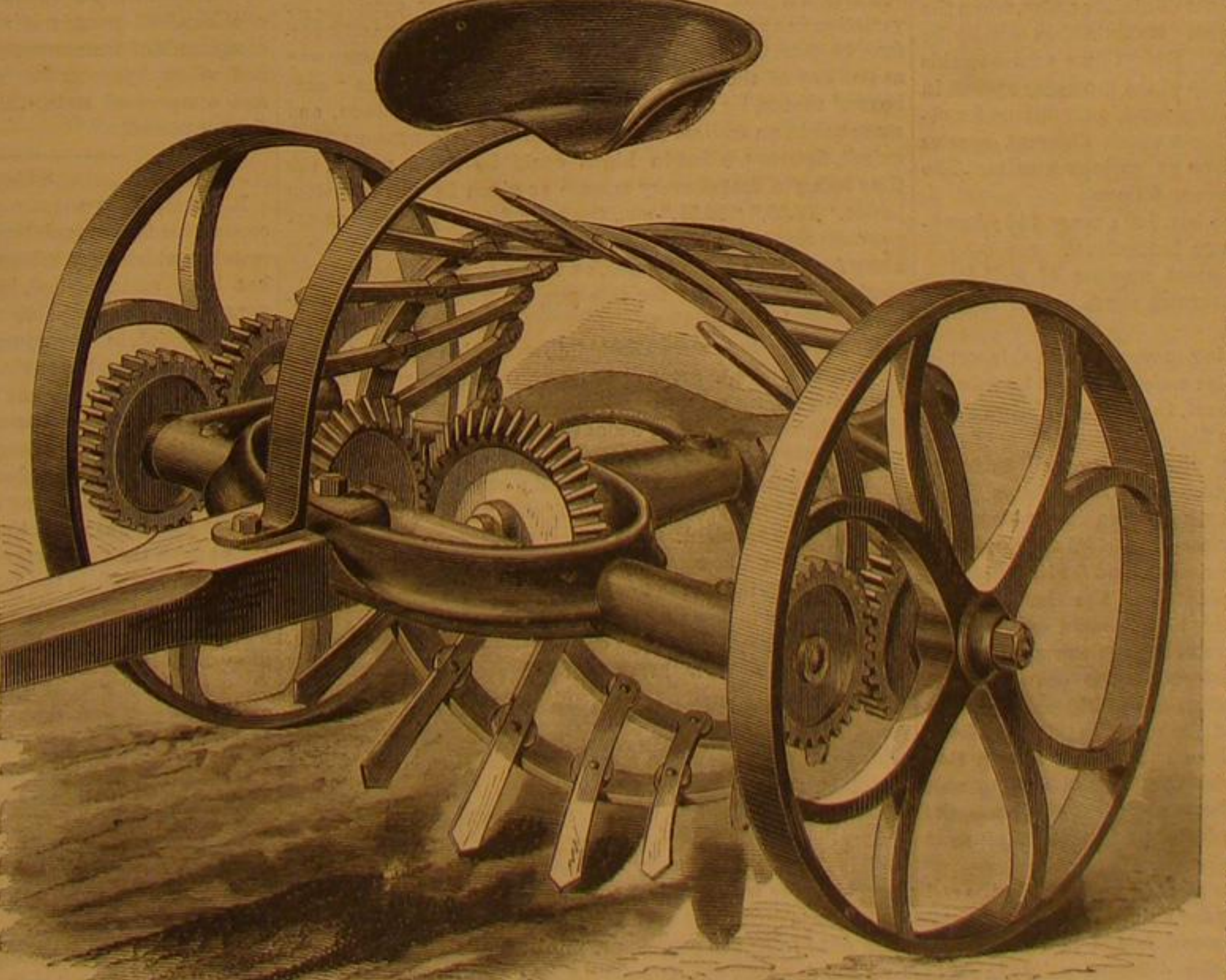
Machine for Digging Potatoes.

The harvesting of that most valuable and popular esculent the potato, is a labor so monotonous and exhausting, that though no one objects to the root, when it appears on the table, in whatever garb, digging potatoes is regarded as quite another thing. So, a machine that will dig the bulb, and save human arms and human endurance the labor, must be acceptable. Such is claimed, by the inventor, to be the machine which the engraving represents.



BAKER'S ROTARY POTATO DIGGER.

It is simply a carriage or frame supported on two driving wheels, and is drawn by a team of two horses, walking on each side of the drill or row of hills. Secured to the driving wheels, and revolving with them, are two gears, engaging with two other gears on a front shaft, carrying, at the center of the frame, a bevel gear that meshes with a similar gear on a shaft in line with the draft pole. This shaft turns in a sleeve forming a portion of the frame of the entire machine, and carries, on its rear end, a cylindrically-shaped frame, the rear of which is open, and the sides of which are spirally-arranged tines, pointed and flaring at the front end, and strengthened by hoops or cylindrical bands.

In operation this basket cylinder revolves, by the draft of the machine over the ground, in a direction with the spiral incline of the bars or tines. The points of these enter the ground to a depth sufficient to lift the roots, this depth being governed by the downward inclination of the tines at their forward or entering end. The forward and rotating movement of the arms of this cylinder, combined with their spiral arrangement, lifts the potatoes from their bed, sifts the clinging soil from them, and deposits them in a regular row. It does not dig the earth as do some other machines intended for the same purpose, but it lifts the tubers, sifts them from the earth, and leaves them clean on the surface of the ground, without plowing. Beside this, it acts somewhat as a plow, cultivator, or harrow, disintegrating the clods, and leaving the soil porous and open for a subsequent crop, or for the action of the frost, preparatory to the next spring's planting. But this preparation of the soil is only secondary to the primary object of the device, which is to lift the potatoes and separate them from the soil. It is intended as a potato digger and not a soil digger.

Letters for information should be ad- dressed to the inventor and patentee, T. Baker, Stillwater, Saratoga county, N. Y.

The Velocity of Insects' Wings During Flight.

The *Comptes Rendus* contains an interesting article, by E. J. Marey, containing the results of an attempt to submit to strict experiment the study of those motions which the eye cannot follow, and the form of which cannot, under ordinary circumstances be discussed, on account of their extreme rapidity. The points to be determined, and the questions to be answered, were:

What is the frequency of the movements of insects' wings? What are the different positions which the wing takes in the different phases of each of its revolutions? By what mechanism does the wing, taking the air for its fulcrum, produce the locomotion of insects?

The results attained have a direct bearing upon the construction of flying machines, and will be perused with interest by aeronauts and those aspiring to be aeronauts.

Physiologists have attempted to determine the frequency of the movements of the wing, from the sound produced by the insect during flight. They have been compelled to admit very high figures; six hundred vibrations a second, for the common fly; yet that number must be tripled in cases of very rapid flight. Other insects must produce a far greater number of beats. Naturalists, nevertheless, have been little agreed upon the cause which produces the sound we hear during the flight of insects. Some authors think the sound independent of the wing movements, produced by a special humming apparatus; it is due, according to others, to the alternate movements of the air, in escaping and entering the tracheal tubes.

In face of these discordances, the author sought for a mode of exhibiting, in an unmistakable manner, each of the beats of the wing of an insect, and the graphic method answers very well for determining their frequency.

He grasped, with a fine pair of nippers, the hind part of the abdomen of an insect, and when it sought to fly, directed one of its wings in such a way, that it rubbed by its point against the surface of a smoked cylinder, which revolved with a known velocity. The wing, at each of these revolutions, carried away a little of the black of the smoke which covered the cylinder, and left a trace of its passage. This experiment gives a diagram exhibiting the varied forms that are periodically reproduced with the same characteristics, and, consequently, correspond to one revolution of the wing. By means of a chronographic diapason, the exact number of the revolutions of the wing which are effected in a second were precisely determined. That which he used, gave a graphic delineation of five hundred simple vibrations per second.

A continual rubbing of the wing on the cylinder, presents a resistance to this organ, which retards its frequency; so in order to have the nearest approach to the truth, those drawings were selected in which the contact of the wing with the cylinder was at a minimum, so that the diagrams were reduced to a series of points.

The frequency of the movements diminishes, also, when the wing is loaded with a little weight. It diminishes equally by fatigue, and the action of cold. Everything occurs in this case, as in the rhythmic movements of the muscular system in different animals. Under equally favorable conditions for observation, the frequency of the beats which different species of insects produce, brings before us curious results. The numbers found for each second are as follows:

Common fly, 330; drone, 240; bee, 190; wasp, 110; hawk-moth, 72; dragon fly, 28; cabbage butterfly, 9.

A more complete study of a great number of well-determined species would, doubtless, furnish much higher figures, as the maximum frequency.

It should be added that the wing movements, in this sort of captivity, on account of the greater resistance, will be reduced in number. The above figures must, therefore, be below those representing vibrations in a free flight.

The graphic method does not answer very well to determine the course of the wing at each of its revolutions. The tracings which the point of the wing of an insect describes in space are inscribed on the surface of an ideal sphere, which has for its radius the length of the wing, and for its center the point at which this organ is implanted in the thorax of the insect. A spherical surface of this nature could only be tangential at one point to the surface of the registering cylinder, and every fuller contact risks deforming the drawing more or less, in reproducing the curvature of the wing. To obtain an exact notion of the course of the wing in space, Wheatstone's optical method was employed. It is well known that this celebrated English physicist terminates vibrating rods with bright metallic balls, whose gleam leaves upon the retina persistent impressions of the periodical movements they execute.

By fixing with varnish a little piece of gold leaf to the end of an insect's wing, and placing the animal in a ray of sunlight, a bright luminous image was obtained in the form of the figure 8, which indicates the different points in space traversed at each revolution, by the gilt spot.

Among different sorts of insects the experiments almost always met with the same form.

Resuming then the graphic method to verify this result, he succeeded in obtaining successively portions of the drawing, in some cases giving the upper loop of the 8, in others the lower, and in others the double point, where is the intersection of the two halves of the 8.

By way of further confirmation, he sought to register the contact of the wing with the cylinder, not only by its point, but by its anterior margin. The theory anticipates that under these conditions the figure 8 ought to disappear, and in its place one should obtain a double contact of the wing with the cylinder. One of these contacts took place at the instant the upper loop of the 8 was formed, and at the point where this loop presents its convexity to the cylinder. The other contact took place where the lower loop was formed under the same conditions.

The author concludes that this complex movement does not result from a series of periodic muscular acts executed by the insect, acts which would produce in one case a simple oscillation in a vertical direction, while in the horizontal direction, other muscles would produce, at the same time, two oscillations. In reality, the insect only executes one movement of lowering the wing, to which succeeds a movement of elevation, and if in consequence of these two contrary movements, the wing is not limited to oscillate in one plane, this results from the resistance of the air, which imposes upon the wing a deviation in each half of its course.

Clocks and Clock Towers.

A correspondent of the *London Building News* writes to that journal some suggestions, both with regard to the construction of clock dials and their illumination by night. He thinks it possible to illuminate the hands alone by making them hollow: in fact, gas tubes with jets of gas close to each other along their entire length, after the manner of lighting to be seen in many places. There would be no difficulty in introducing the gas into the hands, which would by this means be seen as far as the clock tower itself allowed. The figures might be similarly illuminated if considered necessary, but they are really of very little use, the position of the hands alone being a sufficient guide. It may be objected that in an occasional high wind the light would be extinguished, but by having one jet properly protected in the center, the flame would immediately run along the hands, and relight them as often as the light might be extinguished.

Then, with regard to the construction of the towers, there can be no reason why they should all be after one pattern simply to provide room for the weights. In a church or public clock the weights attached to the striking portion of the machinery are (unlike those of domestic clocks) always the heaviest and the most difficult to provide for, but it is practicable to do away with them altogether by substituting an electro-magnet in their place. Electric batteries can now be made so constant and so comparatively inexpensive that the cost would not be so much as the payment for winding often amounts to. The smallest clock in the basement of the tower, or, indeed, in any part of the building, could be made to send the requisite currents both for the "going" and the "striking" parts of the machine. Unsteadiness of the tower would not at all interfere with the performance of the clock.

The suggestion of an oval dial, mooted in a previous issue, is, he thinks, hardly advisable, seeing that it would in effect reduce the diameter of the dial to that of its shorter axis, and as size is tantamount to visibility, the aim is generally to obtain the largest space consistent with the architectural details of the building.

There is a plan, however, which would allow considerable variation in the shape of the dial, and yet, with a smaller surface, be more distinct. It is to show the time in the same way as the day of the week and month are shown in some "date boxes," that is, by the figures being painted on linen, and stretched in an endless coil over rollers. By this means, if required, figures ten feet in hight could be made use of, the time being indicated every minute as given in railway time tables, "12.50," "12.51," etc., the hour figures being in an upper compartment, either immediately over or some distance away from the minute figures, as fancy might dictate. The mechanical apparatus for this purpose would be of the simplest possible description.

If such a scheme were adopted, illumination by night could be effected with the greatest facility. On some portion of the tower gas piping might be arranged, coil within coil, so that all the figures from 1 to 0 should be represented, and then, as each minute passed, by simply turning the proper tap, the requisite figure would be illuminated; one tap being turned on before the other was turned off, the flame would be communicated as required. It is almost needless to observe that the piping could be colored to any required tint to harmonize with the materials of the tower, and, moreover, might be so constructed as to be an ornamental addition.

A New Method of Carriage.

The *London Building News* says an invention of Mr. Hodgson, C.E., was tested lately at Bardon Hill and Markfield, which claims to provide a means for the cheap carriage of minerals, stones, and other substances, far surpassing the cumbrous land carriage system now in use. The inventor claims that, by this system, a way can be constructed very rapidly, that the necessity of leveling the ground, and of bridging over water courses or other obstacles is avoided, and that it costs much less than any other road, varying in price from £250 to £1,000 pounds per mile, to carry from 50 to 1,000 tuns per day over any country, which price includes steam power, rolling stock, and every requisite for work. The cost of transit also is very low, as compared with the expense of carrying on the axle. The system may be briefly defined as a continuous development of the plan now not unusual in India, Australia, and in some mining districts, of bridging over a river or ravine by a single wire, by which, carried in a bucket suspended by a pulley, the necessary loads are transmitted from one point to another. To accomplish (in the words of the inventor) the easy passing of the points of support necessary to carry out a continuous line of communication, and to provide for the distribution of the burden and the application of motive power, have been problems of no small difficulty; but experiments having demonstrated the practicability of this scheme, arrangements were entered into with the proprietors of the Markfield granite quarry.

The line consists of an endless wire rope, supported on a series of pulleys, carried by substantial posts fixed in the form of tripods (varying in hight from 14 feet to 40 feet), which are ordinarily about 150 feet apart, but where necessary much longer spans are taken, in one instance being nearly 600 feet. This rope passes at one of its ends round a drum worked by an ordinary movable steam engine of 16-horse power, and the rope is driven at a speed of about four miles an hour, although when the way is completed six miles and upwards will be attained. The boxes in which the stone is carried are hung on to the rope at the loading end, the attachment consisting of a pendant of groove-like shape, which maintains the load in perfect equilibrium during the whole course of the journey, whether it be traveling up or down the inclines, and at the same time enables it to pass the supporting pulleys freely; and it is a source of wonder to see the ease with which the loaded boxes travel up the inclines, although the gradient is sometimes as much as one foot in six. Each of the boxes carried one cwt., and the delivery will be at the rate of about 200 boxes per hour for the distance of three miles. The cost of the present way is £200, and the saving in the cost of traffic will be 33 per cent to the proprietors, Messrs. Ellis and Everard, in addition to the enormous saving in construction. The scheme is susceptible of extension to carry heavy traffic, the only difference being the providing of stronger gear. The The line was constructed by the Wire Tramway Company, of London, under the personal superintendence of Mr. Hodgson, and with the efficient co-operation and assistance of Mr. Ommanney. The cost of the rope is about 1s. 9d. a foot, and is manufactured at Warrington, being half an inch in diameter. The rent paid to owners of land over which the posts are fixed is 5s. per foot, the whole rent of the course being £25.

Reducing Aluminum from its Ores.

A Boston chemist has patented the following method of extracting aluminum. He mixes alumina with gas tar, resin, petroleum, or some such substance, making it it into a stiff paste, which is divided into pellets; and these pellets or balls are dried in a drying oven, then placed in a strong tube or retort, which is lined with a coating of plumbago. They are then exposed to a cherry-red heat. The retort must be sufficiently strong to stand a pressure of from twenty-five to thirty pounds on the square inch, and be so arranged that, by means of a safety valve or tube, the necessary amount of hydrocarbon gas can be introduced into the retort among the heated mixture, and the pressure of from twenty to thirty pounds on the inch be maintained. Hydrocarbon gas is generated and pumped into the retort, and as it is consumed the supply is maintained. By this process the alumina is reduced and the metallic aluminum remains as a spongy mass, mixed with carbon. This mixture is then remelted with metallic zinc, and when the aluminum has collected in the metallic state, the zinc is driven off by heat. The reduction is due to the action of the hydrocarbon under pressure. The time for reducing one hundred pounds of aluminous earth, cryolite, or other compounds of aluminum, should not be more than four hours; and when hydrocarbon gas can be obtained in a heated and compressed state, the reduction takes place in a still shorter period.

Safety Matches.

It is well known that a great number of serious accidents occur from fire, caused by persons carelessly throwing down matches which they believe to be harmless, because the flame has been extinguished, but which in reality are highly dangerous, and quite capable of communicating fire to any light dry material, in consequence of the wood splint being at a red heat, although not actually in a flame. It has been proposed, in order to prevent this, to saturate the splints (previously to their being dipped), with a solution of any chemical salt which has the property of preventing the wood from remaining at a red heat, after the flame has been extinguished, without being in any way detrimental to the inflammable nature of the splint; and thus to prevent the possibility of accident from the dropping of the match after the extinction of the flame, but while the splint is still at a red heat. The substance which he proposes to employ is alum; though other salts have this same property. The matches before being dipped are to be immersed in a strong solution of alum or other salt with similar action, until they are saturated—they are to be dried and dipped with the ordinary composition. Matches so treated are said to ignite and burn with flame as long, and as readily, as other matches, but the instant the flame is blown out, the match becomes black and perfectly harmless.

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Gold Refining.—Mr. F. B. Miller, an assayer of New South Wales, has recently specified a patent which relates to the refining of gold. The title is "*An improved method of toughening British gold bullion, or refining alloyed gold, and separating therefrom any silver it may contain.*" In his specification, the patentee proposes to effect his desirable object by the employment of chlorine gas or hydrochloric acid gas, applied in such a manner that it shall rise up among and through the alloyed gold in a molten condition, by which means the chloride of silver, and the chlorides of any other metals of baser order which may be present, will be formed, and will rise to the surface of the melted mass, while the gold will remain beneath in a purified and tough condition. The author read a paper upon the subject, before the Chemical Society of London, a few months ago.

EXPLOSIVE COMPOUNDS FOR ENGINEERING PURPOSES.

NO. III.

During the year 1866, a new kind of blasting powder, which promised to supersede gunpowder in mining operations, was introduced to public notice in England. This was the invention of M. Gustave Adolph Neumeyer, of Taucha, Saxony, and to which the term "inexplosive" may appropriately be applied, inasmuch as there is no possibility of its exploding, either during its manufacture, storage, or manipulation. Not until the proper moment of ignition arrives, when it is well rammed home and prepared to do its work, is its energy developed. Then, and only then, it manifests a power, when used weight for weight, considerably in excess of that possessed by gunpowder. M. Neumeyer, all his life connected with the management of quarries, and himself the possessor of a quarry near Taucha, had his attention forcibly drawn to the distressing accidents, which are of such frequent occurrence in blasting operations, and he conceived the idea of producing a blasting powder which should combine the desired degree of strength, with perfect safety when in work. After a long series of trials and experiments, he succeeded in effecting his object, by the invention of a powder which unites in itself the above important qualities. Within two years from the date of his discovery, M. Neumeyer was manufacturing this powder on a large scale; extensive mills with steam power having been erected for its production in the city of Altenburg, and in two other places in Germany.

Although Neumeyer's powder differs in color as well as in action from gunpowder, in that it is slow burning instead of violently explosive when in contact with air, it is composed of precisely the same materials as ordinary gunpowder. To these no other substances are added, the whole secret of the extraordinary result arising simply from the method of proportioning and compounding the ingredients. A reduction is made in the amount of sulphur employed, by which means a much smaller quantity of the noxious vapors is evolved on its ignition than is produced by the combustion of ordinary gunpowder—a point of great importance in underground mining operations. Some difference is made in its preparation, according to the use for which it is required, whether for military or for mining purposes. As a consequence, there results, in the former case, a powder which, when hermetically confined, explodes at the same temperature as ordinary gunpowder, while when prepared and charged for blasting purposes, it requires a somewhat higher temperature. This, so far from being objectionable, is positively advantageous, inasmuch as it makes the possibility of accidental ignition more remote. Bickford's safety fuse, which is now so extensively used in our own and continental mines, is best adapted for the ignition of this powder. Another important feature in Neumeyer's powder is, that although no coating or glaze is imparted to it in manufacture, it is not more hygrometric than ordinary gunpowder, while, if wetted and dried, it is said to retain all its good qualities in full force. Ordinary powder is more powerful as the size of the grain is increased, but Neumeyer's powder, when in a condition of fine dust, is equally if not more efficient than the other. From what has been said, it will be seen that the new gunpowder embodies safety in manufacture, in transport, and in handling, preparatory to actual use; while it has been proved to be superior to ordinary gunpowder, in point of effective power, so that it may fairly be said to be a safe and efficient substitute for our old powder.

In support of the above assertions, both of its inexplosiveness and explosiveness, the author would observe that he has made some trials, which proved conclusively that Neumeyer's powder possessed both those qualities. But as a greater value attaches to trials made publicly, and the results of which have been placed publicly on record, the author prefers to give these in place of his own limited experience of this powder. First, then, as to its inexplosiveness. This was proved by several experiments made in the grounds of the Crystal Palace in December, 1866. The most conclusive test of this quality of the powder was the following:—A small house, 5ft. square, built of brick and roofed with slate, and having two chimneys made of 5-inch drain pipes, was constructed, and in it 35lbs. of Neumeyer's powder, half blasting and half gunpowder, were placed. On firing this mass an immense body of flame issued through the openings in the roof, but the powder simply burned, and moved neither brick nor slate. On 3lbs. only of ordinary gunpowder being placed in the same structure and ignited, a violent explosion took place, which rendered the building a mere wreck

With regard to its explosiveness, the author has a number of authenticated reports of numerous and varied trials illustrative of this quality. A few are selected which have been made in mines and quarries in England. The first trials to be noticed were made on the 4th of December, 1866, at the Bardon Hill and the Markfield Granite Quarries, situated near Leicester, and owned by Messrs. Ellis and Everard. The rock at Bardon Hill, which is of a very hard and stubborn character, was rent and cracked in a most satisfactory manner, and a large quantity of material was thrown down, the results being considered highly successful. At the Markfield Quarry one hole was bored horizontally at the foot of an unbroken face of a large extent of solid rock; others were bored vertically. On firing the horizontal hole, the face of the rock was blown out to a considerable extent in every direction, and an unusually large amount of stone was displaced. The vertical shots proved equally successful, and the results generally were highly satisfactory, the quantity of the new powder used being less than that of ordinary powder required for the same amount of work. In a hard, compact rock, too, such as at Bardon Hill, the effect produced by a given quantity of the new powder is much greater than that produced by an equal quantity in a soft or loose rock. It may be as well to mention here, that, bulk for bulk, Neumeyer's powder, when well tamped, is equally as strong as if not stronger than ordinary powder; while weight for weight, Neumeyer's powder is the stronger of the two. In point of weight, the new powder is one-sixth lighter than the old, which, supposing we take them at even prices, gives over 15 per cent advantage to the former, owing to the fact that bulk for bulk (or one-sixth less weight) gives an equal, if not a superior result, to the best ordinary power.

Having seen the successful action of the powder upon granite, we will now notice its behavior in slate quarries. On the 11th of December, in the same year, five shots were fired at the quarries of the Welsh Slate Company, Rhiwbryfdir, Carnarvonshire. The first shot was in hard rock, the hole being 2ft. 6in. deep, and 1¼in. in diameter; 21in. of the new powder were used, and found to do more work than the same bulk of ordinary powder. The second shot was fired in a hole of the same diameter as the last, but 3in. deeper, cut in the same description of rock; the same depth of powder was used, the result being similar to that obtained with the first shot. Shot No. 3 was in a hole 3ft. 6in. deep, by 1¼in. in diameter, the material bored being pure slate or pillaring rock; the powder filled the hole within 1in., which was occupied with the tamping. The result of this shot was the discovery that the powder was much too powerful—a fault certainly on the right side, and one easily remedied. The next hole was in the same rock as the last, and was 5ft. 8in. deep, with 4ft. 6in. of powder and a light tamping; this gave exceedingly satisfactory results. In another 1¼-inch hole, 4ft. 6in. deep, 2ft. of powder were used, with 2ft. 6in. of hard tamping; the result of this shot was decidedly good, the rock being shattered. On the following day three more experiments were made at the same quarries. With 2ft. 6in. of powder in a 1¼-inch hole, 3ft. 6in. deep, the shot proved much too strong. The second shot was highly satisfactory; but in the third too much power was again developed

The general result of these experiments is to prove that, bulk for bulk, Neumeyer's powder is much stronger than the powder in ordinary use at these quarries, and which was of the very best description. The question, therefore, arose as to how the strength was to be reduced when pillaring. It was proposed to have paper cartridges of much smaller diameter than the holes, and which would hold only about one-third or one-fourth of the present charge of powder. These cartridges, it was believed, would answer the purpose exceedingly well in the pillaring rock, where it was desirable to cleave the slate without fractnre, and would beside produce a very considerable saving of powder.

