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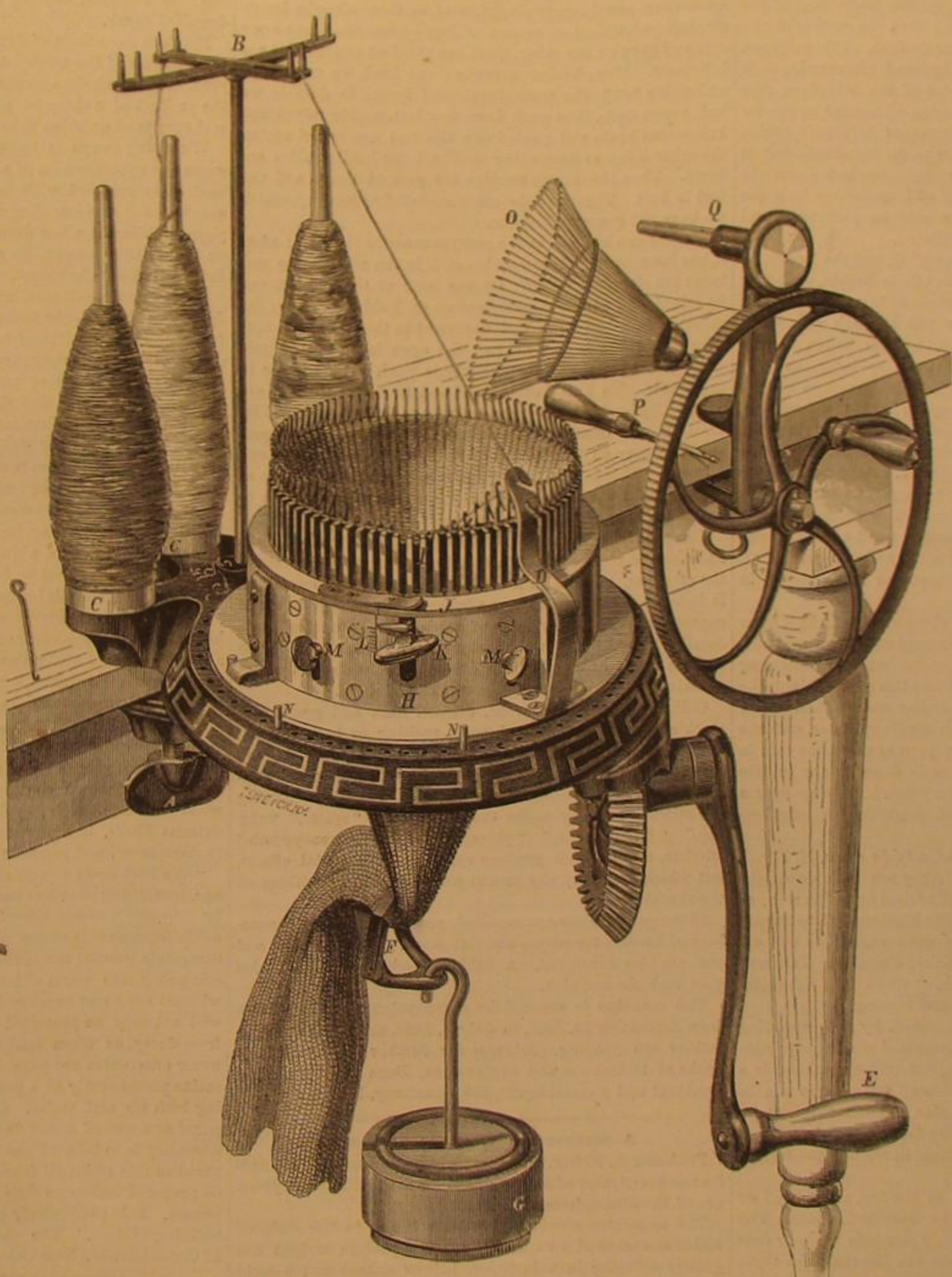
THE BICKFORD FAMILY KNITTING MACHINE.

The machine we this week bring before our readers is one which, in the accomplishment of varied results through the employment of the most simple means, has been rarely equaled. Those who have seen the complicated knitting machines, at work in the large factories, which at present fill the American market with knit goods, have been accustomed to regard them as essentially and necessarily complex. The inventor of this machine has shown, however, that only a few parts are necessary to accomplish a great variety of work, and also that these parts may be of forms easily understood, put together, and operated by those unfamiliar with machinery.

We have taken great pleasure in personally inspecting and operating this machine, and have become convinced that it comprises all that is essential for family use.

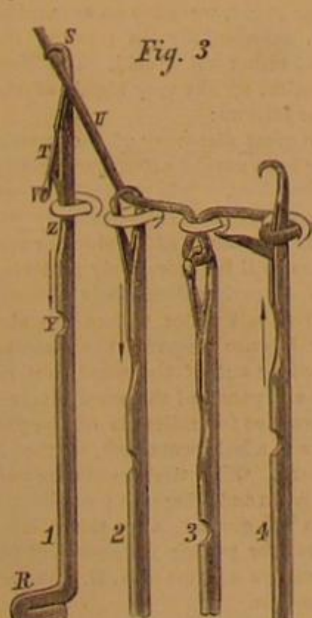
It supplies a means of fabricating many articles of usefulness in every household. A great many ornamental kinds of work undertaken for the purpose of filling up leisure hours, but becoming tedious and burdensome before they can be completed by hand, can be begun and finished in an hour or two in such a perfect manner, and with such facility that the delight in making them is not marred through prolonged labor. We can conceive of nothing more fascinating to a tasteful mind than the rapid production of forms of beauty and usefulness effected by this machine.

The merits justly claimed for it are, the variety of work it executes, its non-liability to get out of order by transportation or use; the perfect manner in which it is made; ease in working, and absence of noise in running; the little skill required to operate it; and its capacity to knit anything that the most expert operator can knit or crochet by hand, from a watch cord to a bed blanket. The machine, having no tension, does not wear or tear the yarn to pieces; it can therefore be raveled and knit over and over again.



THE BICKFORD FAMILY KNITTING MACHINE.

Fig. 3



Referring to the engraving, Fig. 1, it will be seen that the machine, exclusive of needles and the toothed wheel, consists of only sixteen parts, as follows: A, thumbscrew to fasten machine to table; B, yarn stand; C, pins for bobbins; D, yarn carrier, and sliding ring to which carrier is attached; E, machine handle; F, buckle; G, weights; H, revolving cylinder; I, needle cylinder; J, ring clasp; K, cam and screw for changing length of stitch; L, indicator, to show distance moved; M, swing cams and their thumb screws; N, pins for knitting flat web; O, set-up; P, looper.

The three first and the three last enumerated, as well as the buckle, F, and the weight, G, are not moving parts, the latter being only eight in number. To enable the reader to comprehend the action of these parts, we must first explain the stitch taken in the knitting of an ordinary stocking after the ribbed top has been knit, and the work is proceeding in the leg or foot. Fig. 3 represents four of the needles with the yarn looped thereon, as when the machine is at work. The needle employed is shown complete at No. 1. In the other numbers a portion of the lower part is broken away. The needle consists of a body, an angular bent portion or foot, R, a hook, S, and a latch, T. The latter is pivoted to the body of the needle at U, and works partly in a slot formed in the body. The latch has, moreover, a spoon-shaped end, shown at V, which, when the latch is closed as shown in needle No. 2, meets and partly shuts over the point of the hook, S, so that the loop formed on the needle

Fig. 2

easily slips off when the latter makes its downward movement.

The needle as thus described is not a new invention; but Mr. Bickford, the inventor of the machine under consideration, has made important improvements in its form, which obviate all the devices hitherto considered necessary to close the latch. One of these improvements is the depression or hollow shown at Z, Fig. 3. This allows the loop, when passing off the needle, to always pass under the point of the opened latch, so that the latter is closed by the loop itself, avoiding all strain upon the needle, or liability to break from rigid parts getting out of adjustment. The deeper depression, Y, is also another improvement, the use of which will be explained when describing the process of narrowing, further on. Now let the reader suppose one line of stitches already formed on these needles, as shown in the engraving, and the thread of yarn, to be knit, so held that the needle marked 1 will hook over it when the latter descends. The thread will be drawn down by the needle until the latch, T, meets the loop previously formed. This loop, sliding along the body of the needle, lifts the latch and closes it into the position shown in No. 2. The loop then slides off the needle as it continues to descend, and the thread, being drawn down through the former loop, forms a new loop, through which the needle will pass in rising, as shown in No. 4, opening the latch, and leaving the hook free to engage the yarn when the latter is brought under it again, and so on.

Now, it is obvious that if we supply mechanism that will bring the yarn under the hook at the proper moment, and also move the needles up and down successively, and also provide a device for supporting each row of loops till the next row is formed, we shall have a machine that will knit a straight tube.

As soon as the reader understands how this is done, we shall be able to explain how widening and narrowing can be done, and how a variety of stitches can be made, or a flat web knit.

Fig. 2 shows the parts employed for moving the needles up and down. M, in this figure, represents cams. These are screwed on to the inside of the revolving cylinder, H, Fig. 1, their position being directly under the set screws, M. As these cams are carried around by the revolving cylinder, the angular bent part or foot, R (see Fig. 3), of the needle passes through the curved space between the cams, Fig. 2; and as the needles are held from moving sidewise, by being placed in grooves formed in the needle cylinder, I, Fig. 1, they are forced up and down as desired. Each row of loops is also sustained until the next is formed, by means of the needles themselves, as the needle cylinder prevents their bending inward, and keeps them in a vertical position, as shown in Fig. 1.

On the bottom of the revolving cylinder are formed teeth which mesh into a bevel gear turned by the crank, E. The yarn being wound upon a bobbin, is placed on one of the pins, C. It is passed over the yarn stand, B, and thence through a hook in the top of a bent bar, D, called the "carrier." This carrier is fastened to the revolving cylinder, H, which carries the cams, and travels with it, carrying the yarn, and holding it in just the right position to be caught by the hook of each needle as the latter is depressed by the action of the cams.

We have now all the conditions established for knitting a straight tube. If we attach the buckle, F, and hang on the weights, we have but to turn the crank to cause the machine to knit continuously.

The crank may be turned either way, but as the carrier in the position shown will not hold the thread in advance of the cams when the motion is reversed, the needles will descend before the thread is brought under them. The position of the carrier must therefore be so changed as to move in advance of the descending needles. This is effected as follows: The carrier, D, is attached at its base to a sliding flat ring, which moves about the cylinder, H, its motion being limited by stops to a little more than enough to pass the cams, and take its proper position to lead the thread in advance of the needles. If it be desired to knit backwards and forwards, the pins, N, are inserted in the holes of the fixed base of the machine, as shown in Fig. 1. The heel of the carrier striking against one of these pins, is held from further motion, but the cylinder, H, will still move onward till the carrier is shifted to the other stop, when the cylinder, H, also is held from moving any further in that direction. Its motion may, however, be reversed till the carrier reaches the other pin, and is again shifted. Then the crank must be turned in the opposite direction again, and so by this arrangement, the cylinder, H, is made to move backwards and forwards to any desired distance, as regulated by the pins, and as the knitting proceeds, a flat web is knit with a perfect selvedge on each side.

Such a web may be knit from the outset, or in connection with the tube, as in forming the heel or the toe of a stocking. Let the reader suppose the leg of a stocking to have been narrowed (by a process hereafter to be described) down to the heel, and that it is required to knit a straight flat section, to be subsequently joined on to the beginning of the foot. The pins would then be set to limit the motion to the extent required to knit the flat strip desired. This strip can be closed on to the previous web by hand afterwards, or it can be knit on by slipping the loops of the selvedges over the other needles, previous to knitting all around again for the foot. This is not the exact process of knitting a heel—which is done in two ways hereafter to be described—but it illustrates the principle. Having thus seen how a straight tube or a flat web may be knit, we will now show how the work is set up, how various stitches may be performed, and how narrowing and widening are effected.

In setting up the work, the "set-up," O, and the looper, P, are used. A length of thread is run off the bobbin, sufficient to form the first set of loops, the same as in setting up work on hand needles. This thread is put through an eye in the point of the looper. The "set-up" is taken in the left hand, put up and held in the cylinder, so that its hooks are nearly on a level with the tops of the needles. The looper is then passed about the hooks of the set-up and the tops of the needles, carrying the thread with it, and forming a series of loops, like those shown in the lower series, in Fig. 3. As soon as the needles are filled, the machine is given one turn, which completes the first set of stitches. The set-up is then drawn down, and the knitting proceeds until a length sufficient for the attachment of the buckle and weights is attained, when the latter are substituted for it, as shown in Fig. 1.

The stitches are made longer or shorter, so as to knit open or close, by the regulation of the upward and downward motion of the needles. This is done by the raising or lowering of the movable cam, K, Fig. 2. When this cam is raised, the stitches are made shorter, as the needles are not then drawn so far down into the grooves of the needle cylinder, and the loops do not then contain so much yarn as when the cam is set lower. This setting of the cam is done by the middle thumb-screw, K, Fig. 1, an indicator point, L, moving over a scale showing the proper degree of shortening or lengthening of the stitches.

In knitting flat webs, both the adjustable cams, M, Fig. ?, must be in the position shown. If they are both down, the machine will not knit either a cylindrical or a flat web, as there is nothing to raise the needles high enough to release the latches. In this position, the work cannot be run off, should the machine be turned in either direction. This may be done while setting up the work, or when it is left unfinished, as a security against accidental turning.

The needles are taken out, or inserted, by first removing the jointed ring clasp, J. This is provided with a rule joint and a spring catch, so that it can be removed or replaced in a moment of time. When it is taken off, the needles can be drawn up out of the needle cylinder. When they are inserted, they must be put in with the foot, R, Fig. 2, pointing outward. This must be borne in mind in reading the following method of knitting a stocking:

If the stocking is to be seamed at the top, every third or fourth needle is first taken out, as described above. The work is then set up, and the knitting proceeds three or four inches. Then the needles taken out are inserted, and three or four inches are knit plain. The stitch may be made loose over the calf of the leg, and gradually tightened to the ankle, shaping it nicely; or it may be narrowed down to the size desired by taking out needles. This is done by first taking out one exactly in front, putting the stitch over the next needle, and then knitting round six or seven times. Then the third needles on both sides of the one first taken out are removed. Then knit round six or seven times again, and take out two more; and so continue to knit and take out needles till the leg is narrowed to the size desired. The work is then ready for the heel. For a common sock, thirteen or fifteen needles will usually need to be taken out; the number of times knitting between the needles taken out may be determined by the length of the leg, which is about one hundred times round for a common sock.

In knitting a stocking or sock, either a square or round heel may be formed. The square heel is knit as follows:

After knitting the leg long enough, the machine is stopped with the carrier, D, at the back side. The needles in front or toward the operator, are then pulled up, being half of the entire number in the cylinder. These may be called the instep needles. They are drawn up till each loop passes into the notch, Y, Fig. 3, which holds them so that they will pass over the cams without knitting for the instep. Then the pins, N, are inserted on each side opposite the fourth needle of those drawn up. The object of the holes in the base of the machine is, as already explained, to insert the pins for the purpose of gaging the width of work knit; for example, in using thirty-six needles for knitting the heel, these pins are inserted far enough beyond the number of needles used to form each stitch perfectly on either side of the web. After the carrier, D, strikes the pins, the machine is turned until the sliding ring the carrier is attached to comes to a full stop. This places the carrier opposite the other cam in a position to knit the other way. The knitting is continued backwards and forwards until the heel is long enough, being thirty-six times for a common sock. Then the heel is run off and closed up; and, taking up the loose loops on the selvedge of the heel on the needles the heel was on, and pushing the instep needles down in place, we proceed to knit the foot the length required, being seventy times round for a common sock.

In knitting a round heel, one half the needles are put up, and the pins are placed as described for the flat heel. Then the machine is turned as far to the left as it will go, then back to the right, when the first needle on the left, next to those already drawn up, is raised; then to the left, pulling up the first needle on the right, next to those already drawn up; and so knitting across and pulling up needles, first on one side and then on the other, until one third of the needles are left down. Now, having narrowed the heel, we commence and widen out to the same size started from; to do this we knit across once, then push down the last needle raised up; knit across again and push down the last one raised up, on the other side; so continuing until all the heel needles are down. Then the instep needles are pushed down, and the foot is knit. There are also other modes of narrowing, which we have not space to describe.

The toe can be knit in the same manner as the heel; after it has been narrowed and widened, it is run off and the end loops are closed together. Or, one half of the needles can be raised, and one third narrowed on each side as before; the other half pushed down and narrowed in the same manner; then the whole is run off, and the open loops of the two sides closed together. Either way is good, but the latter is preferable. To knit double heels and toes, two threads are used. Old heels and toes are quickly and nicely mended by knitting new ones on. The minute description of this process may give an impression that the manipulation is complicated. This is not the case, however; a single sitting of half an hour will enable any one of ordinary intelligence to knit a stocking perfectly.

The example given of the knitting of an entire stocking is sufficient, in connection with this description of the parts of the machine, to give an idea of its principle and operation. It fails, however, to give any adequate idea of its scope and capacity to perform a variety of work. Our space forbids a detailed exposition of the manipulations through which the various styles of stitches are effected, and we will content ourselves with an enumeration of some of them.

Children's socks, flat webs, seamed back and gored foot stockings, mittens, Balmoral work, ruching or tufted work, fringes, cords, scarfs, affghans, blankets and spreads, are some of the many articles which can be wrought in a beautiful and substantial manner with ease and rapidity. Among the stitches we may name the "diamond," "spiral," "zig-zag," "herringbone," "pineapple," and "honeycomb" stitches, all of which produce very fine ornamental effects, but which do not by any means exhaust the capabilities of the machine.

Different cylinders are supplied, containing different numbers of needles for coarse and fine work. Extra needles and pins are also furnished. A bobbin winder, Q, Fig. 1, also goes with the machine.

The machine is covered by seven patents, bearing dates from September 10, 1867, to July 6, 1869, and further applications are pending. Address for further information, or books of instruction and explanation, Dana Bickford, Vice-president and general agent, 689 Broadway, New York city.

A Barometer without Mercury.

Professor A. Heller, of Ofen, gives in Poggendorff's *Annalen* the description of an apparatus for determining the pressure of the atmosphere.

The apparatus consists of a scale beam, to the ends of which are screwed two bodies nearly equal in weight but greatly differing in volume,—a hollow sphere and a solid cylinder. On one end of the beam is a mirror which is approximately at right angles to the axis of the beam. At some distance from the apparatus is a telescope with a vertical scale, the image of which in the mirror is observed by means of a telescope. It is clear that when there is any change in the expansion of the air in the vicinity of the apparatus, the beam will indicate varying angles with the horizon, which angles may easily be read off in the mirror by means of the telescope.