A few days after the foregoing experiments, a series of trials were made with the new powder at the slate quarries of Messrs. Matthews & Sons, at Festiniog, Merionethshire. Here two holes 2ft. deep, in a hard rock of an underground chamber, each half filled with Neumeyer's powder, and two similar holes in a slate rock, were fired with perfectly satisfactory results. Two more shots in the hard rock of the tunnel were not quite so successful; but it was owned that the tamping had been imperfectly rammed, the man having fired them before they were inspected. The two next shots were stated to have done as much with 11in. of Neumeyer's powder as with 15in. of ordinary powder. In another hole, in very hard rock of the tunnel, the result was completely successful, it being stated that with ordinary powder two holes would have been necessary, or the shot would not have succeeded in effecting the required detachment. A 1¼-inch hole, 8ft. deep in hard rock in the open air, was charged with 4ft. 6in. of powder. This shot was considered very successful, for although not much rock fell, an enormous bulk was loosened, which was readily brought down with a small blast of ordinary powder placed in the rent. Experiments have since been made in various collieries to test the capabilities of this powder in the working of coal, and the results have been exceedingly satisfactory, and have fully borne out the expectations formed. Experiments in the copper mines of Cornwall have also given similar results.

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THE EFFECT OF LIGHT ON MINERAL OILS.

Herr Geotowsky, at a recent meeting of the Society for the Advancement of the Manufacture of Mineral Oils, in Halle-on-the-Saal, Prussia, made some remarkable communications on a new property of photogenic hydrocarbon oils, discovered by by him. In exposing various kinds of such oils to the rays of light in glass balloons, he invariably found that the oils absorbed oxygen and converted it into its allotropic condition, ozone. It was found that the air was even ozonized in well-corked vessels, the effect being to some degree also dependent upon the color of the glass. The respective results were marked down after the space of three months. Before enumerating them, it is perhaps appropriate to remark that by "photogen," oil from peat or bituminous coal is meant, which distills between a temperature of 212° and 550° Fah., and is of a specific gravity of from 0·795 to 0·805. The term "solar oil," is given by the Germans to oils having a specific gravity of from 0·830 to 0·835 and distilling above the temperature of 550° Fah. The former is burned in lamps adapted for that object, the latter in Argand or Carcel lamps. The observations of Herr Grotowsky are the following:

1. Photogen and solar oil stored in barrels and cisterns, lined inside with iron, remained free from ozone and burned faultlessly.

2. Photogen and solar oil kept in balloons of white glass, wrapped up in straw, showed traces of ozone but burned well otherwise. Both the color of the oil and that of the cork were were found to be slightly changed.

3. Photogen and solar oil in balloons of white glass, which were painted black, exhibited traces of ozone, but the oils were less changed than in experiment No. 2. The corks were not bleached

4. Solar oil and photogen in unwrapped and white glass balloons, which had been kept outside, gave very strong indications of ozone. They burned very badly, charred the wick, and nearly extinguished the flame, after burning for six or eight hours. The solar oil was turned to a deep yellow, and showed an increase of 0·003 in its specific gravity.

5. Solar oil which had been exposed to the light in unwrapped balloons of green glass, gave also strong indications of ozone, though the wick charred it burned well. The color had been little changed.

6. Solar oil in green balloons, painted black, proved to contain some ozone. It bursed, however, perfectly well.

7. Solar oil in green balloons, wrapped in straw, gave indications of traces of ozone; it burned like the former. Color slightly bleached.

8. American kerosene, which had been exposed to the light in white and unwrapped glass balloons, had become strongly ozonized, so much so that it scarcely burned. The originally bluish white oil had assumed a vivid yellow shade of color, and the specific gravity was found to have increased for 0·005.

9. American kerosene, which had been kept in the dark for three months, did not show any ozone and burned perfectly well.

The oils had been exposed from April to July, 1868. Those which had become strongly ozonized smelled otherwise than before, and the corks had become bleached as if attacked by chlorine, while those of the unaltered oils had also remained unchanged.

Though the experimenter favors the opinion that the oxygen of the air, in being absorbed by the oil and converted into ozone, does not effect any chemical change, but remains simply absorbed, it cannot be seen why such oils should deposit carbon when burned. They should, on the contrary, burn better. According to Dr. Ott, of this city, there is only only one case possible by which we may account for the decrease in the illuminating power; it is this: The ozone seizes a part of the hydrogen and forms water therewith, while a higher carbonated oil remains. Vohl, a German chemist, expressed the opinion, years ago, that the depositing of soot is invariably caused by an admixture of carbolic acid. If this is taken for granted, it would have to be admitted that a part of the hydrocarbon is directly oxidized by the ozone. This, however, is impossible, as any chemist will admit who is acquainted with the chemical constitution of carbolic acid. Dr. Adolph Ott gives a ready means for ascertaining whether a photogenic hydrocarbon oil will deteriorate in time or not. This test is based upon the property of nascent chlorine gas to act in the same manner as ozone does, which action, however, takes place in a much shorter space of time. In order then to test the oils, it is prescribed to measure equal quantities, say ten ounces of each. Take as many flasks as you have samples of oil, cover the bottom of each, when flat, to the length of one-tenth of an inch with black oxide of manganese, or take otherwise a corresponding quantity of it. Add now so much of strong muriatic acid as will cover the manganese to twice the hight indicated. Fill, finally, the flasks with the oils, and set them on a heated sand bath or in some other warm place, until the generation of gas ceases. Separate now the oils from the residual manganese, and shake them well with warm water before applying them to the burning test.

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India-rubber Soles for Boots and Shoes.

A method of making india-rubber soles for boots, etc., has been patened, and consists in applying to a linen cloth india-rubber dissolved in naphtha, camphine, or other suitable solvent. With this india-rubber solution is mixed whiting, sulphur, litharge, or white lead, calcined magnesia, lampblack, and clay, in the following proportions: Four pounds of rubber, two pounds of whiting, one pound of sulphur, one pound of litharge, one-half pound of magnesia, one-half pound of lampblack, and two pounds of clay. When sufficient of this compound has been applied to the cloth, it is passed between rollers, the surface being sprinkled with French chalk to prevent adhesion. Patterns can be imprinted in this manner by the use of an impression cloth, or the surface can be simply roughened. The sheet should be exposed for three hours and a half to a temperature of 60° Fah. The impression cloth is then removed from the surface of the india-rubber. The cloth on which the india-rubber was first spread can be removed, by moistening it with warm water, naphtha, or camphine. The sheet of prepared rubber can be then cut into any desired forms

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India-rubber Tubing.

Ordinary vulcanized india-rubber tubing becomes saturated with gas, which again evaporates at its outer surface, causing a most disagreeble smell. An invention for the prevention of this, by coating the india-rubber tubing with a varnish, has been made in England. The chief novelty in it is that the varnish is easily made, and it renders the substance of the tube impervious to gases. The varnish is composed of linseed oil, fine litharge, or white lead, in the proportion of one quart of oil to one pound of litharge. These substances should be well boiled together until brought to a proper thickness or body, and while hot the composition is applied by running it through the tube to be coated or lined. The varnish for the outside is made by mixing one quart of linseed oil with half a pound of litharge, and by adding to the same about a gill of gold size, these ingredients should be well boiled together, and while hot should be applied with a brush or a sponge.

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If a shaft springs in running one of three things is certain to occasion the difficulty; either a too small diameter of the shaft for its weight and velocity, a set of unbalanced pulleys, or an unequal strain on either side by the belts. Either of these may be remedied.

Mr. Graham's Experiments with Hydrogen.

At the February meeting of the Royal Institution in London, Dr. Odling delivered a lecture upon the new discoveries made by Mr. Graham, F. R. S., respecting the properties of hydrogen, tending to prove that hydrogen is a metal having a boiling point much below the temperature of the air. The lecturer took a tube closed at one end with a single thickness of well-moistened calico, and showed that when the tube was half filled with water, and its lower end just dipped below the surface of some water in a glass vessel, the water in the tube would not run out, because the wet calico was, practically speaking, air-tight. Air could only enter the tube by dissolving in the water upon the calico, and then evaporating on the other side—a very slow operation. Ammonia being a gas much more soluble in water than common air,a jar of it was inverted over the wet calico; it was quickly dissolved in the water, and evaporated on the other side, so as to push down the column of water in the tube. In the same way gases are believed to pass through india-rubber and colloid septa by first dissolving in the material of the diaphragm, then passing through it as a condensed volatile liquid, and finally evaporating on the other side.

M. Deville, a French chemist, proved that hydrogen gas would pass through red hot solid platinum. Mr. Graham took up the discovery of M. Deville, and, by other experiments made, gained fresh information respecting these phenomena. He showed that platinum absorbed a certain quantity of hydrogen before the transmission began, as is the case with india-rubber. Next he tried palladium, and discovered that this metal will absorb or occlude about 1,000 times its own volume of hydrogen gas, the greatest amount taken up in the actual experiments being 980 times the bulk of the palladium. One volume of water will dissolve 800 times its volume of ammonia, the water being then increased in bulk by one half—that is to say,that two centimeters of water, after absorbing 800 times their volume of ammonia, will have increased to three cubic centimeters. Palladium does not increase in bulk to anything like the foregoing extent when it absorbs hydrogen; it only enlarges to 1-20 or 1-21 of its former volume, after taking up 900 times its bulk of the gas,in which operation the hydrogen is reduced to 1-19,000 of its former volume.

The enormous mechanical pressure necessary to compress hydrogen to this extent, would equal that at the base of a column of mercury three times as high as Mont Blanc, supposing hydrogen, at such a pressure, still to obey the laws of gases, and to possess all the properties of a gas. The weight of hydrogen, thus absorbed, is from 8-10 to 9-10 that of the palladium. Mercury can be boiled into an invisible gas, and analogy seems to point out that hydrogen, at all temperatures yet produced by man, is similarly the vapor or gas of a metal, and that, by a sufficiency of pressure or cold, it may be reduced to a liquid metallic state, so as to resemble quicksilver. Many chemists support this opinion,much evidence on the point having been brought to bear by M.Dumas.

In physical properties the gas acts like a metal, by conducting heat with facility. Dr. Odling illustrated this by passing a current of electricity through two platinum spirals, till the two coils of wire kept at a white heat. Over the one spiral he inverted a jar of common air, and over the other a jar of hydrogen, and the latter cooled the wire so rapidly that it ceased to glow. He said that it was but fair to state that Dr. Tyndall's questions whether the cooling effect shown in this experiment is due to the rapid conduction of heat by the hydrogen; still, it is the prevalent opinion, that conduction by heat really causes the cooling, and Professor Magnus, of Berlin, has come to the same conclusion. Mr. Graham's experiments also favor the view that hydrogen is a metal.

Dr. Odling then proved that the condensed hydrogen has a more powerful action upon reducing agents, than when in its ordinary state, by showing its bleaching action upon several colored solutions of chemical reagents. The greatest absorption of hydrogen by palladium, takes place at moderately low temperatures, but a high temperature is necessary for the passage of the gas through the solid metal. He then took a tube of palladium, closed at one end, and connected the other end with the Sprengel air-pump. A tube of glass was then slipped over the palladium tube, and a stream of hydrogen gas passed between the two, which were then made hot in the middle by the flame of a Bunsen's burner. The hydrogen gas then passed readily through the solid metal, being, it is supposed, liquefied in the pores of the palladium, and as it evaporated again inside the tube, the Sprengel pump delivered it into a glass vessel inverted over a trough of mercury. The hydrogen thus collected was then set on fire by the lecturer, to prove that it was hydrogen and nothing else.

Dr. Odling showed that a palladium wire is elongated after being allowed to absorb hydrogen for half an hour; but the remarkable fact is that when the gas is driven out again by heat the wire contracts, not to its original length, but to less than its original length. The cause is not known. As a final illustration of the probable metallic nature of hydrogen, a bar of palladium, charged with the gas, was suspended by a fiber of silk in the field of an electro-magnet, and was seen to be attracted like iron, though not so strongly. The bar had thus acquired a metallic property, not possessed by palladium in its unalloyed state.

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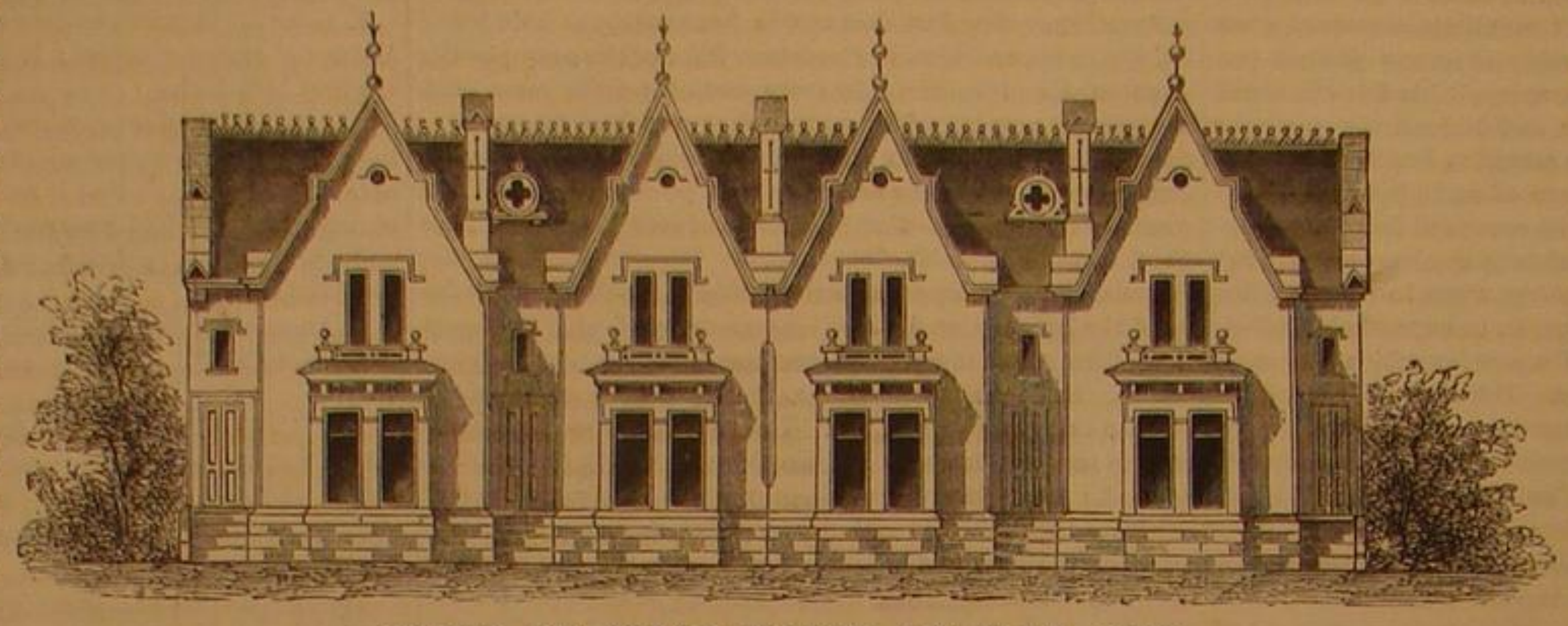
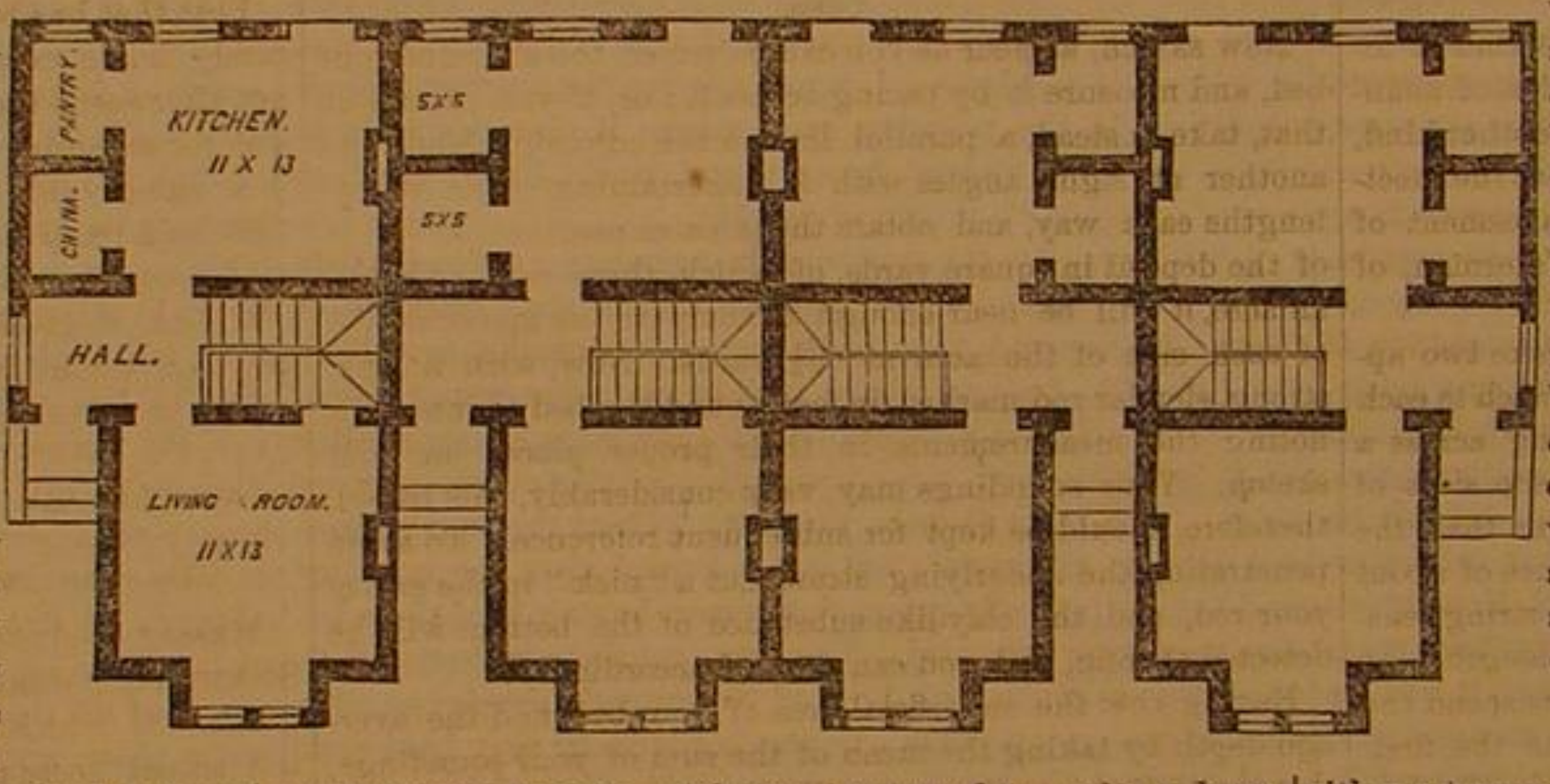
Strength is a general term. The strength of an iron bar resisting torsion is entirely different from the strength of the same bar resisting deflection or tension. No general rules can be applicable in all cases.

Plan for a Block of Cheap Houses on 75-Foot Lots.

We copy from the *American Builder*, of Chicago, a plan for a block of buildings, for laborers and others of small means, which is not only pretty, but cheap; a block of four such buildings, it is estimated, can be erected in that section for $4,000. The elevation at once strikes the eye as being exceedingly cosy and tasty, while the plan of the first floor, which we also give, shows that such a house may indeed possess conveniences which many more pretentious structures are destitute of. The cottages are two stories high, with attics; and the upper floors, being arranged to meet individual requirements, may be made to accommodate quite a large family.



BLOCK OF CHEAP HOUSES ON 75-FT. LOTS.



Brass Chains for Gaseliers.

A correspondent of the *London Times*, states that it is only a question of time as to the certain fall of gaseliers, the consequent escape of gas, and a very probable explosion, so long as the weights which hold up gaseliers are supported by brass chains. He attributes the deterioration of brass chain to decay by the action of the atmosphere and says the only wise remedy is to discard the use of brass chain altogether and to substitute copper chain in the place of it. In this explanation of the weakening of the chain he is undoubtedly at fault. The true reason is given by another correspondent to the same journal who writes as follows:

"In a letter in the *Times* of to-day attention is properly directed to the danger which may occasionally arise from the use of brass chains for suspending gaseliers. This is a subject on which during many years I have been collecting information. I have seen brass wire, about an eighth of an inch thick, after having been subjected to occasional vibration while stretched, become so tender and brittle in the course of a few weeks as to be capable of being easily broken into short pieces between the fingers. I have also seen the links of brass chains, which have been employed in suspending gaseliers, undergo a similar change, though in a less degree. These effects, so far as I have observed, have been due to spontaneous physical changes in the metal, and not, as your correspondent states, to atmospheric corrosion. It is well known that other alloys undergo singular spontaneous changes. Brass which has become tender and brittle may, by annealing, be rendered as tough and flexible as at first. It appears that only certain varieties of brass are liable to be thus affected; and, if so, the explanation will probably be found in the presence of foreign matters in small proportion. I have never seen copper become tender and brittle like brass."

Toys at the French Exhibition.

Not the least interesting of the English reports on the French Exhibition is that of Mr. G. C. T. Barclay on toys. According to this report the chief French toy is a doll, not a representation of an infant for a child to fondle, but a model of a lady attired in the height of fashion, a leading manufacturer changing the costume every month to ensure accuracy. As an excuse for this apparently early inoculation of childhood with a love for finery, it is explained that these dolls serve as models to colonial and other extra-Parisian milliners before they are handed over to their children. French dolls, unlike our wax-faced natives, have china heads. Mechanical toys, made in tin out of such refuse material as empty biscuit and sardine boxes by M. Dessein, are, however, in more commendable taste. This ingenious toymaker manufactures a train, consisting of a locomitive, tender, and carriage, in separate compartments, with a finish that admits of their running smoothly, packed in a cardboard box, for twopence halfpenny. His economical genius is rewarded with an annual sale of a million railway-carriages. Another train, having clockwork movement, which enables it to run round a table, he sells for less than three shillings. The mechanical singing-birds of M. Boutemps, shown in the Exhibition, attracted much admiration, but were too costly to become general favorites. Military toys, too, in France, commanded a large sale. M.Andreux manufactures 70,000 toy guns per annum, beside immense quantities of cannon, gun-carriages,swords,and othermilitary equipments. The taste for military toys is, however, on the decline, owing, Mr. Barclay says, to the present notion of giving children objects suggestive of the arts of peace. Nevertheless, M. Andreux sold 38,000 toy imitations of the Prussian needle-gun in three months, when that weapon was under public consideration. Prussian toys, as represented in the Exhibition, were not needle-guns, but the furniture of dolls' houses, horses and carts, sensible dolls open to caresses without certainty of destruction, and glass marbles. Mr. Barclay gives the palm to Biberach for tin toys. Messers. Rock & Craner seem to manufacture every description of carriage, cart, cab, omnibus, and perambulator of every nationality; our own insular peculiarities being catered for in the shape of Hansom cabs, with little wheels on the feet of the horses as well as on the vehicles. Bavaria has an original idea or two about toys. One of these is the popular model of a shop, manufactured at Nuremburg. The kind of shop that commands the largest sale is a grocer's—a selection accounted for on the ground of its having the most drawers to open and shut, full and empty. Another toy, not domiciled with us yet, consists of pictures of men, animals, carts, trees, painted on stiff cardboard, and furnished with a block of wood, to enable them to stand upright, which children can arrange in different combinations, and which appear likely to exercise their taste aud ingenuity. The Austrian conception of a toy appears to be, that it should be a musical-box internally, whatever form it may externally take; the Danish, that it should be an implement; the Moorish, that it should be either a trumpet or a top; and the Russian, that it should be made of india-rubber.

The Tennessee Chair Factory.

The *Daily Press and Times*, of Nashville, Tenn., contains an account of a visit to the above factory, located near that place, which it seems rivals in extent many of our Eastern establishments. It has an engine of sixty-horse power, and at present employs seventy hands. It has, however, capacity for about three hundred. The establishment is now turning out two hundred chairs daily, but with its full complement of men will be able to turn out eight hundred. We are glad to record these evidences of returning prosperity to the South, and we feel the assurance that a few years will more than restore her former commercial and industrial health, and establish it on a firmer basis than ever before.

Mines of the West.

J. B. Ford & Co. have issued a special edition of the Report of Rossiter W. Raymond, United States Commissioner of Mining Statistics, for the past year. It is entitled, "The Mines of the West:" a report to the Secretary of the Treasury; being a full statistical account of the mineral development of the Pacific States for the year 1868, with sixteen illustrations, and a treatise on the relation of governments to mining, with delineations of the legal and practical mining systems of all countries, from early ages to the present time. The information contained in this report is of value to those who take interest in the development of the mineral wealth of the West.

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The East River Bridge.—Brevet Major-Generals Newton, Wright, and King met yesterday at Army Headquarters, in Greene street, as a Commission from Government to consider the feasibility of the East River bridge. They will meet daily for perhaps a month. There are many important points to be considered, such as the possible obstruction of navigation, feasibility of the project, etc., upon which, we trust, the committee will be fully satisfied, so that this great work may proceed without delay.

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Beet Root Sugar.—We continue this week our series of articles on the beet root sugar manufacture. They are written by a practical engineer, formerly the superintendent of a beet root sugar manufactory in Belgium and perfectly familiar with all the details of the subject. The next number will be illustrated by suitable engravings.

Correspondence.

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

The Interference of Vibrating Pendulums.

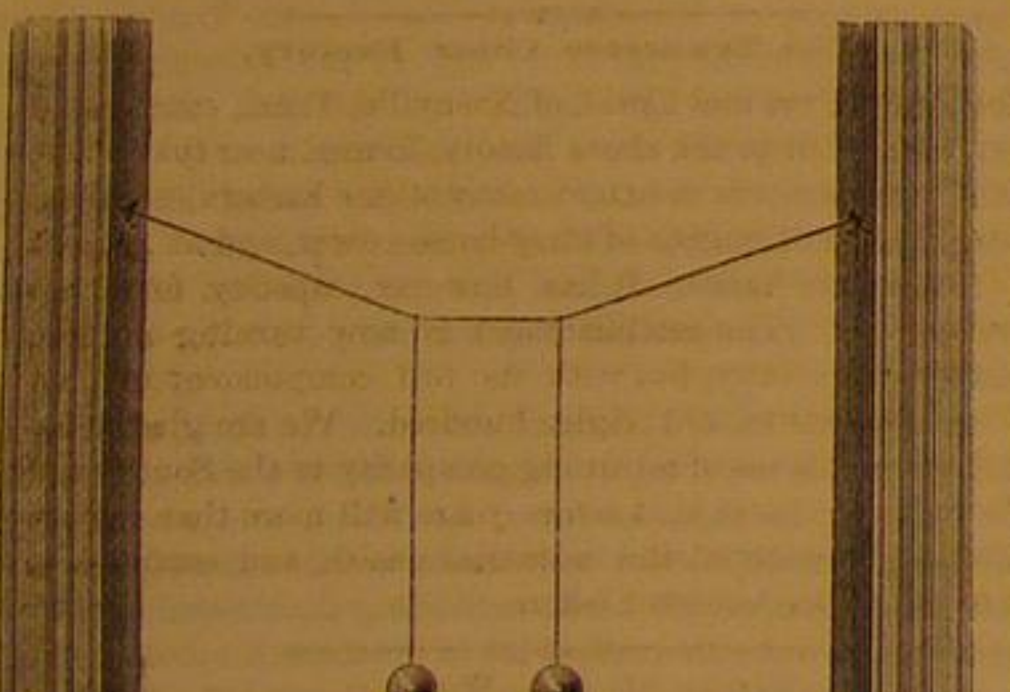
[MESSRS. EDITORS:—In compliance with your request I send a sketch of the experiment with the interfering balls. I am very truly yours. E. N. HORSFORD.]

We often hear the word "interference" used to explain certain phenomena of light, heat, and sound. To the popular mind it is not easy to present an intelligible illustration of the process to which reference is made in the use of this word. We can understand that if a violin string be twanged at one end of a lead tube of, say, a thousand feet in length, the note peculiar to the tension or taughtness of the string will be heard by the ear applied at the other end of the tube. So would it be heard at the end of another tube a few yards longer than the first. Now it will not be so readily understood, why, if the two tubes be placed side by side to receive the vibrations of the violin string, and the longer tube be made to curve and enter the shorter, at a very sharp angle, just before its distant terminus, that the ear now placed at the end of the shorter tube will hear nothing. Let us see if we cannot present a mechanical conception of what takes place.

This is a case of interference. The sound is due to what may be called currents of alternate compression and dilation in the air, falling on the drum of the ear, throwing the membrane into vibration, the compressed air forcing the membrane inward and the dilated air permitting it to return. These alternate layers of compressed and dilated air are caused by the sudden backward and forward movement of the violin string. They produce the same effect on the ear when propagated through either tube. But when the two tubes—one so much longer than the other that the air at the distant terminus of the long tube is dilated, while that at the exit of the shorter is compressed—are joined, the stratum of compression in one will mingle with that of dilation in the other, and the air at the end of the shorter tube will have its normal condition of uniform density, and no oscillation of the drum of the ear be produced, and of course, no sound heard.

This illustration will at least give an idea of one kind of interference, and will open the way to the presentation of an interesting experiment illustrating interference of another kind, which was brought to the attention of the public at the meeting of the American Association for the Advancement of Science, at Burlington in 1867, by Mr. Henry Waterman, of Hudson, New York.

The experiment may be made by any one. Take two apples, or balls, or spools of about the same size. Attach to each a slender cord or strong thread. Suspend a string across a doorway, from tacks at equal hight on the opposite sides of the doorway. Let the string be a quarter longer than the width of the door so as to hang slack. At a distance of about three inches from the middle point of the slack string, suspend one ball, giving its string about two feet of length. At the same distance on the other side of the center, suspend the other ball, giving its string the same length as the first. The apparatus is now complete and this diagram will illustrate it.



Now taking hold of the ball 2, draw it from the doorway about a foot and let it swing. It will cause the other ball to commence swinging. After a few oscillations ball 2 will gradually come to rest, when ball 1 will have attained a maximum sweep nearly or quite equal to the original sweep of ball 2. Ball 2 will however immediately resume its oscillations and the other will gradually come to rest; in its turn, however, starting, rising to a maximum of sweep and subsiding to momentary repose. Thus the two balls will continue to interfere with each other for a long time.

If the string attached to one ball be shortened the phenomena will be modified: neither ball will come to absolute rest, but both will have alternately maxima and minima of sweep.

If both balls be drawn from the perpendicular on the same side, but one farther than the other, and both be released at the same instant, the effect will be the same as if one string had been shortened.

If, instead of starting the vibration through the doorway, it be instituted across it, that is, in the direction from one jam to the other, the same phenomena of alternate momentary rest and renewed oscillation will be observed.

If the vibration be commenced obliquely across the doorway the resulting phenomena will be wonderfully interesting, but difficult to detail, involving two sets of maxima and minima of effect, and a very complex system of alternate motions and rest.

Additional balls will modify the results, and the length and approximate taughtness of the string, as well as the distance of the support of the balls from the points of suspension of the slack string, will, in a great variety of ways, influence the phenomena. As a source of entertainment and a theme for investigation it will not be likely soon to exhaust itself.

Two or three points borne in mind will perhaps be of service in pursuing the subject as a problem of mechanics.

1st, When the two balls swing strictly together through the doorway the whole will be a pendulum, the length of which is the perpendicular distance of the balls, from a straight line joining the ends of the slack string.

2d, When one ball is at rest and the other swinging, the length of the pendulum is less, than when both are swinging evenly together.

3d, The time required for the sweep of a pendulum is greater as its length is greater.

Let me now give an application of the truth of this kind of interference.

Most persons are familiar with the fact that clocks are sometimes brought to rest, or their rate modified by the jarring of neighboring machinery. It is related that two clocks have been so placed on a common shelf that they have not only modified each other's rate, but have alternately brought each other to rest, and caused after each pause, the motion to be resumed. The action of two pendulums on each other, where the motion of the point of support of one may influence the motion of the point of support of the other, is shown in the experiment above detailed.

Persons fond of material conceptions of psychological phenomena, will find much of suggestive interest in experiments that show how vibrations may awaken or strengthen, or weaken or arrest their fellows; and I am persuaded that the simple apparatus I have described will afford lasting entertainment and food for thought to all, old as well as young, who will be at the trouble to put it in operation.

Peat.

[Concluded from page 230.]

ON HARVESTING AND MANIPULATING PEAT FOR HEATING USES.

Now sketch, as near as you can on paper, the shape of your bed, and measure it by pacing across it; or, if you cannot do that, take, instead, a parallel line on the adjoining land, and another at right angles with it, ascertaining approximate lengths each way, and obtain the area as near as convenient of the deposit in square yards, of which, there being 4,840 to an acre, it will be near enough to compute the measurement of each side of the acre at 69½ yards. Now, with a long, strong, slender rod marked, in feet, sound the bed at intervals, noting the measurements in their proper places on your sketch. Your soundings may vary considerably, this record, therefore, should be kept for subsequent reference. To avoid penetrating the underlying strata, cut a "nick" in the end of your rod, and the clay-like substance of the bottom will be detected therein, and you can proceed accordingly.

Having now the superficial area of your bed, find the average depth by taking the mean of the sum of your soundings, this multiplied into the area will give the cubical contents in peat. It is difficult to calculate accurately the quantity of useful material in a bed of peat. I find the published estimates differ considerably, and my own investigations greatly vary. These differences arise from the different proportions of water and foreign matter mixed with the peats, and also from their own different densities.

For most practical purposes, in estimating quantity by the cubic yard, peat, as ordinarily in the bed, will weigh from 2,100 to 2,400 pounds, and if drained in the bed, 1,340 to 1,490 pounds, and air-dried 320 to 380 pounds, when it will be found to be reduced to about one-fourth to one-sixth the original bulk.

Peat, saturated with salt water, is generally unfit for heating purposes.

The fine clay-like substance found underlying peat beds is sometimes marly, particularly where the saturating water holds lime in solution, as at the vast beds under the Cayuga marshes in the State of New York. But generally it is of a very different nature, an impalpably fine powder, varying in color from white to dingy slate, and from yellowish white to brown, and composed of infusorial shields of animalculæ—little shells which, under a microscope, are resolved into the most exquisite shapes and forms, yet not composed of carbonate of lime but of pure silex. It forms a superior powder for polishing metals.

In working a bed of peat, the first step will be to ascertain if drainage is necessary; and, secondly, how it can be effected and at the least cost. Generally the material removed in this process will be available for future treatment. If the bed cannot be economically drained, resort must be had to mechanical excavation, which I should only use from compulsion, as I doubt, all points considered, any practical advantages of mechanical over hand labor for that purpose. If, however, it is necessary, a most excellent and economical apparatus has been made and successfully used therefor. One man raising fifty lbs. of peat a minute, will lift and place fifteen tuns in ten hours, whereas some men will do more. It is best not to drain a bed below the level to which you can effectually work out in a season, unless you can close the outlet drain to allow it to fill again with water for the winter, for the reason that drained peat that has been frozen is apt to disintegrate after thawing, and become impoverished for a solid homogeneous fuel.

For economic heating purposes and rendering the peat compact, the substance must be kneaded to break up the sponginess reducing the mass to a smooth, paste-like, homogeneous consistency, which will dry hard and solid, without pressure. To effect this result, cheaply and rapidly, has been the great problem, a solving of which has occasioned many costly failures and annoying disappointment.

Many expensive essays have been made also to dry peat artificially, but always resulting, as trial for this end always must do, in final abandonment.

Many contrivances have also been invented for pressing the water from peat, and also to mold it under pressure, but never in either case with economic success; and I believe all systems for these purposes must eventuate in failure to produce a good fuel at remunerative cost; indeed, I know almost every conceivable plan has been exhausted for these objects and all failed alike; beside, all peat, from which water has been expelled by pressure, requires subsequent drying.

All that is needful to be done with excavated peat is to manipulate the mass properly, and expose it directly to the air until it is dried or fit for removal; and as its cost for fuel is almost entirely due to manual labor, the complete process should be accomplished by the least possible number of handlings, in the shortest possible time, occupying the least possible area of ground therefor, and in a given time producing the largest possible quantity in tuns of prepared fuel.

Various machines have been made embracing several distinct mechanical systems, and modifications of each. The most satisfactory being on the general principle of the "pug mill," for working brick clay, where a vertical shaft with working arms and kneaders is used. And those various patented contrivances have failed from their liability to derangement, or from breakage of some of the parts, or from insufficiency of product in a given time, or from inferiority of fuel made, or what is perhaps the shortest road to the trouble, the ultimate expense in producing 100 tuns of satisfactory fuel.

Aside from the necessity to turn off day by day a required amount of good work, the machine must possess within itself protection from injury against stones, bones, and even roots, which must pass unseen into the machine with the peat, and be separated and forced away from the working parts, while the general flow of the useful matter continues on unobstructed in its proper course, and such a machine has been made, tried, and proven to embrace all those essential elements of success.

Peat that has been well manipulated and dried for fuel rarely holds more than ten per cent of moisture, and it will not afterwards become saturated with water, even by immersion for an entire winter.

A cubic yard of closely packed peat fuel will weigh from 1,620 to 2,180 pounds, and the heating value of one pound of such peat is equal to even one and a-half pounds of wood. One cord of good wood will weigh almost ,4200 pounds, and one cord of peat fuel will weigh about 3,750 pounds, showing a gain in space as well as greater heating power.

J. B. HYDE.

New York city.

Do We Measure Horse-power Correctly?

MESSRS. EDITORS:—On page 197, current volume of the SCIENTIFIC AMERICAN, I noticed an article signed "Mathematician," in which the author says: "When we wish to find the actual horse-power of a steam engine, and compute the same by multiplying area of cylinder by stroke of piston, pounds of steam, and number of strokes per minute, without other qualification, the result is erroneous. As for instance, apply the foregoing rule to a steam engine furnishing power for a machine shop, and running at the rate of seventy-five revolutions per minute, and let the result in horse-power be thirty; then disconnect, throw the belting off the power wheel, use the some amount and pressure of steam, and the number of revolutions will be doubled on account of outside resistance being removed. Now measure the horse-power by same rule, and the result will be sixty-horse power, which is evidently absurd; for it is equal to saying that the engine uses most horse-power when doing least work, and least horse-power when doing most work."

The above method of computing power, or "horse-power," as the author styles it, is not correct or not correctly stated. He says, "multiplying *area of cylinder* by stroke of piston, *pounds of steam*, and number of strokes per minute, without other qualification, the result is erroneous."

I believe it would necessarily be so, since the above data, are not required for computing power. All that is necessary is the mean total pressure of steam on piston and its velocity.

EXAMPLE.—Suppose the total mean pressure of steam on the piston to be 1,000 lbs., and the velocity of the same 300 feet per minute, then by the above rule we have 300 feet × 1000 lbs.=300,000 foot-pounds, indicated power of engine. For useful effect, exclusive of friction, see table of friction and make the necessary deductions, or apply a dynamometer.

To prove the accuracy of the preceding rule, let us take the experiment the gentleman proposes on an engine of thirty-horse power, driving a machine shop, and throw off the main belt. Of course he would have to disconnect the regulator, for if not it would close the valve. He says, use the same amount and pressure of steam, and the number of revolutions will be doubled. To use the same amount and pressure of steam would be impossible, for since the velocity is double, the cylinder will be filled twice as often and consequently if you use the same pressure the quantity would be double.

This would be an interesting experiment which I would like to see tried, provided I were out of the reach of the flying fragments. Suppose the engine consumed two-horse power when working seventy-five revolutions per minute to overcome the friction, and suppose the ports of the cylinder were of sufficient dimensions to allow a free passage to the steam; then thirty-horse power would drive the engine fifteen times as fast. For we have two-horse power × 15=30-horse power consumed in friction giving a velocity of 15 × 75=1125 revolutions per minute.

Consequently the engine would do what the gentleman considers absurd, viz.—Use most horse-power when doing least work, and least horse-power when doing most work.

The method he gives us for computing the power of an engine exclusive of friction is equally erroneous, as he supposes the friction to be the same, whether the engine is doing work or not, which is evidently wrong.

Again he says, "It must be admitted that a better test of the superior economy of one man's make of engine over another could scarcely be had than that of the amount of steam consumed in running any engine alone." I believe that the gentleman is also mistaken on this point. The fact is that a toy engine, like the one of which you give an illustration on the same page on which the gentleman's article appeared, would run with less steam alone than the most perfect engine yet made, on account of the simplicity of parts. I think it capable of demonstration that the poorest engine would run alone with the least steam, and also that a very bad engine may show a good card by indicator. B.

Newark, N. J.

Large Centrifugal Pumps.

Messrs. Editors:—In a recent number of your paper you published an extract, from the *Colliery Guardian*, about two large centrifugal pumps which had lately been made in England, and which were said to be the largest in the world. The writer of the article in question cannot have been very well "posted" as to the dimensions of some of the large pumps at present in operation—as I know of two (and there are probably others), each of which exceeds in size those described in the article referred to. These pumps are at present at work on the sugar estate of Messrs. Ewing, of Glasgow, in Demarara, and were made from the designs of Prof. James Thomson, C. E., Belfast, Ireland. The larger of the two was constructed under my supervision by Messrs. Harland & Wolff, Belfast, and as some of your readers may desire to know some of the particulars I give you the principal dimensions. Diameter over all, 15 feet 6 inches; diameter of wheel, 7 feet 9 inches; breadth of wheel at periphery, 2 feet 7½ inches; diameter of shaft, 7¼ inches; diameter of suction pipes (2), 4 feet 9 inches.

St. Louis, Mo. Jas. Simpson.

THE LAW OF STEAM.

BY PROF. JULIEN M. DEBY.

Regnault, the celebrated chemist and natural philosopher, in the published results of his admirable researches on steam, undertaken at the requisition of the French Government, while speaking of the intimate relation existing between the pressure and the temperature of steam, says: "The question we are at present studying is probably one of the least complex of the theory of heat, and if the law which governs it has not been made manifest by our experiments, this depends probably on the empirical definition given of *temperature*, which definition, in all likelihood, does not establish any simple relation between various temperatures and absolute quantities of heat."

He further says: "We are at present totally unacquainted with the theoretical law which connects the elastic forces of vapors with their temperatures."

Dalton, long before Regnault, propounded a law, stating that, while the pressures increased in geometrical ratio, the temperatures did so in an arithmetical one; and Faraday, to a certain extent, corroborated Dalton's theory during his investigations on the expansion of gases. More recent observations have, however, proved the fallacy of this supposed law, especially when applied to long ranges of pressures or to great differences in temperature.

Neither the researches of Arago and Dulong, nor those of the Franklin Institute, nor of other modern physicists have, to our knowledge, been able to solve the mystery, and we have, to this day, been reduced either to direct experiment or to the use of empirical formulæ in order to determine the temperature of any given pressure of steam, or, *vice versa*, to determine the pressure from the temperature.

The formulæ for this purpose are quite numerous; but as I have said before, they are, without exception, purely empirical; and their results must be considered only as rough approximations to practical results. Many of these formulæ are complex, involving quantities to be raised to the fifth or sixth power or require the extraction of the fifth or sixth root, and combine the use of various constants and coefficients with multitudinous rows of decimals attached to them.

How much more simple the matter really is, I shall now proceed to show, leaving those who take interest in the subject to judge for themselves, whether or not Dame Nature has long mystified the mathematicians in this special case.

While reflecting on the theory which regards heat as a mode of motion, it occurred to me to think of the cause of the well-ascertained fact, that the latent heat of steam decreases as the tension increases, and this naturally led me to the conclusion, that, in all probability, as the pressure of steam increases so is a portion of the latent heat really converted into this pressure itself, or, more properly speaking, the tension is in reality itself only modified latent heat.

Expressed mathematically, if such be the case, no matter what the tension is, we have: Tension of steam (a certain amount of motion) + latent heat of same steam (a certain amount of motion) = total amount of heat (total motion) in steam.

In order to ascertain if I was right in my supposition, I took up—not any of the tables calculated by the formulæ of various authors, but the results of direct experiments made by the most reliable scientific authorities—and I soon had the satisfaction of discovering that I had, to all appearance, solved the gordian knot.

The tension of steam, or its elastic force, does not present any natural simple relation to either thermometric temperature or to the total units of heat supposed to be contained in steam, but is most intimately related to its latent heat, a portion of which, in fact, it really is. According to my views, the simple law reads as follows:

While the pressure of steam increases in a geometrical progression, the latent heat decreases in an arithmetical progression, and vice versa.

If the pressure in atmospheres be as 1, 2, 4, 8, 16, 32, etc., the corresponding diminution in latent heat will be, respectively, as 1, 2, 3, 4, 5, 6, etc. The same would occur with the series 3, 6, 12, 24, 48, 96, etc., or 5, 10, 20, 40, 80, etc., or any other

If we take 537 C. units of caloric as the quantity of "latent heat" in steam, indicating 100° C. on the thermometer under atmospheric pressure, we find that the difference between the terms of the above arithmetical progression is 17, or a number which approximates to it within a very minute fraction.

This number of 17 units of heat is an average of the differences found by me to exist between a large number of the carefully *observed* temperatures, noted by Arago, Dulong, and Regnault, as corresponding to *observed* pressures.

It gives us:

Pressure in atmosphere.	Latent caloric.
1	537 units.
2	537—17
4	537—17 × 2
8	537—17 × 3
16	537—17 × 4, etc.

By interpolation, I have formed the following table, showing the latent heat (which may always be readily calculated from the thermometric indications, by means of Regnault's formula T ·305 + 506·5 for Centigrade degrees, or (T—32)·305 + 911·7 for Fahrenheit degrees, and the corresponding pressures of steam in atmospheres, from 1 to 16. The temperature is also readily calculated from the latent heat by the formula T=606—L÷·695, in which L represents the units of latent heat.

The letter A indicates the units of latent heat of steam of 100° C., or 212 Fah. or of atmospheric pressure, and *b* indicates the number corresponding to the difference between two terms of the arithmetical progression. I shall here only exhibit the Centigrade series in numerals.

Pressures in atmospheres.	Corresponding units of latent caloric.	In general.
1	537	$A - o$
2	537—17	$A - b$
3	$537-(17+\frac{17}{2})$	$A-(b+\frac{b}{2})$
4	$537-(17\times2)$	$A-(b+b)$
5	$537-[(17\times2)+\frac{17}{4}]$	$A-(b+b+\frac{b}{4})$
6	$537-[(17\times2)+(2\times\frac{17}{4})]$	$A-(b+b+2\frac{b}{4})$
7	$537-[(17\times2)+(3\times\frac{17}{4})]$	$A-(b+b+3\frac{b}{4})$
8	$537-(17\times3)$	$A-(b+b+b)$
9	$537-[(17\times3)+\frac{17}{8}]$	$A-(3b+\frac{b}{8})$
10	$537-[(3\times17)+(2\times\frac{17}{8})]$	$A-(3b+2\frac{b}{8})$
11	$537-[(3\times17)+(3\times\frac{17}{8})]$	$A-(3b+3\frac{b}{8})$
12	$537-[(3\times17)+(4\times\frac{17}{8})]$	$A-(3b+4\frac{b}{8})$
13	$537-[(3\times17)+(5\times\frac{17}{8})]$	$A-(3b+5\frac{b}{8})$
14	$537-[(3\times17)+(6\times\frac{17}{8})]$	$A-(3b+6\frac{b}{8})$
15	$537-[(3\times17)+(7\times\frac{17}{8})]$	$A-(3b+7\frac{b}{8})$
16	$537-[(3\times17)+(8\times\frac{17}{8})]$	$A-4b.$

I am at present occupied in computing the latent heat of all pressures, from 1 to 16 atmospheres and up to 1,000ths parts, which will furnish more complete data than any extant.

In order to facilitate at once to others the verification of my statements, I will limit myself to showing how the 10ths, 100ths, and 1,000ths are interpolated by an example.

PRESSURE FROM ONE TO TWO ATMOSPHERES.

TENTHS.

		Units.
Atmospheres	1	537
"	1·1	$537-\frac{17}{10}$
"	1·2	$537-2\times\frac{17}{10}$
. . .	. . .	. . .
"	1·9	$537-9\times\frac{17}{10}$
"	2	537—17

HUNDREDTHS.

		Units.
Atmospheres	1	537
"	1·10	$537-\frac{17}{10}$
"	1·11	$537-(\frac{17}{10}+\frac{17}{100})$
"	1·12	$537-(\frac{17}{10}+2\times\frac{17}{100})$
. . .	. . .	. . .
"	1·99	$537-(9\times\frac{17}{10}+9\times\frac{17}{100})$

THOUSANDTHS.