The variations of the scale beam in consequence of alterations in the pressure will not amount to much, if the dimensions of the apparatus are moderate; but the use of Poggendorff and Gauss's method of reading affords such a degree of accuracy that, as a brief calculation shows, under assumptions which are easily realized, the changes in the position of the beam can be measured with far greater certainty and accuracy than the hight of the mercurial column in the ordinary barometer, provided the whole construction is light, and that its center of gravity is at a short distance from the knife edge of the beam.

Causes of Summer Diseases.

The *Journal of Health* for June, under a different heading, states the following facts concerning the causes of disease:

The mistletoe bough, like the Spanish moss, which drapes the trees of Southern swamps in such sad funereal garb, is a growth outside of the natural condition of the tree; it is a parasite, a fungus; a very low form of life, exceedingly slow in development in some cases, in others so inconceivably rapid as to be reproduced in millions in a few hours, as in the toadstool and mushroom. The common yeast, with which we make our bread, is a mass of living things, a dozen of them generating myriads more in a night. These fungi, sporules, or germs, are not only the pests of living plants, eating out the entire life in the course of time, but they infest animals and man, carrying with them, sometimes, the most dreadful deaths. The mushroom, the morel, and the truffle, among the greatest delicacies of the table with some, are fungi. In some cases they kill, or cause disease, or poison. Ergot, blight, mildew, rust, brand, dry rot, are all the diseased results of fungous growth.

There are similar growths or products in the animal world, called "cell" life. Vegetables come from seed, animals from eggs by cell development, and these cells or eggs are as amazing in their fecundity as fungous growth. A man swallows a few mouthfuls of raw pork in which are a few trichinæ. In a very few days, living things are found burrowing in the flesh by millions, causing the most agonizing pains and a dreadful death.

Between the effects of fungi and cell products, the vegetable germ and the animal egg, men perish in millions every year. Asiatic cholera seems to be, by the latest researches, the product of a thing of life, but whether vegetable or animal admits of question thus far.

Whooping cough is apparently of vegetable growth; for when the expectoration of a child suffering from it is examined, it is crowded with germs; on one occasion a small amount of it was introduced into the windpipe of a healthy young rabbit; in a few days it had a troublesome cough, and on examination a countless number of these same germs were found all along the throat, windpipe, and lungs.

Plague and pestilence, and all those diseases, called epidemic, which suddenly fall upon a whole community, such as fever and ague, chill and fever, bilious fever, yellow fever, diarrhœa, and dysentery, are caused by marsh miasm.

In the worst time of yellow fever and cholera in New Orleans, the evening and the morning air was so cool and delicious and balmy that many a time we have breathed it by the hour in perfect delight; and yet the resident knew that it was but the sure intimation that the disease would be more fearful in a day or two. But if this air be bottled and taken a thousand miles away, put into a close room where a healthy man is sleeping, he will have the ordinary symptoms of chill and fever in a day or two, and myriads of these pestiferous things will be found about his tongue, his throat and windpipe, and his lungs and stomach.

The newspapers announced recently that the Asiatic cholera had made its appearance in India; its progress has been always westward along the most prominent lines of travel, until it reaches America, crosses to the coast of California, and is lost in the boundless Pacific.

Thomas' Process for Preserving Wood.

In a previous number of our paper, we gave an account of this process, which consists, substantially, in treating the wood with oil of resin, applied either hot or cold. The New Orleans *Times*, in a recent notice, speaks very highly of the improvement, and remarks as follows:

"We look upon this as the great discovery of the present age, something that has long been sought after, particularly by ship builders and wharf builders. It is particularly valuable because it is cheap, plentiful, and easily applied. By using this process the timbers or bottoms of all ships or vessels going into warm climates will be thoroughly protected without the great expense of coppering them, their bottoms will not only be protected from salt water worms, but also from decay, as when timber is once prepared the material never evaporates nor passes off or out of the wood, but remains permanently as a part and parcel of the wood, excluding both air and water. Crossties for railroads can be prepared at a cost of about five and a half cents each, all that is necessary is to take off the bark. Other timbers can be prepared in this ratio; all fence posts and telegraph posts should be prepared before putting in the ground; also, the sills of houses. It is particularly good for paving purposes and for building bridges." The patentee's address is N. H. Thomas, 32 Carondelet St., New Orleans, La.

A New Danger to Ocean Cables

A recent announcement of the Superintendent of the International Telegraph Company between Punta Rosa and Key West, has placed a new item upon the list of dangers to which ocean cables may be subjected.

The cable in question had, during the past year, been so frequently injured or broken, that a careful examination was decided upon, the result of which was to the effect that the damage was to be ascribed to the loggerhead turtles, which are abundant in those waters. In many places, the cable presented the appearance of having been bitten through; and in others of having been crushed from both sides until it had become so much flattened as to destroy its conductivity. The conclusion of Colonel Heiss, the superintendent, is further confirmed by the fact that at the depths where the breaks and injuries occur, there the loggerheads most abound. The Company has sent an order for a much larger and stronger cable, and when it is laid, the assailants will have something more substantial than the present steel-wound cable, upon which to whet their teeth.

THE APPLICATION OF STEAM TO CANALS.—NO. I.

BY GEORGE EDWARD HARDING., ESQ., C. E.

The immense capital invested in canal property, and the extended lines of inland navigation throughout the various districts of Great Britain, Northern Europe, and the United States of America, cause regret that, while so much has been done in years past to develop the trading interests of these countries, such extensive internal communications have been suffered to remain dormant, burdened by the same defective system of navigation which, once ample for the transportation of goods, when the pack horse and the country wagons were their only competitors, now is in most miserable contrast with the perfected system and dispatch that characterizes the management of the railways of the present day. The defects and delays in the transportation of goods *viâ* canal, not lessened by the private interests and conveniences of drivers, boatmen, and others engaged in their traffic, where heavy boats are dragged from one destination to another at the slowest possible speed, by the wretched beasts that lean for support against the towing lines, point to the necessity of a radical change, to redeem them from the position to which they have sunk, in the competition of the day.

Commencing with the early history of canals, we propose to present some of the more prominent experiments which have been designed to improve the construction of vessels adapted to inland navigation, and the application to them of mechanical means of propulsion.

Save that the large drains cut by the early churchmen in the Cambridge fens seem to have been employed for purposes of occasional inland navigation as early as the fifteenth century, the great commercial republic of Holland may safely claim centuries of European priority in the construction of a system of artificia' water-roads, which the industry of its people had turned to a good account of prosperity and power. France, Sweden, add even semi-barbarous Russia, had also taken the lead in this respect long before England had entered upon her career of canal construction; though in Egypt, long before the invasion of Great Britain by the Gauls, and in China, at a still earlier date, we know of their introduction, yet their origin is undoubtedly merged in the system of irrigation which, for unknown ages, has been pursued in those countries.

Certain authorities have claimed that during the invasion of England by the Romans, the works executed by them in the Fen districts were also used for navigable purposes, but of this we have no tangible proofs. In 1623, however, we find from Parliamentary records that Sir Hugh Myddleton was engaged in considering a bill "For the making of the River Thames navigable to Oxford;" while, twenty-three years later, one Francis Mathew addresses, to Cromwell and his Parliament a paper upon the immense advantages of opening up a water communication between London and Bristol, which purposed making the rivers Isis and Avon navigable to their sources, with a short canal to connect their heads across the intervening country; but, for Mathew's time, a scheme for the construction of three miles of canal, even by the State, was far too daring, and a century elapses before a canal is made in England.

Andrew Yarrington, gentleman, next publishes, in 1677, a curious book, entitled "England's Improvements by Sea and Land, to outdo the Dutch without fighting, to pay debts without moneys, to set at work all the poor of England with the growth of our own land," in which he strongly contrasts the prosperous energy of the Dutch, especially regarding their inland water communication, with the passive indifference of Englishmen to the immense advantages in their numerous streams and rivers, lying dormant at their very doors, wanting only improvement in their existing beds, with proper connection, to develop the trade and prosperity of the country.

To the lack of capital at this time can be traced the secret of the little progress of the internal communication of the country, and, though Parliament liberally granted permission for river improvements, yet, from the want of money, few were attempted, or, if commenced, failed from the same cause.

About the beginning of the eighteenth century, the opening of the navigation of the rivers Aire and Calder gave a great impetus to the trade of that portion of Yorkshire, and stimulated the demand for improvements in inland navigation; and we find its first fruits in an act of 1720, to make navigable the Mersey and Irwell, from Liverpool to Manchester; and, at about the same time, acts for the improvement of the Weaver, Douglass, and the Sankey navigations were granted, and, what was more to the purpose, the works carried out. Again, in 1817, as a reference to the pamphlets of the British Museum will show, Dr. Thomas Congreve published some views, headed "A Scheme and Proposal for making a Navigable Communication between the rivers Trent and Severn, in the County of Stafford," which paper project slumbered for forty years, t ll, in 1755, a survey was made for this very line of canal, under the auspices of the "Liverpool Corporation of Merchants," which line proceeded by Chester to Stafford, Derby, and Nottingham; and from Brindley's "Note-book" we find that he executed a fresh survey over the same ground in the years 1759-60, but at the expense of Earl Gower and Lord Anson.

Thus, it is not till the middle of the last century that English enterprise was fairly awakened to the necessity of a system of artificial canals; and directly traceable to the execution and extension of these earlier river improvements, can we date the present system of internal communication, which has conduced so largely to the industrial prosperity of the English nation; and to the consequent increase of British manufactures, and their distribution, do all countries owe many of their indispensable comforts of life.

Apart from the deductions that would naturally follow from the river improvements, it is well known that, in 1755, the deepening and widening of the Sankey-brook, tributary to the Mersey, with the application of a floodgate for retaining tide water, gave the hint which culminated in the construction of the well known Bridgewater canal, under James Brindley; but the rapidity of extension was afterwards such that, between the years 1760 and 1803, no less than 2,295 miles of canal were opened. From the exceedingly interesting history of this society, written by Mr. Davenport, we learn that the gold medal of the Society of Arts was awarded, in 1800, to the Duke of Bridgewater, as the father of inland navigation, and for his general exertions in promoting the interests of inland water carriage; since which date there seems to be no note of special award to the workers in this particular field of the economy of the nations. Indeed, since the adoption of canals, except in the substitution of horses for men at the towing lines, and some improvements effected in the manner of passing boats from one level to another, they may be truly said to have remained stationary in the general march of improvement, and, unlike all other arts, have partaken of none of the benefits arising from the increase of mechanical science.

It is with the view of calling attention to the fact, that, by the exercise of a tithe of the mechanical ingenuity which has been expended on railways, canals might again assume a position and importance which, if not in general economy superior to railways, yet may, in relative utility, compete in the transit of minerals, and other merchandise, that this paper is now before you; and the immense capital embarked ir canals certainly renders it a subject of national as well as pecuniary importance.

A further enumeration of the progress of canal construction in this country is unnecessary, yet a glance at the commencement of inland works in America will be interesting; and in connection we find, as early as 1724, Cadwallader Colden, then Surveyor General of the colony of New York, suggesting a system of works somewhat similar to those now existing. Sir Henry Moore, the Governor of the colony, in 1768, also recommended the improvement of the inland navigation. These recommendations slumbered through the Revolutionary war which followed, to be again projected with the independence of the country. As in England, the improvement of the existing navigations was first in course, and, as early as 1791, acts for surveys and estimates relating to the removal of obstructions to the navigation of the Hudson and Mohawk rivers were passed. In the following year, the Western and the Northern Inland Companies were incorporated, and, by 1802, the former company had succeeded in spending an immense sum of money, with but very small proportional results. The route now occupied by the Great Erie Canal was adopted in 1812, repealed in 1814, to be again revived two years later. Ground was broken near Rome in July of the same year, while the first boat passed from Lake Erie to the Hudson in October, 1825, thus consuming a little over eight years in constructing the distance of 364 miles, with a total of 71 locks. The Champlain Canal was commenced in 1816, and completed in 1823, since which date the many lateral branches of the Erie have been added to the system, and the application of inland navigation extended to many of the other States.

It is a fact of interest, that the original dimensions of these canals were established by the commissioners, in 1817, at 40 feet in width by 4 feet deep, with locks 90 feet by 15; but, as early as 1834, the wants of a growing commerce demanded an increase of capacity, and in 1835, an act of enlargement of the Erie Canal was passed, since which time the depth has been increased to 7 feet, its width to 70, and the locks to 18 by 110 feet. Before the commencement of the Erie, the cost of transporting a tun of merchandize from Buffalo to Albany equaled £20, and consumed twenty days; the canal at once reduced the cost to £4, or one fifth, and the time to eight days. But mark, that the mere enlargement of the canal again reduced the average cost of movement, including all tolls, to ten shillings per tun, or one eighth of the expense previous to the improvements.

It may be interesting to review some of the more or less ingenious attempts to overcome the disadvantages of towing by horses, and hastily glance at the various methods of propulsion by mechanical means which have been especially designed to supersede animal labor in propeling boats on inland navigable waters, in Europe and America, up to the present time. In this enumeration, we shall necessarily find, among the first experiments, some which have been broadly designed for purposes of general navigation, and touch upon the early history of the steam engine; but, so far as possible, preference will be given to those where application to canal or river navigation has been the paramount idea of their inventors.

CARAVANS.

Every caravan is under the command of a chief. When it is practicable, they encamp near wells or rivulets, and observe a regular discipline. Camels are used as a means of conveyance, and there are generally more camels in a caravan than men.

The commercial intercourse of Eastern and African nations has been principally carried on, from the remotest period, by means of caravans. The formation of caravans is the only way in which it has ever been possible to carry on any considerable internal commerce in Asia or Africa. The governments that have grown up in these continents have seldom been able, and seldom have they attempted, to render traveling practicable or safe for individuals. The wandering tribes of Arabs have always infested the immense deserts by which they are intersected, and those only who are sufficiently powerful to protect themselves, or sufficiently rich to purchase an exemption from the predatory attacks of these freebooters, can expect to pass through territories subject to their incursions without being exposed to the risk of robbery and murder.

In the pilgrimage to Mecca enjoined on the followers of Mohammed, the prophet grants them the privilege of trading: "It shall be no crime in you if ye seek an increase from your Lord by trading during the pilgrimage." The camels of each caravan are loaded with those commodities of every country which are of easiest carriage and readiest sale, and during the latter part of the month of June and the early part of July, the Holy City is crowded with opulent merchants and zealous devotees. A fair or market is held in Mecca on the twelve days that the pilgrims are allowed to remain in the city.

Few pilgrims, says Burckhardt, except the mendicants, arrive without productions of their respective countries for sale. Pilgrims from Morocco and the north coast of Africa bring their red bonnets and woolen cloaks; the European Turks, shoes and slippers, hardware, embroidered stuffs, sweetmeats, amber, trinkets of European manufacture, knit silk purses, etc.; the Turks of Anatolia bring carpets, silks, and Angora shawls; the Persians, cashmere shawls and large silk handkerchiefs; the Affghans, tooth brushes, made of the spongy boughs of a tree growing in Bokhara, beads of a yellow soapstone, and plain coarse shawls manufactured in their own country; the Indians, the numerous productions of their rich and extensive regions; the people of Yemen, ornaments for Persian pipes, sandals, and various other works in leather; and the Africans bring various articles adapted to the slave trade. The pilgrims are, however, often disappointed in their expectations of gain: want of money makes them hastily sell their little adventures at the public auctions, often at very low prices.

The two principal caravans which yearly rendezvous at Mecca are those of Damascus and Cairo. The first is composed of pilgrims from Europe and Western Asia; the second, Mohammedans from all parts of Africa. The Syrian caravan is said by Burckhardt to be very well regulated. It is always accompanied by the Pasha of Damascus, or one of his principal officers, who gives the signal for encamping and starting by firing a musket. On the route, a troop of horsemen ride in the front, and another in the rear, to bring up the stragglers.

The different parties of pilgrims, distinguished by their provinces or towns, keep close together. At night torches are lighted, and the daily distance is usually performed between 3 o'clock in the afternoon and an hour or two after sunrise on the following day.

The Bedouins or Arabs, who carry provisions for the troops, travel by day only, and in advance of the caravans, the encampment of which they pass in the morning, and are overtaken in turn and passed by the caravan on the following night at their own resting place. At every watering place on the route is a small castle and a large tank, at which the camels water. The castles are garrisoned by a few persons, who remain the whole year to guard the provisions deposited there. It is at these watering places, which belong to the Bedouins, that the sheikhs of the tribe meet the caravan, and receive the accustomed tribute for allowing it to pass.

The caravan which sets out from Cairo for Mecca is not generally so large as that of Damascus, and its route along the shores of the Red Sea is more dangerous and fatiguing. But many of the Africans and Egyptian merchants sail from Suez, Cosseir, and other ports on the western shore of the Red Sea, for Djidda, whence the journey to Mecca is short and easy. The Persian caravan for Mecca sets out from Bagdad; at many of the Persians are now in the habit of embarking but Bussorah, and coming to Djidda by sea.

Caravans from Bagdad and Bussorah proceed to Aleppo, Damascus, and Diarbekir, laden with all sorts of Indian, Arabian, and Persian commodities; and large quantities of European goods, principally of English cottons imported at Bussorah, are now distributed throughout all the Eastern parts of the Turkish Empire by the same means. The intercourse carried on in this way is every day becoming of more importance.

The commerce carried on by caravans in the interior of Africa is widely extended and of considerable value. Besides the great caravan which proceeds from Nubia to Cairo, there are caravans which have no object but commerce, which set out from Fez, Algiers, Tunis, Tripoli, and other States on the seacoast, and penetrate far into the interior. Some of them take as many as 50 days to reach the place of their destination, traveling at the rate of from 18 to 22 miles per day.

The trade of these caravans is a barter of various kinds of goods for slaves. Three distinct caravans are employed in bringing slaves and commodities from Central Africa to Cairo. They do not arrive at stated periods, depending upon the success they have had in procuring slaves, ivory, gold dust, drugs, and such other articles as are fitted for the Egyptian markets. The largest of these caravans, the Darfur caravan, consists of 2,000 camels, and its departure is looked upon as a most important event, and for a while engages the attention of the whole country.