		Units.
Atmospheres	1	537
"	1·101	$537-(\frac{17}{10}+\frac{17}{1000})$
"	1·102	$537-(\frac{17}{10}+2\times\frac{17}{1000})$
. . .	. . .	. . .
"	1·999	$537-(9\times\frac{17}{10}+9\times\frac{17}{100}+9\times\frac{17}{1000})$

I have applied my formula to most of Regnault's practical observations, taken high and low in the scale, and find the discrepancies to be really insignificant.

He gives, for instance, pressure 1·905 atmospheres; observed temperature, 119·16; latent heat, 523; I find 521,615, or a difference of only 1·385 units. Another is T=119·16; pressure, 1·924 atmospheres; latent heat, 522·2; I find 521·292 units, or a difference of 1·008 units.

Among the higher pressures, we find: Pressure, 13·344 atmospheres; temperature, C., 193·8; latent heat, 472·2. We here, by our theory, have 473·662, a difference of 1·42 only; and again, P=13·625; T=194·8; latent heat, 471·2, when I find 474·047, a difference of 2·847 units.

The above are only a few examples, taken at random from among many, to serve as a verification of my law, but all those I have tried have approximated as closely to the practical results of experiment as those we have just quoted.

I have rapidly penned the present notice for the purpose of eliciting the opinion of others upon this important and interesting subject.

In a future article I may furnish various practical formulæ in connection with it, and will enter into the discussion of the relation existing between, so-called, latent heat and the volume of steam, as also its connection with the present theory of expansion and condensation, all of which we hope to show, have the most intimate dependence on its amount.

Let us conclude by reminding the reader, that we are, in all probability, fast approaching the day when it will be admitted by all sound philosophers, that only one law exists in nature, MOTION, the modes of which are familiarly known as heat, light, electricity, chemical affinity, molecular forces, gravitation, innervation, etc., all of which will be found to be perfectly convertible into one another. This will constitute a sufficient proof of their identity.

THE SEWING MACHINE---ITS ORIGIN AND SUGGESTIONS FOR IMPROVEMENT.

In the year 1825, there lived in the city of Saint Etienne, in France, a poor and obscure tailor whose patrons were few and far between. His carelessness about the work intrusted to him, joined to his eccentric habits, obtained for him throughout the neighborhood an unenviable reputation, the natural consequences of which were that his business declined from day to day and he ended by becoming a veritable pauper. In 1827, he was considered as laboring under the constant influence of hallucinations, and in 1829, he was unanimously regarded by the gossips of his precinct as insane.

This madman was no other than Barthlemy Thimonnier, the inventor of the first sewing machine. He was born at Abreste in the year 1793, and was the son of a dyer of Lyons.

It is an old custom with many manufacturers of the south of France, to give out large quantities of needle-work and embroidery to the country girls residing around their establishments. This attracted the notice of Thimonnier and originated in his mind the first idea of a sewing machine. On its construction he worked without help or money during four successive years, at the expiration of which, in 1830, he obtained his letters patent.

A government engineer by the name of Beaunier, living at Saint Etienne at the time, examined the machine, and appreciating at a glance the value of the invention, took the tailor with him to Paris, where a firm was soon started under the title of "Ferrand, Thimonnier, Germain, Petit & Co., with a view to the profitable working of the patent.

In 1841, in the Rue de Sevres, might have been seen a workshop in which eighty wooden sewing machines were constantly employed in making army clothing.

That same year, however, the tide of a fierce revolutionary outbreak swept over France, and the laboring men of the capital, in their blind and ignorant fury, saw in this new substitution of machinery for manual labor, nothing but a means of robbing their wives and daughters of their daily bread. The consequence was exactly the same as in the case of the canal boatmen of Münden, who destroyed the first steamboat started there in the year 1707, and of the Belgian weavers, who some years ago broke up the first flax-spinning machinery imported from England into the city of Ghent. An armed and infuriated mob smashed all of Thimonnier's machines, and he himself had to flee for his life.

Soon after this Beaunier died, and the firm of Germain, Petit & Co., was dissolved leaving our poor tailor out in the cold.

In the year 1834, Thimonnier returned to Paris, and having improved his machine, attempted to make a living by taking in sewing. In this, however, he failed, and was at length obliged to walk all the way back to his native home with his machine upon his back, exhibiting it as a curiosity along the road in order to enable him to purchase his daily meals.

After this sad experience it would be thought Thimonnier would have given up the matter in despair, but, on the contrary, he went to work and constructed several new machines which he disposed of with the greatest difficulty.

In the year 1845, the date of Howe's patent in America, the French machine was already making two hundred stitches a minute.

M. Magnin, of Villefranca, at this crisis joined our inventor, and furnishing the necessary funds, the construction of ten-dollar machines was at once begun by them, with a fair prospect of pecuniary reward. In 1848, these machines made three hundred stitches per minute, and could sew and embroider any material from muslin to leather inclusive. The woodwork had now also been replaced by metal.

In the memorable month of February, 1848, another convulsion of the people took place in France, and for the second and last time were Thimonnier's hopes of success entirely blighted, himself and his partner being completely ruined by it.

He sold his English patent to a Manchester company for a trifle, sent his best machine in 1851 to the great London Exhibition, but too late to be noticed; and, finally, after thirty years of a life of incessant struggle and adversity, he died at the age of 64, in the greatest poverty, on the 5th day of August, 1857, at a place called Amplepuis.

While our poor tailor was starving in Europe, the sewing machine was being perfected on a new principle, in the United States, and in 1845, Elias Howe, Jr., obtained his patent out of which he eventually made quite a large sum of money.

Since 1852, American sewing machines by various makers have taken the premiums at all the shows, and were soon known and appreciated over the whole civilized world. At the present time improved machines, together with a few original patterns, are manufactured in England, France, Germany, and other countries, some of which are not surpassed by our own, being compact, cheap, and simple, and work rapidly and efficiently. If our manufacturers wish to contribute to the wants of the outer world in sewing machines, they must apply their energies and ingenuity to perfect their machines as some of them appear to be doing.

A good needlewoman with her needle makes from twenty-five to thirty stitches per minute, while a modern sewing machine will make one thousand ; and yet we cannot call this last a *labor-saving* machine, so far as regards the operator on it. As compared with sewing by hand, the sewing with the machine is a really very laborious and fatiguing occupation.

A general law of mechanics is that whatever we gain in speed must be compensated by increase in power. For every extra stitch over the twenty-five or thirty mentioned above, a greater effort will be needed from the operator, until she may occasionally be taxed to her very utmost.

Increased power in this case is increased muscular action ; muscular action needs fuel for combustion in the human machine ; fuel for combustion means increased expense for daily food, a strain on the digestive organs, or a certain and dangerous physical waste of the individual. Our stage and street car horses are changed several times a day, but sewing girls at their machines are expected to work for ten or twelve consecutive hours with intermittent but continually repeated motions of the muscles of the lower limbs. Persons express surprise, if the remark be made that the poor operator is actually wearing herself out, and this much more rapidly than the slight movements she is making would seem to indicate.

We have before us a very interesting report, addressed to the "Société Médicale des Hopitaux," in 1866, by Doctor Guibout, on the sanitary condition of the many sewing machine operators which came under his personal notice in the public hospitals of Paris. Hollow cheeks, pale and discolored faces, arched backs, epigastric pains, predisposition to lung disease, and other special symptoms too numerous to be specified, were found to be the general characteristics of all the patients.

In the public houses of correction, where the female prisoners are obliged to work at sewing machines, in order to contribute toward diminishing the public cost of their detention, it has been found indispensable to issue to them supplementary rations over the usual diet of the establishments in order to keep them in good health.

These disastrous effects must eventually tend toward the deterioration of our race, and deserve, in a humanitarian point of view, the most serious consideration of all friends of mankind.

The way to remedy these evils is simple enough, viz., to make the sewing machine an automotor. In large establishments, where numbers of them are in daily use, steam has been applied with success, simple contrivances allowing them to be stopped or their speed to be increased at the will of the operator. Steam, however, is unavailable in private dwellings ; and here we meet with a need which American inventors ought long ago to have fully and satisfactorily supplied, that of a "family" automatic machine.

The only really practical device of the kind with which we are acquainted (and this leaves much to be desired), is the electro-magnetic automotor invented in France by H. Cazal, which occupies so little space that it may be hidden under a foot stood. The fact that the cost of combustion of zinc is thirty times higher than if the power had been obtained by the combustion of coal, is to a certain extent compensated by the advantages of absence of boiler, fires, smoke,smell,or dust. Four of Bunsen's elements are sufficient for driving an ordinary sewing machine at a cost of fifteen or sixteen cents per day.

The apparatus itself consists in an iron pulley with an externally toothed rim, which revolves freely within a metallic ring, toothed similarly to the pulley, but on its internal surface, so that the points of the teeth of the pulley, face and approximate to those of the outer circle. An insulated wire runs over the pulley, which thus becomes a magnet whenever an electrical current is run through it, and ceases to be so from the very instant that the current is interrupted.

While the current from the battery is active, each of the teeth of the pulley attracts its opposite on the rim, and if the current were to remain constant, each of these would remain *in situ* and no motion would be imparted to the wheel;to avoid this, a commutator, which is set in motion by the motor itself, regulates the passage of the electrical current through the wire and renders it intermittent. As soon as the apexes of the teeth have placed themselves into opposition, the current ceases and the teeth on the pulley proceed onward, when a fresh current forces them into a second opposition with the next set on the rim, and so on indefinitely, producing a very satisfactory rotary motion. The power being symmetrically disposed around the axis and in each tooth, there is very little friction on the bearings and no noise produced. The speed can be varied at will, and the simple pressure on a knob or button causes instantaneous stoppage.

It is our conviction that electro-magnetic, or other small motors, fit for many domestic uses, could easily be devised, superior to even the simple machine of Cazal. We recommend this subject to the immediate attention of our mechanics and engineers. Should they succeed, they will have found not only a source of wealth for themselves, but they will have contributed their mite towards alleviating some of the thousand hidden miseries incident to our modern civilization, and will thus have acquired a right to the gratitude of their laboring brothers and sisters.

SHAFTING, PULLEYS, AND BELTS.

Improperly hung shafting, unbalanced pulleys, and crooked and badly constructed belts absorb an amount of the power used for manufacturing purposes that would probably, if known, astonish the most observant. When it is considered that this power is costly—costly not only in the first means for its utilization, as in the construction of a dam, flume, wheel, etc., when natural water power is employed, but eminently costly when the source of power itself is an item of continual expense, as in the employment of steam—it will be conceded that the subject of saving the amount now wasted from imperfection in the means of its transmission, cannot be of merely slight interest. Too many of our shops and manufactories present a spectacle, anything but pleasant to the mechanical eye,in sprung shafting, cut boxes, inefficient belts, unbalanced pulleys, shafts of insufficient size, and a general lack of evidences of intelligent arrangement and proper management. Some, it is pleasant to say, are models in all these respects ; the manager allows no leaks to escape his observation ; from the source of the power to its ultimate delivery, every step and every means are carefully scanned and kept in perfect order. For such, any directions we may give, any advice we may offer, any suggestions we may make, are superfluous. We write the following for others.

Before selecting the iron for a shaft, or for several lines with their counters, the machinist or millwright should take into consideration the weight each section of shaft is to sustain in the size of pulleys and strain of belts, the distance between points of support (boxes), the velocity of the shaft, and the nature of the machinery it is to drive. In all cases the iron for shafting should be chosen for its homogeneousness and perfection of rolling, seen by the finish of its surface. Each section should be handled carefully in transportation. As it comes from the mill it is usually straight, or nearly so, but teamsters and dealers in iron bars seem to suppose that no more care is necessary in handling a bar calculated for shafting purposes than in treating so much scrap iron. Frequently the lengths come crooked, bent, and sprung, to the hand of the machinist ; they receive in transit no more consideration than the trunks of passengers on a railroad or steamboat at the hands of baggage smashers. It would be well for manufacturers of rolled iron for shafting, if they would follow the example of steel makers, or of Jones & Laughlins, manufacturers of cold rolled iron at Pittsburgh, Pa., and pack their bars in boxes. It would be well not only for them,but for the workman who is to convert these bars into shafts.

And here let us say a few words in favor of a most meritorious improvement, that just referred to, *en passant*, the cold rolled shafting. Its first cost is greater than that of the best refined iron ordinarily used for shafting, but it comes with a perfect finish, rolled to perfect size, without bend, kink, or spring, is ready at once to receive pulleys, and only requires centering and sufficient turning at the ends to give a shoulder for the couplings ; although if the coupling adapted for it and illustrated in No. 20, Vol. XVII, Scientific American, be used, the end turning may be dispensed with if not the centering.

But, passing from this style of nearly perfect shafting, let us look at the processes to be employed to produce proper sections where they must be turned. The first process is the straightening. To begin at the beginning, the shaft should be centered at the ends. It is evident this center must be found by the circumference. If the shaft is bent or straight, in either case the center should found and drilled, before any attempt to straighten the shaft is made. For this purpose the ends of the shaft should be squared. This is done preferably by the vise and file ; for if placed on temporary boxes in the lathe in order to use the side, or squaring-up tool, we do not know that the bearings of the shaft are true, and it cannot be placed upon centers until center holes are made, and this is our first object. Let the machinist take the shaft or bar to his vise, resting one end on the floor, and file by the trysquare until he has the end square with the longitudinal surface ; the center punch and dividers will give him the proper center. This, be it borne in mind, before any attempt at straightening is made. We are aware that a centering lathe is frequently used, and if used judiciously it is a valuable machine, even for crooked or sprung bars, but for those who have not this tool the plan above is sufficient.

The center being found, drill by the hand or breast drill, if a lathe is not convenient, a hole of about one-eighth of an inch diameter at least half an inch deep ; then chamfer or flare the hole with a cone-shaped drill, milled on its face—not a four-sided or three-sided tool, or a flat drill of two sides, but one circular to bear on every point at the same time.

The shaft is now centered, and is to be straightened. To determine how much out of true it is, suspend it between the centers of a lathe and rotate it by hand ; no dog is required. If sprung in a long sweep,put a block of solid wood across the ways of the lathe, with a hook bolt projecting above it at the rear end, and use a wooden bar as lever, placing one end under the hook, and at the other end apply your weight. Any crook not too short can thus be straightened. If short crooks occur, not manageable in this way, do not strike the iron cold on an anvil, but heat it to a red, or nearly so, and then straighten, not by the direct blow of the sledge, which will indent the iron, but through the medium of a hollow "former," the reverse of the "fuller," so that the iron is not injured.

We place great stress on this method of straightening kinks, as we know that not only is cold hammering injurious in indenting the iron, and injuring its texture, but that after these indentations are removed by the turning tool, if it goes so deep, the crooks sometimes return, like curses, to vex the peace of mind of the ignorant or careless workman. Turning the shafting must be deferred to another time.

BEET ROOT SUGAR IN THE UNITED STATES.

The *Evening Post* (Chicago), in noticing our announcement that we would give a series of practical articles on the manufacture of beet root sugar and expression of our belief that Yankee beet root sugar will, at no distant day, be offered in the markets of the world in successful competition with both colonial and European brands, admits it to be "a very comforting and encouraging fact, if fact it shall prove to be." It, however, throws some doubt upon the probability of successful beet root sugar manufacture here, based upon the very partial success hitherto attained in the attempt at such manufacture up to the present date. It says: "The establishment at Chatsworth, in this State, which was hailed when first begun as a certain triumph of low priced land and a home market over the competition of cane-growing districts, has had anything but an encouraging experience. A very large sum of money, probably not less than $300,000, has been expended by the company, but, thus far, without anything like the expected return. It is said that all the causes of failure are easily explained—that a bad crop of beets in one year, insufficient and defective machinery in another year, a want of water in a third year, will account for the continued inability of the works to pay."

Those acquainted with the history of this establishment, and who have a knowledge respecting the details of the manufacture, will readily admit that the causes assigned are ample to account for the "inability of the works to pay." These works are, however, doing better than the *Post* seems to think. It is stated, that during the last year they made a million pounds of sugar, which ought not to imply anything like imminent bankruptcy.

The *Post* states strongly the difficulties which attend the introduction of new industries, and shakes its head doubtingly thereat. But there are plenty of precedents to reassure it and other doubters. Of these we will instance only one, the silk manufacture, now a profitable and permanently-established industry on this continent. Surely, on the score of failures in the few and imperfect trials hitherto made in the beet root sugar manufacture, we find little to give reason for doubt when we remember the numberless failures and discouragements that obstructed the earliest attempts at spinning and weaving silk. It is hardly fair, however, to consider the only attempts worthy of the name, yet made in this country, as failures until it shall be proved beyond a doubt, that they have not only been doing business at little profit for the limited time they have been in operation, but have lost, and must continue to lose, from the insurmountable obstacles they are forced to encounter.

This has not yet been demonstrated, and the very fact that, notwithstanding the misfortunes of the works alluded to, it has kept its head above water, is, we think, evidence that it will not soon be demonstrated.

In this connection, it may not be amiss to give some figures from the New York *Shipping and Commercial List*, showing the extent of the sugar trade in the United States for 1868. The quanties are given in tuns of 2,240 pounds :

	Tuns.
Received at New York	259,073
Received at Boston	62,237
Received at Philadelphia	66,120
Received at Baltimore	53,458
Received at New Orleans	10,706
Received at other ports	10,380
Total receipts	461,974
Stock, January 1, 1868	45,746
Exports and inland shipments	8,246
Stock, January 1, 1869	41,942
Consumption of foreign in 1868	446,533
Consumption of foreign in 1867	378,068
Crops of Louisiana, Texas, etc.	33,000
Total consumption of cane sugar for 1868	479,533

"The crop of Louisiana, now about made, is estimated at 100,000 hogsheads. The season has been unusually favorable—so much so that at one time strong hopes were entertained that the yield would reach 125,000 hogsheads; but the weather has recently been unpropitious, and the estimates have been reduced to the first mentioned figures.

"The insurrection in Cuba will interfere materially with the supply from that quarter. The crop of maple sugar in the United States the last year will be about 23,000 tuns, though the data is imperfect upon which the estimate is made. The production of sugar throughout the world, including the beet sugar of Europe and the palm and date sugar of the Indies, for the year 1867, is estimated at 1,299,600 tuns, of which Cuba produces nearly one-third; of this Great Britain and her colonies consumed about 689,000 tuns, and the United States 467,300 tuns—the two nationalities consuming nearly one-half of the world's supply."

It will be seen that the foreign sugar consumed in 1868 in this country exceeds that of 1867 by 68,465 tuns, or more than the increase in home production, although the season has been unusually favorable. We do not believe the American people will content themselves with dependence upon foreign countries for this important staple, when there is no solid reason for so doing. With our fertile soil, and fertile brains, it will go hard if we do not make beet root sugar supply our own consumption, with some to spare for export. Let us not expect too much from the brief experiments yet made; we have planted only a few small seeds, it is not yet time for the reaping.

PAIGE'S PATENT IMPROVEMENT IN STEAM BOILER FURNACES.

Where bituminous coal is used as a fuel to generate power, for steam engines or other purposes, much of the carbon, of a volatile character, is carried off and left to settle down through the atmosphere, to the annoyance of everybody in its vicinity and to the direct loss of the consumer. For want of legal enactments, such as exist in England, some of our towns and cities are rendered unpleasant to their inhabitants and unattractive to strangers. The unconsumed carbon, which vitiates the atmosphere, where bituminous coal is the fuel, is neither healthy nor comfortable. The object of the device shown in the accompanying engraving is to provide for the complete and entire combustion of the gases and of the volatile, but solid particles of fuel, usually carried off by the draft to be deposited in a solid form.

Fig. 1

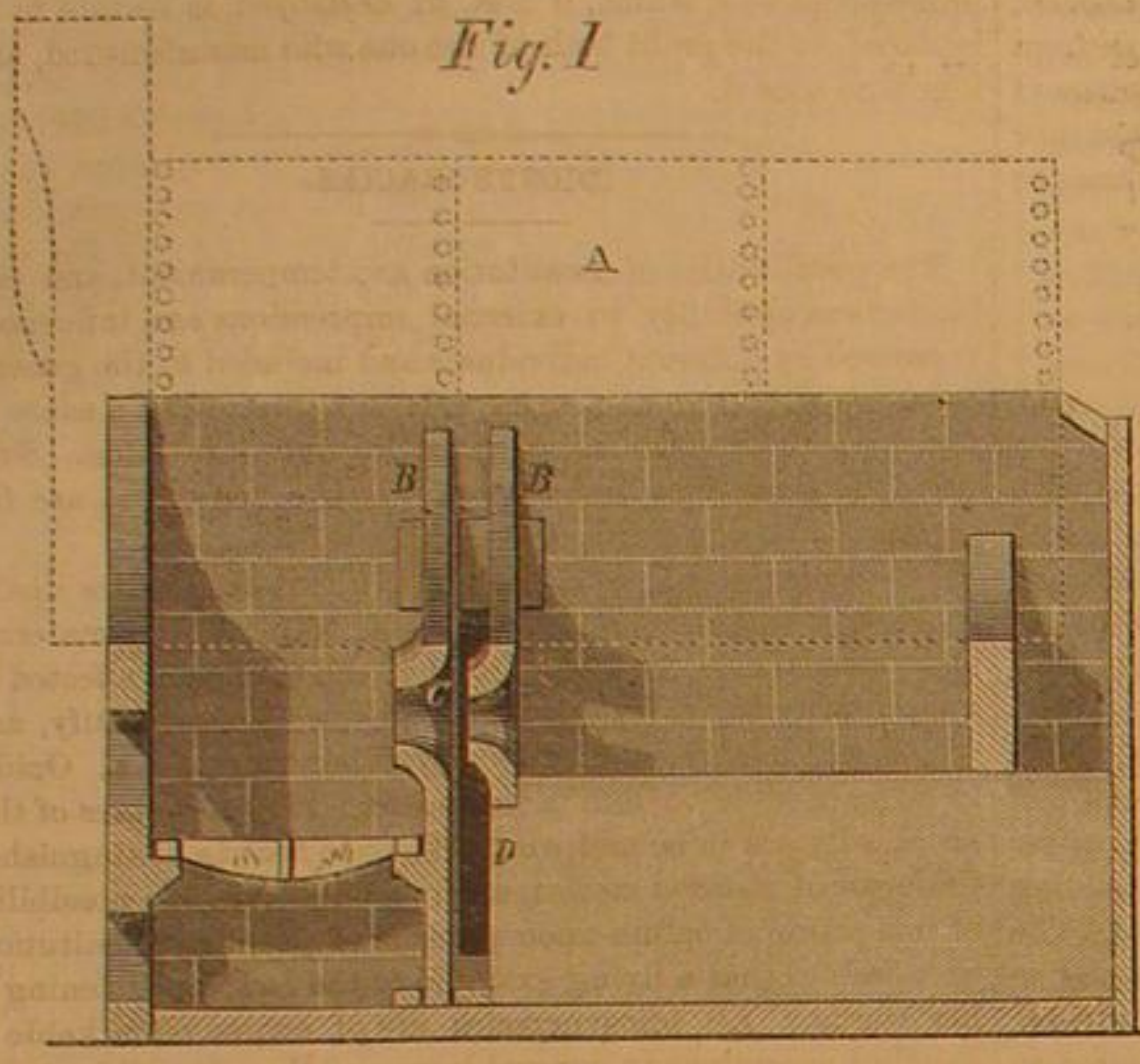
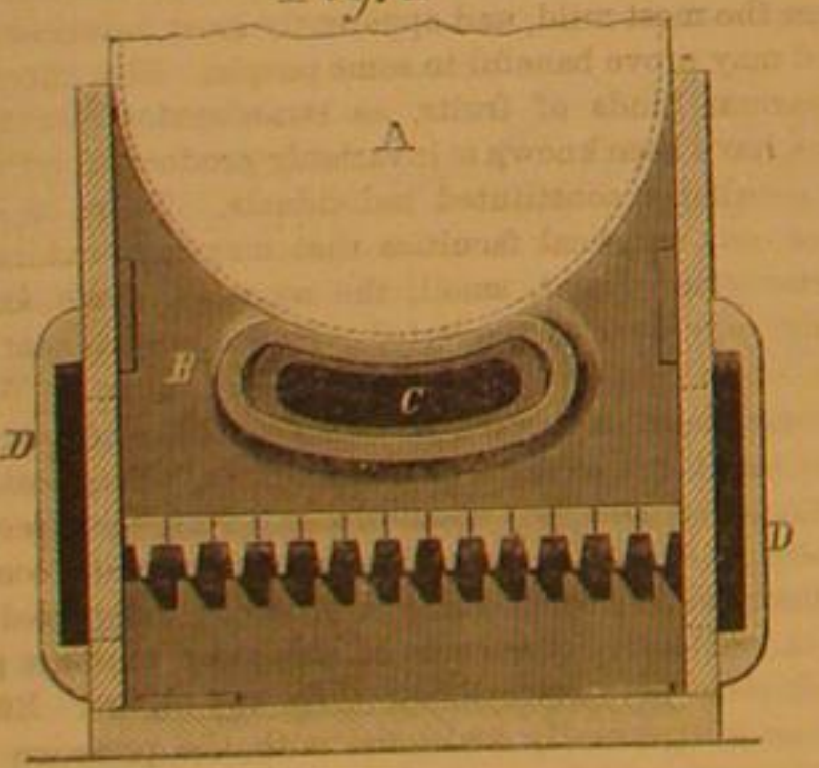


Fig. 1 is a vertical longitudinal representation of a furnace and boiler, and Fig. 2 is a cross section, taken on a transverse line at the rear of the grate. Similar letters refer to similar parts in both engravings. The furnace is of the ordinary style, its back, however, being an upright plate fitting the convexity of the boiler and the level of the grate, and having an opening of an elliptical form, but curved on its upper surface, to the circumferential line of the boiler. Another upright plate, similarly formed, is placed just behind the first, having a similar projection. These are seen in both figures: A is the boiler in Fig. 1 extending to the horizontal dotted line, and in Fig. 2 being shown in transverse section. B, in Fig. 1, shows the sections of the plates. The same in both figures show the form of the plates; and, in Fig. 2, at C, the whole contour of the openings is shown, also in section in Fig. 1, same letter—C.

The gases of combustion are met at a point between the two plates by a column of atmospheric air (oxygen) admitted through side apertures—seen plainly at D Fig. 2—to the space between the plates, B. It is evident that the outer air passing into the chamber, formed by the space between the two plates, and meeting the heated gases, smoke, etc., from the furnace, is at once expanded and intimately mixed with these products of combustion; not passing through the opening in the rear plate in a direct line, but deflected against the surface of the plate, and thus receiving a recoil or revolution before passing off with the draft. Thus perfect combustion is assured, and an intense heat results, that passes along the bottom of the boiler and envelops its sides. The inventor believes that not only is the smoke all consumed, but that the power of the heat and, consequently, the economic use of the fuel are increased twenty per cent. Where, as on vessels, the bulk and weight of the fuel carried are important elements in calculating the capacity of a ship, the advantage of such a device is apparent; and also where the cost of the fuel is an important item. This improvement may be applied to any ordinary furnace as well as to those built specially for its reception.

Fig. 2



The inventor and patentee guarantees that the improvement will accomplish all that he claims, and invites those who desire further information to address J. L. Paige, No. 7 Howell street, Rochester, N. Y.

Treating Textile Fabrics.

M. Pierre Armand Neuman, of St. Denis, Paris, treats textile fabrics with sulphuric acid, for the purpose of rendering them impermeable. By this process the fibers on the surface of the fabric are partially dissolved, and converted into a glutinous substance, without the fibers in the body of the fabric being destroyed. The fabric, after being passed through the sulphuric acid, is quickly washed and rinsed in water, to stop the action of the acid, and remove all traces of it, and it is afterwards dried, when the part which has been acted on by the acid, having impregnated and coated the fibers of the fabric, and filled up the interstices between the warp and the weft, will convert it into a parchment-like and impermeable materiel.

Heat and Steam.

A correspondent writing to us on the subject of "Waste and Economy of Fuel," seems to misapprehend Joule and Tyndall. One cubic foot of water when transformed into steam, does not, as he supposes, only contain 1,169 units of heat, but contains 1,169 multiplied by 62¼ pounds, or 73,062·5 units.

The steam engine furnishes a ready and convenient method of determining the mechanical equivalent of a unit of heat, and shows conclusively, we think, that Joule's figure is too low.

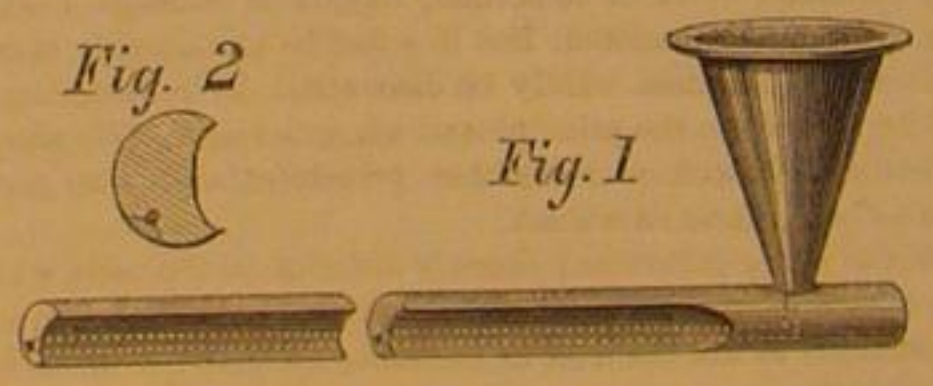
If we accept the results of the most careful physicists of our day, we may take the calorific value of one pound of good coal as equal to 7,500 Centigrade degrees.

Two such pounds consumed in as perfect a steam engine as we can construct, gives us an indicated horse power of 33,000 foot-pounds per hour, so that twice 7,500 units, or 15,000, in this case, will produce in an hour an effect equivalent to 33,000 × 60 minutes, or 1,980,000 foot-pounds. One unit at atmospheric pressure of 14·706 pounds will then represent 132 foot-pounds.

Reducing the pressure to zero, we obtain the equivalent of 1,931·192 foot-pounds for each unit of heat. Had the calorific power of 1 pound of coal been 6,000 units of heat, our equivalent would have been 1,838·25; if 8,000 deg., 2,426·32. The average would be 2,065 foot-pounds. This result we *practically* obtain every day with engines which we know to lose 30 per cent of useful heat. Adding this 30 per cent to our equivalent, as above, we obtain 2,684·5 foot-pounds, as the real equivalent of one unit of heat as exhibited by the working of the modern steam engine.

SELF-LUBRICATING AND SELF-CLEARING DRILL.

Boring deep holes in metals, especially when the hole is of very small diameter,and it is necessary to have it drilled straight and true, is not always an easy matter. In boring pistol and rifle barrels, for instance, nearly as much time is employed in in removing the drill,clearing,and lubricating it,and replacing the barrel and drill, as in the drilling itself. The drill shown in the accompanying engraving was brought to our notice by Wm. A. Chapin, of White River Junction, Vt., and introduced by him into the U. S. Armory, at Springfield, Mass., and is intended to obviate the difficulties alluded to,and save this otherwise wasted time.



The drill is, as seen in Fig. 1, a "pod" drill, milled to crescent form, in transverse section, the milled semicircular score being for the reception of the chips. Throughout its whole length it has a channel, seen in both figures, but more plainly in Fig. 2, that terminates at the cutting end, or point, and near the other end connects with a funnel to receive the oil or alkaline water, which acts as a lubricant. This score is milled or planed in the body of the drill, and covered with a piece of sheet steel, held in place by soft solder. Fig. 2, the enlarged cross section, shows this arrangement.

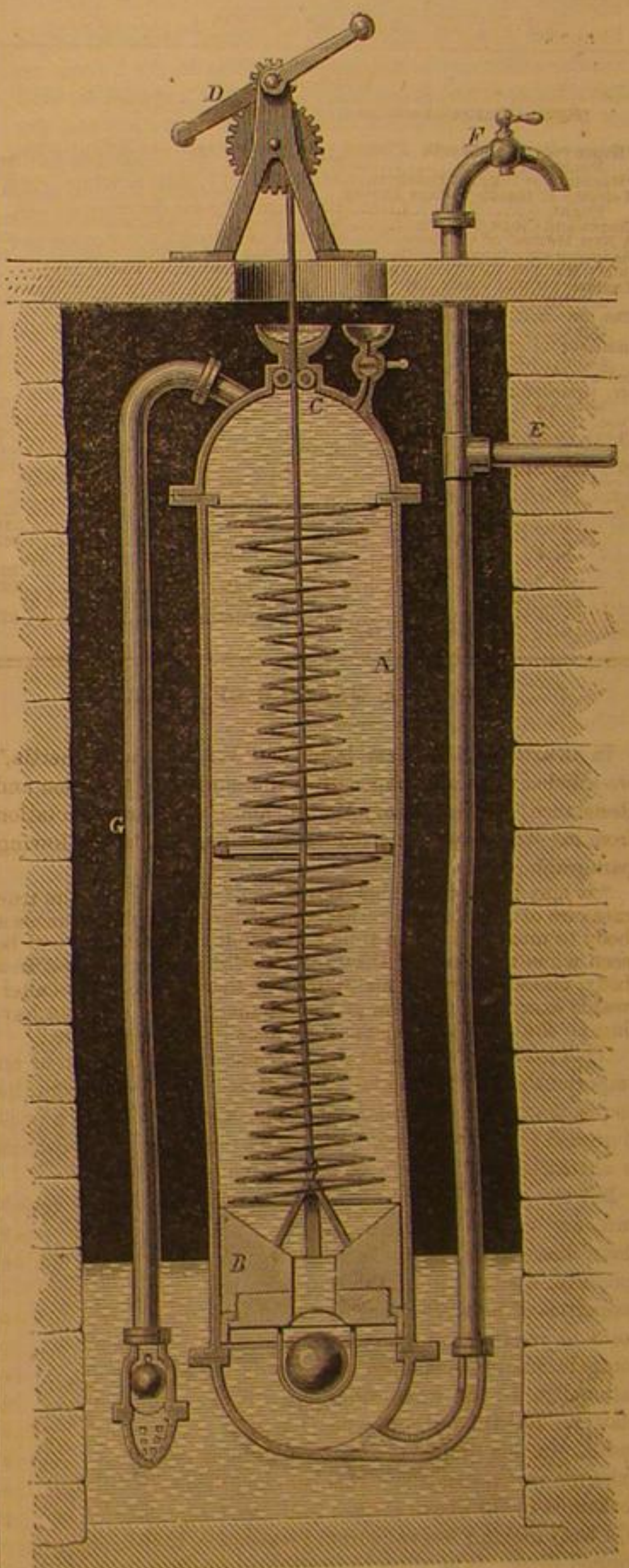
At the cutting end of the drill, the heat, caused by friction, will be greater than at any other point,and if the drill is used horizontally, the oil will be thinned and find its way to the point. If, at any time, the oil passage should become clogged, the hand end may be opened and a wire introduced for its cleansing. This end may be closed by any simple plug that may be readily removed for the purpose. This clogging, however, rarely occurs.

Tunneling Street Crossings.

Engineering speaking of the proposition to construct either bridge or tunnel crossings on the crowded streets of London, condemns both plans. Arguing against bridges, *Engineering* says: "We have sufficient experience, from a lengthened trial of the overhead bridge spanning the most crowded portion of Broadway, New York, that such a system of street crossings is of but little service; decrepit persons were unable to use it, business people too hurried, ladies were assisted over the street by the police, and the bridge was scarcely employed, save by idlers, while the only one who derived profit from it, till it was removed a few months ago, was a neighboring photographer. And if a bridge has proved itself objectionable in a situation where, of all others, a bridge should have proved itself most beneficial, a subway would be still more useless and objectionable." We certainly cannot see the force of this reasoning. In no single respect, but that of being on a different level from the street, is a subway like a bridge. But while the bridge must be high enough to allow vehicles and loads of all sort to pass under it, and its ascent and descent is consequently wearisome, the floor of a tunnel need not be more than eight or nine feet from the upper surface of the roadway. We have yet to hear any valid or even plausible objection to tunneled street crossings.

KOCH'S COMBINED AUTOMATIC LIFTING PUMP.

The object of this pump is to produce a continuous flow of water, by means of mechanical appliances brought into action by occasional exertion of force storing up power, for the time when required. The intention is to concentrate a force by a moment's application of physical power, to develop gradually into a power extending through a period much longer than that required for condensing or compressing it.



The cylinder, A, is suspended in a well, tank, or cistern, having inside it a piston, B, to which is connected a wire or other rope by which it may be lifted. This rope passes between rollers, C, at the top of the cylinder, made of elastic or flexible material, thus forming an air-tight joint, or packing. It is wound around a barrel by means of the double crank, D, and pinion and gear at the top of the well or cistern, or at any convenient point in the building. Connected with the piston is a series of spiral springs two or more in number, guided by means of diaphragms fitting the interior of the cylinder, but not necessarily air or water tight. In raising the piston, B, of course these springs must be compressed, and this compression is the means for furnishing the power necessary to re-depress the piston by their resilient force, and thus raise the water. Suppose the cylinder be, as represented, filled with water, the piston raised,and the springs contracted; it is evident, if pipes E and F, are furnished with cocks and they are closed, no air could enter the cylinder from these sources when the piston was raised, and a consequent vacuum would be formed under the piston. Then water passes from the pipe, G, to above the piston and rushes down through the cylinder and the central hole in piston, B, up through the upright pipe, to be delivered by the pipe, E, or the pipe, F. The descent of the piston will be governed entirely by the water drawn through these pipes, so that the amount of water that can be drawn, before again contracting the spring, is limited only by the capacity of the cylinder.

Patent pending through the Scientific American Patent Agency. Further information may be obtained by addressing Christian H. Koch, at Davenport, Iowa.

Scientific American.

MUNN & COMPANY, Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW (PARK BUILDING), NEW YORK.

O. D. MUNN. S. H. WALES. A. E. BEACH.

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

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

☞ Messrs. Sampson, Low, Son & Marston, Booksellers, Crown Building, 188 Fleet street, London, are the Agents to receive European subscriptions or advertisements for the Scientific American. Orders sent to them will be promptly attended to.

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VOL. XX., No. 16...[New Series.]....*Twenty-fourth Year.*

NEW YORK, SATURDAY, APRIL 17, 1869.

Contents:

(Illustrated articles are marked with an asterisk.)

TIME AS A MEASURE OF FORCE.

In an article in our last issue, on "Vis Viva and Inertia," we alluded to an able paper upon the subject of "Motion and Resistance," by Prof. Henry Morton, and made a brief quotation from it. The paper referred to contains, also, the following paragraph:

> "It may be objected that the time of action is not the true measure of a force, but rather the distance which it causes a body to move in a given time. But that this is not so, will be seen when we consider that any velocity once implanted in a body, needs no force to maintain it, so that all the motion afterwards executed by reason of that element, is a clear gain having no equivalent of expended force as its representative."

This paragraph contains the very partial enunciation of an important and fundamental law, and as it is evident, from the connection, that the author, when speaking of force as a positive, also considers with it its negative, resistance, his position is unassailable. Distance is not a measure of motion.

But the real meanings of the correlatives, force and resistance, are but dimly comprehended by many even who essay their discussion. Force is regarded by many as a hidden property, distinct from the ordinary and easily discernible properties of matter as seen in its aggregated state. Others seem to regard it as an exterior and occult influence, which compels matter, but does not reside in it. Others, more rationally, we think, consider it as being simply motion of matter. But the latter is true, if true at all, only in a limited sense. In this limited sense force implies resistance; cannot exist without resistance. This is evident from the illustration contained in the above extract from Prof. Morton's paper, that is, a body moving forever without resistance, from a previously applied force. It is, then, only while motion is imparted from masses to masses, from molecules to molecules, from atoms to atoms or molecules, from molecules to molecules or atoms, from atoms or molecules to masses, or from masses to atoms or molecules, that motion becomes a force. If motion is recognized, in this limited sense, as force, the true idea of resistance is expressed by saying that a body, by impact, loses motion or imparts it to masses, molecules, or atoms. In this view of the subject the relations of force and resistance exist together, and time is a measure of both, or either.

Momentum, amount of motion, expressed in the works on physics, by M×V, which is the weight of a body multiplied by its velocity, is not an absolute expression, unless we establish a unit of velocity. The mathematical expression of a unit of velocity is found by dividing the entire number of units of distance by the number of units in the time required for a body to move through that distance. It is $(D \div T)$, in which D represents the distance, and T the time. It is at once seen that neither time (T) nor distance (D) is a measure of momentum (M V), when considered separately; and the momentum of a body, or its amount of motion, is a constant one for all times when velocity $(V = D \div T)$ is constant, and M is also constant.

So far as motion is concerned, considered simply as motion and not as force, time is no measure of it. As soon as a body begins to impart its motion, or, as is the common method of expression, "to overcome resistance," time alone may be a measure of the motion received (force), and the motion imparted (resistance), the equality of which has long been recognized by physicists in the expression, "action and reaction are equal." For if the entire amount of motion imparted and received be uniform during a period of time, the motion imparted during a unit of that time will be an exact measure of the whole motion imparted; and the motion imparted for a unit of time is only found by dividing the entire amount of motion imparted by the time.

The author of the article on "Vis Viva," in the *Chemical News*, from which we made an extract in our article on "Vis Viva and Inertia," in our last issue, seems to have reached a somewhat similar conclusion, when he asserts that, "as he understands 'vis viva,' it relates only to change in velocity, and does not apply to the maintenance of a uniform velocity after it has been once attained." Now, change in velocity is purely and simply the subtraction from, or addition to, the motion of a body—of motion considered as quantity—and as (if the views of the identity of motion and force be correct) this, of necessity, implies force and its correlative, resistance, we see how "vis viva" can only relate to *change of velocity.*

There is little doubt that the differences which arise upon topics like these, between those who attempt their discussion, originate more from the inefficiency of language than from the real views entertained respecting them. The language of scientific discussion should be cleared of many terms that now are only sources of embarrassment. Some of these may be noticed, more especially, in a future article.

THE BURDEN OF MEMORY.

Appleton's Journal contains in its first number a calculation, by Berthelot, the eminent French organic chemist, of the number of combinations which may be made of acids with certain alcohols. He says, if you give each compound, thus possible, a name, and allow a line for each name, and then print 100 lines on a page, and make volumes of 1,000 pages, and place a million volumes in a library, you would want 14,000 libraries to complete your catalogue.

The science of chemistry is perhaps the most striking example of the rapid accumulation of facts so characteristic of the present age. Hosts of investigations in every field of research are unearthing treasures of knowledge and adding them to the accumulated scientific wealth of the world. The burden which the memory is called upon to bear is already so heavy, that it could scarcely be possible for any man, however gifted by nature, to carry with certainty, those pertaining to any one department of science, even though his entire life were devoted to it.

This fact explains the increasing demand for works of reference. Encyclopedias, hand-books, compilations of tables, and various and multiplied helps to memory abound; new books of like character are constantly issued, and those which already exist, need constant revision, to keep pace with the march of discovery.

It is quite evident that only a small fraction of the mass of facts can ever be stored up in any individual memory; the attempt to remember them would occupy thrice the years allotted to the life of mankind. If only part can be remembered, it becomes important to know what *ought* to be remembered, and what must be left to the works of reference.

While facts are almost numberless, principles are few. We can then, easily remember principles, and a knowledge of general principles is the key to research in books for facts we do not know; it is also the means whereby we can test the truth or falsity of the statements contained in such works. It would be strange indeed that errors should not creep into any extended work of reference; nay, it is strange that so few errors are committed. But if a fact be erroneously stated, the error will almost surely be discovered by considering it with reference to the principles which underlie it. We should therefore first seek to remember principles, and after them, just as many facts as we can.

But to every individual there is a choice in the facts which are to be remembered. Those which are of the most frequent application in his business or profession, are the ones he will be most likely to choose to remember, and with good reason. The life-long student (there are a few such still to be found) will choose such facts as he must frequently refer to in his studies. But facts to be most easily remembered, require thorough and careful classification.

To classify properly is however a task of skill—skill only acquired by a proper appreciation of the true end of all classification, namely, convenient reference. A business man classifies his notes, receipts, letters, etc., and places each kind of document in its proper pigeon hole; but this classification might be carried so far as to utterly defeat the purpose it is designed to subserve. The pigeon holes might be so multiplied that a letter, or note, or receipt could be picked out of a single bundle sooner than a particular pigeon hole could be found among the entire number. Of course this is supposing a very extreme case, but it illustrates the point we wish to make, namely, that too much classification is as bad as too little.

A great many people have too many pigeon holes in their memories; more have too few; and a few, those who seem largely gifted by nature in power of memory, have neither too many nor too few; but no single man has room in his memory for everything. All must more or less have recourse to their book shelves.

A poor recourse it is in many cases. Down comes a huge volume, the title of which in broad letters on its back, shows that the fugitive fact we are after, is or ought to be within its covers. We turn to the back part to find the index, but we don't see it. Perhaps it is at the beginning. We hopefully turn over the leaves of the book to find it there, and discover nothing but a meager table of contents. We throw down the book in infinite disgust; if we have got to hunt two hours for that fact, unless it be of great importance, we conclude to do without it. We relieve our feelings by heaping anathemas upon the author, who maliciously thought to force us to read his entire work, before we should have our fact. We look for another book. Ah how different! A copious and carefully compiled index—by its help we unearth our fact, in less time than we occupied in searching for an index in the former one. Good! We dust it carefully and place it close to hand, and put the other away among the rubbish. As action is the soul of eloquence, so an index is the soul of a book of reference, and we admire both large souled men, and large souled books.

Books of reference are a necessity of the age. In fact all books on scientific or technical subjects, are books of reference and are more or less used as such, according to their worth. Authors should not lose sight of this fact. It is not enough that the subject should be ably handled, it should be so arranged that any passage may be found with the greatest facility. When this last and essential requisite is added to merit in other respects, it is a well-tempered, well-sharpened professional tool, which, if lost, or destroyed, is certain to be replaced, to the profit both of the one who manufactured, and him who uses it.

IDIOSYNCRACIES.

The peculiarities of constitution and temperament, and particular susceptibility to external impressions and influences, possessed by different individuals and included in the general category of idiosyncracies, have been a puzzle and a snare to the theoretical physiologist since the days of Galen. Such peculiarities are not confined only to the body, but are frequently to be detected in the mind.

The writer of this article is a descendant of families distinguished through several generations, both on the maternal and paternal side, for idiosyncracies, and is himself affected by a peculiarity to which his family physician can testify, and which will hardly be credited by other physicians. Opium in large doses is to him a cathartic. Very few cases of this peculiarity are to be met with. We once heard a distinguished professor of *materia medica*, assert in a lecture the possibility of this action of opium upon persons of peculiar constitution, unconscious that a living example of the fact was listening to his words. All idiosyncracies are of course remarkable as seeming exceptions to general laws, and there is nothing more so about the one mentioned than any other, except the rarity of its occurrence. We have met, indeed, with a physician of this city, who has known a similar case in Europe, but this is the only other case of the kind we ever heard of. On the whole we are inclined to think idiosyncracies much more common than is generally supposed, many escaping notice on account of their unimportant character.

One of the most common classes of idiosyncracies are those connected with eating and drinking. Almost every one is acquainted with somebody who cannot eat honey without subsequent distress at the stomach. Not quite so common are those who cannot eat the flesh of certain kinds of animals. A number of cases are recorded of those who could not eat mutton without poisonous effects. An instance of this kind once came within our personal knowledge. Supposing it to be purely the effect of imagination, the mutton was once smuggled into mince pies, usually made with beef, and thus disguised was eaten, by the person affected, with quite serious results. Violent pain in the stomach and sickness, followed by copious vomiting, in fact nearly all the symptoms of irritant poisoning succeeded the eating of the mutton in this case, and although the vomiting relieved the more distressing symptoms, the effects were felt for several days. Similar effects from eating mutton are recorded in the books.

Even the most mild, and apparently most harmless, articles of food may prove baneful to some people. Rice, cheese, eggs, and various kinds of fruits, as strawberries, oranges, and melons, have been known to invariably produce ill effects upon some peculiarly constituted individuals. There is scarcely one of our physical faculties that may not exhibit these idiosyncracies. Sight, smell, the sense of touch, and even hearing, may be thus perverted. How often we hear of certain sounds that they "set ones teeth on edge." We have read somewhere of women so sensitive to the effects of such sounds that the whistle of a thread drawn through stiff cloth in sewing was positively unendurable. Nay, there seem to be instances where deleterious effects are produced by commonly harmless objects, when their presence is recognized by no sense in particular. Instances of the latter kind are perhaps as well or better authenticated than any others. Effects of this class are generally connected with the presence of animals, as cats, rabbits, etc., the near approach of which is noxious to the persons affected, as is also quite frequently the touch of their furs.

All that we have stated is based upon the best authority and may be relied upon as perfectly credible. Now, how, we ask, disregarding such facts, can medicines be prescribed by rule, as is the too common custom, without occasionally evil, nay, even disastrous results?