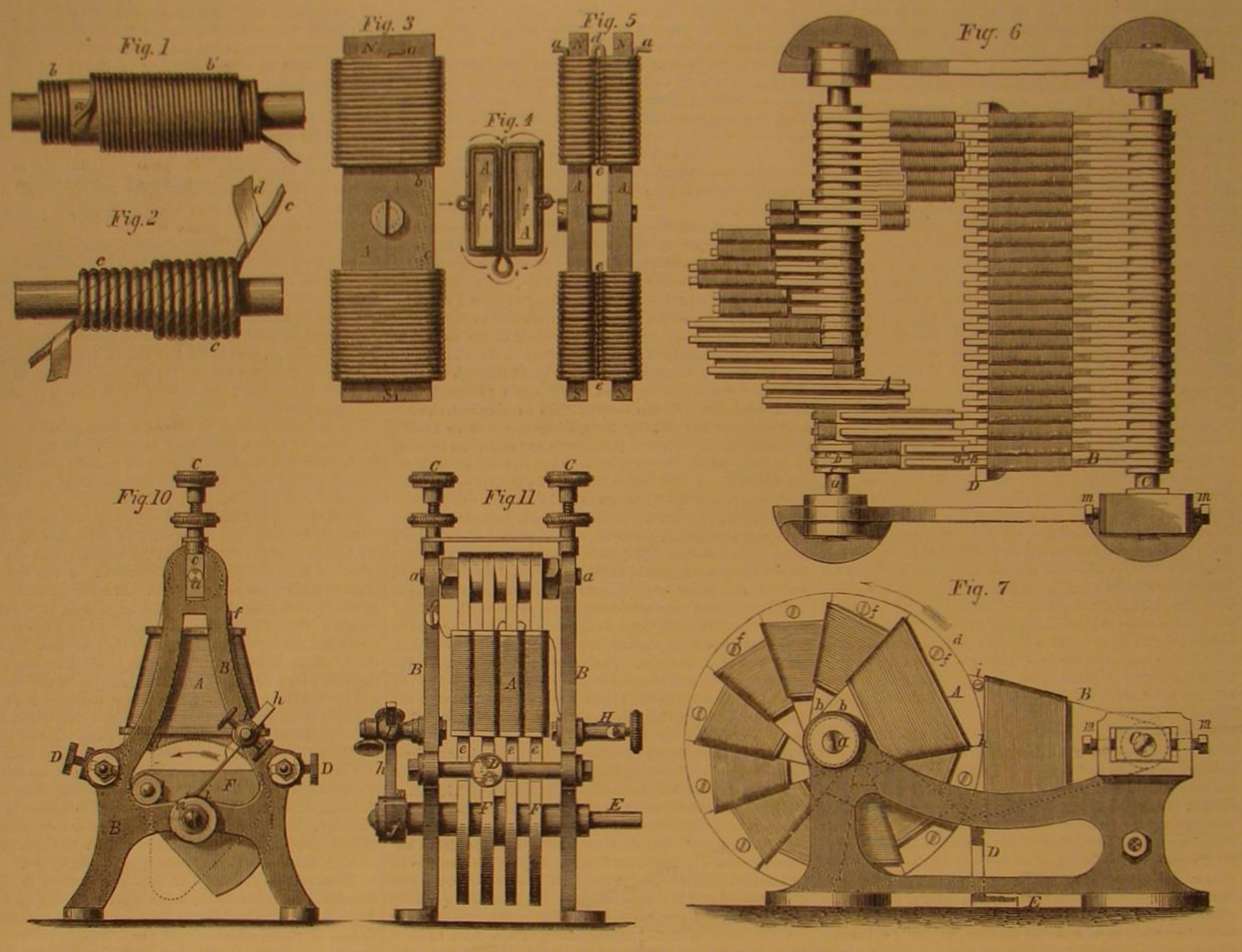
Caravans are distinguished into heavy and light. Camels loaded with from 500 to 600 pounds form a heavy caravan; light caravans being the term applied to designate those formed of camels under a moderate load or half a load.

No particular formalities are required in the formation of caravan. Those that start at fixed periods are mostly under the control of government, by whom the leaders are appointed. But any dealer is at liberty to form a company and make one. The individual in whose name it is raised is considered as the leader, unless he appoint some one else in his place. When a number of merchants associate together in the design, they elect a chief, and appoint officers to decide whatever controversies may arise during the journey.

Paine's Electro-magnetic Improvements.

These improvements are covered by several patents, granted to H. M. Paine, of Newark, N. J., in 1870 and 1871, and we shall allude to them in this description by their patent numbers, quoting chiefly from the specifications of the patents.

Figures 1 and 2 are illustrations of patent No. 103,231, being an improvement in the construction of electro-magnets. The object of the invention is to increase the power of electromagnets by neutralizing the induced currents, and thus rendering available the full dynamic value of the battery. The improvement consists in the interposition, between the layers of coils, or the application as a clothing or covering to the insulated wires of which the coils are composed, of a metallic medium, by which the antagonism of like currents to each other is neutralized. The metallic medium which may be employed may be of various kinds, but that which it is now proposed to use, as most convenient for the purpose, is what is known as metal foil. The medium may be applied in various ways, but for illustration there are shown in the engravings two ways of applying it. In Fig. 1, metal foil, *a*, in the form of a sheet or ribbon, is shown wound or lapped around and between the successive layers of coils, *b b'*, of insulated wire. In Fig. 2, the entire length of the insulated wire is shown as having a ribbon, *d*, of metal foil wound around it, to form a complete clothing or covering.



PAINE'S ELECTRO-MAGNETIC IMPROVEMENTS.

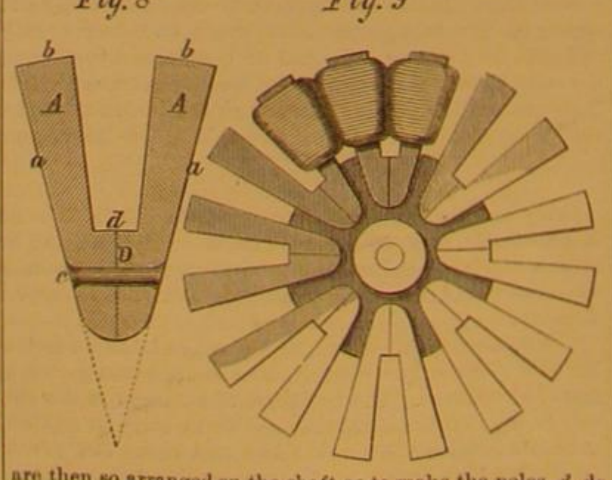
CLAIM.—The interposition of a metallic medium between the layers of the coils of an electro-magnet, or the application of a metallic medium as a clothing or covering to the wire of an electromagnet.

Figs. 3, 4, and 5, illustrate patent No. 103,230, being an improvement in electro-magnets. The object of the invention is to obtain the same relative results by compounding electro-magnets as are acquired by the compounding of permanent magnets. In order to accomplish this result, the poles of two or more rectangular bars, A, Figs. 3 and 4, are wound with insulated wire, commencing at *a*, Fig. 3, on each bar, and winding around the requisite number of turns to reach the guide pin, *b*, and then pass down to guide pin, *c*, and wind in same direction till the same number of turns has been made on the opposite end of the bar: then return up to guide pin, *c* and *b*, and up to commencement, *a*. Having thus wound two or more bars (all being wound in the same direction), they are bound together, as shown in Fig. 4, and connection is made between the coils at *d*. It is not proposed to obtain any valuable result from magnetic induction by this method of constructing electro-magnets, but an increased dynamical value is claimed from the action of the currents on each other. It is well known that electrical currents moving in opposite directions accelerate each other, and, although the currents are moving in the same direction around the axis of all the bars, yet, at the juncture, *c*, Figs. 4 and 5, of the combination, their course is directly opposite, as shown by the arrows, *f f*, in Fig. 5, which is an end view of Fig. 3.

CLAIM.—The compounding or binding together of bars, separately wound, and in the same direction.

Figs. 6 and 7 illustrate patent 103,229, being an improvement in magnetic engines. The invention relates to a peculiar and novel mechanical arrangement of a sector magnet for purposes of motive force, which has for its object economy of space, cost of construction, and rigidity of parts. The value of the magnet attraction being inversely as the square of the distance, it becomes necessary, in order to obtain the best results, to work the poles in as close juxtaposition as possible. To accomplish this requirement, even in very small engines, with the poles working with a between-space of $\frac{2}{100}$ths of an inch, without contact by spring of frame or other parts, requires a heavy cumbrous frame and shaft. To avoid this necessity, both the rotating and fulcrum magnets are so arranged that all strain of attraction will be resisted by the longest cross section of the magnets themselves, and thus just in the ratio that the magnets are enlarged the increased strength is met. Any required number may be taken, of magnet sector limbs, A, Figs. 6 and 7, and they should pass the driving shafts, *a*, Figs. 6 and 7, through their several tie bolt ends, *b*, with washers, *c*, between, to secure even spacing for the current wire. These sector limbs

Fig. 8 Fig. 9



are then so arranged on the shaft as to make the poles, *d*, describe a circle as regards their path of rotation, and a thread of one or more revolutions as regards the length of the shaft. They are then bound in their position by the nuts, *e*, and screw bolts, *f*, which pass through one series of limbs into the next, till the whole series is securely held in its required position. It will be seen that this combination presents the longitudinal section of the sector limbs to the strain. The fulcrum magnets, B, are bound on one common bolt, C, Figs. 6 and 7, in the same manner that the rotating magnets, A are held, and their poles, *h*, are bound by the rods, *i*, passing through the whole series, which makes one uniform breast of sector limbs, the axis of all lying in one common plane. As in the rotating magnets, so in these, all the strain is met and resisted by the longitudinal section of the limbs, and this extreme stiffness of construction allows the two series of magnets to be brought in close and accurate range of motion by means of the adjusting screws, *m*. The magnets, A, revolving in the direction of the arrow, will subject the fulcrum magnets, B, to a downward strain, which is met by the bridge, D, resting firmly on the bed plate, E.

CLAIM.—First. The arrangement of the magnets on the shaft. Second. The breast of fulcrum magnets in their combination with the rotating magnets, A.

Figs. 8 and 9 illustrate patent No. 103,768, being an improvement in sector electro-magnets. This improvement relates to shaping the limbs of sector magnets in such wise that they will describe radial lines, and thus form a compact mass, when brought together around a common axis. The limbs, A A, Fig. 8, are made separate, and their outer lines, *a a*, taper from the poles, *b b*, toward their junction, D, at angles that will meet at the center of the shaft, which forms the center of motion around which they rotate. The junction of the limbs is shouldered, *d*, so as to secure a space between them for the current coils, and screw bolts, *c c*, or rivets, bind the limbs together. Fig. 9 represents a wheel made up of these radial magnets.

CLAIM.—The construction of radial limbed magnets, substantially as described.

Figs. 10 and 11 illustrate patent No. 103,228, being an improvement in electro-magnetic engines. A sector magnet, A, Fig. 10, is suspended in a frame, B, the tie bolt, *a*, being seated in an adjustable box, *c*, which is operated by the milled head screw, C. D D are adjusting screws, which operate as lateral adjustments of the magnet, A. On the driving shaft, E, Figs. 10 and 11, a sector armature, F, whose links correspond in number and position with the links of the magnet, A, is keyed. The radius of this armature, if described from the center of the shaft, E, and the curve, *d d d*, Fig. 10, described in the poles, *e e e e*, Figs. 10 and 11, of the magnet, A, must coincide with the radius of the armature, the vertical and lateral adjusting screws, C and D, determining the proper distance between the poles of magnet and armature, which, to secure the best results, should be only sufficient to avoid the friction of actual contact. One end of the wire around the magnet, A, is secured to the frame at *f*, Figs. 10 and 11, and the other end to a pole binder, H, Fig. 11, which is electrically insulated from the frame. Another pole binder, I, Figs. 10 and 11, also electrically insulated from the frame, holds a spring arm, *h*, Fig. 10, which rests on a circuit breaker, *i*. The operation of this arrangement is such that, when the arm, *h*, rests on the non-conducting portion of the circuit breaker, no current can traverse the links of the magnet, but, when the conducting part, *m*, comes in contact with the arm, *h*, a circuit is made, and the armature made to rotate during the contact. Having thus described the mechanical details of the application of the sector magnet to the production of rotary motion, we will proceed to describe the mode of utilizing the reflex currents. Referring to Fig. 10, and considering the armature to be revolving in the direction of the arrow, and supposing that the circuit breaker is so adjusted, with reference to the arm, *h*, as to continue the action of the current till the axis of the magnet and armature are coincident, and then break, we should find that the reflex action of the current would resist any attempt of the armature to continue its onward motion, and this resistance is equivalent to seventy-five per cent of the battery current. But, if the adjustment of the circuit breaker be such that the current is broken previous to the coincidence of axis of the magnet and armature, then the reflex current, instead of retarding the motion of the armature, will expend itself in assisting its motion; therefore, in order to convert this reactionary property of the currents into a valuable element of force, the circuit breaker is adjusted under such conditions as will insure a break previous to the coincidence of the axis of the magnet and armature, as shown in Fig. 10, the dotted lines showing the position that the armature obtains through the action of the reflex currents, the break having been made when the armature was in the position shown by the full lines.

CLAIM.—First. The combination of the sector magnet, A, and sector limbed armature, F, with their adjustments or without. Second. The breaking of the circuit previous to the coincidence of the axis of magnet and armature, substantially in the manner specified.

Breweries and their Fittings.

A paper "On the Machinery and Utensils of a Brewery," was read before the Society of Engineers, in the hall of the Westminster Palace Hotel, London, by Mr. Thomas Wilkins, C.E.

The size of a brewery is stated in the number of quarters of malt that can be used in one brewing; thus, a brewery having a mash tun in which twenty combs of malt can be mashed at a brewing, would be a "ten quarter brewery," and so on, the rest of the plant being made in proportion.

Until steam came into general use as a motive power, all the labor was done by hand or horse power; sometimes a water wheel was used; but it is believed that on no occasion has wind power been applied. Of late years, steam has not only been used in breweries as a motive power, but also as a means of transmitting heat; so that the brewer having a boiler to supply steam to the engines, uses it also to supply steam for boiling both liquor and wort, either by forming the boiling coppers with an outer pan or jacket of iron, and passing steam through the space between that and the inner pan of the copper, or by passing the steam through coils of copper pipe fixed at the bottoms of vessels made of wood, iron, or copper, whichever of these be preferred.

In building a brewery every advantage should be taken of any favorable natural features of the locality, such as a hill side, where the building may be arranged so that the utensils can be placed in a position one above another in level, taking advantage of the natural slope to save labor, which might otherwise have to be expended in pumping the worts or beer about. A good supply of suitable water, or "liquor," as it is called in breweries, is also indispensable. That there is this should always be ascertained before either building a new brewery or extending an old one.

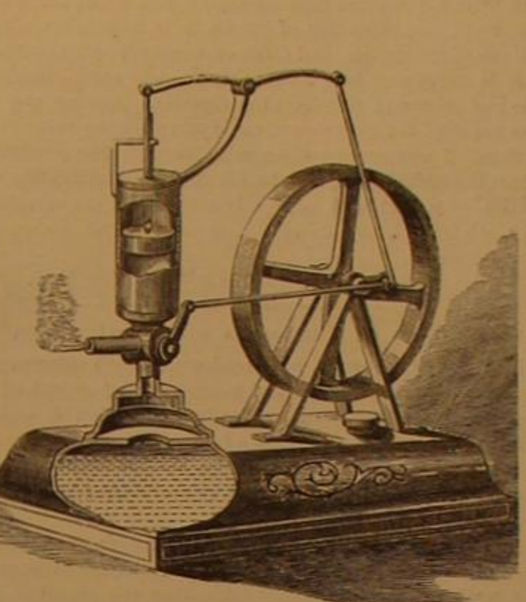
The mash tun should be made either of good yellow deals or of oak, and should have a false bottom, generally of iron, made of several plates, so as easily to be removed for cleansing the tun. These plates are very closely perforated with holes about one twelfth of an inch in diameter; sometimes, however, with slots that width, but about two inches to three inches long, cast in them. These slots and also the small holes are about three eighths of an inch on the bottom side of the plate, being made so much taper to prevent their blocking. The plates with slots are more expensive than the others, but some brewers prefer them. The mash tun should contain from eighteen to nineteen cubic feet for every quarter of malt. Formerly, when the crushed malt had been placed in the tun, the nearly boiling hot liquor was run in, and the whole was thoroughly mixed together by men with poles, each having several cross pieces, about the size of the staves of a ladder, in one end. This operation is termed mashing, and these oars are still used by some brewers, more especially where a "Steele's" or a similar machine is used.

A better and more certain method of mashing was required; for it was found that in some parts of the mash tun a sort of cake or dumpling would be formed, the outside of which, consisting of a pasty mass of flour, prevented the liquor reaching the inside, to extract the valuable ingredient of the malt. The machine which for many years has been fitted to mash tuns, to perform this operation, is made as follows: A circular crank, with radial teeth, is bolted to the sides of the mash tun; a vertical shaft is erected in bearings in the center of the tun. This shaft is either carried some few feet above the top of the tun, or else passes through a stuffing box in the bottom, and is worked by bevel wheels from a horizontal shaft. The vertical shaft supports loosely a bearing which carries one end of a second horizontal shaft, which is inside the tun, at about half its depth. The other end of this shaft has a pinion keyed upon it. This pinion gears with it, and is supported by the circular rack before mentioned. A revolving motion is given to this horizontal shaft by bevel wheels from the vertical one, and upon it is hung a sort of rake, which, as the shaft revolves, thoroughly mixes up the mash. Sometimes there are two, and even three of these rake shafts. It will be obvious that, as these shafts revolve, the pinion gearing into the fixed rack causes the whole to revolve somewhat slowly round the tun.

In large breweries, where there are sometimes a dozen or more mash tuns, rather than have a large engine, it is better to have a small one to pump all the liquor, and another to grind the malt; and these may be kept at work all day, preparing for the morrow. Indeed, a vast amount of money in first cost, and in labor afterwards, may be saved by properly planning and arranging everything beforehand.

TOY STEAM ENGINE.

This is a very simple and pretty toy engine, consisting of very few parts. It is the invention of Philander Macy, of Rochester, N. Y. It is a beam engine with oscillating valve



gear, and the pedestal upon which it stands is the boiler. By filling the boiler and setting it upon a stove, the engine will work as long as the water supply lasts.

Cracked Sovereigns.

It has probably fallen to the lot of many readers to have come into possession occasionally of gold or silver coins which were hollow, or cracked on their edges, and therefore not sonorous when tested by the well known "ringing" process. Speculations as to the source of the imperfection are numerous, and various theories have been advanced and discussed in regard to it.

Perhaps one of the most extensively prevailing notions as to the origin of cracked sovereigns and cracked coins of other denominations, is, that all pieces of money fabricated at the British mint are, in the first place, made in halves, the heads and the tails being afterwards paired and united by cementing, soldering, hydraulic pressure, or some other means. This operation being in some cases imperfectly performed (as it is argued), a partial or complete divorce may afterwards take place, and hence the phenomena of cracked moneys.

Another supposition is, that the hollow coins have been tampered with by gamblers for their own nefarious purposes. Neither of these theories, however ingenious they may be, is the correct one. The evil really arises in the way we shall attempt to describe. All the legitimate metallic money of this country is made from bars of cast gold, silver, or bronze. At the Royal mint there are orthodox sizes for these bars, so as to produce each variety of coin in use outside its walls. Those for sovereigns are twenty-six inches long, one and a half inches wide, and one inch thick; and, for the purpose of facilitating explanation, let us confine our attention to gold only.