We have often had opium prescribed in the ordinary full dose with the view to produce the ordinary, but exactly the opposite effect, invariably resulting to us from its use. We have seen the feet and limbs of a young lady whose skin is peculiarly susceptible to poisonous effects, so swollen and inflamed from the effects of mustard drafts, as to excite fears of the worst consequencss. We have seen similar effects from the application to the skin of carbolic acid. We have stood by hundreds of sick beds and have seen numberless doses prescribed, and hardly ever have heard a physician ask how certain medicines usually effect the patients. As a consequence, we have seen patients completely prostrated by the action of drastic purgatives, in doses that would not perhaps have seriously injured the average patient. We have seen others completely narcotized by doses of morphine, that would only have quieted a cough in most; and so on to the end of the chapter.

We are well aware that book doctoring is held at its proper valuation by the leaders in the medical profession, and that to such, the really skillful, even the slightest peculiarity of temperament is not deemed unworthy of attention; but there are too many, far too many, who put all patients on the same plane, and confine themselves rigidly to one routine of treatment.

No less are idiosyncracies of mind and disposition to be regarded in imparting instruction to the young, or in our everyday dealings with our fellow men. Most mental peculiarities are easily discovered by the practiced student of human nature, and it as much our duty in our attempts to instruct and reform others, to avoid nauseating them mentally as it is that of the physician to avoid over-dosing those he is attempting to heal.

STEAM BOILER INSPECTION AND INSURANCE.

At a meeting of the Directors of the Hartford Steam Boiler Inspection and Insurance Company, held at their office in Hartford, March 31st, the following report of business done in the month of February, was read by the President: "Visits of inspections made, 180; number of boilers examined, 332; external examinations, 261; internal examinations, 84—while, in addition, 18 were tested by hydraulic pressure; number of defects in all discovered, 226; number of dangerous defects, 26; furnaces out of shape, 13; fractures, in all, 21—3 dangerous; burned plates, 20—2 dangerous; blistered plates, 53—2 dangerous; cases of incrustation and scale, 45; cases of external corrosion, 23—3 dangerous; internal corrosion, 3—1 dangerous; internal grooving, 6; water gages out of order, 6; blow-out apparatus out of order, 2—1 dangerous; safety valves overloaded, 22—3 dangerous; pressure gages out of order, 14—8 dangerous; boilers without gages, 1; cases of deficiency of water, 3. In the month's work four boilers have been found in such condition as to be positively dangerous, and beyond repair. These four have been condemned, and are being replaced by new boilers. In one of the cases of internal corrosion, noted above, an internal examination revealed to the inspector plates so badly weakened that upon sounding them with a hammer a hole was broken entirely through. This shows the importance of careful internal examinations. Many cases similar to the above have been found in localities where laws requiring annual inspections to be made are in full force. State and municipal inspection laws require only the hydraulic test to be applied; hence incrustation, scale and internal corrosion are defects which such inspections take no cognizance of.

"We must again revert to the subject of *overloaded safety valves*. Twenty-two have been found; while three were entirely inoperative—from excessive loading and neglect. One spindle was very crooked, and extra weighting was resorted to. In another the valve was corroded fast in its seat, and was raised with great difficulty. In another the fulcrum joint was corroded fast, and in raising the lever the connection was entirely broken out.

"Now, although a manufacturer may think he has a very careful engineer, and that inspection is hardly necessary, he must admit that a man whose business it is to thoroughly examine boilers, internally and externally, will discover defects which another would pass over. While many and serious defects have been discovered by the company's inspectors, no risk has been assumed except where the boilers have been put in good repair. Among the 2,500 boilers under the care of this company, slight damage has occurred to one in the city of Providence, during the month. Our inspector from this office visited the establishment at once, and made careful examination of the ruptured sheet; repairs were immediately made, this company assuming the expense."

DEATH OF JAMES HARPER.

The recent sudden death of James Harper, senior member of the celebrated publishing house of Harper & Brothers, of this city, has taken away from us one of our most honored and respected citizens. His death resulted from injuries received by being thrown from a carriage while taking a drive. His funeral, which took place upon the 30th of March, was largely attended by the most prominent citizens of New York; and was further honored by the closing of the different houses in the book trade throughout the city. He was, in many respects, a remarkable man, and his life was one long example of the beauty of all social and Christian virtues, combined with business and literary judgment, to a highly exceptional degree.

Applications of Steel Castings.

A few days ago we saw a number of specimens of steel castings imported by Philip S. Justice, of this city, which showed a degree of tenacity and ductility seldom found in steel forgings. The castings were of varying thickness, form, and weight, and had been subjected to forging, bending, percussion when cold, hardening, tempering, etc., all the tests that would be used to determine the toughness of the best wrought iron, and some that would be inadmissible with steel forgings. The result was wonderful. Cored castings were brought together under the hammer, and drawn out without showing any evidences of unsoundness. The castings showed no blow holes or evidences of want of homogeneousness, but were in all respects as sound as any forgings. They finished under the file or on the lathe elegantly. It is claimed they can be made as thin as one-sixteenth of an inch with facility. Their solidity may be conceived from the fact that hydraulic cylinders, unlined, of fourteen inches inside diameter, two feet ten inches long, and only two and a half inches thick, stand a test to which one of cast iron eight inches thick, would succumb.

These castings have been used in England for some time, but have only lately been introduced into this country. The applications of this method of working steel are numberless, or at least equal in number and similar in character to those of cast iron, and calculated to supersede wrought iron and steel forgings to a very great extent.

BEET ROOT SUGAR.

No. IV.

Technology.—Part I.

As a complete account of the various modern processes for manufacturing beet root sugar would fill several reasonably sized volumes, it will be impossible for us to exhibit them in all their multitudinous details in the pages of the Scientific American, where they would stand in the way of the publication of a large amount of useful and interesting reading matter of a more varied nature.

For this reason we shall have to confine ourselves to the illustration of the most recent and perfect methods of manufacture only, which we shall strive to do, as concisely as possible, without omitting any item of importance.

We will add, the specifications and detailed estimates for the establishment of a sugar factory, calculated to work an average of 150,000 lbs. of beet root per twenty-four hours, during a campaign of from four to five winter months, and corresponding in the United States to the average product of the cultivation of 500 acres in beets. This important subject has never, to our knowledge, been fully elucidated in any printed work on the making of sugar, and may be found of value to parties intending to start this branch of industry in America.

PRODUCTION OF STEAM.

Beet root sugar works consume a large amount of steam for driving engines which propel root-washers, hydraulic pumps and presses, pulpers, water pumps, centrifugals, etc. Steam also conveys the juice and sirups from one place in the building to another, and is the agent used for evaporating and boiling them.

The quantity of heating surface needed is generally estimated at about 250 square feet for every 10,000 lbs. of roots worked during 24 hours, or the H. P. is supposed to correspond to 50·8 lbs. of water evaporated per hour, or 6 lbs. of water for every square foot of heating surface of the boilers.

Practically, we have found that a well-managed modern sugar factory employing vacuum pans, both for the concentration of the juice and for its final boiling down, and capable of working 150,000 lbs. of beets every 24 hours, necessitates 120-H. P. boilers, and 17·216 feet of heating surface to the H. P.

The pressure of steam through the whole works ought never to exceed three atmospheres, or 45 lbs. to the square inch.

From the above, we derive the information that the steam department of a 500-acre beet root sugar factory and its cost in gold, will be as follows:

1. Three steam boilers of 40-H. P. each, with two internal pipes and one flue, calculated at 17·2 feet of heating surface per H. P., with fire boxes, grates, safety valves, gages, anchors, steam valves, H-pipes, etc., complete. Cost, $3,700.
2. Two steam drums, superposed over the boilers, with fittings complete, serving as reservoirs for the return steam from all parts of the works. Cost, $260.
3. One small 4-H. P. donkey engine, driving two feed pumps, each of which is capable of supplying a 120-H. P. boiler. Cost, $520.

The total valuation of the appliances for the production of steam in a 500-acre factory, is thus seen to reach $4,480.

WASHING AND PULPING OF THE BEETS AND EXTRACTION OF THE JUICE.

As soon as the works are in perfect readiness for a start, which will generally take place during the latter end of the month of September or during the month of October, the steam is "got up" in the boilers to 40 or 45 lbs. pressure, and the beets to be worked are at once, and regularly, carted in.

Each empty wagon or cart employed for the conveyance of the beets from the trenches to the factory is carefully weighed, and its number and weight noted. Every time this wagon reaches the factory with its load of beets, it is reweighed, and the weight of the wagon being deducted from the total, furnishes at once the amount of beets carried in for consumption. The wagons and their loads are weighed on large platform scales placed on the roadside near the works. In this manner, during the whole campaign, an exact account is kept of every load of beet entering the works, and of every pound of beet consumed.

The quantity and percentage of sugar made is thus controlled, and in case of some fault in the processes of manufacture, it is at once made manifest. Much valuable information is also furnished by these data as regards the relative value of different fields or portions of land, and the amount of beets grown on them; information which may be made available during following seasons.

The beets as they are brought in are placed in piles alongside of the beet root washer. This is a long, cylindrical, slightly inclined revolving drum, constructed of parallel rods of iron, so distanced as to allow the water and small rootlets to pass between them without permitting the passage of large fragments or of small-sized beets.

This drum revolves in an iron tank, furnished below with a manhole door, which allows it to be occasionally cleaned out; this refuse being carted off as manure.

The proper speed for a root washer is from ten to twenty revolutions per minute.

The more water employed in washing the beets the better, but the supply of both roots and water must be as regular as possible.

Care must be taken that at the lower outlet of the root washer, where the beets fall on an incline plane, interstices be left wide enough for the superfluous water to escape before it reaches the pulper, where its presence would cause irremediable damage.

On leaving the root washer, or rather the incline below it, the beets are pitched into the jaws of the pulper, where they are seized between revolving cylinders, armed with spikes or or knife blades, which rapidly reduce them to a fragmentary form. These fragments pass into the pulper proper, which consists of a double revolving drum, driven by belting. It is constructed by *tightly* fitting into two circular iron end plates, alternate series of small saw blades with projecting straight teeth, and carefully-made wooden rulers 0·39 of an inch broad and 0·78 of an inch high. The saw blades are toothed on both edges, so that by reversing them, one side can be employed after the other has been worn off. The teeth are from 0·156 to 0·195 of an inch in length, and measure 0·078 of an inch from tip to tip in the same row. The thickness of the saws is about $\frac{2}{50}$ of an inch.

The steel of which these saws are made is tempered in such a manner as to cause them to be stiff and hard without being easily broken.

Immediately in front of the revolving drum, whose speed must be from 600 to 700 revolutions per minute, is placed a stout, finely-attached blade of steel facing the points of the saw teeth, and adjusted so nicely as to leave no holes or intervals through which any fragments of beet root would find their way.

This precaution alone prevents solid particles of beet from getting into the woolen sacks during the subsequent pressing, an accident which would be sure to be followed by the bursting of the sacks and wasting of pulp over the spots where the lumps are to be found.

A newly-set pulping drum always produces a rough pulp, in which a portion of the vegetable cells remain untouched; a consequence of this fact is that a larger quantity of juice is actually extracted from pulp made by a pulper which has had some usage, and whose teeth have become worn, than from a new one.

The pulp to be of good quality must be thin, and present no rough or angular "grain" when pressed between the fingers. A limit, however, exists to the advantageous divisibility of the beet root, which is reached when the teeth of the pulper are nearly worn away, and the pulp becomes "pasty," and will ooze through the meshes of the wool sacks when pressed, a circumstance attended with very serious consequences.

A small stream of water, regulated by a cock, is allowed to run constantly on the top of the drum, and to mix with the pulp, where it effects a partial maceration. The influx of this water is to be so regulated that the juice which is expressed will indicate 4·5 to 4·8 degrees of Baumé's densimeter.

The pulp is received in front of the pulper in a small reservoir.

At this point the further processes of manufacture may vary according to the system of extraction of juice adopted. Four of these are now practiced in Europe; they are as follows:

1. The use of powerful hydraulic presses.
2. The employment of centrifugal machines.
3. The method of maceration.
4. The diffusion process.

Without entering here into a discussion of the relative merits of these various processes, which, when well conducted, have in all cases produced the same amount of sugar from the same amount of beets, we shall simply state that the second materially increases expenses for the fuel used during evaporation, on account of the large quantity of water which has to be added to the juice, and that the two last processes need an amount of care and skill on the part of the laborers, which is difficult of attainment.

The system of extracting the juice from the pulp by means of hydraulic presses, worked by pumps driven by steam power, is simple, easily managed, and efficient. In order to effect this, the pulp is first put into bags made from the wool which grows on the bellies of sheep. These bags are 33 inches deep by 22 inches broad, and the quantity of pulp put into them is a shovelful, or a quantity which, when slightly flattened, will not exceed the thickness of a finger.

The sacks are piled up one over the other, separated by sheet-iron trays, and are first submitted to a preliminary pressure in a rapidly-working press, which extracts a large quantity of the juice contained in the pulp. They are then transferred to the hydraulic presses, where the remainder of the juice is squeezed out.

When working in the proper manner, the table of beet root sugar presses must ascend in from five to six minutes, and stop for several minutes before beginning to descend. Too rapid rising of a press destroys the sacks. If the pulp has been sufficiently pressed it will look and feel dry, and will not weigh more than 18 per cent of the weight of the beet root which produced it.

The expressed juice, both from the first press and from the hydraulic presses, is run through pipes connected with funnels or "chapels" into an iron reservoir united by means of a valve or cock, with an upright boiler, called a "*monte-jus*" which we shall describe in our next article.

Specifications and valuations in gold for the washing, pulping, and pressing department of a 500-acre beet root sugar manufactury are as follows:

1. One horizontal 20-H. P. steam engine for driving the root washer, pulping drum, the hydraulic presses, and two pumps capable of delivering 37,000 gallons per hour. Cost, $1,700.

2. The beet root washer, 12 feet long, with iron drum and cistern. Cost, $350.

3. One pulping machine, with double drum, and capable of working 150,000 lbs. of beets in twenty-four hours. Cost, $660.

4. One spare double drum for the above. Cost, $130.

5. Spare saws for same. Cost, $40.

6. One sack filler, or "*paletteur.*" Cost, $74.

7. One Lecointe press. Cost, $320.

8. Six hydraulic presses, with eight guides to each, two movable counterweights, twelve-inch pistons, and 40 inches stroke. Cost, $4,000.

9. One iron frame, with two hydraulic pumps, these alternate, with differential pistons, eccentric transmission of motion, and patent compensator, fitted to work the eight hydraulic presses. Cost, $1,200.

10. Six "returns," stops, and wrought-iron pipes for the hydraulic presses. Cost, $200.

11. Two sheet-iron gutters, and three large funnels or "chapels" for collecting all of the expressed juice. Cost, $150.

12. One "*monte-jus*" of a capacity of seventy-five cubic feet, with all its accessories, and a connecting reservoir of same capacity. Cost, $210.

13. Pulleys, belts, etc., for transmissions of motions to root washer, pulper, hydraulic pumps, etc. Cost, $520.

Total cost of washing, pulping, and pressing department of a factory which will work 150,000 lbs. of beet per twenty-four hours, will be $7,274.

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VELOCIPEDE NOTES.

The velocipede has got into the highest court in England. A lower court has decided that it is unlawful for toll-gate authorities to charge toll for a velocipede; but the company against whom this decision was rendered, mean to carry the case up to the chief tribunal. The charge of toll was made under the clause empowering to charge for "a foot passenger driving a wheelbarrow."

It has also got into the magazines, into the theatres, and into the hearts of the sport-loving community so deep that it will take it a long time to get out. It has a language of its own, and a literature of its own, which is not confined to prose, but includes also rhyme if not poetry. Grave periodicals write dissertations upon it, humorous ones caricature it, the daily press tells very extraordinary yarns about it. For our part we simply endeavor to keep our readers posted upon its progress.

In Boston the municipal authorities have recently granted fourteen licenses for velocipede rinks.

Two new styles of velocipede, which conflict with no existing pattern, are reported from Worcester, Mass. One of these is to run entirely by friction and the other with common foot paddles.

Mr. Calvin Witty has just received the original velocipede—the one built by Pierre Lallement before he had received his patent. It is a good velocipede in every way and has a much better saddle than is manufactured to-day. Lallement was a machinist, and this velocipede proves that he was a good workman. From appearances Lallement has ridden it a good deal. As a curiosity it is very valuable to Mr. Witty.

A new style of velocipede was exhibited at Witty's school on Tuesday night. It is a wire velocipede, the wheels being formed of wire entirely. Small thin wire takes the place of spokes, and it is made strong on the same principle that makes a suspension bridge strong—each wire strengthening the others. It is exceedingly light, and there is a slight vibratory motion which is very pleasant; doubtless it would do exceedingly well on the street. When it was run last night upon the new spring floor which Mr. Witty has laid down, the spring was very great. It attracted much attention on the night spoken of.

The unreasonableness of prohibiting velocipedes from the public highways is thus satirically spoken of by the *New York Herald*:

"Man's own feet or crutches and a wheeled vehicle with a horse in front—these, it seems, must be the Alpha and Omega of locomotion in the city streets. A wheeled vehicle without a horse is a thing so preposterous to the eyes of aldermen that it must be forbidden altogether. Such is the experience of several cities, and our city promises to follow suit. Now, though the horse is favored by popular prejudice, a man may move his wagon with a mule, or a jackass, or a goat, or a dog; but he is not permitted to move it without one of these in front, or he will be fined twenty-five dollars. We recommend the sports to tie their tan terriers in front of the machine with a piece of pink ribbon, and go it on the same dodge adopted for the dummies, where an old blind horse trots in front of the locomotive within city limits. Although the aldermanic abdomen is a guarantee against any experiment of the Fathers on the velocipede, cannot some juvenile of aldermanic lineage convince the old fellows how ridiculous they are in endeavoring to prohibit what only needs regulation?"

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When the machine, or its parts, is beyond the operator's powers, the machine has usurped the place of its governor or manager. Every person running a machine should understand it, sufficiently at least to retain his natural superiority. If not, the machine is his master, which is reversing the order of nature.

ARE UTENSILS OF COPPER INJURIOUS FOR CULINARY PURPOSES?

Translated from the German "Aus der Nature."

Utensils of copper are held in high esteem by most ladies, because they form when well scoured, a kind of ornament to the kitchen. They do not however, take into consideration that food may be poisoned when cooked therein. It has been stated, though scarcely to be believed, that articles of food containing acids may be prepared in copper vessels without any injurious effect, if they be not allowed to remain in such vessels any length of time. This opinion has even been sustained by men of science, who maintain that the action of the acid upon the metal is prevented, because the vapors which are constantly generated in cooking prevent oxidation taking place. Recent investigations, however, have proved beyond doubt that this supposition is incorrect. Pleischl, in Vienna, showed that cabbage, fresh and dried plums, etc., absorb a quantity of copper sufficient to cause injurious effects within one hour's boiling in pans made of this metal. Meat also, because of the acids, it contains, is acted upon by copper. This is also the case with water when it contains chloride of sodium or salt, which is rarely ever lacking in spring water. Copper is also readily dissolved by oil. In placing a drop of oil upon polished copper, it will be seen that the oil soon assumes a dark bluish green color, which change is due to the fact that the oxide of copper formed, has combined with the fatty acids contained in the oil. The power of solubility is, of course, considerably increased when the oil or lard has previously been subjected to the action of heat.

Quite recently Dr. Wald asserted in a German periodical that copper is not poisonous and the objection to utensils of copper therefore unfounded. He asserts that no case of poisoning by salts of copper is recorded! The doctor certainly must be unacquainted with Orfila's toxicology or similar works.

Copper, as long as it remains metallic, is indeed not always injurious to the system. Instances are known where individuals have swallowed copper coins and discharged them again without the least injury, and Drouard has administered nearly one ounce of finely pulverized metallic copper to a dozen dogs, without observing any case of poisoning. Still, Orfila himself relates that an individual in swallowing copper powder was seriously affected.

It is also well known that braziers and electrotypers are often subject to a peculiar disease called copper colic. Its symptoms are fever with violent pains in the bowels. The sickness itself consists in inflammation of the stomach and the intestines, and is produced by the introduction of finely divided copper into the system. The late Professor Runge also mentions that a dealer of the oxide of copper, in Berlin, was unable to obtain laborers for collecting and packing it, because of the illness it occasioned among them.

Orfila relates several cases of poisoning which were produced by salts of copper. Five children, of from three to eleven years of age, were taken ill after eating bonbons which had been colored green by the vessel in which they were prepared. Drouard suffered three days from colic and diarrhea after having eaten a "ragout" prepared from the wine of a cask of which the cock was found to be oxidized.

Orfila says that a dog died in less than three hours from the effects of a dose of verdigris not exceeding fifteen grains. A small one died in sixty-five minutes from a dose of sulphate of copper of forty grains. Death, also, took place invariably when the sulphate of copper was applied upon wounds.

Renne in his treatise on judicial chemistry also relates a number of cases of poisoning by copper.

We admit that cooking utensils of copper very rarely cause sudden death; but are they, nevertheless, to be called harmless?

If the copper taken up by food acts but slowly, it does not act with less certainty, no matter whether this may at the time be positively proved or not. That utensils of copper may be dangerous in certain cases seems to be known to cooks, for we have never found any who used copper pans for frying omelets.

The distinguished French chemist Chevallier who treats upon this question in a memoir recently presented to the French Academy of Sciences has been led to somewhat different conclusions from those of Dr. Wald. After having quoted numerous instances of poisoning caused by food prepared in copper pans, concludes as follows: "All the facts which have come to my knowledge, prove positively that the use of utensils of copper for culinary purposes is dangerous, and that it is unwise to say that copper and its salts are not injurious, or that cooking utensils of this metal are harmless." Chevallier suggests that copper ware employed in the kitchen should always be coated with tin. In Paris, and the department *de la Seine*, this is already the case, but he demands that the respective decree be made a law in all the departments, or that the mayors of the cities direct attention to the great importance of tinned copper. We find that in Sweden, though copper is one of the principal products of that country, the use of copper vessels is prohibited for the preparation as well as for the preservation of food. In 1774, the *chef de police*, in Paris, forbade the dealers of milk to carry the same in vessels of this metal, and even before that date a large establishment was founded in that city for the making of iron utensils for culinary purposes. At first, however, they met with little success, but gradually they came more into use. In 1790 copper vessels were made, the inner surface of which were silverplated. It was also, recently proposed to silverplate iron.

The silverplating of copper, aside from the expense, cannot be recommended. The silver, because of its soft nature, is easily detached, leaving the copper surface exposed, and wherever this is the case the copper is more readily attacked than otherwise. The reason for this is found in the electro-chemical action which occurs. Cast iron vessels with enameled surfaces inside are better for culinary purposes. The enamel, however, should be free from lead.

The presence of copper in liquid food is readily detected by holding in it a knife blade for about ten minutes. If copper is present, it is thrown down upon the iron and can easily be recognized by its red color.

We find it stated in various cook-books that in order to restore the green color of pickled cucumbers, a copper coin should be dissolved in the vinegar. The evil effect of such a process must be apparent to all.

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Chrome Green.

Oxides of chrome are prepared either in the dry or wet way; obtained thus, they vary from greenish grey to a more or less deep greenish yellow. They generally have neither brilliancy nor freshness. It is possible, however, to produce green oxides of chrome which are not devoid of beauty. One of the most intelligent chemists of the commercial world, M. Casthelaz, has, conjointly with M. Leune, prepared a chrome green, which is justly styled imperial green. This coloring matter of a superior brilliancy is obtained exclusively by the wet way. The process consists in slowly precipitating chrome salts by treating them with hydrated metallic oxides, insoluble, or but slightly soluble, in water, or by hydrated metallic carbonates, or hydrated metallic sulphides, or, again, by other salts of weak acids, which easily leave their bases; the action is only produced progressively, and the oxide of chromium is precipitated in the hydrated form; the color of the compound is magnificent, of a deep emeral green. For this preparation, it is convenient to adopt economical reagents, such as gelatinous alumina, oxide of zinc, carbonate of zinc, sulphide of zinc, etc., whose price is reasonable. The same result may be obtained by treating a chrome salt with the non-alkaline metals, which have a sufficient affinity to unite with acid of the chrome salt and precipitate the oxide. Iron and zinc will be more particularly used, as they are cheaper. It is necessary to select from among the metals, with their oxides and salts, those which, with the acid of the chrome salt, give soluble salts, as they should be removed by washing. If recourse is had to reagents forming, with the acid of the chrome salt, insoluble salts, it is only in order to modify the color and composition of the chrome precipitates and of the green color thus formed. As to the magnificent imperial green color obtained by M. Casthelaz, it possesses properties which will enable manufacturers ultimately to renounce the justly condemned and dangerous copper and arsenic greens. The use of the imperial green removes all danger from insalubrity; it is an impalpable substance, of perfect tenuity. It is believed that this property will cause the new green to be adopted for printing on stuffs, and for other purposes. The oxides of chrome known up to the present time, and generally obtained in the dry way, cannot, by pulverization, attain to the degree of fineness of the imperial green. It is expected that this substance will have great success in oil painting, colored papers, colors, and artificial flowers, printing, lithography, perfumery, and soap manufacture, as well as in the making of glass and in the ceramic arts.—*Moniteur Scientifique.*

NEW PUBLICATIONS.

Appleton's Journal of Literature, Science, and Art.

The first number of this new candidate for popular favor has made its appearance, and its mechanical execution is well calculated to invite the reader to "a feast of fat things," but we confess to a disappointment in the literary branch. Victor Hugo's new novel opens in a somewhat disjointed style, but the fame of the man assures us that the tale will progress with an increased power and interest; the opening chapters being the rougher work, which always precedes the more symmetrical structure. The general contents lack somewhat of that spicy flavor which necessarily must enter into all journals of a popular character; but the editorial department may improve with a little more experience.

The Architectural Review. Edited by Samuel Sloan, Architect. Published by Claxton, Remsen & Haffelfinger, Philadelphia.

The number for April contains a good article upon "Architecture in America, "The Cathedrals of England," beside several practical articles and illustrations of value to all who take an interest in the development of architectural taste in our country.

Answers to Correspondents.

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

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

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

A. J. S., of La.—Your inquiries relative to caloric engines will be found answered in our description of the Roper improved hot air engine, to be illustrated in our next issue, No. 17 current volume.

W. H., of Pa., is running a quarter-turn belt, 60 feet long and 16 inches wide, from a 48-inch pulley at the bottom to a 32-inch pulley above. It does not run well and binders are necessary. A 12 inch belt of the same length ran well for a time but subsequently required binders. He asks if there are any cases known where quarter-twist belts of these lengths and widths have run well without binders. We know of no such cases. In our practice we never attempted to run a belt of either 16 or even 12 inches wide on a quarter turn, and if compelled to do so would have insisted on a greater distance between shafts than that in this case—less than 15 feet. Where the limit is between widths of belts and distances between points for the quarter turn we are unable to determine. The millwright usually relies much upon his own judgment.

H. B., Jr., of Canada.—If an invention has been patented abroad, that will not prevent the original inventor from patenting it here—unless the invention has not gone into public use before the date of his application in this country; but the term of his grant here, in such case, would be limited to the expiring of the term for which letters patent were first issued to him abroad for such invention. If a patent exists in a foreign country, that fact would debar the granting of a patent here to another inventor, unless he could show that he made his invention before the date of the foreign patent.

H. W. P., of Vt.—Carbolic acid will not remedy the odor arising from concrete walks, in which coal tar is an ingredient.

R. & B., of Conn.—The knitting machine to which you refer is we believe more generally used than any other.

L. F. M., of Mass.—The "Patent Claims" are now issued weekly, in pamphlet form, by the Patent Office, at $5 per annum.

S. A. H., of Conn.—Gumbridge & Co., to whom you refer, have been dealt with according to law. They were humbugs, no doubt.

H. H., of N. J.—There is no particular degree or dividing line that marks the difference between hot and cold, warm and cool. It is a mere matter of sensation.

H. C., of Pa.—We cannot admit any further discussion of the subject into our columns. The subject is stale, flat, and unprofitable.

D. T. Jr., of Pa.—We recommend you to get the "Silver Sunbeam" as the best work for you on photography.

S. F. M., of Ill.—Small pieces of brass can be melted in a sand crucible with a coal fire, but the crucible must be kept covered. You would be likely also to lose a large portion of the zinc. The best way to use up scrap brass is to melt it in with new brass, putting it in with the zinc after the copper is melted.

C. E. H., of Iowa.—The researches referred to as more recent than those of Joule, Rumford, Tyndall, etc., in the article entitled, "Waste and Economy of Fuel," are those of Auguste Laugel, Victor Delacour, Hirn, Zeuner, Bede, Emile Martin, and Scholl, and other able engineers, including the author of the article in question.

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.

Velocipedes cheap.—Specifications and elaborate lithographic drawings, by the aid of which any mechanic may construct a velocipede, together with full instructions for learning to ride, sent for 25 cents. Address M. M. Roberts, Box 3481, Boston Postoffice.

Wanted — A Wilmot portable sawing machine. Address Sawyer, Box 773, New York.

Velocipedes.—Working drawings, scale 3 in. to the foot, with plans and specifications in detail, enabling any one to construct one of the best two or three-wheeled velocipedes at less than one third usual cost. Price 50 cents. G. F. Perkins & Co., Holyoke, Mass.

For State and county rights for best portable fire extinguisher, address Postoffice Box 3,983, Boston, Mass.

I wish to make arrangements with a manufacturing establishment for the manufacture of my improved velocipede, illustrated April 3d, page 212 of this paper. I challenge all other machines for speed and ease of locomotion. Address L. H. Soule, Albany Postoffice, N. Y.

Manufacturers of brick machines and machinists' tools send circulars and price list to A. J. Shotwell, Washington, Ind.

An experienced patent-right salesman, about starting out, will sell a first-class article, not interfering with his own, on commission. Address, with full particulars, Box 311, Elwood, N. J.

See A. S. & J. Gear & Co.'s advertisement elsewhere.

Wanted—Parties to manufacture the spring-jaw wrench illustrated in this paper Nov. 18, 1868. Address Bradshaw & Lyon, Delphi, Ind.

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

For the best velocipede, and other small forgings, address R. A. Belden & Co., New Haven, Conn.

The new method for lighting street lamps! For illustrated circular, with letter from President Manhattan Gas Light Co., and Sup't of Lamps and Gas of the City of New York, address J. W. Bartlett, Patentee, 569 Broadway, New York.

For the latest improvement see the Inventors and Manufacturers' Gazette. The cheapest illustrated paper in the world. $1 per year. Published by Saltiel & Co., Postoffice box 448, or 37 Park Row, New York City.

For sale—The best propelling wheel for canal boats or boats of shallow or swift waters. Address H. T. Fenton, Water st., Cleveland, O.

200 bars 1-in. octagon tool steel, best quality, for sale.—The lot at 14 cents per lb. Sweet, Barnes & Co., Syracuse, N. Y.

Rare chance for agents. D. L. Smith, Waterbury, Conn.

The Tanite Emery Wheel.—For circulars of this superior wheel, address "Tanite Co.," Stroudsburgh, Pa.

Money Plenty—To patent and introduce valuable inventions for an interest in them. National Patent Exchange, Buffalo, N. Y.

One hundred horse power Corliss steam engine for sale in good order. Address W. B. Le Van, Machinist, 24th and Wood sts., Philadelphia.

The manufacture and introduction of sheet and cast metal small wares is made a specialty by J. H. White, Newark, N. J.

The Magic Comb will color gray hair a permanent black or brown. Sent by mail for $1·25. Address Wm. Patton, Treasurer Magic Comb Co., Springfield, Mass.

For coppered iron castings address J. H. White, Newark, N. J.

W. J. T.—We think the patent asbestos roofing manufactured by H. W. Johns, of this city, is the best substitute for tin or slate. It is cheap and easily applied.

Tempered steel spiral springs. John Chatillon, 91 and 93 Cliff st., New York.

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

Iron.—W. D. McGowan, iron broker, 73 Water st., Pittsburgh, Pa.

Machinists, boiler makers, tinners, and workers of sheet metals read advertisement of Parker Brothers' Power Presses.

Winans' boiler powder, N. Y., removes and prevents incrustations without injury or foaming; 12 years in use. Beware of imitations.

The paper that meets the eye of all the leading manufacturers throughout the United States—The Boston Bulletin. $4 a year

Recent American and Foreign Patents.

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

Scroll-Sawing Machines.—August M. Schilling, Chicago, Ill.—This invention has for its object to furnish an improved scroll-sawing machine, which shall be so constructed and arranged that holes may be sawn with facility and accuracy, without its being necessary to stop the saw to introduce the material to be sawn.

Broadcast Seeder.—Matthew Sackett, Monticello, Iowa.—This invention has for its object to furnish an improved broadcast seeder, designed especially for sowing timothy, clover, and other small seeds, and which be simple in construction and convenient in use.

Corn Planter.—Peter Rogers, Sharon, Ohio.—This invention has for its object to furnish an improved machine for planting corn, which shall be simple in construction, reliable and accurate in operation, and convenient in use; being so constructed and arranged that the dropping device may be readily thrown out of gear, allowing the machine to be turned or backed without dropping the corn, and which may be turned in a small space.

Stovepipe Shelf.—John P. Sherwood, Fort Edward, N. Y.—This invention has for its object to furnish an improved detachable and adjustable shelf for attachment to stovespipes, which shall be simple in construction, and easily attached, detached, and adjusted.

Raking Attachment for Reapers.—Charles Barns, Oskaloosa, Iowa.—This invention has for its object to furnish an improved raking attachment for reapers, which shall be so constructed and arranged as to take the grain, as it crops from the cutters, and deliver it to the binders or upon the ground, as may be desired, and which shall, at the same time, be simple in construction and effective in operation.

Horseshoe Nail Clincher.—E. E. Fisher and William H. Mack, Indianola, Ill.—This invention has for its object to furnish a simple, convenient, and effective instrument for turning down and clinching horseshoe nails, so as to obviate the necessity for the use of the rasp, hammer, and clinching iron, while doing the work neater and better.

Cultivator.—John Powell, Sullivan, Ill.—This invention relates to improvements in cultivators, or gang plows, and has for its object to provide a more simple and convenient arrangement of means for vibrating the plows laterally, adjusting than to vary the distance apart, and to govern their depth of cutting.

Soldering Apparatus.—Conrad Seimel, Greenpoint, N. Y.—This invention relates to a new apparatus for soldering the upper and lower edges of sheet-metal cans of cylindrical, prismatic, or other shape. It consists in providing an adjustable cover for the annular or other vessel in which the solder is kept, so that by forcing the said cover down, by means of suitable levers, the solder will be forced into the soldering pan, wherein it will rise to a suitable desired hight to surround the edge of the can to be soldered. When the levers are released, the covers will be raised by spring or weight, and will draw the solder back into the closed vessel in which it is protected from the injurious influences of the air. The soldering pan is endless, either round, square, or oblong, or of other suitable form, according to the shape of the box to be soldered.

Combined Knife and Fork.—Arthur W. Cox, Malden, Mass.—The object of this invention is to provide a combined knife and fork, better adapted for the double use than any now made, and intended more especially for use by persons who have but one hand.

Adjustable Reamers.—Henry James, Hudson, N. Y.—This invention relates to improvements in adjustable reamers, whereby it is designed to provide an improved arrangement of two or more cutters, upon a stock to be adjusted by screwing a nut forward and back upon the shank of the stock.

Machinery for Ginning Cotton.—B. Dobson and Wm. Slater, Bolton, England.—This invention consists, first, in applying to saw gins, which are provided with one or two sets of saws, a treadle lever, by which the feeding hopper may be agitated to clear the teeth of the saws, and to discharge the seeds and impurities, so that, when such treadles are used, the hands of the operator may remain at liberty; secondly, in applying to saw gins which are provided with one or two sets of saws, a fan, and two perforated metal cylinders, in which a partial vacuum is formed by the fan, to withdraw dust and other impurities from the ginned cotton passing over said cylinders; thirdly, in applying to, and in the aforesaid perforated cylinders, stationary dampers, by which the action of the vacuum is destroyed on those parts of the cylinder which deposits the cotton upon a feed apron, or other suitable apparatus.

Self-locking Cover for Coal Holes, Scuttles, etc.—Morison Hoyt, Brooklyn, N. Y., and G. Van Cleef, New York city.—This invention has for its object to furnish an improved cover for coal holes, scuttles, hatchways, etc., which shall be so constructed as to fasten itself when dropped into place without the possibility of failure, and in such a way that the cover cannot be removed from the outside.

Paint Mills.—John A. Berrill, Waterville, N. Y.—This invention has for its object to improve the construction of paint mills, so that the ground paint may be more conveniently collected from the mill and guided into the receiving vessel.

Portable Fence.—Joseph Richard, Columbiaville, Mich.—This invention has for its object to furnish an improved portable fence, which shall be simple in construction, strong, and durable, easily put up, taken down, or moved from place to place, and which can be easily and readily repaired when required.

Horse Collar.—B. W. McClure, Wyoming, Iowa.—This invention has for its object to furnish a simple, convenient, and cheap horse collar, which shall be so constructed that it may be used without harness.

Corn Sheller.—S. S. Cole, Henryville, Ind.—This invention has for its object to furnish an improved corn sheller, which shall be so constructed and arranged as to do its work quickly and thoroughly, while, at the same time, it may be manufactured at small expense, and thus brought within the reach of all farmers, even those of limited means.

Brick and Mortar Hod.—E. B. Black, Joseph Hinkle, Jr., and T. S. White, Columbia, Pa.—This invention has for its object to furnish an improved hod for carrying brick and mortar, which shall be stronger, more durable, less expensive, and equally as light as, or lighter than the ordinary wooden hod.

Attachment for Adjusting Cords for Hanging Pictures, etc.—R. d'Heureuse, New York city.—This invention has for its object to furnish an improved attachment for cords for hanging pictures, glasses, and for other purposes, by means of which the cords may be easily and quickly taken up and let out, for adjusting the hanging of the suspended object, without forming knots in the cords or untying knots previously formed.

Foundery Flasks for Sugar Kettles.—George Walworth, Peekskill, N. Y.—This invention relates to a new and useful improvement in flasks for making certain kinds of castings, but which has more particular reference to the molding and casting of sugar kettles.

Combined Foot-stool and Foot-warmer.—Jacques Jacquet, Newark, N. J.—The object of this invention is to produce an apparatus for travelers and others, which shall at once serve as a convenient foot-stool, and also as a foot-warmer in winter.

Boiler Scraper.—Monroe Morse and Charles H. Morse, Franklin, Mass.—This invention relates to a new self-adjusting boiler scraper, which is composed of a bent plate having straight sides, so that all its edges will form cutting edges within the tube to be cleaned. Thereby quicker operation is obtained with simpler apparatus than with the devices heretofore used.

Hop House.—William Loofbourow, Fayette, Wis.—This invention relates to a new building for drying and storing hops; it being so arranged that the hops therein can be easily handled and conveniently conveyed in the building from the cooling to the drying, and thence to the storing room.

Whips.—Edgar Easton, Ashland, Ill.—This invention relates to improvements in the construction of driver's whips, having for its object to provide an improved means of securing the lashes to the handles or stalks. It consists in forming a knob on the end of the stalk and braiding the lash thereon in a manner to form a swivel connection.

Automatic Raker.—C. Lidren, La Fayette, Ind.—This invention relates to a new and useful improvement in the method of operating automatic rakers for reaping or harvesting machines, whereby the mechanism for operating such rakes is very much simplified.

Device for Practicing the Handling of Violins and Bows.—Stephen Upson, New York city.—This invention has for its object to teach beginners the manner of handling the bows of violins and equivalent instruments, and the mode of using the fingers and practicing the shifts on the fingerboard of the instrument without producing any noise, and without exposing valuable instruments to the risk of being spoiled by the practitioners.

Skate.—Moses Kinsey, Newark, N. J.—This invention relates to a new adjustable skate, which can be applied to larger or smaller feet, and conveniently attached and taken off. The invention consists, chiefly, in the application of two plates, which are pivoted to the front of the skate, and which extend to the rear of the same, they being adjustable at any angle to each other by means of a screw. These plates carry the front and heel fastening clamps, which are moreover laterally adjustable on them. The invention also consists in the use of adjustable wedge-shaped heel clamps, which are adapted to firmly secure heels of all sizes and shapes to the skate.

Combined Spinning Wheel and Churn.—Morgan A. McAfee, Talbotton, Ga.—The object of this invention is to provide an arrangement whereby a common spinning wheel may be economically and conveniently arranged for employment as a propelling medium for a churn; also to provide certain improvements in churns.

Car Coupling.—I. L. Vansant, Glasgow, Del.—The object of this invention is to provide a simple, cheap, and effective automatic car coupling, constructed so as to avoid the use of springs of any kind.

Water Elevator.—Charles F. Woodruff, Newbern, Tenn.—This invention is an improvement upon the devices patented by the same inventor February 4th and September 15th, 1868, and consists in a combination in one machine of the main features covered by said two patents, thereby producing a more simple and permanent, and less expensive water elevator than either of the old ones.

Breech-loading Firearm.—Wm. Golcher, St. Paul, Minn.—In this invention, by moving a single lever, the breech of the barrel is thrown up, the gun cocked and held in that position, and the old cartridge shell retracted; by returning the lever to its original position, the barrel is brought down to its proper position for firing, and the gun is left cocked and instantly discharged. The whole apparatus is exceedingly simple, cheap, and not liable to get out of order, and its use will enable the gun to be fired much more rapidly and with less labor than heretofore.

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FOR THE WEEK ENDING MARCH 30, 1869.

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88,261.—Reversible Knob Latch.—Alonzo Aston (assignor to Russell and Erwin Manufacturing Company), New Britain, Conn.

88,262.—Screw Machine.—E. A. Bagley, Worcester, Mass.

88,263.—Mechanism for Connecting Horses to Vehicles.—Daniel Belcher, Easton, assignor to himself and Alvin Colburn, Lynn, Mass.

88,264.—Edge Plane.—Charles P. Bigelow, Clinton, Mass.

88,265.—Mucilage Brush.—Douglas Bly, late of Macon, Ga.

88,266.—Washing Machine.—Jacob Brinkerhoff, Auburn N. Y.

88,267.—Machine for Fitting Felloes to Wheels.—Frederick H. Brinkkotter, Callahan's Ranch, Cal.

88,268.—Bobbin for Spinning Machine.—Wm. M. Brisben Philadelphia, Pa.

88,269.—Last.—Thomas Bullivant, Newark, N. J.

88,270.—Hay Spreader.—Hiram M. Burdick, Ilion, N. Y.

88,271.—"Tinkers' Pot."—Gustav Burkhardt, Homer, Ill.

88,272.—Cistern Top.—T. M. Bush, Hastings, Mich.

88,273.—Fastening for Breast Pins.—Calvin G. Cahoone, and Bela E. Brown, Providence, R. I. Antedated March 15, 1869.

88,274.—Car for Brick Dryers.—Cyrus Chambers, Jr., Philadelphia, Pa.

88,275.—Garden Cultivator.—James F. Chapman, Newton, Iowa.

88,276.—Welted Seam-finishing or Reducing Machine.—John H. Cole, North Bridgewater, Mass.

88,277.—Dumping Wagon.—John Craig, San Francisco, Cal.

88,278.—Steam Engine.—Archibald C. Crary, Utica, N. Y.

88,279.—Clamp Bar for Holding the Cutters of Mowing Machines while being Ground.—Munson C. Cronk, Auburn, N. Y. Antedated March 19, 1869.

88,280.—Gang Plow.—Artemas Davison, San Leandro, Cal. Antedated March 20, 1869.

88,281.—Ironing Table.—Henry T. De Montigny, West Troy, N. Y.

88,282.—Sewing Machine.—Charles F. Dunbar, Erie, Pa.

88,283.—Channeling Tool.—George D. Edmands, Saugus, Mass.

88,284.—Railway Track.—Marmont B. Edson, New York city. Antedated March, 18, 1869.

88,285.—Application of an Electrical Current to Steam Boilers.—Moses G. Farmer, Salem, Mass.

88,286.—Velocipede.—Alonza Farrar, Boston, Mass.

88,287.—Vapor Burner.—Louis Fischer, Brooklyn, N. Y.

88,288.—Steam Generator.—Addison C. Fletcher, New York city.

88,289.—Churn.—John Geiger, Peoria county, Ill.

88,290.—Pneumatic Tooth Mallet.—George F. Green, Kalamazoo, Mich.

88,291.—Manufacture of Colors and Pigments.—Eberhard Harrsch, New York city.

88,292.—Water Wheel.—Orrin L. Hart, Millville, Wis.

88,293.—Wagon Brake.—D. Healey, Dansville, N. Y.

88,294.—Metallic Studding for Fire-proof Walls.—Isaac V. Holmes, New York city.

88,295.—Potato Digger.—John R. Hopper, Rochester, N. Y.

88,296.—Fruit Jar.—Daniel Hughes, Henry E. Shaffer and William S. Thompson (assignors to Henry E. Shaffer and William S. Thompson), Rochester, N. Y.

88,297.—Chair.—George Hunzinger, New York City.

88,298.—Device for Securing Bed Clothes.—George Inwood, San Francisco, Cal.

88,299.—Process and Apparatus for Making Iron and Steel.—Jacob Jameson, Philadelphia, Pa.

88,300.—Flea Powder.—Charles E. Jaycox, San Francisco, Cal.

88,301.—Portable Field Harrow.—Jacob D. Johnson, Tylersville, Pa.

88,302.—Railway Safety Switch.—Richard M. Johnson and Ezra Stiles, Bridgeport, Conn.

88,303.—Stump Extractor.—Wm. R. Johnson, Binghamton, N. Y.

88,304.—Horseshoe.—James Jorey, Westville, Conn.

88,305.—Dancing Motion for Toys.—James M. Keep, New York city. Antedated September 30, 1868.

88,306.—Clapboard Machine.—Oscar R. Kendall and Lemuel C. Kendall, Groton, N. H.

88,307.—Belt Fastening.—Gebhard Koeb and Louis Houcke, Springfield, Ohio.

88,308.—Washing and Wringing Machine.—John Lamb, Jeffersonville, N. Y.

88,309.—Plow Coulter.—John Lane (assignor to himself, C. H. Hapgood, William B. Young, and G. H. Laughton), Chicago, Ill.

88,310.—Heel for Boots and Shoes.—Rufus Lapham, Boston, Mass. Antedated March 11, 1869.

88,311.—Cultivator.—James R. Little, Galesburg, Ill.

88,312.—Horse Collar.—J. C. Mahaffey, Little York, Ill.

88,313.—Cooking Stove.—John F. Marvin and Samuel E. Vose, Milwaukee, Wis.

88,314.—Hay Spreader.—Nathan F. Mathewson, Barrington, R. I.

88,315.—Beehive.—T. F. McCafferty, Columbus, Ohio.

88,316.—Brick Kiln.—J. M. McCarthy, Canal Dover, Ohio.

88,317.—Tool for Shearing Sheep.—David McCarty and J. F. Beck, Tiffin Township, Ohio.

88,318.—Sash Lock.—George McGregor and George Voll, Cincinnati, Ohio.

88,319.—Gun Lock.—John C. Miller, Danville, Ky.

88,320.—Churn.—Morgan B. Miller, Peoria county, Ill.

88,321.—Apparatus for Composing and Exhibiting Groups of Card Pictures.—Sarah F. Mills, San Francisco, Cal.

88,322.—Stop Motion for Looms.—George E. Milroy, Lowell, Mass.

88,323.—Farm Gate.—A. T. Morris, Seal, Ohio.

88,324.—Aerial Car.—William Morrow, San Francisco, Cal.

88,325.—Drag Rake.—H. F. Morton, West Sumner, Me.

88,326.—Gas Purifier.—Peter Munzinger, Philadelphia, Pa.

88,327.—Extension Basket.—Addison Norman, Rochester, N. Y.

88,328.—Tremolo Regulator for Reed Musical Instruments.—Isaac T. Packard, Chicago, Ill.

88,329.—Grape Crusher and Stem Separator.—Turner C. Purington, Lincoln, Cal.

88,330.—Securing Ships' Hatches.—John R. Rich, Tremont, Me., assignor to W. J. Stockbridge, Gloucester, Mass.

88,331.—Machine for Making Joints in Table Leaves.—John Richards, Cincinnati, assignor to himself and J. N. Brittingham, Columbus, Ohio.

88,332.—Milk Cooler.—Cyrus L. Sabin, Barnard, Vt.

88,333.—Journal Box.—E. W. Skinner, Madison, Wis.

88,334.—Harvester.—Wm. D. Slack, Lewisburg, Pa.

88,335.—Croquet Wicket.—Friend W. Smith, Jr., Bridgeport, Conn.

88,336.—Stump Extractor.—Henry Smith, 3d, North Chili, N. Y.

88,337.—Railway Car Coupling.—O. L. Smith, Providence, R. I.

88,338.—Safety Toggle for Watch Chains.—P. C. Smith (assignor to himself E. S. Dodge, and L. A. Kotzow), Providence, R. I.

88,339.—Farm Gate.—R. M. Smith, Lafargeville, N. Y.

88,340.—Animal Shearing Machine.—R. T. Smith and J.K. Priest) assignor to themselves, Wm. Earle, Jr., and J. G. Blunt), Nashau, N. H.

88,341.—Turbine Water Wheel.—W. H. Snyder, Phelps, N. Y.

88,342.—Car Coupling.—Henry Soggs, Columbus, Pa.

88,343.—Automatic Fan.—G. C. Steinhauer, Indianapolis, Ind.

88,344.—Shovel Plow.—U. T. Stewart, Fayette county, Tenn.

88,345.—Steam Generator.—Joel Tiffany, Albany, N. Y.