Such bars are cast in vertical molds of iron, which latter are fitted together in halves, so as to allow the giant nuggets to be realized easily from within them. On filling a mold from the crucible of molten metal held over its mouth, the resulting bar cools rapidly. Those parts of the bar which touch the sides of the mold cool first, and more gradually the center is reduced in temperature. As the sides of the bar harden at once, they cling, as it were, to the walls of the mold, whilst the metal in the middle contracts in cooling, and subsides down the mold. The upper end of a bar of gold resembles much at this juncture the mercurial column in a barometer when the "glass" is said to be "falling." It is hollow or depressed in the middle, and sometimes very much so, the depression occasionally extending to one inch.

The lower end of the bar is perfectly squared, because the base of the mold is square. When removed from its iron case, the bar is carried to the rolling mill for lamination. It is passed again and again between the rollers, until it is attenuated into a strap or ribbon; but that which was its upper end is still defective. The rollers have simply compressed the precious metal, and therefore left the hollow end a mere crevice or thin line in the middle of the strap. This end is considered as scrap, and, first cut off by a pair of shears, it is returned to the melting pot. It happens, sometimes, nevertheless, that a sufficient portion of imperfect ribbon is not cut away, the crack thus extending beyond the amputating point. When this occurs, it creates the evil of "cracked sovereigns." The ribbon is removed to the punching press, and perforated from end to end by a punch of the exact size of a sovereign. Some of the disks of metal thus produced *may* be cut from the bad end of the strip of gold. To detect these criminals, if they exist, a small staff of boys is employed. They are each armed with a bright-faced anvil block of cast iron, and they ring every individual disk in very rapid succession on the anvil. The sound and perfect pieces give forth harmonious music, whilst the others are dumb dogs, and have no music in their souls. The defaulters are, or should be, all picked out, and condemned to the "fiery furnace" once more. Boys are not infallible, and they have permitted "dummies" to escape now and then. These pass forward to be stamped at the presses, milled on their edges, and issued to the public, by whom they are criticised, and justly condemned. The hollowness of their characters is only detected, it may be, after some contact and friction with their neighbors, just as speciousness in the human character is only found out by the application of the tests of adversity and trouble. With the care at present exercised at the mint, hollow coins cannot escape detection.

Correspondence.

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

Utilizing Coal Dust for Fuel.

MESSRS. EDITORS:—Bringing into practical use the coal dust or slack coal, is today the great question; and as you have given space in your columns to a great many communications on the subject, will you do me the favor to insert this letter on the manufacture of artificial fuel or compressed coal dust?

It is a well known fact that coal, either bituminous or anthracite, produces in mining, breaking, screening and handling, an amount of dust, commonly known as slack coal, amounting, on an average, to 50 per cent of the coal production, thus causing a considerable loss to the parties engaged in mining, as but a small portion of this dust coal, and that only of the bituminous coal, is needed for blacksmith purposes, while the anthracite slack is entirely useless. The immense quantity of refuse coal must necessarily be got out of the way, whether dumped into a stream, to be carried off, or heaped on ground which has to be dearly paid for.

In the anthracite coal regions, this immense amount of waste is constantly being piled up around the mines in vast, unsightly mounds, burying the mining villages, and sadly encroaching on the limits of many of the chief towns. The amount of this waste cannot be less than fifteen millions of tuns, and every year adds to the rapidly increasing dirt bank.

In France, in Germany, in Belgium, and in England, the slack of the bituminous coal has been converted into lumps or cakes of different sizes and shapes by mixing it with coal tar. Monsieur Debaynin, from Paris, started the first manufacture of artificial fuel or agglomerated slack, at Montigny-sur-Sambre (Belgium) about eleven years ago. He possesses today two manufacturies in Belgium and two in France. He manufactured in 1870 over 1,200,000 of tuns; railroad companies used 931,600 tuns, the navy used 250,000 tuns, and other industries used 70,000 tuns.

Among the railroad companies, that of the Paris, Lyons, and Mediterranean consumes pressed coal exclusively, requiring 1,200 tuns per day. The Northern Railroad Company, of France, between Paris, Amiens, Dunkerque, and Calais, does not use pressed coal exclusively, although its daily consumption amounts to 300 tuns. The scarcity of coal tar is the only thing which prevents M. Debaynin from erecting other factories and increasing the manufacture of his compressed coal.

It will be observed that the railroad companies and the navy are using almost exclusively compressed coal, while private manufacturers do not seem to like it. The reason is that the burning of that coal produces such a smoke and such a bad smell that it is entirely unfit for domestic use, and cannot even be used in stationary engines, people in the neighborhood complaining of the nuisance. It was only permitted to be used in some sugar refineries and distilleries, situated at a reasonable distance from cities; and even then the law compelled the proprietors of those manufactures to raise their stacks to a specified hight.

So important has this subject of converting coal dust into lump coal been regarded, that the United States Commissioners, to the Paris exposition of 1867, have made a report on pressed or agglomerated coal, which presents the subject and its importance in an able and instructive manner.

That report sets down among the advantages attending the use of pressed coal, the following:

"Its purity and compactness adapts it to the rapid production of steam in furnaces and small fire grates, and it is, therefore, a desirable fuel for steamers and locomotives, for which it is largely used in Europe.

"Being manufactured in prismatic form, it can be very compactly stored on shipboard or elsewhere.

"It can readily be transported to great distances with very little waste, amounting, it is stated, to less than one tenth the waste of ordinary coal, handled under similar circumstances.

"It is not injured by frost, by snow, or by rain. Bricks of pressed coal produce as much steam in locomotives as an equal weight of coke. It is much liked by firemen, especially for raising steam in ascending heavy grades.

"Soft bituminous coal, or the mixture in which it predominates, is generally used in the manufacture of pressed coal."

I will especially call your attention to this last paragraph of the Commissioner's report.

In France and Belgium, the soft bituminous coal contains from 60 to 70 per cent carbon, and costs twice as much as the hard coal, which contains only from 30 to 40 per cent carbon, the balance being slate, schist, and other substances. The compressed or agglomerated coal, made from the bituminous slack, is sold as high, and sometimes higher than the bituminous lump coal itself. In this country, on the contrary, the bituminous coal contains from 45 to 60 per cent carbon, and is sold at a cheap price, whereas the anthracite contains from 80 to 95 per cent carbon, and is sold twice as high as the bituminous coal. The bituminous slack has some value for blacksmiths, and is burnt in furnaces, while the anthracite slack has no value at all.

The difference in the value of the coals accounts for the fact that all the experiments, or, at least, most of them, made in this country, have been made on anthracite slack.

A great many attempts have been made to convert slack coal into a solid combustible. For this purpose, gum, coal tar, petroleum, asphaltum, rosin, solutions of glue, alkalies, silicates, magnesium, Grahamite, and the remains of fabricated oil have been used, and the processes patented. These various experiments of solidifying anthracite slack have been failures. The high price of the ingredients used increased the expense so that it could not be applied to bituminous slack, in order to compete with the lump coal. Applied to anthracite slack, there was another difficulty. It has always been easy enough to solidify the slack, but to keep it solid in the fire till the coal is entirely consumed is something which has not been achieved yet.

Some inventors are still trying to solidify anthracite slack by means of coal tar, pine pitch, or rosin, giving the lump a heavy pressure, by using powerful machinery. In their opinion, the more compact the lump, the better it will stand the fire. In my opinion, no matter the pressure given to the lump, fire will penetrate it and consume the resinous substance, before half the heating power of the coal has been obtained. The pitch or rosin being consumed, the lump will slack in the fire, and pass through the grates.

I have been for five years, from 1857 to 1862, commercial agent of one of the most important coal mines in Belgium, and have sold to Mr. Dehaynin tho first two shiploads of slack coal for his factory at Montigny-sur-Sambre. I have seen him trying for three years to compress slack of hard coal with pitch and other substances, so that it would stand the fire, without succeeding.

In Belgium principally, and also in Germany and in France, the working population in the coal regions, and the country people, are burning any kind of slack coal by mixing it with from 30 to 40 per cent of yellow clay. It will be easily understood that such a large proportion of clay must reduce considerably the burning qualities of the coal. Still, after a fire has been started with ordinary bituminous lump coal, they pile upon it, as high as they can, a pyramid of coal dust and clay, mixed together, and simply molded and pressed by hand. The coal is used exclusively for open grates. They obtain, at least, a good fire, sometimes lasting a whole day without replenishing. The coal made in that way has to be sheltered, as rain and snow dissolves it.

This being a fact well known by everybody who has traveled in these countries, I have been working and experimenting for three years on that principle, always trying to increase the proportion of coal, and consequently reducing the proportion of clay. I succeeded so far, by a peculiar way of mixing and of working the mixture, as to reduce the proportion of clay to 8 per cent for bituminous slack. I invented a composition in which the coal is dipped, so that it becomes waterproof, and does not need to be sheltered. I have been manufacturing and selling that coal made from Sewanee slack coal, for the last four months, in Nashville (Tenn). The cost of manufacturing, including the ingredients used, has not exceeded one dollar per tun.

As I had never tried my process on the anthracite slack, I came to Philadelphia expressly for that purpose. The slack of the anthracite not being so coarse as the bituminous slack, I have been able to make the lumps compact with only 5 per cent of clay. Samples of all shapes have been submitted to the Franklin Institute, who will report on it at the next meeting. These samples have been made from Lehigh coal slack, by myself, at the Delaware Chemical Works, or at those of Messrs. Baugh & Sons, of this city, who have had the kindness to give me all the facilities for my experiments.

I am going to manufacture some tuns of it, so as to be able to test publicly the burning qualities of this fuel, and will send you the results of the experiments.

Philadelphia, Pa. EMILE F. LOISEAU.

The Earth Closet System.

MESSRS. EDITORS:—On page 326, current volume of your valuable paper, I was pleased to see an article on the earth closet system, accompanied by an engraving of a new English invention in this line. Too much cannot be said or written on this important matter, and you will therefore, I trust, pardon me for relating some of my experience, for the benefit of your readers.

I have tried a good many experiments with dry earth, and have used the earth closets at my country place, and am convinced that nothing but ignorance stands in the way of the universal adoption of the system, both for the city and country. It is always with regret that I return to the wasteful and unhealthy water closet of the city, after having been spared all of its bad odors and dangerous gases during the summer months, by the employment of the simplest of all disinfectants, dry earth.

The open vaults of the country are the worst contrivances, for the dissemination of malaria and fevers, that could be invented. The saying that "there is health in the old house and death in the new," is founded upon the effects of those vaults in a thickly settled country, to poison the waters by percolation and the air by the escape of bad gases. When the homestead was built on the side of a hill, the drainage water ran away, and did little damage, but when the shoots from the parent stock planted their houses on the plain, they caught the foul waters and the fever at the same time, and hence the origin of the saying.

The simplicity of the dry earth disinfectant prevents many persons from trying it; they are as wrath as was Naaman when commanded by the messenger of Elisha to wash in Jordan seven times—they want some extravagant chemicals —nothing short of carbolic acid, permanganate of potash, protosulphate of iron, or chloride of lime, has the true scientific ring about it; as for dry earth, they do not believe in it. In the country, it is a few minutes work to sift enough earth to last a family, of five persons, a month, especially as the earth can be used over again five or six times.

The great point is to avoid sand, and to have perfectly dry earth. Hard coal cinders can be used, but not wood ashes.

After the small wagon under the seat is full, it can be emtied upon a protected floor for drying, and when the odor of the earth resembles that of guano, it is admirably adapted for use in the garden, and fresh earth may take its place.

It is surprising how thoroughly the dry earth absorbs all the bad gases and disinfects the deposits. And no one who has not tried the experiment can appreciate the value of the system. I advise every one who lives in the country to adopt the earth closet, and to abandon the unhealthy open vaults, which are such unsightly objects and the occasion of so much irregularity of habit, and the fruitful source of so many diseases.

CHARLES A. JOY, Columbia College, New York city.

Examination of Engineers and Boiler Tenders.

MESSRS. EDITORS:—I have read with much interest your complimentary article, on the second annual report of this department, in the number bearing date May 6, and the reference to it in the number of May 13, in which the idea is conveyed that more light on the subject of the examination of persons having charge of steam boilers, would be acceptable.

In answer to your words: "I am not aware what the standard of classification adopted in Philadelphia is; it is probably none too rigid," I would state that the standard for a first-class engineer is, that he should be able to calculate safety valve lever examples, and thoroughly understand the principles involved; also to calculate the pressure required to burst a boiler, when all the dimensions are given, together with the value of the material to be used to the inch of section. He is also required to calculate the difference between the strains on the curvilinear and longitudinal rivets; the difference in value between double and single rivets; and the comparative strength between the shell, flues, and other parts of a boiler. His knowledge of the importance of keeping the water at all times above the fire line; of keeping the safety valve in good order, together with daily examination, and the necessity of keeping the boiler clean inside and out, is also tested. He is also questioned as to the proper mode of blowing off a boiler. Should he answer all of these questions satisfactorily, and still entertain the idea that a boiler will not explode so long as the water is at its proper level, he would not be entitled to a first class certificate.

Then with reference to the engine, he must know how to set the steam valve, aud be able to explain the effect and advantage of lap, lead, and cushion. He must also be reasonably well posted on the various parts of a stationary engine.

I should be pleased to know your opinion of the Philadelphia standard for a first class certificate, and if you consider it too rigid.

You say the safe boilers are those known as "sectional." This is a fact beyond controversy, but I cannot resist the temptation to call your attention to another fact with reference to the boilers under the charge of this department. This is the third year of its existence, and it has inspected as large a number as 2,000 in a year, of which only one, and that a sectional Harrison boiler, has so far scratched a single individual. Some of these boilers are eighty inches in diameter, and of all sizes and forms.

Five men have been scalded by insured boilers during our existence. These are exempt from city inspection at the option or the owner or user. We have one boiler insurance company in operation and another in prospect.

T. J. LOVEGROVE,
Inspector of Steam Engines and Boilers.
Philadelphia, Pa.

[We do not think the system of examination described by our correspondent any too rigid. It is perhaps sufficiently so, however, when coupled with proper inspection of boilers. —EDS.

Invention Wanted.

The following letter from a Texas deer hunter has been forwarded to us by Messrs. E. & H. T. Anthony & Co., of this city, dealers in photographic materials, etc., who think such a lamp as is sou ht for, would meet with good sale:

Gentlemen: Those in this country who follow hunting feel the need of a perfect head lantern to hunt deer with at night. Seeing the kind of business you are in from your advertisement in the papers, I thought you might be able to invent a lamp or lantern for night hunting, that would be a success. We want such an one as will reflect the light in front of the one who wears it to the distance of 100 yards or more. A strong reflector is needed; it must be made light, so that it can be worn on the head without much inconvenience. It should reflect the light in front only. We have a lamp made here, of tin, to burn lard oil, but it is not a complete success, though we kill a great many deer with it, by first shining in their eyes and then shooting them.

Such a lamp as described above, and patented, would be a source of revenue to the getter up of it. It should be constructed to burn lard oil, as this oil does not produce much heat or deposit much soot. J. B. STEMSON, M. D.

Sherman, Texas.

Wyoming Coal.

MESSRS. EDITORS:—In a recent issue, I notice an account of Wyoming coals, which was really news to people here; and whoever wrote it must have obtained his knowledge from some very unreliable source.

In the first place, they are not using Carbon, or any other Wyoming coal, at the gas works in Omaha, for the very reason that it is not at all suitable for gas making, and it is not probable that it is used at Denver. Rock Spring and Evanston coals, which are by far the richest in gas, only give about 7,000 feet to the nett tun, and the quality of it for light is about equal to an alcohol flame, which it greatly resembles. Wyoming coal will not coke, but turns in the retorts to what is known as breeze. An approximate analysis is, carbon, 76·95; volatile matter, 15·00; ash, 8·00; sulphur, 0·05. Of the volatile portion, about one half is water.

Pittsburgh coal is used in the gas works here. The Wyoming is not a bituminous coal, but more properly a black lignite; nor is it the opinion of competent geologists that bituminous coal will ever be found in the Rocky Mountains. It is reported, however, that 120 miles south of Salt Lake City, there exists a bed of true bituminous coal. For smelting furnaces and blacksmithing, it is nearly as good as nothing. It is splendid for heating the chimney above the forge fire, but the helpers might as well go to sleep, for they would not be needed to strike for hours; and I doubt if a welding heat can be obtained easily in an ordinary forge fire, on an iron of any considerable size. They are not using it at the Union Pacific Railroad shops, for smithing or smelting. They have carefully tried it, and condemned it. For domestic, and also for steaming purposes, it is certainly very fine; but it is all nonsense to talk of its giving more heat than Lehigh. It makes but very little clinker, and can be burned so that there is little waste. It is hoped for and believed that some mode may be discovered by which it can be used in the manufacture of iron; but it is not so used now, to the knowledge of the leading mechanics of the city, with whom I have conversed, or from whom I have heard.

Let me say that Western people would rather have the truth known in regard to their country; and before that Philadelphia paper again comments, it would be well to ascertain the facts. T. L. VONDORN.

Omaha, Nebraska.

Diamond Drills.—Another Richmond in the Field.

MESSRS. EDITORS:—We inclose a slip from your issue of 6th inst., under heading "Removal of the Hell Gate Obstructions," the last paragraph of which contains a misstatement to which we beg leave to call your attention. The paragraph reads: "These diamond drills are being used very extensively in the marble and slate quarries of Vermont, and Severance & Holt are extensively engaged in making them. In addition to drilling single holes in the rock, they are used for channeling purposes, a number of drills being used intersecting the holes, so that a complete cutting is made."

It is a fact that such machines as are above described are in general use in the marble quarries of Vermont. It is *not* the fact that Severance & Holt made or are making such machines, all, without exception, now in operation having been manufactured by the Sullivan Machine Company. Messrs. Severance & Holt employ the core drill of Rudolph Leschot. The drill employed in our quarrying machines is the solid head diamond drill. Yours, etc.,

Sullivan Machine Co., R. W. LOVE, Treasurer.
Claremont, N. H.

Metal Founders' Blacking.

To provide metal founders with a blacking possessing good slecking and heat resisting properties, and to enable them to produce castings with smooth skins of desired hues, the inventor mixes sea weed, sea grass, or sea plants, in any convenient or desired proportion, with still coke, peat charcoal, soft wood charcoal, gas coke, coked coal, oil retort coke, coal dust, soot, hard wood charcoal, or other suitable coke or charcoal, or with lime, chalk, or clay, or with a mixture of two or more of these substances. The seaweed may be added in the newly cut, partially dried, dried, or dried and pulverised state to the coke, coarcoal, lime, chalk, cr clay, the latter being either in a rough or ground condition. The addition of seaweed to coke, charcoal, lime, chalk, and clay in every proportion, so long as the moisture is insufficient to cause the mixed mass to form a paste in the process of reducing or grinding or to cause the particles of the blacking when furnished to adhere and form lumps, is beneficial either, first, for improving the quality, or, second, for reducing the cost.

This is an English invention recently patented by J. C. Sellars, Birkenhead.

SILVER SOAP FOR CLEANING SILVER AND BRITANNIA.—One half pound of soap, three tablespoonsful of spirits of turpentine, and half a tumbler of water. Let it boil ten minutes; add six tablespoonsful of spirits of hartshorn. Make suds of this and wash with it.

ON SOUND.

BY PROFESSOR TYNDALL.

Last week, Professor Tyndall delivered the first of a series of lectures on sound to a large auditory at the Royal Institution.

Dr. Tyndall began by saying that sound makes itself known to human consciousness by means of objective and subjective phenomena. The objective phenomena exist entirely outside of ourselves, and are altogether independent of us; so sound, objectively considered, is not sensation at all; it is but a kind of motion given to the air. That motion reaches the brain by some process not yet unveiled, and perhaps it will never be given to man to unveil how the motion produces sensation. A very little observation will show that sound consists of some kind of mechanical motion. For instance when a gun is fired, say at Shoeburyness, the observers near the gun feel a shock which disturbs them from head to foot, and sometimes the shock is so great that it will flutter an umbrella. Everybody also knows that glass windows may be broken by loud noises. Sound also is evidently a kind of wave motion, and not something projected from the sounding body; for instance when a gun is fired, and a person is placed near it so as to be perfectly protected from all projected portions should it burst, he still hears the noise.

All the foregoing facts about sound might be learnt in very early times, but before the knowledge of the nature of sound could progress to any great extent, it was necessary that other sciences should grow and give their aid. The air pump and other things had to be invented before the philosophical mind could trace its way from facts to causes. By means of the air pump it can be proved that it is the air which conveys waves of sound. The speaker then set a small bell, driven by clock work, in motion in a very perfect vacuum under the receiver of an air pump, but not a sound was heard. The objection might be made, he said, that the glass sides of the receiver cut off the sound, but he would prove this not to be the case by letting the air in gradually. He did so and as the air entered, the tinkling of the bell made itself perceptible, grew louder, and finally was clearly heard all over the theatre of the Royal Institution.

The foregoing experiment, said Dr. Tyndall, might lead to the impression that the loudness of the sound depends upon the destiny of the atmosphere. He then proved this to be not necessarily the case by a very remarkable experiment. He admitted air into the exhausted receiver, till a pressure of only 2 in. of mercury was exerted inside, and in this partial vacuum he set the bell to work. A faint tinkle could be heard. He then let hydrogen gas into the receiver, so as to greatly increase the pressure and density of the atmosphere inside, yet instead of the sound growing louder, it gradually became fainter. Thus increasing the density of the atmosphere diminished the sound. He then explained that air has to be struck violently and sharply to produce a sound. Waving the hand in the air, for instance, does not set up sound waves, because the disturbed air has time to flow round to the other side of the hand, instead of being set in that kind of wave motion which produces sound. Hydrogen gas, he believed to have the power of flowing round a vibrating tongue more rapidly than air, so that it is less easily beaten into sound waves; and this surmise, which was first mooted by Professor Stokes, he believed explained the true philosophy of the experiment he had just shown.

In some other experiments he took some long polished wooden rods, and rubbed them with resined flannel, whereby each rod in turn was made to give a musical note. In this way he proved that deal conveyed sound more rapidly than oak, although oak is the denser wood of the two, so it is an error to ascribe this power to density.

Professor Tyndall then called attention to the top of a thin wooden rod projecting 2ft. into the air through the floor of the theatre. He said that the rod went down through two floors of the building, and rested at its lower end upon a musical box. That box was then playing, and throwing the rod into musical vibratory motion, which music, however, could not be heard in the theatre because the top of the rod presented too small a surface to the air to set up good loud sound waves. He then placed a guitar, on the top of the rod to act as a sounding board, and instantly the playing of the musical box could be heard distinctly by everybody. A piece of board instead of the guitar, answered the same purpose when it was placed on the top of the rod. Next, one of his assistants played a fiddle, which was placed in contact with the lower end of the rod, and every time the lecturer placed a board on the top of the rod the music could be heard.

The lecturer next explained that sound travels more rapidly through warm than through cold air, and whenever the elasticity of the air is augmented, the velocity of sound is augmented likewise. A the temperature of 0° C. the velocity of sound is 1,090ft. per second, and it augments about 2ft. for every degree C. added to the pressure. The velocity of sound in air depends upon elasticity of the air in proportion to its density; the greater the elasticity the swifter is the propagation, the greater the density the slower is the propagation. The velocity is directly proportional to the square root of the elasticity, it is inversely proportional to the square root of the density; hence, where elasticity and density vary in the same proportion, the one will neutralise the other as regards the velocity of sound. But that this law shall hold good, it is necessary that the dense air and the rare air shall have the same temperature. From the foregoing it follows that given the velocity of sound in air, the temperature of the air may be readily calculated. If the molecules of air be supposed to be balls held together by springs, then heating the air is tantamount to increasing the rigidity of the springs. The very motion of waves of sound through air raises the temperature of the air; thus a sound wave raises in its own path things which augment its rate of propagation.

The distance of a fired cannon or of a discharge of lightning may be determined by observing the interval which elapses between the flash and the sound. Hence, it is easy to see that if a row of soldiers form a circle, and discharge their pieces all at the same time, the sound will be heard as a single discharge by a person occupying the centre of the circle. But if the men form a straight row, the simultaneous discharge of men's pieces will be a continuous kind of roar. A discharge of lightning along a lengthy cloud may in this way produce a long roll of thunder; the roll of thunder must, however, be in part, at least, due to echoes from the clouds.

The following was the most beautiful of the experiments exhibited in the course of the lecture. A thin thread of light from the electric lamp was thrown upon a small mirror, about the size of a sixpence, mounted on the top of one of the legs of a large tuning fork. This mirror reflected the line of light back, behind the lamp, upon a looking glass which Professor Tyndall held in his hand; this large mirror reflected the light as a bright spot upon a large white screen facing the observers. The vibrating fork gave a slight up-and-down motion to the line of light, and the lecturer by by moving the large mirror on its vertical axis, gave a horizontal motion to the light. The result of these was that a series of very beautiful waves of light was seen upon the screen, and thus gave optical expression to the sound of the fork.

PAPIER MACHE AND CARTON PIERRE.

The use of paper for various constructional purposes has occupied the attention of the *savans*, in many forms. We have seen boots, shoes, panelling for coaches and other purposes, coffins, and even guns, made of this material; but with these exceptional and speculative adaptations of the material we have not now to deal, the subject of the present notice being simply the use of paper in its various forms for architectural decorative purposes. It probably does not strike the unpractical or unprofessional mind, when assisting at the opening of some new theater, and admiring the decorations of the house, and the enrichments of the front of the stalls, the proscenium and the ceiling, that these are for the most part hollow, and made of that most homely of all materials, brown paper. Such, however, is, in the great majority of cases, the simple fact; and we propose to give a short account of the manipulation of the material, and the method of its adaptation.

The sweepings and waste of the factories are the materials used, moistened with water with a little glue, and pressed in a brass mold—this is *papier maché* (pressed paper); while the cuttings of cardboard stewed to a pulp and ground to an even consistency by steam rollers and cast in a plaster mold, are the constituents of *carton pierre* (stone made of card); and we quote Her Majesty's Theatre, the Gaiety, most of the new theatres in the provinces, and private mansions in numbers throughout both town and country, as instances of its use. The brown paper for the *papier maché* is softened in water sufficiently to allow it to be forced into the sharpest angles of a brass mold previously coated with a light skin of paper pulp which has been cast for the purpose, and has the inside carefully chased. The sharpest curves and angles of delicate foliage are thus reproduced; and for all the lighter portions of the work, enriched moldings, beads, and foliage, this is the material adopted, light strips of wood glued to the back keeping the work in its place, and being available for its fixing, which is simply a matter of nails and screws. For the heavier portions of work, such as sofa or table legs, large coffers for ceilings, trusses, figures, and the more solid features, *carton pierre* is used. A mold is prepared in plaster, which takes to pieces in the ordinary way. This is, in the majority of cases, not filled up solid, but only carefully lined by hand pressure with a thickness varying from one fourth inch to one half inch, or perhaps a little more, with the *carton pierre* in a state of pulp. It is allowed to dry for a certain time; and when sufficiently consolidated for the mold to be removed, it is heated in a drying room until hard, and the process is then complete. A similar process of drying is applied to the *papier maché*; in fact, they are dried in the same room. As compared with ordinary plaster, upon the question of cost, plane surfaces, or work involving a large amount of repetition, can be more cheaply executed in plaster; while the most elaborate and expensive enrichments can be executed to better advantage in *papier maché* which has the great advantage of being much more manageable in fixing. It can be prepared to any pattern, and put together in the workshop; and its fixing is either by glue, nails, or screws. The mess invariably attending the working of plaster is also avoided—a most important element in buildings finished, as is now so much the fashion, with the wood stained in its native color, and not painted; and the use of water is avoided—a great advantage in new buildings, where it is of importance that the seasoned joiner's work should be kept as dry as possible.

Before dismissing the subject, we may just allude to a material which, though neither *papier maché* nor *carton pierre* is used for some of the same purposes. This is Desachy's patent fibrous plaster. There is nothing new in the materials employed; it is a combination of ordinary fine or common plaster, and canvas. The plaster is cast very thin, less than one-fourth inch, in a mould, and then upon the back of it is laid the canvas, which becomes incorporated as it sets; the shape is supported by light strips of wood, laid on at the same time; and for the plain moldings and large panelling, this system gives all the usual effect, combined with extreme lightness and facility for fixing. As an instance, we saw a large circular molding, more than seven feet in diameter, for surrounding a light, made in one piece, ready for fixing, no portion of the face of which was more than a quarter of an inch in thickness. We may mention the ceiling of the library of the new Record Office as an instance of its use, the apparently massive Gothic ribs, forming the groins between the skylight, being of this material, screwed to wrought iron girders inside, which really do the work. The method combines great lightness with absolute security from fire; and its cost is not such as to preclude its being adopted in any case where it is desirable to attain a similar result. In addition to the advantages alluded to above, as gained by the introduction of these various materials, the demand for which is increasing, we may notice the question of rapidity of completion as most important. Time, especially in connection with theatrical matters, is of the first importance; the delay of a few months in the completion of a building makes a difference of a whole season; and it would have been impossible to complete any of the theatre recently opened within some months of the time actually occupied, had it not been for the facility afforded for their decoration by the use of *carton pierre* and *papier maché*.—*London Architect.*

Profits on Patent Sewing Machines.

The organization of a large sewing machine company—capital, five hundred thousand dollars—is being agitated at Chicago, for the manufacture of the Secor machine. The following statements in regard to the past and present progress of the sewing machine business are furnished by the projectors of the new enterprise:

Up to 1860 there had been manufactured and sold in the United States only about 104,000 machines of all kinds. In that year, the total number made was less than 55,000 machines, of which Wheeler & Wilson made 21,000; Grover & Baker, 10,000; Singer & Co, 11,000; Willcox & Gibbs, 7,500; all others, about 5,000.

The business was then in its infancy, still $5,000,000 were invested in the manufacture; and these leading manufacturers have, since that date, so increased their great establishments that in the year 1870 there were turned out more than 500,000 machines, a half million in a single year, and yet the demand could not be supplied. It is stated as a fact, that orders came in upon these factories much faster than, even with all their facilities, they can turn out the machines.

In 1870 Singer & Co., made and sold the enormous aggregate of 140,000 sewing machines, and the others kept up their proper proportion.

These companies have their own factories and their own own machinery, and do all of their own manufacturing, and the cost at which a complete machine can be put upon the market, in working order, ready for sale, would be surprising to the uninitiated. But if Singer & Co. only realized $10 profit upon each machine, (which is less than half the real profit on the cost) then the dividends in 1870 must have been 1,400,000, or ten per cent on a capital of $14,000,000, all of which has been accumulated within ten years. At the same rate, the profits on all the machines sold reached the great sum of $5,000,000. But it is probable that the sum of $10 does not amount to more than a third of the profit on a single machine.

These machines have not only become a necessity in every family, but they are largely used in all the factories of boots and shoes, clothing, hats and caps, etc., so that the merely domestic demand does not amount to one fourth part of the entire trade; some of the large factories of New York and New England have in constant use from 200 to 1000 machines each. In the State of Massachusetts, in the manufacture of boots and shoes alone, $15,000,000 are annually saved by the use of the sewing machine, and in New York city, the clothing manufacturers save yearly more than $12,000,000 in the same manner, and this applies with equal force to all of the various branches of trade where the use of the needle is required.

There is no limit to the demand for all first class machines, and it has been estimated that before the expiration of the next ten years, 1,000,000 sewing machines per annum will be required.

It is generally understood by the public, that sewing machine companies have made large fortunes; but we doubt if the facts are not sufficient to show that the dividends declared by the companies making the most popular machines, have been much larger than the most extravagant ones outside of the ring have supposed.

The old companies accumulated their vast capital of millions out of the profits of the business, and the principal companies have declared and paid dividends for years, of from 75 to 400 per cent upon their capital stock, besides accumulating a reserved fund of an equal or larger amount, for the extension of their works and the general business of stocking their branch offices throughout the country.

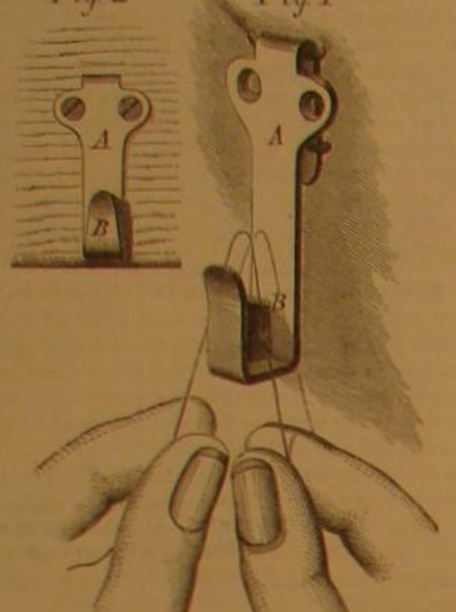
Of the value of the stock in the principal companies, we would illustrate by stating the fact, that the par stock in some of the best companies five years old cannot be bought for 2,500 per cent premium, and the value is entirely unknown to the outside public.

SEXES OF THE LOBSTER.—A correspondent of *Land and Water*, makes an announcement, which is endorsed by the editor of that paper, to the effect that the sexes of lobsters can be readily determined by the character of their claws, since, in nearly fourteen hundred specimens examined, it was ascertained that in the male, the blunt, tufted claw is always on the left side, and the sharpest serrate claw on the right, a condition of things exactly reversed in the female. This, however, has been subsequently denied, and the question, of determining the sex by means easily understood by the laity, yet remains open.

THREAD CUTTER.

Our engraving illustrates a very simple device intended to replace scissors in the cutting of thread while sewing, and for use on counters for cutting twine, etc., in the tying of packages. Fig. 1 shows it attached to a lady's dress, and Fig. 2 shows it attached to a counter. When fastened to the dress, it is secured by sewing, or by a hook formed for that purpose on the upper end. Screws are used to fasten it to the counter.

Fig 2 Fig 1



It consists of a metal hook, A, formed as shown, with a small blade, B, the vertical sides of which fit in recesses formed in the bent part of the hook, and are held there by the springing together of the opposite sides of the hook. By springing the hook open slightly, the blade is easily removed for sharpening. The upper and cutting edge of the blade is inclined backwards, as shown, so that the thread slides along over the edge of the cutter, and is thus more easily severed than if pulled straight down over the edge. The implement may be attached to the waist of the dress of the operator.

To avoid using the scissors, which necessitates the releasing of the work with one hand, ladies have very generally adopted the injurious process of biting off threads. This practice damages the teeth, and ought never to be employed. The device herewith presented will enable the thread to be severed without releasing the work, and thus obviate the bad habit alluded to.

Patented through the Scientific American Patent Agency, by J. J. Henry, assignor to Henry & Williams, corner Pearl and Baltimore streets, Baltimore, Md., whom address for further information.

APPARATUS FOR CARBURETING HYDROGEN GAS.

Jacob Ambuhl, of Morristown, N. J., has invented an apparatus for carbureting hydrogen gas. A tank in which the hydrogen gas is generated, of a capacity which depends upon the amount of gas to be supplied, or, in other words, to the number of burners to be supported, has a top plate or cover connected with the top of the tank by a rubber connection, so that the cover may yield to, or raised by, the pressure of the gas which is forced out by the weight of the cover.

From a hook attached to the cover is suspended a wooden basket to receive iron filings or turnings. The bottom of the basket is perforated to allow water or dilute sulphuric acid contained in the tank to have free access to the iron contained in the basket. Beneath the perforated bottom is placed a close bottom to receive any small pieces of iron that may drop through the holes in the upper bottom, in order to prevent pieces from dropping to the bottom of the tank.

The tank is filled and emptied through a stop cock as may be required, and is provided with a glass gage pipe, in which the water or acid stands at the same hight as in the tank, so that it may be conveniently seen when the tank has been sufficiently supplied.

The hydrogen gas passes from the generator to the carbureter through a pipe connected with the tank by a three-way cock; one of its openings being connected with the tank, the second with the pipe, and the third being left free; and so arranged as to point towards a stand attached to the cover and holding a platinum sponge.

When the tank has been charged, the cock is so adjusted that the air in the tank and the hydrogen gas, as generated, may escape through the open way or branch, and impinge upon the platinum sponge, which will become red hot when the air has all escaped from the tank and pure hydrogen is escaping. The cock is then adjusted to cause the hydrogen to pass through the pipe to the carbureter.

The body of the carbureter is formed of a series of ten, more or less, shallow rectangular pans, set parallel with each other, securely soldered together, and filled with granulated charcoal. The pans have openings formed through them, near the ends of their upper sides, and the first pan or compartment is connected by a short return pipe with the second pan or compartment. The first compartment is filled with granulated charcoal and soda, and with this compartment is connected the pipe leading to the generator. The carbureter is supplied with gasoline or other suitable light hydrocarbon oil, which passes through the middle part of the pans near one end, through a pipe perforated with numerous holes, opening into all the pans except the first one.

The hydrogen enters the first compartment, is purified by the soda, and passes thence into and circulates through all the compartments, where it becomes carbureted, and escapes from the last compartment into a pipe, through which it passes to the burners.

Any water that may form in the first compartment, or any surplus oil that may remain in the other pans or compartments may be drawn off through suitable cocks.

IMPROVEMENT IN STOCK CARS.

George Washington Fox, of Laramie Territory of Wyoming, has invented a new and useful improvement in stock cars, which will, we think, commend itself to stock shippers, and as a sanitary benefit to the public at large.

The invention provides for the better transporting of beef cattle, from the western prairies, mountains, and valleys, to the seaboard markets, without suffering, or having to unload or reload them, thereby delivering them to the markets in a sound, healthy condition.

The invention will be valuable, also, for shipping horses or mules. Water buckets or troughs are supplied by hose, connected with a tank, the hose connecting with pipes to receive and conduct the water through the car, and connecting with sections of pipe or hose to conduct the water to the troughs.