88,346.—Grappling for Anchors.—A. S. Trafton and T. J. Trafton, Portsmouth, N. H.

88,347.—Velocipede.—J. A. Vander Waag (assignor to T. Van Skelline, for one-half of said invention), Brooklyn, N. Y.

88,348.—Preparation of Aerated Drinks for Medicinal Purposes.—P. H. Vander Weyde and J. Matthews, Jr., New York city. Antedated March 18, 1869.

88,349.—Cabbage Cutter.—F. S. Vogel, and J. R. Albright, Lancaster, Pa.

88,350.—Weather Strip.—D. G. Walker, Oshkosh, assignor to himself, and G. H. Buckstraff, Winnebago county, Wis.

88,351.—Hinge.—Francis H. Walker, Boston, Mass.

88,352.—Portable Cooking Furnace.—R. H. Waldron (assignor to himself, and J. J. Flanders), Portsmouth, N. H.

88,353.—Method of Pressing Bricks.—W. G. White, Bedford, Ohio.

88,354.—Method of Making Inkstands, etc.—Henry Whitney, East Cambridge, Mass.

88,355.—Grate Bar.—Jas. Yocom, Jr., Philadelphia, Pa.

88,356.—Axle Box Bearing.—A. B. Allen (assignor to himself and J. D. Allen), Rutland Vt.

88,357.—Cheese Cutter.—S. R. Bailey, Bath, Me.

88,358.—Harvester Rake.—Chas. Barns, Oskaloosa, Iowa.

88,359.—Fire Extinguisher.—W. H. Bate, Medford, and G. F. Pinkham, Cambridge, Mass.

88,360.—Paint Mill.—J. A. Berrill, Waterville, N. Y.

88,361.—Brick and Mortar Hod—E. B. Black, Jos. Hinkle, Jr., and T. S. White, Columbia, Pa.

88,362.—Water Meter.—J. A. Bradshaw, and W. H. Brown, Lowell, Mass.

88,363.—Combined Harrow and Cultivator.—G. W. Bressler, La Fayette, Iowa.

88,364.—Railway Hose Bridge.—Jas. Burson, Yates City, Ill., assignor to James and Geo. B. Waterhouse, New York city.

86,365.—Take-up Mechanism for Looms for Weaving Irregular Fabrics.—Hugo Carstaedt, New York city.

88,366.—Velocipede.—J. M. Case, Worthington, Ohio.

88,367.—Corn Sheller.—S. S. Cole, Henryville, Ind.

88,368.—Spading Machine.—F. C. Cone, San Francisco, Cal.

88,369 —Music Binder.—Lewis B. Covert, Brooklyn, N. Y.

88,370.—Combined Knife and Fork.—A. W. Cox, Malden, Mass.

88,371.—Piston Valve for Steam and other Enginery.—Robert Creuzbaur, Brooklyn, N. Y.

88,372.—Truss.—L. P. Dayton, North Buffalo, N. Y.

88,373.—Attachment for Adjusting Cords for Pictures, etc.—R. d'Heureuse, New York city.

88,374.—Cotton Gin.—Benj. Dobson and Wm. Slater, Bolton, England.

88,375.—Whip.—Edgar Easton, Ashland, Ill.

88,376.—Carriage Axles.—T. H. Elder, Chicago, Ill.

88,377.—Chuck.—G. B. Fairman (assignor to John Telford), Rochester, N. Y.

88,378.—Horseshoe Nail Clincher.—E. E. Fisher and W. H. Mack, Indianola, Ill.

88,379.—Apparatus for Discharging Coal.—E. F. Flood, Chicago, Ill.

88,380.—Metallic Boot Strap.—David Forrest (assignor to himself, and James Eldridge), Eastport, Me.

88,381.—Harvester.—W. F. Goodwin, East New York, N. Y.

88,382.—Combined Marker and Planter.—R. A. Green, Martinsville, Ohio.

88,383.—Mode of Lettering Signs, etc.—Alonzo Griffin, Meshoppen, Pa. Antedated March 25, 1869.

88,384.—Acoustic Stage.—Troutman Grob, San Francisco, Cal.

88,385.—Lock Nut.—J. W. Hilton, Bradford, Pa.

88,386.—Vault Cover.—Morison Hoyt, Brooklyn, and G. Van-Cleef (assignor to themselves, and J. T. Lockhart), New York city.

88,387.—Wash Boiler.—P. H. Inman, and C. B. Withington, Janesville, Wis. Antedated March 27, 1869.

88,388.—Combined Foot-stool and Foot-warmer.—Jacques Jacquet, Newark, N. J.

88,389.—Adjustable Reamer.—Henry James (assignor to himself and W. H. Gifford), Hudson, N. Y.

88,390.—Clothes Pin.—Peter Johnson, Wauconda, Ill.

88,391.—Land Roller.—E. O. Jones, Brandon, Mich.

88,392.—Preserving Wood.—Chas. Karmrodt and Nicholas Thilmany, Bonn, Prussia.

88,393.—Skate.—Moses Kinsey, Newark, N. J.

88,394.—Harvester Rake.—C. Lidren, La Fayette, Ind., assignor to himself and R. Jackson.

88,395.—Hop Dryer.—Wm. Loofbourow, Fayette, Wis.

88,396.—Grain Separator.—Leonard Low, Peoria, Ill.

88,397.—Horse Hay Fork.—A. W. Lozier, New York city.

88,398.—Flood Gate.—Andrew Main, Delaware, Ohio.

88,399.—Churn.—Morgan A. McAfee, Talbotton, Ga.

88,400.—Horse Collar.—B. W. McClure, Wyoming, Iowa.

88,401.—Fence.—J. W. McCormick, Youngstown, N. Y.

88,402.—Ventilating Faucet for Discharging Liquids.—J. W. McKee (assignor to himself and John Gibbs), Brooklyn, E. D. N.Y. Antedated March 19 1869.

88,403.—Cattle Tie.—Achille F. Migeon, Wolcottville, Conn.

88,404.—Bottle Corking Apparatus.—Giacomo igliavacca, Napa, Cal. Antedated March 19, 1869.

88,405.—Boiler Flue Cleaner.—Monroe Morse, and Chas. H. Morse, Franklin, Mass.

88,406.—Governor for Steam and other Enginery.—D. F. Mosman, Chelsea, Mass.

88,407.—Wind Wheel.—C. W. Palmer, Riga, N. Y.

88,408.—Cigar Ash-holder, etc.—Adolph Philipp, Manchester, Great Britain.

88,409.—Cultivator.—John Powell, Sullivan, Ill.

88,410.—Soldering Apparatus.—Chas. Pratt, New York city., and Conrad Seimel, Greenpoint, N. Y.

88,411.—Tinman's Machine.—C. H. Raymond, Southington, Conn.

88,412.—Fence.—Joseph Richard, Columbiaville, Mich.

88,413.—Gang and Trench Plow.—J. G. Robinson, Springfield, Ill. Antedated March 23, 1869.

88,414.—Trench Plow.—J. G. Robinson, Springfield, Ill. Antedated March 22, 1869.

88,415.—Corn Planter.—Peter Rogers, Sharon, Ohio.

88,416.—Broadcast Seeder.—Matthew Sackett (assignor to self and John Filson), Monticello, Iowa.

88,417.—Scroll-sawing Machine.—A. M. Schilling, Chicago, Ill.

88,418.—Washing Machine.—Adolph Schlingman, West Alexandria, Ohio.

88,419.—Soldering Furnace.—Conrad Seimel, Greenpoint, N. Y.

88,420.—Stovepipe Shelf.—J. P. Sherwood (assignor to himself and B. S. Burnham), Fort Edward, N. Y.

88,421.—Game.—A. G. Slagle, Memphis, Tenn.

88,422.—Water Wheel.—J. E. Stevenson, New York city.

88,423.—Device for Violin Practice.—Stephen Upson, New York city.

88,424.—Car Coupling.—I. L. Vansant, Glasgow, Del.

88,425.—Flask for Molding Kettles.—George Walworth, Peekskill, N. Y.

88,426.—Velocipede.—Edward Whitehead, Cincinnati, Ohio.

88,427.—Portable Fence.—H. C. Wilson, West Elkton, Ohio.

88,428.—Water Elevator.—Chas. F. Woodruff, Newbern, Tenn.

88,429.—Road Scraper.—Sidney Alderman, Stafford township, Ind.

88,430.—Lamp Shade.—J. B. Alexander, Washington, D. C.

88,431.—Device for Controlling Fluids under Pressure.—Jearum Atkins, Washington, D. C.

88,432.—Manikin, with Fœtus, etc., for Illustrating the Practice of Obsterics.—B. H. Aylworth, Oxford, N. Y.

88,433.—Extension Table.—Henry Bachman, Philadelphia, Pa.

88,434.—Apparatus for Distilling Spirits.—Eli D. Bannister, St. Louis, Mo.

88,435.—Iron Bedstead.—Jabez Bayston, Chicago, and Geo. W. Nicholson, Naperville, Ill.

88,436.—Breech-loading Firearm.—Hiram Berdan (assignor to the Berdan Fire Arms Manufacturing Company), New York city.

88,437.—Ironing Machine.—Laurent Berenger, Paris, France.

88,438.—Car Brake.—A. A. Bliven, Jersey City, N. J.

88,439.—Mode of Preventing Corrosion in Metallic Caps.—L. R. Boyd, New York city.

88,440.—Car Coupling.—W. L. Braddock (assignor to himself and C. H. Minor), Boston, Mass.

88,441.—Spike for Overshoes.—G. W. Bradley, Weston, Conn.

88,442.—Refrigerator and Weighing Apparatus.—Ira Buckman, Jr., Williamsburgh, N. Y.

88,443.—Fertilizer.—S. A. Burkholder and G. W. Wilson, Bendersville, Pa.

88,444.—Drying Furnace and Oven.—J. K. Caldwell, Allegheny City, Pa.

88,445.—Hedge Fence.—S. N. Caldwell, Pilot Grove, Ind.

88,446.—Iron Bridge.—F. E. Canda, Chicago, Ill.

88,447.—Railway Car Brake and Starter.—R. R. Carpenter, Tippecanoe, Ohio.

88,448.—Printing Press.—Wm. H. Chandler, Winchester, Mass.

88,449.—Umbrella Cover.—J. C. Clime, Philadelphia, Pa.

88,450.—Spinning Mule.—B. C. Coldwell, Wyoming, Pa.

88,451.—Button.—Isaac Cole, New York city.

88,452.—Lathe.—Terrence Collins and Asher Castiel, St. Louis, Mo.

88,453.—Harvester.—G. T. Coolman and C. M. Young, Corry, Pa.

88,454.—Making Nails.—J. M. Cooper, Philadelphia, Pa.

88,455.—Wooden Pavement.—John R. Cushier, New York city.

88,456.—Mouse Trap.—A. G. Davis, Watertown, Conn.

88,457.—Sled.—Constantine de Bodisco, St. Petersburgh, Russia.

88,458.—Sign.—W. P. Delaplain, Peoria, Ill.

88,459.—Skate Fastening.—Patrick Dooley, Newark, N. J.

88,460.—Machine for Cutting Screws.—John Dougherty, San Francisco, Cal.

88,461.—Heel.—W. T. Downs, St. Louis, Mo.

88,462.—Sad-iron Heater.—H. C. Drexel, Baltimore, Md.

88,463.—Toy Gun.—E. C. Edmonds, Albany, N. Y. Antedated March 25, 1869.

88,464.—Cotton Gin.—H. L. Emery, Albany, N. Y.

88,465.—Seeding Machine.—J. J. Esler, Belleville, Ill.

88,466.—Fertilizer.—L. S. Fales, New York city.

88,467.—Slate Frame.—J. H. French, Albany, N. Y.

88,468.—Refrigerator.—R. S. Godfrey (assignor to himself, Thomas Baner, and J. C. Hires), Philadelphia, Pa.

88,469.—Portable Fence.—W. P. Goff, Yorkville, Wis.

88,470.—Breech-loading Firearm.—Wm. Golcher, St. Paul, Minn.

88,471.—Sash Balance.—Lewis Goodwin, Bangor, Me.

88,472.—Oven.—G. Y. Gray, Niles, Mich.

88,473.—Weather Strip.—A. J. Harmon, Charlestown, Mass., assignor to himself, W. H. Howland, and J. E. Hasseltine.

88,474.—Churn.—John Harper, Hillsborough, Iowa.

88,475.—Meter.—James Harris, Boston, Mass.

88,476.—Milk Cooler.—L. T. Hawley, Salina, N. Y.

88,477.—Horse Hay Fork.—G. W. Heath, Burlington, Pa.

88,478.—Washing Machine.—C. W. Hermance, Schuylerville, N. Y.

88,479.—Puddling Process for the Manufacture of Wrought Iron.—Chas Hewitt, Hamilton Township, N. J.

88,480.—Manufacture of Iron and Steel, and Furnace and Apparatus therefor.—Geo. J. Hinde, Wolverhampton, England, and T. C. Hinde, Ynispenllwch, near Swansea, Wales.

88,481.—Wagon Seat.—Edgar Hitt, Poundridge, N. Y.

88,482.—Picture Frame.—C. A. Hodgman, Tuckahoe, N. Y.

88,483.—Harvester.—G. M. Jackson, North Hector, N. Y.

88,484.—Apparatus for Heating and Separating Lime from Water.—S. F. Jackson and J. A. Davis, Eureka, Ill.

88,485.—Water Closet.—Henry James and Edward Drewett, Weybridge, England. Patented in England, Nov. 21, 1867.

88,486.—Plow Carriage.—W. L. Jeffries, Lancaster, Ohio.

88,487.—Device for Holding Plates of Glass.—Thomas Jones, New York city.

88,488.—Piano Lock.—R. J. Jordan, New York city.

88,489.—Trace Buckle.—E. M. Kinne, Cuba, N. Y.

88,490.—Combination Lock.—H. S. Leland, Mount Union, Ohio.

88,491.—Tide Power.—J. R. Leon, Havana, Cuba.

88,492.—Velocipede.—H. W. Libbey, Cleveland, Ohio.

88,493.—Machine for Making Bolts.—Edwin B. Locke Exeter, N. H.

88,494.—Insole.—R. O. Lowrey, Salem, N. Y.

88,495.—Steam Engine Governor.—J. A. Marden (assignor to J. H. and C. E. Abbott), Boston, Mass.

88,496.—Steam Engine Governor.—J. A. Marden (assignor to C. E. and J. H. Abbott), Boston, Mass.

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88,498.—Steam Engine Governor.—J. A. Marden and C. E Abbott (assignors to J. H. and C. E. Abbott), Boston, Mass.

88,499.—Sewing Machine.—J. N. McLean (assignor to himself and B. W. Lacy), Philadelphia, Pa.

88,500.—Cheese Cutter.—W. A. McDonald, Alna, Me., assignor to F. G. Cooker, for one half his right.

88,501.—Fastening for Curtains and Carpets.—Purches Miles, New York city.

88,502.—Adjustable Door Sill.—John H. Morris, Philadelphia, Pa.

88,503.—Loom.—Benjamin Oldfield and Edwin Oldfield, Norwich, Conn.

88,504.—Vault Cover.—G. H. Palmer (assignor to William Dale), New York city.

88,505.—Machine for Stretching Fabrics.—I. E. Palmer, Hackensack, N. J.

88,506.—Water Elevator.—William M. Palmer, Middlebush, N. J.

88,507.—Velocipede.—T. R. Pickering, New York city.

88,508.—Corn Planter.—N. M. Powers, Kirksville, Mo.

88,509.—Fireplace.—C. S. Rankin, Cincinnati, Ohio.

88,510.—Corpse Preserver.—A. G. Reed, Philadelphia, Pa.

88,511.—Harvester.—M. H. Ripley and W. N. Temple, Minapolis, Minn. Antedated March 25, 1869.

88,512.—Steam Pump.—W. H. Roberts, Mauch Chunk, Pa.

88,513.—Folding Chair.—A. M. Rodgers, Brooklyn, N. Y.

88,514.—Mosquito Canopy.—Samuel Roebuck and John Roebuck, New York city.

88,515.—Paper Stock, Box Board, Roofing Paper, etc.—R. W. Russell, New York city.

88,516.—Fibrous-composition Slabs and Panels for Roofs, Floors, Walls, Tanks, and for other Purposes.—R. W. Russell, New York City.

88,517.—Valve of Steam-fiber Guns.—R. W. Russell, New York city.

88,518.—Fibrous-composition Tube.—R. W. Russell, New York city.

88,519.—Manufacture of Paper for Protecting Goods from being Injured by Moths, etc.—Robert W. Russell, New York city.

88,520.—Gas Cooler and Washer.—Richard Salter (assignor to himself and J. B. Davis), Cincinnati, Ohio.

88,521.—Construction of Safes.—Benj. Sherwood and Daniel Fitzgerald, New York city.

88,522.—Pianoforte Action.—D. H. Shirley, Boston, Mass.

88,523.—Portable Fence.—S. C. H. Smith, Belpre, Ohio.

88,524.—Manufacture of Steel Direct from the Ore.—R. S. Stenton, Brooklyn, N. Y. Antedated March 25, 1869.

88,525.—Machine for Sowing Grass Seed.—Henry Springer, Brady, Mich.

88,526.—Animal Trap.—J. J. St. Ledger, Philadelphia, Pa. Antedated March 25, 1869.

88,527.—Hat Ventilator.—C. C. Stremme, Austin, Texas.

88,528.—Street Letter Box.—Samuel Strong, Washington, city, D. C.

88,529.—Churn.—J. A. Tice, Windsor, assignor to T. C. South, Mattoon, Ill.

88,530.—Breech-loading Firearm.—A. L. Varney, Watertown, assignor to A. B. Ely, Newton, Mass.

88,531.—Breech-loading Firearm.—A. L. Varney, Watertown, assignor to A. B. Ely, Newton, Mass.

88,532.—Renewing Rolls for Printing, Calendering and like Purposes.—C. E. Wilson, New York city.

88,533.—Harvester.—G. W. N. Yost, Corry, Pa.

88,534.—Tire Shrinker.—Joseph Adkins, Warrenton, Ga.

REISSUES.

79,730.—Dated July 7, 1868; reissue 3,342.—Steam Fire Engine.—E. R. Cole and H. S. Cole, Pawtucket, R. I.

51,387.—Dated Dec. 5, 1865; reissue 3,343.—Hand Pegging Machine.—R. W. Drew, Lowell, Mass., assignee of Louis Goddu.

59,957.—Dated Nov. 27, 1866; reissue 3,344.—Machine for Applying Reinforcing Patches to Button Holes of Collars.—G. W. Ray and V. N. Taylor, Springfield, Mass., assignees, by mesne assignments, of J. T. Bruen and G. M. Jacobs.

38,190.—Dated April 14, 1863; reissue 3,345.—Machine for Making Covered Cord.—John Turner, Norwich, Conn., for himself, and assignee of I. E. Palmer.

85,149.—Dated Dec. 22, 1868; reissue 3,346.—Tube for Steam Generators.—G. E. Van Amringe, New York city.

83,345.—Dated Oct. 20, 1868; reissue 3,347.—Binding Books.—F. B. Wells, for himself, and J. H. Cook (assignee of one half of said invention), Fishkill on the Hudson, N. Y.

51,680.—Dated Dec. 26, 1865; reissue 3,348.—Cultivator.—James Armstrong, Jr., Elmira, Ill.

41,411.—Dated Jan. 26, 1864; reissue 3,349.—Harvester.—C. Aultman, Canton, Ohio, assignee, by mesne assignments, of Henry Fisher.

52,968.—Dated March 6, 1866; reissue 3,350.—Wrench.—A. G. Coes, Worcester, Mass.

22,549.—Dated Jan. 11, 1859; reissue 3,351.—Soda-water Apparatus.—Thos. Daniels, Toledo, Ohio.

48,614.—Dated July 4, 1865; reissue 3,352.—Boot and Shoe—A. B. Ely, Newton, Mass., assignee of Francis D. Ballou.

44,637.—Dated Oct. 11, 1864; reissue 3,353.—Nail-cutting Machine.—J. B. Kingham, Dorchester, Mass.

22,812.—Dated Feb. 1, 1859; reissue 3,354.—Machine for Rolling Horseshoe Iron.—W. W. Lewis, Cincinnati, Ohio.

12,780.—Dated May 1, 1855; reissue 3,355.—Shuttle for Looms.—L. Litchfield, F. C. Litchfield, and L. M. Litchfield, Southbridge, Mass., assignees of Lydia W. Litchfield, administratrix of the estate of Laroy Litchfield.

65,003.—Dated May 21, 1867; reissue 3,356.—Reciprocating Steam Engine.—H. O. Perry and J. L. Lay, Buffalo, N. Y.

DESIGNS.

3,431.—Trade Mark.—J. H. Ackerman, New York city.

3,432.—Center Piece.—Henry Berger, New York city.

3,433.—Trade Mark.—S. W. Dexter and D. S. Dexter, Pawtucket, R. I.

3,434.—Oil Cup for Journal Boxes.—Isidore Dreyfus, New York city.

3,435.—Trade Mark.—J. A. Hamlin and L. B. Hamlin, Elgin, Ill.

3,436.—Lamp Chimney.—Robert Hemingray, Cincinnati, Ohio.

3,437.—Front of a Clock Case.—Elias Ingraham, Bristol, Conn.

3,438.—Bird House.—John Murdock, Jersey City, N. J., assignor to John Savery's Sons, New York city.

3,439.—Table Caster Stand.—Wm. Parkin (assignor to Reed & Barton), Taunton, Mass.

3,440.—Fruit Tazza.—Wm. Parkin (assignor to Reed & Barton), Taunton, Mass.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

570.—Mechanism for Making Circular Tenons and Mortises.—W. A Ives, New Haven, Conn. Feb. 24, 1869.

577.—Harvesting Machine.—Cyrus Newhall, Hinsdale, N. H. Feb 24, 1869.

586.—Furnaces and Apparatus for Oxidizing and Desulphurizing Iron and other Ores.—W. H. Reinoehl, Pine Grove, Penn. Feb. 25, 1869.

625.—Lawn Mowing Machine.—Samuel Colt, Hartford, Conn. March 1, 1869.

629.—Improvement in Navigable Vessels.—John Howe, Jr., Boston, Mass. March 2, 1869.

593.—Ships and other Vessels for Carrying Liquid Cargoes.—W. C Hibbard, West Roxbury Mass. Feb. 26, 1869.

612.—Means for Effecting the Mixture of Molten Cast Iron with Solid Oxides and other Bodies.—T. S. Blair, Pittsburgh, Pa. Feb. 27, 1869.

651.—Water Closets.—John Keane, New York city, and G. H. Brown, Washington Hollow, N. Y. March 4, 1869.

686.—Process for Casting Chain.—C. C. E. Van Alstine and J. C. Hofer, New Haven, Conn. March 3, 1869.

701.—Apparatus for Converting a Reciprocating Motion into a Rotary Motion.—C. L. Spencer, Providence, R. I. March 9, 1869.

709.—Operating Tilt Hammers.—T. T. Prosser, Chicago, Ill. March 9, 1869.

718.—Turbine Wheels.—William Foos and J. W. Bookwalter, Springfield, Ohio. March 9, 1869.

720.—Devices for Rendering Gas Burners Self-Lighting.—Samuel Gardner, Jr., New York city. March 10, 1869.

730.—Cases for Holding Cigars, etc.—H. B. Wheatcroft, S. B. Guernsey, and F. J. Terrell, New York city. March 11, 1869.

739.—Spinning Machinery Materials.—Thomas Mayor, Providence, R. I. March 11, 1869.

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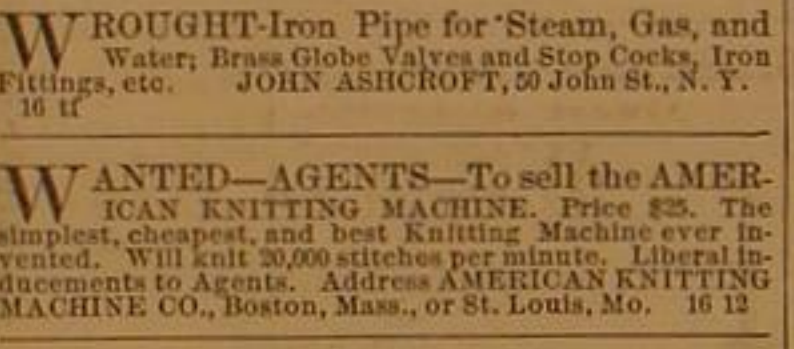

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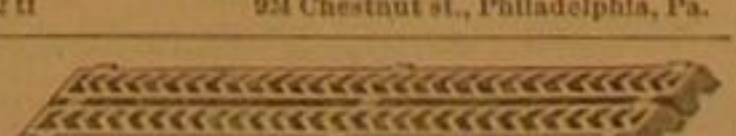

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