The timbers for the roof are framed together, so that the rafters and the cross pieces form openings for doors on the roof, one half of which are over a loft floor, and one half over a feed rack, giving space to reach the provender and fill the feed racks from the top of the car, over which openings are made through the floor of the provender space at the top of the car.

A pipe extends from the bottom of each trough or bucket, down through the floor, with a cock at the end to hold the water, or to draw off the surplus water in freezing weather. The water is forced to each trough or bucket at the same time, by the pressure of water in the tank with which the hose is to be connected at the stations.

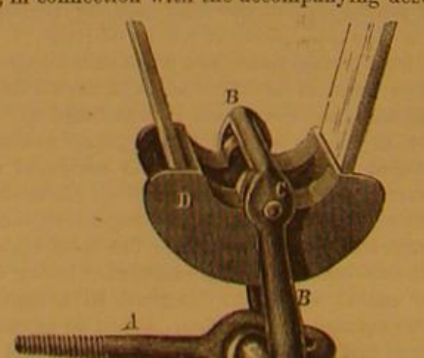
Wire nettings are employed to keep out sparks of fire, and flies during warm weather, while affording the required ventilation.

The partitions between the stalls are made of hard wood plank, the ends of which slide in the grooves of the posts. The partitions have a hand hole at either end, by which they can be removed without entering the car by using the pike hooks, one man being at each side of the car to place a pike hook in the hand hole, raise the partition to the top of post, and take it out of the groove at the niche for that purpose.

Gentle stock may be loaded in this car all at one door, by having the partitions down, and putting them up as the animals are led to their places; they may be unloaded in the same manner, by taking the partitions down as they are led out. In shipping valuable stock, every alternate partition may be taken out, thus giving them double stalls. Wild, ferocious stock can be put through the doors in their respective stalls, after which there is no need of entering the car to take care of them. In unloading ferocious animals, it is necessary to use the pike hooks and remove the partitions, held by the posts, for letting out two animals at a time, each passing out at the door the other came in at, or passing nearly directly forward through the car, instead of backing them out; the next are led out in the same manner, and so on to the last.

REAT'S IMPROVED DESIGN FOR NECK-YOKE RING AND SLIDE.

The design shown in our engraving possesses advantages over the old style ring, which will appear on reference to the engraving, in connection with the accompanying description.



The part, A, screws into the end of the neck yoke, in the usual manner. The ring, B, is made of an elongated angular shape, as shown, and has pivoted to it, at C, a slide, D. This slide is made with a broad surface, upon which the breast strap draws; the method of pivoting allowing any ordinary motion of the ring to take place without any sliding of the strap on the ring and consequent wear. The strap is, moreover, kept smooth and flat on the slide, which also adds to its durability.

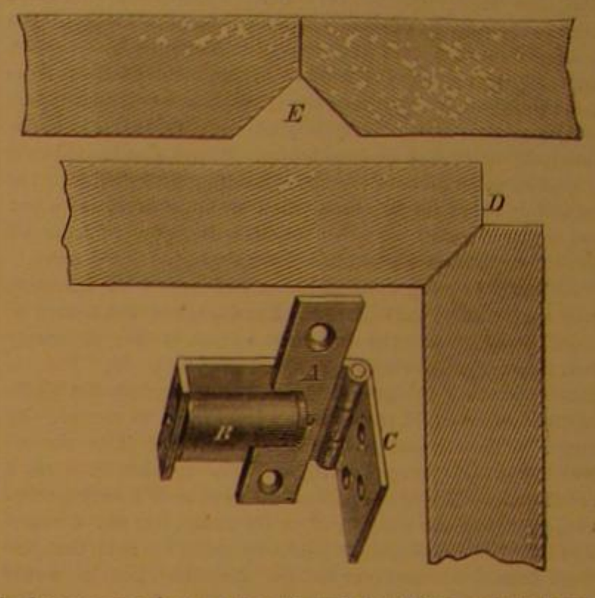
Patented, August 9th, 1870, through the Scientific American Patent Agency, by Robert L. Reat, of Charleston, Ill, whom address for state, county, or other rights.

THE recent dry weather has had the effect of producing such a demand for hose pipe that the New York Belting and Packing Company find it difficult to supply the demand although they turn out over one mile a day.

HIRE'S PATENT TABLE HINGE.

Our engraving represents an improvement, patented April 25, 1871. It consists of a wrought or malleable cast iron hinge for table leaves. One end, C, is of the same size and shape as the hinge now in use, and is screwed to the leaf in the same manner; the other part, A, is fastened to its place by a cast iron plate, and slides on a gum or spiral spring, B, as shown.

The joint is made by cutting down a square bevel on the table and leaf, thus entirely doing away with the knuckle, the only troublesome and expensive part of the table as now made, and the only part that gets out of order. The cost of



the hinges over those of the old style is trifling, and the bevel can be worked and the hinge put on, thereby completing the joint, in a very few minutes, by any ordinary mechanic. The positions of the joint when the leaf is dropped and extended are respectively shown at D and E.

For rights, or other information, apply to Hires, Ringo & Co., Columbus, Ky.

PLOWING AND CULTIVATION OF CROPS BY STEAM. IMPROVEMENTS WANTED.

We publish in another column an interesting description, by Horace Greeley, Esq., of the practical operation of steam power in agriculture, as now worked in Louisiana, near New Orleans. Mr. Greeley is at present travelling in the South, and his letters to the *Tribune* contain much useful information.

The importance of steam in plowing is well illustrated in the example which Mr. Greeley describes, whereby the furrows are turned to a depth of two feet, when before, without steam, a depth of six inches only was attainable. The practical result of the steam plowing is 2,000 pounds of sugar per acre, against 800 pounds by mule plowing.

He shows that an equally important gain results from the use of steam in the cultivation of the crops.

The general adoption of steam for the purposes of agriculture would add incredibly to the wealth of the nation. If it works so well and profitably in the hands of the colored laborers of the South, we see no reason why it may not be be adopted with equal success in all parts of the country. But it is clear that the mechanism needs to be simplified and reduced in cost.

We call the attention of our readers to the subject in the hope that it may be carefully examined and studied. A great and important field for invention is here opened for the ingenious. Steam plows, steam seed planters, steam cultivators, and steam harvesters, are wanted everywhere. But our farmers must have small, strong, simple, and reliable machines.

What is a Carat?

The carat is an imaginary weight, that expresses the fineness of gold, or the proportion of pure gold in a mass of metal; thus, an ounce of gold is divided into 24 carats, and gold of 22 carats fine is gold of which 22 parts out of 24 are pure, the other two parts being silver, copper, or other metal; the weight of 4 grains, used by jewelers in weighing precious stones and pearls, is sometimes called diamond weight—the carat consisting of 4 nominal grains, a little lighter than 4 grains troy, or $74\frac{1}{16}$ carat grains being equal to 72 grains troy. The term or weight *carat* derives its name from a bean, the fruit of an Abyssinian tree, called *kuara*. This bean, from the time of its being gathered varies very little in its weight, and seems to have been, from a very remote period, used as a weight for gold in Africa. In India also the bean is used as a weight for gems and pearls.

ARTESIAN WELL.—Great trouble and expense has heretofore been experienced by the Union Pacific in supplying their stations and cars in the alkaline district with water. The extent of territory from Rawlins to Green river—136 miles—had to be provided for entirely by water transported in cars. Mr. T. E. Sickels, the General Superintendent, was of the opinion that purer water might be had if a well were sunk deep enough, and a recent experiment has justified his view. The Omaha *Daily Herald*, May 10, '71 says it has a specimen of soft, pure water, from a well which has been sunk 350 feet deep, at Point of Rocks. This is 805 miles west of Omaha, and is in the heart of the alkali district. The supply of water is plentiful, and it rises to within eleven feet from the top of the well.

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NEW YORK, SATURDAY, JUNE 10, 1871.

Contents:

(Illustrated articles are marked with an asterisk.)

PAINE'S ELECTRO-MOTOR.

In recent numbers of the SCIENTIFIC AMERICAN, we have given accounts of the extraordinary claims put forth by Henry M. Paine and friends, concerning his improvements in electromagnetic machinery. They assert that his engine, now running at Newark, N. J., develops two horses' power by the use of a battery of only four ordinary telegraph cups; and, further, that any desired degree of power may be obtained with the same four cups, simply by multiplying the number of magnets.

In other words, Mr. Paine has discovered the perpetual motion, and found the long sought philosopher's stone.

This absurd proposition has been received, yea, swallowed whole, by persons who have heretofore enjoyed reputation for common sense, if not sagacity, in things scientific. But this easy credulity in the present case, shows that they have been over-rated. They belong to that large class of individuals, intelligent and sound in ordinary matters, but in whose minds there runs a vein of lunacy upon the perpetual motion question; the result of careless and deficient training in scientific principles. From this class, Mr. Paine will draw followers and money; in fact, he has already done so, with much success, unless we are misinformed.

The exhibition of the original machine, which, for a time, was open to a favored few who had money to invest, is now closed, for the purpose, it is stated, of perfecting preparations to show the improvements on a more grand scale.

Mr. Paine's patents have been assigned to a joint stock company, capital three millions of dollars, called the Paine Electromagnetic Engine Company; and they are now busy, at Newark, in building a new machine, by which they expect to convert all such doubters as the SCIENTIFIC AMERICAN, and bring the world in general to a realizing sense of the astounding nature of their discoveries.

The company is said to be composed, for the most part, of gentlemen of wealth, who are abundantly able to lose any amount of money that they choose to subscribe. It is to be hoped that they will be liberal in their estimates, and give us an example of the mechanism on a scale sufficiently large and brilliant to attract the attention of the world. It is only by the exhibition of the most striking examples of absurdity and failure, that the malady to which we have alluded can be reached or suppressed.

We understand that the new machine is to be of five hundred horse power, and is to run, as before stated, with only four cups, at a cost of about twenty cents a day, and is to be ready for operation about the 4th of July next; after which date, unless the company should be disappointed, steam boilers will be no longer wanted, horses may be turned out to grass, and workmen may take things easy. Their places will be supplied by electric engines, electric horses, and magnetic laborers.

During the brief interval that remains before the inauguration of this great electromagnetic revolution, we have thought it best to prepare and enlighten the minds of our readers concerning the nature of the mechanism by which the Paine Company expect to accomplish so much. We have, accordingly, provided a series of engravings, representing the salient points of Mr. Paine's improvements, which we print on another page, together with his own explanations of them, as presented in his patents.

These patents embody several apparently good improvements in electro-dynamics; but we are unable to detect in them anything that is likely to turn the world upside down, in the astonishing manner that Mr. Paine and his worthy coadjutors so confidently predict.

THE NEW SYSTEM OF PIERS FOR NEW YORK.

It seems at last that the Dock Commissioners have resolved upon definite action in the matter of the improvement of the docks and piers. Many plans have been submitted to them, but it is finally announced that the one adopted will be that of a magnificent street, completely surrounding the water front, to be in width not less than 150 feet in any part. The river front is to present a solid wall of granite masonry, in combination with *béton*, which has proved its value for this purpose in many European harbors.

The plan is a very expensive one. Its cost is estimated at about two and one half millions of dollars per mile. The building of docks and piers is, however, essentially a costly undertaking, and we are inclined to believe that the plan proposed could hardly be replaced by another, embracing greater durability and convenience at less cost.

In any system of public works, durability is an element that should be considered of primary importance; especially in structures where frequent repairs entail interruption to business.

The depth of water along the frontage is to be not less than twenty feet. From the granite wall will project piers, from three hundred to five hundred feet in length, and from sixty to one hundred feet wide, according to situation. The superstructures will be, for the most part, of timber, supported on iron, stone, or timber pillars, but having at the head of each pier a column of solid granite masonry the full width. It is stated that some of the piers will be constructed wholly of iron, and a limited number entirely of stone.

The iron columns are to be hollow and six feet in diameter, so that men may enter them to work, while sinking them to their permanent foundation. Each pier will have three rows of these columns, which, when sunk to bed rock, will be filled with a concrete of stone and cement. The spaces between the piers will be two hundred feet in width. The sewers are to be carried through under, and made to discharge their contents at the outer ends of the piers, so as not to fill up the slips.

The completion of this work is not intended to be accomplished at present, but it is designed to at once carry out the system from Grand street to East Fourteenth street, on the East River, which, it is stated, will give a pier length of twenty-one and one half miles, and will for a long time to come amply accommodate the commerce of the port.

It seems to be the general opinion among those qualified to judge of the merits of this plan, that it is one of the best that could have been adopted, and it is estimated that the additional rents will pay the interest on the bonds to be issued, without advancing the rates at present demanded.

The completion of this great work, and that of the East River suspension bridge, together with the removal of the Hell Gate obstructions, will render the East River famous for the engineering skill devoted to its improvement.

There is, however, one point which the system proposed does not cover. It makes, so far as we can see, no provision even in anticipation of any disposal of sewage, other than its discharge into the river as now practiced. The results attained by several processes, particularly that known as the "A. B. C. process," in which sewage is treated by the use of alum, blood, and clay, indicate that the time is coming when the discharged filth of cities will be used to restore fertility to impoverished lands instead of being allowed to poison the water about docks and piers. In constructing a work of such permanence as the one under consideration, it would have been wise to have anticipated the future employment of improved methods of treatment in such a way that their application would not entail expensive alterations. This could be done without increase of first cost to any noticeable extent.

DOCTORING IRON.

The attempts made, from time to time, to obviate the process of puddling, in the manufacture of iron by doctoring, are, while they have some warrant in chemistry, still entirely empirical. The two principal substances sought to be removed—carbon and phosphorus—possess strong affinities, and form combinations in the metal, very difficult to break up. Their presence in undue quantity produces qualities in iron which unfit it for many purposes; and, practically, only oxygen, administered in large doses, has, as yet, been able to remove these undesirable elements. The introduction of oxygen mixed with nitrogen, as in atmospheric air, is the essential feature of puddling and of the more recent Bessemer process. In the Heaton process, which has now ceased to attract much attention, the oxygen was introduced in the nitrate of soda employed, the salt, being decomposed by the heat, yielding its oxygen to the crudities contained in the metal, and forming with them gases which passed off. In the Ellershausen process, oxygen is introduced in the oxide of iron employed in making the pig blooms. The Peters process, which, we understand, is soon to be put into practical operation in Rhode Island, is a new way of introducing and controlling the admission of oxygen.

Thus we find that oxygen is the giant of the chemistry of iron. This fact, however, is not, and should not alone be, a bar to experiments with other materials, although the uniform failure which has attended dosing with chemicals, is, to say the least, discouraging. There would be more hope in this direction were our knowledge of iron more complete than it is. There is scarcely a field of industry more beset with difficulties and perplexities, than that of the iron manufacture. So manifold have the varieties of iron and steel become, that no one knows where to draw the line of distinction between them, and the terms have become entirely too indefinite. There are so many things called steel, that no one knows where to say iron leaves off and steel begins.

There are also mysterious reactions and physical changes, in the condition of these metals, yet unexplained, upon which more light must be shed before the use of chemicals, salts, etc., can be intelligently applied.

To attempt to doctor iron is, then, to grope in the dark The attempts may add to our stock of knowledge, but there is little prospect of their revolutionizing the processes now employed. For this reason we accept with much allowance the glowing statements indulged in by some English journals, in regard to the Sherman process, and also that of a central New York paper, which now lies on our table, containing an enthusiastic encomium of what it calls the "Bendell" iron, which, it states, is produced by dosing, the drugs and medicines employed being exceedingly cheap, but the names of which are not given. The sanguine author of the article in question regards the process as destined to revolutionize iron working throughout this country. We hope it may—but for the reasons above assigned, we doubt it.

MENTAL EMACIATION.

A strange title, do you say? What new disease is this? Not by any means a new disease, dear reader, but one astonishingly prevalent. The number of men whose minds are weaker and smaller at forty or fifty, than when they were were twenty-five, is legion. Their bodies are sleek and plump, their purses, many of them, are fat; both have been well nourished; but their minds are in a feeble, emaciated condition, unable to cope with the great questions of this pre eminently advancing age.

Engage them in conversation upon any topic involving much grasp of thought; propound to them any one of the great problems of vital importance to the human race; you shall see how their minds shrink from effort they are incapable of performing; and how they fall back upon the supports of old superstition and prejudice, and there find rest from the labor such questions involve. This general mental emaciation is one reason reforms move so slowly. The best and strongest minds are tugging at the mysteries of nature, and expending their energies in physical researches. Some intellectual giants are also grappling with problems of social construction, political economy, and morals, but, as their teachings are directed mainly to the mentally emaciated, they make but little headway in correcting existing evils. Men, in the hot pursuit of wealth, which is the most absorbing of present human aims, neglect systematic thought, feed their minds upon little else than the sloppy pabulum of sensational daily papers, and become mentally starved. How few there are that can safely think for themselves upon any subject not immediately related to their profession or calling! What millions might be counted, who might far better shut their eyes and accept without thought the conclusions of such men as Mill and Spencer than even to attempt to reach a conclusion or form a definite opinion from their own thinking!

Talk with men engaged in professions which imply greater breadth of thought than ordinary business occupations, and how often you will hear the admission, that their habits of thought have unfitted them for correct thinking upon topics which require systematic thought, and strictly logical method! Ask nine out of any ten, selected at random, what is their religious belief? and you will find that they either have none, or that they accept a creed they cannot comprehend or explain. If they vote at general elections, they are guided by hastily formed opinions, for which they have never sought good and sufficient reason. Somebody's plausible speech, or some half conceived principle of right or wrong, is enough to influence their action; and so they give their minds the rest they crave, and trust to luck that it will all come right in the end. Many are going on through life, similarly trusting that their future will all come out right—hoping that it will—which they call having faith; and when they suppose themselves to be trusting in God, they are simply trusting in luck.

Hence it follows that sects and creeds multiply, charlatans prosper in politics, religion and medicine, and false teachers only find it necessary to assert, with show of authority and with simulation of knowledge, to win numerous disciples.

The majority of men prefer to have other people think—or pretend to think for them. Glittering generalities that either mean nothing, or mean falsehood, are accepted as formulas of action, and repeated as maxims for the guidance of individual conduct. If such a formula be attacked by some bold critic who sees its hollowness, the masses who have accustomed themselves to blindly follow, cling to it, refusing to give up that which has saved them the labor of forming an independent opinion, and dreading the mental effort which the formation of new opinions, or the selection of another formula, would entail.

So the world moves slowly in some respects, but it moves. There remains an immense amount of superstition, but day begins to dawn. People are not so easily led blindfold as they were a century ago, and the rights of individual conscience begin to assert themselves.

STEAM ON THE ERIE CANAL--ANSWERS TO QUERIES.

We call attention to an able paper read by George Edward Harding, C. E., before the Society of Arts, in London, May 10, of the present year. The paper is entitled "The Application of Steam to Canals," and gives a great deal of practical information, useful to inventors at the present time. We shall publish it in parts.

We also take the present occasion to answer a large number of queries relative to the dimensions and models of canal boats. The largest boats are 96 feet long, 17 feet 8 inches in width, and 9 feet in depth over all. Their greatest draft is 6 feet, as prescribed by law, and they will carry 240 tuns of freight.

The bridges are 11 feet from the water; that is, this is the least distance allowed. The mean depth of the canal between the bottom of the banks, is 7 feet.

The model of the boats may be described as an oblong box with vertical sides, and having all the corners slightly rounded. To propel such a boat, when loaded, at a rate of three miles per hour, would require not less than sixteen horse-power, taking as a basis for the estimate, the fact that two horses now scarcely make more than a mile and one half per hour when the boats are loaded to full capacity, and that the resistance of fluids increases as the cubes of the velocities of bodies moving through them.

From this it will be seen how visionary it is to suppose that any boat of this model can be propelled, when loaded, at five or six miles per hour, without reducing its freight carrying capacity more than can be allowed. To propel such a boat at five miles per hour would require a power of nearly seventy-five horses, not making the least allowance for waste of power, which always takes place in any method of steam propulsion. To propel it at six miles per hour, would require one hundred and twenty-eight horse-power.

Another query, in which many are interested, is: what does the law, offering the prize, mean by the "Belgian system" of propulsion? We will give an engraving of this plan in our next issue. Meanwhile we will say, that the plan is the invention of Baron Oscar de Mesnil and Max Eyeth. who patented their inventions in the United States, Feb. 9. 1866.

It consists essentially of a rope, laid on the bottom of a canal, which is simultaneously wound on and off a drum, attached to the boat and turned by steam or other power.

In answer to other inquiries, we give it as our opinion that the meaning of the last clause of the first section of the act authorizing the prize, excludes all use whatever of the banks, and confines the means of propulsion to the boat itself, and the propeller must be made to act either upon the water or the canal bottom.

The commissioners have not held their first meeting, and have as yet no office in this city. As soon as they take action of any kind, our readers will be informed. The chairman of the Commission is General George B. McClellan, and his office is at the Department of Docks, 348 Broadway, New York.

PLOWING AND CULTIVATING BY STEAM.

Horace Greeley, editor of the New York *Tribune*, is now on a tour in the South, and, in a recent letter to the above paper, describes a visit to a plantation fifty miles below New Orleans, where the manufacture of sugar is a specialty. The plantation, Magnolia Grove, is 3,000 acres in extent, and the owner, Mr. Effingham Lawrence, conducts all the operations on a large scale, and in an enterprising manner. One thousand acres are actually cultivated. Fowler's plowing machinery is used, imported from England. The plows are drawn across the field by two thirty horse steam engines, provided with drums, on which the wire ropes that operate the plows are wound. One engine is placed on each side of the field, and the drums alternately wind and unwind the rope, drawing the plows back and forth between the engines.

"The ground," writes Mr. Greeley, "was cane stubble, heavily ridged or hilled to counteract excess of moisture, with the 'trash' of last year's crop lying between the rows, and constantly clogging and choking the plows, often requiring the machinery to be stopped in order to clear them. The subsoil—never disturbed till now—was a glatinous clay loam, compacted by sixty years treading of heavy mule teams, so wet that it came up unbroken, as if it were glue, and about as easy to pulverize as so much sole leather. So obstinate is it that Mr. Lawrence had reduced each gang of plows to two, lest his engines should be stalled, or his wire ropes broken. These two each cut a furrow sixteen inches wide, and fully two feet in average depth; had the surface been level, they would have averag-d twenty-six inches. They were drawn across the field (576 feet) faster than most men would like to walk. Three men were required to keep them in place, and clear them of the choking 'trash,' which I would have burned out of the way, though I, had I been planter, would have preferred to have it buried, as they buried it. Against all these impediments, each set of machinery was plowing from five to six acres per day—plowing them two feet deep, remember, and thus relieving them of the generally superabundant moisture, as shallow plowing, or even ordinary subsoiling, never did and never can. Mr. Lawrence, upon land thus plowed, makes an average of 2,000 pounds per acre of sugar, where he formerly made but 800 pounds. And he regards himself as yet on the threshold of steam cultivation.

"And even this was not the best he had to show us. In other fields, perhaps half a mile distant, other machines were cultivating cane by steam. I believe the like of this has not yet been done elsewhere on earth. The rows of cane are fully seven feet apart; the plants now fully a foot in average hight. A locomotive engine stands at either end of the field, moving forward or backward by a touch of the hand of the negro boy standing upon it and looking out for signals. The cultivator is composed of five or six ordinary horse cultivators, enlarged and fixed in a frame, whereof the half that that has just stirred the earth to a depth of two and a width of five feet is lifted clear of the ground on reaching the engine which draws it, while its counterpart is brought down to its work by the plow guider stopping upon it. At a signal, the boy at the other end of the field, or 'land,' starts his engine, and begins to unwind his wire rope, and uncoil or pay out that of the drum beneath the opposite engine, pulling the cultivators through the earth as they are guided nearer the row that they were kept further from as they passed in the opposite direction. Having thus thoroughly pulverized the space between two rows, by traversing it twice, the engines move forward to the next space and repeat the operation; and so on till nightfall. Mr. Lawrence assured me that one such thorough working answers for the season; whereas, while tilled by mule power, every cane field required working six times per season, at intervals of fifteen days. A set of machinery and hands tills about twelve acres per day. I judge the cost of this day's work, including fuel and wear of machinery, ranges from $25 to $30. This is far below the cost of repeated workings by mule power, while it is far more efficacious. The land plowed and tilled by steam is far dryer than the rest. Mr. Lawrence considers his thousand acres under tillage worth $100 per acre more than they would be but for steam culture. He will keep his two sets of plowing machinery at work, not only throughout each day, when the earth is not too sodden, but (by relay of hands) throughout each night also, when the moon serves. Steam tillage of growing crops, being a nicer, more critical operation, will be confined to daylight.

"I close with an avowal of my confident belief, that Mr. Effingham Lawrence has rendered an immense service to American agriculture, especially that of the Prairie States, by demonstrating the benefits not merely of steam plowing, but of subsequent steam tillage, and that the day is not remote wherein the 'barrens' of Long Island and New Jersey, the rich intervales of the Connecticut and the Susquehanna, will be profitably plowed and tilled, to a depth of 24 to 30 inches, by steam power, and that far larger and surer crops than those of the past will therefrom be realized."

The Birmingham Gunmakers' and Inventors' Club.

At the first general meeting of the Birmingham (England), Gunmakers' and Inventors' Club, the President, Mr. A. Wyley, delivered an address in which he reviewed the position held by gunmakers and other mechanics; noted the difficulties which beset the trade, and suggested means by which these might be alleviated or overcome. He said that "the manufacture of firearms at the present day, involves a wider range, if not a greater amount, of knowledge than any mechanical pursuit, if we except the more scientific manufactures, such as those of optical, geodetical, and astronomical instruments." Referring to the drawbacks of the manufacture of firearms, Mr. Wyley said that, "First of all, the trade, especially the military branch of it, is, in its nature, exceedingly spasmodic and irregular; at one time utterly stagnant, at another in a perfect fever of activity. During the period of slackness, men take to other branches, some times to totally different pursuits. When the trade suddenly revives (and the transition is always sudden) these men return to their former posts, but, of course, not so efficient as if they had remained in it all along. This is one cause of the indifferent work that is always turned out when any sudden demand arises." The gunmaking trade had not taken the position in public estimation that it might occupy, and its leading men were ranked far below civil and mechanical engineers. Many causes have contributed to this, but clearly one of the foremost is the utter want of unity or cohesion in the trade. In almost every case, the individual interests of its members seem the only motives of action (and even these interests are poorly understood), while those of the trade and of the public are totally disregarded. These causes have kept the masters in the gun trade at arms length from each other, and they naturally endeavor to to keep all those in any way dep ndent on them in the same state of isolation; and so it happens that no one knows or cares what his next neighbor is doing. Hence it is that blunders innumerable are made, costly experiments repeated over and over again, although the question, to solve which the experiments were made, may have been settled years before. From this source arise endless multiplication of patterns, all sorts of useless bores of barrels, all sorts of rifling, and that inability to judge of the cost of manufacture of anything out of the usual course of their own experience which often leads masters to give unduly low estimates, these necessarily ending in screwed down prices and inferior work. If those engaged in the gun manufacture, were animated with a spirit of brotherhood—if they were to unite and co-operate, many great improvements would be effected by systematising the de.ails of the trade To bring about a closer union among the active members of the the trade, is the principal object of the Gunmakers' and Inventor's Club.

The Wreck of the Saginaw---Mechanical Ingenuity of a Shipwrecked Washingtonian.

The following is from the Washington *Morning Chronicle*:

When the Saginaw was wrecked on Ocean Island, last October, a boat saved from the wreck was started for Honolulu to seek aid to rescue the crew from that island. The boat foundered in the surf when near her destination and all of the crew perished save one, who told the tale of the Saginaw's fate, and had relief sent to the shipwrecked crew. The length of time which elapsed before succor came, caused such apprehension in the minds of the sufferers on the Pacific Island, that they fitted out another boat to tempt the perilous navigation of nearly 1500 miles. This work on the boat went on well; but they had no sextant, the only one saved from the wreck having been taken in the other boat. Second Assistant Engineer Herschel Main, U. S. N., of this city, who was among the shipwrecked, collected from the *débris* of the wreck cast ashore, a variety of materials, from which he constructed a sextant with such tools as he could improvise, and which has been tested and found accurate.

Mr. Main exhibited considerable ingenuity in constructing an instrument so delicate and intricate under such disadvantageous circumstances, and has given an additional proof by his achievement of the truth of the old adage that necessity is the mother of invention.

The material used in the construction of the sextant consists of a piece of a steam gage, a piece of zinc, some small pieces of brass filed to suit the different portions of the instrument, rivets made from any material found, and the mirrors necessary, from such pieces of looking glass as were washed from the wreck. These last were set in frames of brass desk locks, and all the work was principally done with a pocket knife and rough tools made for the occasion.

This instrument is now in the possession of Mr. King, chief of the Bureau of Steam Engineering in the Navy Department, and can be seen by all who take an interest in a curiosity which exhibits such skill and mechanical ingenuity as is rarely found under such difficulties.

There happened to be no necessity for a practical test of the instrument, for by the time it was completed and second boat ready to start, relief arrived and the shipwrecked men were rescued from the island and conveyed to Honolulu. The instrument, however, as above stated, has been tested by navy officers and found accurate.

The Decomposition of White Light.

Mr. Lewis Rutherford, of New York, so well known for his magnificent stellar, lunar, and solar photographs, was in London a few weeks ago, and brought with him a prepared piece of glass which would produce a diffraction spectrum. A diffraction spectrum is produced, without the use of prisms, simply by the aid of a glass plate, which contains a great number of fine parallel lines ruled with a diamond upon one of its surfaces. These lines should be $\frac{1}{1500}$th of an inch apart, and extend over a surface about two inches square There is a great degradation of the light when it is drawn out in this way into a spectrum, but the spectrum is a very pure one.

The ruled glass plate is technically called "a grating," and a number of spectra are produced on each side of the glass plate, any one of which spectra may be viewed by a telescope of low power placed in the right position. By means of the grating prepared by Mr. Rutherford, about eight spectra could be seen, and the whole arrangement was exhibited at the last *soirée* given by General Sabine to the Royal Society.

The great difficulty in preparing these gratings consists in ruling the lines with sufficient accuracy, it having been found that an error of $\frac{1}{250000}$ is sufficient to render them inapplicable for purposes of scientific research. The spectrum is exceedingly faint as compared with that obtained by the use of prisms; but in scientific researches it presents the great advantage that any spectrum obtained by the diffraction plate will bear direct comparison with another spectrum produced by any other diffraction pla e, even though the plates may have been made of different glass, prepared in a different manner, and the number of spaces between the lines on the glass of different widths.

There are other advantages appertaining to this little-known method of producing a spectrum. It is not liable to the difficulties produced by what is known as the "irrationality" of the ordinary spectrum. This irrationality, as it is called, is caused by the property, possessed by different kinds of glass, of acting specially on different rays of light. For instance, the very densest flint glass, when compared with crown glass, draws out the blue and violet rays of the spectrum more than the red. A bisulphide of carbon prism exerts a still more marked influence of the same kind. In consequence of the impartiality (for so it may be called) of the glass gratings upon the rays, a remarkable spectrum is produced, very unlike the one with which the public are familiar; for in the diffraction spectrum, the yellow rays are in the middle of the spectrum, instead of near one end. They are midway between the extreme red and blue.—*William H. Harrison, in the British Journal of Photography.*

Iron teleg.aph poles are being introduced into Switzerland with great success. They have also been placed on 350 miles of Swiss railways. It is predicted that in Germany, where iron is cheap, that it will be substituted for wooden poles on all the lines. We would suggest that iron poles be substituted, in our cities, for the cumbrous and unsightly ones which meet the eye in every direction. They may be made light and artistic, and besides they will endure so much longer than wood as to render them economical in the end. President Orton, of the Western Union Telegraph Company, will, we trust, take the matter into consideration.

Optical Appearance of Cut Lines in Glass.

The use of high powers in delicate investigations renders it necessary that the microscopist should study the character of appearances which arise from optical laws, and which can only be rightly interpreted by referring them to forms and structures to which they bear no real or exact resemblance. A short time since, the writer called attention to the deceptive nature of the appearances presented by the fine cracks in silica films; and further observations show that if the finest or narrowest of such marks are selected for examination, the chances of obtaining perfect illusion are increased by the amount of magnification and the perfection of the objectives employed. Delicate interference bands, pseudo-beading, etc., look more real with well corrected object glasses than with bad; and careful illumination will often add to the structural aspect of mere optical effects. The edges of silica cracks differ from edges of minute furrows cut in glass, being smooth instead of jagged. The latter as well as the former are well worth study. Preparatory to examining such furrows as are cut with diamonds in glass for micrometers or diffraction gratings, it is well to notice the edges of thin glass cut for slide covers. If half a dozen or more thin glass squares are held close together, and viewed, edges upward, as transparent objects, a variety of curious optical effects will be seen, arising from interfering reflections and refractions. The examination should begin with an inch or two thirds, after which half inch, and quarter or one fifth will be advantageously employed. It is easy to focus parts of the glasses' edges, so as to show their true form; but portions a little in or out of focus will show beads, appearances like columns of Egyptian architecture, etc. Most of these optical appearances are sufficiently hazy or confused to give warning of their true nature; but generally some will be found so sharp and clear that, if viewed separately, they may easily mislead a practised observer. In making these experiments, it is best to have handy a box containing at least several dozens of the thin glasses, as some sets will prove much more interesting than others. They should be viewed with their edges parallel to the plane of the objective, and also at various angles. The corners of the squares should also be looked at.

Lines cut in glass for micrometers or diffraction gratings are usually filled up with finely divided black lead, and the same material has been employed in the writings and patterns made with the Peter's machine. This substance of course modifies the appearances. To see them in the simpler form, recourse was had to Mr. Ackland (Horne and Thornthwaite), who ruled several sets of fine lines, each on glass slides, at varying distances 1—2000″, 1—3000″, and 1—4000″, and mounted them with Canada balsam, so that they could be safely used with immersion lenses. One set was not covered or mounted in any way.

Those who have examined very minute writing done by the late Mr. Farrants with the Peter's machine will be aware that even when a very fine diamond point is used, the incision partakes more of the character of a scratch than of a clean cut. It seems impossible to cut glass with a smooth, clear edge, such as certain metals readily give with a sharp tool. A line cut in glass is thus a furrow, more or less rough at the bottom and sides, and when viewed correctly under the microscope, has the appearance of a narrow depression less transparent than the adjacent spaces. It is difficult to get a really correct view. Even under favorable circumstances of illumination and correction, the edges of a cut are apt to appear as two raised lines.

Many instructive optical appearances, which might bewilder the observer if the character of the object were not known, may be easily produced, as the following notes will show. The observations are made with Powell and Lealand's immersion one eighth and Ross's four tenths, condenser aperture 109°. Using central stop, A, and varying inclinations of mirror. Paraffin lamp. (1*a*) Cuts as rounded bands; interspaces flattish furrows. The bands illuminated on right side, shaded on left. Tint of lightest part of furrows bluish. (2*a*) Flattish bands and rounded furrows, the former slightly shaded on left; tint of shading bluish. (3*a*) Oblique rounded furrows with narrow blue ridges; broadish bands with narrower elevated bands up their centers, light on right side, shaded deeply down the furrowed side on left.

Same condenser 109°, two radial slots forming obtuse angle. Angle of mirror varying. (1*b*) Broad, flat spaces, narrow, shaded, and elevated ridges. (2*b*) Ridges four times as wide as No. 1, with rounded tops. (3*b*) Narrowish grooves, something like actual object. (4*b*) False ridges, puzzling to count and hollow.

Same condenser 109°, two rectangular radial slots. Angle of mirror varied. (1*c*) Half round hollows, with rod-like ridges in the middle; rounded interspace elevations somewhat lower than ridges and between them. (2*c*) Narrower ridges; nearly flat spaces. (3*c*) Appearance of additional ridges, strongly shaded on left. (4*c*) Narrow ridges, shaded on right; flattish spaces, and low ridges, with narrower shelving shade spaces down to ridges, etc., etc.

Same condenser, 109°; one radial slot which was rotated to various angles. Angle of mirror varied. (1*d*) Each cut made into a flattish space, with two narrow raised edges, shaded on left. (2*d*) Cuts made into flattish, ribbon-like elevations, with raised edges. (3*d*) Interspaces raised, with rounded edges; cuts made to look flattish, and at lower level. (4*d*) Appearance of additional and imperfect ridges. (5*d*) Series of imbricated and shaded bands.

In the lines cut by Mr. Ackland no attempt was made to produce the narrowest possible furrows. The width of furrows found practically convenient for micrometers was only slightly deviated from, as some cuts were a little deeper than others, and thus caused the wedge-shaped diamond point to open the furrows a little wider. The interspaces of the narrowest were much wider than the cuts. It is obvious that a cut wide enough to be distinctly seen, under given magnification, will present to view two linear edges, and thus be reckoned as two lines, if its true character be not considered.

Cuts very close together may, if the cohesion of the glass and the perfection of the cutting tool permit, be wider than their interspaces.

It will be seen that in the preceding statements only one instance is mentioned of appearances agreeing tolerably well with the real facts. It must not be inferred from this that it is not easy to exhibit moderately fine cuts correctly, or very nearly so. The object of this paper was to select a number of appearances all looking as if they might correspond with the facts, and all differing more or less from them.

Those who study the most vexatious diatoms or Nobert's test lines must, it appears to the writer, not only take into account what they do see, but what they ought to see, provided the object has a certain definite structure, and certain powers of producing optical images under given conditions.

ON A NEW CONNECTION FOR THE INDUCTION COIL.

By Prof. Edwin J. Houston, in the Journal of the Franklin Institute.

The following experiments were made at the Central High School of Philadelphia, with a view of increasing the quantity of the spark of the induction coil without greatly diminishing its length. The instrument used was made by Ritchie, of Boston, and will throw the spark six inches in free air.

One of the poles or ends of the secondary wire was connected with the earth by a copper wire, attached to a gas pipe. The other pole was connected with a wire, which rested on a large lecture table holding the coil. On turning the break piece, the electricity, instead of being lost by passing along the wires to the earth, jumped from the pole connected with the table to that connected with the earth. The thickness of the spark was greatly increased, its length diminished, and its color changed to a silvery white, as when a Leyden jar is placed in the path of the discharge.

While the electricity is flowing between the points, long sparks may be drawn from any part of the table, or from any metallic article within eight or nine feet of the coil. On one occasion, the gas was lighted by a spark drawn from the finger of a person standing on the floor. The gas pipe being in almost perfect connection with the earth, the spark must have been given to it from the body of the person.

On another occasion, one wire was attached to the gas pipe, as before, and the other to a stove, whose pipe connects with that of another stove in an adjoining room. The thickness of the spark was greatly increased. Sparks were drawn from the distant stove, and even from a small steam engine, which latter was fully thirty feet from the coil. In all the experiments it was found necessary to insulate the handle of the break piece, as a slight shock was experienced at every break. The poles being kept at a distance from each other less than the insulating power of the coil, six inches, no danger of injuring the instrument was apprehended. In one instance sparks were drawn, in a room underneath the adjoining room, from a wire which connected with the table on which the coil rested.

These facts showing great loss of the electricity, but indicating the need for a large conductor, probably to allow the rapid discharge of the secondary wire, a large insulated conductor was extemporized, by placing some old tin stills and percolators on large glass jars. On connecting one of the poles with this conductor, and the other with the gas pipe, the quantity of the spark was increased, though there was reason to believe that, with a larger conductor, better results would have been obtained. The conductor was then divided into two, of about equal size, which were connected with the poles. The quantity of the spark was increased, with, however, great diminution in the length. By successively diminishing the size of one of the conductors, and increasing that of the other, the length of the spark was increased, without any sensible diminution in its quantity, until, when one of the conductors was less than one square foot in surface, a fine quantity spark of about five inches was obtained.

It will be noticed that this connection is somewhat similar to that used in the common cylinder or plate machine, in which one of the conductors, generally the negative, is connected with the earth, and the quantity of the electricity thereby increased.

In all the experiments in which one pole was in partial connection with the earth, as when it rested on the table, the loss of electricity must have been very great, for several gas and water pipes were in connection with the table. If, then, the table merely serves as an imperfectly insulated conductor, which allows the rapid induction of electricity in the secondary wire by its rapid discharge, and thereby, notwithstanding the loss, gives so great an increase in the quantity of the spark, it would seem that if, instead of the table, an insulated conductor of very large surface were used, a much greater increase in quantity would be obtained.

It would seem from the above experiments, that the maximum increase will be obtained when one of the poles is connected with an insulated conductor, say several hundred square feet in surface, and the other with the earth.

Cultivation of Rice.

In preparing the land for rice, the ground is cleared, embanked and ditched in a thorough manner, and is often laid out into independent fields, so that a certain number of hands can complete any one operation connected with the culture of the rice, in a single day. The ditches are often five feet wide, and as many deep, and the main one is sometimes large enough to be used as a canal in boating the rice in large flats, from the fields to the place of stacking. The land is plowed or dug over with the hoe early in the winter, and is kept under water during the warm changes in the weather. In March, the ground is left to dry, and made ready for the seeds. Trenches for the same are run at right angles with the drains from thirteen to fifteen inches apart, with a four inch trenching hoe. From April till the middle of May, the seed is scattered in these trenches at the rate of about two and a half bushels to the acre. The seed is sown lightly covered with the soil, and the plan has been to let in the water upon the land for several days after the seed is put in, or until it sprouts. Latterly it is considered better to stir the seed in clayey water the day before sowing, as the clay adheres to the seed so that it remains in the trenches when the water is let on, if not covered by the soil. After the water stands from four to six days on the sprouts, it is let off, and when the plants are about five weeks old, the first hoeing takes place. The plants are again hoed in ten days, and then the "long water" is put on for two weeks, at first deep for four days, afterwards gradually diminishing the depth of water. After two more hoeings, the joint appears in the plant, and the "joint water" is let on to remain a few days before the grain is ready to be cut with the sickle.

Rice grows much like wheat, with stalks from four to six feet high. It is closer jointed than wheat, with leaves resembling those of the leek, and the seed is inclosed in a rough, yellow looking husk. The average yield on the low land is about forty bushels to the acre, a bushel weighing usually forty-five pounds.

South Carolina is the most successful rice growing State in the Union, and her rice commands the highest prices in market. It is said that the seed was first introduced into the State accidentally, from a Madagascar vessel that put into Charleston in 1694

It was formerly customary for the planters to have their slaves separate the rice from the outside husk by pounding in small hand mortars. Each male hand had his task allotted him, of pounding three pecks before breakfast, and the same amount after the day's work was over in the field. It is now done by machinery at the rice mill. The mill is provided with long upright wooden pestles, which pound the rice a certain number of strokes in long wooden mortars. After undergoing this process the rice is cleaned and then passed over wire sieves, so arranged that the small and broken grain falls through the fine meshes in the sieve, the large and perfect grain through the larger ones. In this way the various grades of rice are assorted for market.

WOVEN WIRE MATTRESSES.

In almost every newspaper one takes up, the eye meets a very artistic engraving of a mattress, fabricated in wire, and, accompanying it, an advertisement of the Woven Wire Mattress Company, Geo. C. Perkins, Secretary, Hartford, Conn.

In the SCIENTIFIC AMERICAN about a year and a half ago, when the manufacture of these mattresses was in its infancy, and before some of the improvements since added were made, we published an engraving of the article, which elicited considerable inquiry from managers of hospitals and other public institutions, in various parts of the United States, and from some of the warmer countries in Middle and South America.

From the time of the fall exhibition of the American Institute of 1869, when the energetic secretary of the company first exhibited them, the wire mattress has been gaining favor with the public, until it is now on sale in nearly all cities and large towns in the United States.

The company, we learn, is turning out several hundred beds a week, and the demand for hospitals, steamships and private use is constantly increasing.

The mattresses are durable, cool for warm weather, comfortable to lie upon, and insects avoid them.

A MANUFACTURER of Easthampton has offered an endowment of $500,000 to Amherst College, on condition of the name being changed to "Williston University."

A RAILROAD of 30 inch gage, 11 miles in length, is to be constructed in Green county, Tenn. It will cost $20,000 only

PATENT OFFICE DECISION.

Henry Moule and James Bannehr—Appeal from Examiner-in-Chief. March 31, 1871.—In the matter of the application of Henry Moule and James Bannehr, for letters patent for Improvements in Earth Closets.—Applicants have invented, and in their specification have described, a particular form of mechanism adapted to the earth closet, and which, if new, will entitle them to a patent. The claims set up are in the following language:

1. The application of dry and powdered earth, in closets and commodes, to the excrementitious matters deposited therein.

2. In combination with an excrement chamber and a hopper, or other receptacle, for deodorizing material, a charger or distributer, located between them, and adapted to discharge portions of the contents of the deodorant receptacle into the excrement chamber in the manner set forth.

3. In combination with a commode or closet, in which there is a means provided for deodorizing the excrement, a means for mixing the discharged mass, substantially as set forth.

In conformity with the current practice of the Office, as grounded upon the decision in *ex parte* Charles Rubens & Co. (Commissioner's Decisions, 1869 107), the concluding words of the second and third claims should be ignored in considering the novelty of what is therein claimed; and in fact applicants' attorney has based his whole argument upon the supposition that these words are mere surplusage, and are not to be regarded as in anywise limiting the scope of the claims. It will thus be seen that applicants do not confine themselves to the mechanism described, and of which they are doubtless original, and perhaps the first inventors, but are seeking to secure claims in their nature calculated to lay under contribution every existing form of the useful invention to which their mechanical improvement relates.

The English patent granted to these same parties upon the invention now offered for an American patent bears date May 28, 1860.

All the references, then, which are cited by the examiner of a later date than the date of the English patent are manifestly insufficient, since they neither disprove the novelty of the invention nor establish a public use in the United States for more than two years prior to the pending application. At the time when they were given, May 24, 1870, they were pertinent, as tending to establish the fact of common and public use in the United States prior to the application; but the legislation of 1870 so far changed the law in this regard that public use in the United States for a less time than two years prior to an application upon an invention previously patented in a foreign country, cannot constitute a bar to the grant of a patent here; and by the second proviso of section 111, of the act of July 8, 1870, the applicants are entitled to the benefit of this more liberal legislation. Going back, however, to the English patent of Legras, No. 12,869, of 1849, there are found, minutely described, various forms of commodes, portable and otherwise, having mechanical devices for applying a disinfectant to the fecal substances deposited therein. By the arrangement of parts shown in Figs. 6 and 7, the deodorizing compound in the form of a powder is placed in a hopper, and from this it is taken in determinate quantities, as needed, and thrown into the receptacle provided below for holding the excreta. Different devices are shown for effecting the discharge of the disinfectants from the hopper into the general receptacle, but the location of them all is between the two. The reference is so complete an answer to the second claim of the pending application that the wonder is that the claim should ever have been carried beyond the first rejection by the primary examiner.

As to the first claim, it is to be considered that commodes were not new at the time when the invention of the present parties was made, as is to be seen by reference to the Legras patent; that it was a part of the plan of prior inventors to employ in their commodes any disinfectants which might be suited to the purpose, as is also to be seen by reference to the same patent; and that the disinfectant properties of earth were previously well known, as is abundantly shown in "Ure's Dictionary," vol. 2, p. 29, cited by the examiner, as also in the twenty-third chapter of Deuteronomy, to which reference is made by the examiners-in-chief. Under such circumstances there certainly can be no foundation for the claim which applicants now assert. To apply this well known disinfectant to an old purpose, and in so doing to employ an old apparatus specially designed for effecting the application of any disinfectant to the same purpose, contains no element of invention. Applicants lay great stress upon the fact that they bring the earth into a *dry and powdered* condition prior to its use, of the advantage of which they claim that they were the first discoverers. In this, too, they mistake. The whole inference from the passage referred to in "Ure's Dictionary" is, that the deodorizing properties of earth depend upon its dryness and its porosity, or, which is the same thing, its fineness. From the note upon page 154 of the "Bulletin de la Société d'Encouragement pour l'Industrie Nationale, 1818," it appears also that earth has been artificially dried in furnaces in order to perfect its action as a disinfectant. The claim must be rejected.

The third claim relates to a stirrer or mixer, placed in the receiving chamber of the commode, and moved by any appropriate means, for the purpose of thoroughly mixing the earth with the other contents of the chamber. There is no evidence to show that the applicants were not the first to conceive of the advantage of thus mixing the contents of the general receptacle, and the first to invent a mechanism therefor. The idea once reduced to practice, it is plain that various forms of mechanism might be found useful for this purpose. It would seem, therefore, that the protection afforded to the inventors should not be confined to the specific device shown, since their real invention consists, not so much in this particular device, as in the discovery that any device mechanically capable of performing the work can be advantageously applied in the direction indicated. With proper amendments of the body of the specification, and the abandonment of the first and second claims, no good reason appears why the last claim should not be allowed.

As the case now stands, however, the decision of the examiners-in-chief is confirmed, and the application refused.

DUNCAN, Acting Commissioner.

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.

Queries.

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

1.—EXPLANATION WANTED.—I am running an engine lathe, twenty-four inch swing; and a short time ago, I tried to bore a pair of sixteen inch cylinders, and could not do it, as the gearing gave way at every trial. I first used wood (as "steadies" in my boring head, using a 4½ boring bar of wrought iron); and thinking the wood created too much friction, I took them out and took a single cut (not over one sixteenth cut), and still the lathe would not drive it, and I finally had to give it up. I substituted a brass pinion for one gear, and lost a tooth out of it. The lathe is all right again, and today I am turning off a twenty-four inch pulley (using the same gears on the lathe). Now, it seems to me that the lathe should have more to do (the cuts being equal) in turning off a twenty-four inch pulley than in boring a sixteen inch hole. Will some one explain why it requires more power for the bore than the pulley?—K.

2.—ELECTROPLATING.—How can I prepare Britannia metal, tin, and ordinary soft solder, so that they can be electroplated or gilt in a cyanide solution? I cannot get the information from Smee or Napier, but have no doubt that some of your readers can readily describe the desired process.—J. F.

3.—ICE BOAT.—Will some one tell me the dimensions of an ice boat which would carry two medium sized persons?—C. S. M. K.

4.—FIXING LEAD PENCIL MARKS.—I would like a ready way of fixing lead pencil marks to paper.—J. H. R.

5.—JAPANNING.—I wish a recipe for making and using the quickest baking and best Japan.—B. B. C.

6.—MALLEABLE IRON.—Will some one give me practical information how to make malleable cast iron? Or, are there any works explaining the theory?—E. D. P.

7.—SPECTROSCOPE.—I have a hollow glass prism, filled with bisulphide of carbon, two inches on each face. I would like to know what the width and depth of the slit should be, through which the light first passes, what should be the diameter and focal length of the lens in the first tube, and what distance should it be placed from the prism? Also, what power should the telescope be for viewing the spectrum formed, and of what lenses should it be made?—M. T.

8.—MUCILAGE AND INK.—Will some of your readers give me a formula or making mucilage, such as sold by stationers, and also a formula for a good, cheap, black copying ink?—A. S.

9.—CHEAP LATHE.—I would like practical directions for constructing, at the least possible expense, a light lathe of about eight inches swing; as great accuracy is not essential, metal need be employed only where absolutely necessary, as for spindles, bearings, centers, etc. Precise directions, giving dimensions and all other details, would no doubt be welcome to many an amateur mechanic who cannot afford to buy even a cheap lathe, but would at once go in for one if he could only make it himself.—C. M.

10.—NICKEL PLATING.—I wish plain practical directions and formula for nickel plating?—T. D. T.

11.—DYEING COTTON BLACK.—I want to dye soft cotton black, and have no steam. Can I do it and get a good color without steam, and would it be better to use aniline black, or the usual dye stuffs?—H. W.

12.—GILDING ON GLASS.—What is the size used for gilding on glass?—M.

13.—TELESCOPE AND HOROSCOPE.—I wish to know, if, with the addition of one more convex lens of one inch diameter I cannot make a terrestrial telescope from the directions given in No. 18, by A. W. G., of Mich.; and will it change the power? I also wish to know the meaning of tracing the horoscope, and how it is done.—E. T.

14.—EMERY WHEEL.—Can any reader of the SCIENTIFIC AMERICAN tell me how to make solid emery wheels that will not gum nor chip?—T. W. B.

15.—OVERSHOT WHEEL.—I wish a rule, simple and practical, for calculating the power of overshot water wheels, and the means of determining with accuracy the power of water in a flowing stream.—T. W. B.

16.—SPEED OF CIRCULAR SAW.—I want a rule for determining the number of revolutions a circular slitting saw, of any given size should make per minute.—T. W. B.

17.—REFINING GOLD.—Can some one give me any information on refining gold? I melted over some scrap gold leaf, which appeared to be very free from dirt, but after melting, it looked like a lump of tin instead of gold. When we sell it to the gold beater, he melts it over into fine gold.—F. E. H.

18.—BELT.—Can you tell me why a belt runs to the largest part of a pulley? I have asked a number of mechanics for a year past, but they cannot tell why.—F. E. H.

Answers to Correspondents.

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

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

TURNBULL'S BLUE.—With much deference to the undoubted erudition of your correspondent, E. C., of N. J., I must point him to an error into which he has certainly fallen, and into which he is likely to lead J. B., who wants to know how to make "Turnbull's blue." E. C. has given a good formula for the preparation of ordinary Prussian blue (Fe_7Cy_{18}). But to make Turnbull's blue, (Fe_5Cy_{12}), the ferricyanide (red prussiate), and not the ferrocyanide (yellow prussiate) must be used. Also, instead of using the tersulphate of iron, which is a sesqui-salt, the proto-sulphate, or some other proto-salt of iron is absolutely necessary to the production of Turnbull's blue, which differs from common Prussian only by being of a brighter tint. Fownes, or any other chemical authority will furnish further information.—C. L. R. S., of D. C.

POUNDING OF PISTON.—Let E. S. take out the trap and put in a half inch globe valve at each end of the cylinder, and keep them open while the engine is in motion. The trap, while good in theory, is liable to fail in exhausting the water whenever the spring, which lifts the valve, loses its strength or is held down by weight of water. The advantage of the globe valve is, that while but a little steam will escape, it effectually exhausts the water.—H. A. G.

TO KILL BEDBUGS.—Any woman ought to be ashamed to ask for an article to kill bedbugs. No one will be troubled with these pests if they will take the trouble to thoroughly cleanse the bed and room once a month. Bedbugs can stand anything better than cleanliness. The March cleansing is the most fatal to them; it destroys them root and branch. Any one troubled with this "peculiar heathen" who will take the trouble to observe the foregoing method for three or six months, will be entirely relieved of them without fail. If the cleaning be continued at intervals of three months, bedbugs will never appear.—C. A. H., of Mass

TO KILL BEDBUGS.—If "Housekeeper," No. 11, page 346 Vol. XXII., will use benzine or gasoline, she can kill bedbugs as fast as she can find them; and by using a spring bottom oiler, the fluid can be forced into cracks and crevices which can be reached only by this or similar means. I cleaned them out of a room lined and ceiled with matched boards, by it. Housekeeper will have to be careful about fire, and the room should be well ventilated till the gas passes away.—J. M. A.

HONING RAZOR.—P. R. says that in honing his razor, he always gets a rough wire edge. So he ought to have. Always hone until you turn the edge, or you might as well not hone at all. Now to get a smooth cutting edge is what you want. Moisten your thumb nail and draw the edge of the razor back and forth a time or two across the nail. Put it on the coarse side of your strap first. Keep trying it across the nail until you get a smooth edge. You can tell this by its feel; for when smooth, it will seem to cut right in the nail, and no roughness will be felt. Then bring up the edge on the fine side of the strap, with a few strokes on the palm of the hand to finish it. If you once get a smooth edge, and it shaves well, never use any strap but the palm of your hand; and I will guarantee it to keep its edge for months. It is very easy to strap the edge off of a razor by strapping too much. Never wipe your razor on dry paper, or cloth of any kind; it will take the edge off.—H. D. W., of D. C.

MAGIC LANTERN.—Your querist, No. 11, page 282, can construct a magic lantern to meet his requirements, as follows: Use a plain convex lens, 4 inches in diameter, and 8 inches focus; put one double convex lens, 2 inches in diameter, in the focus of the first. The light should be placed three inches from the large lens.—H. W. G., of Mich.

OILING FURNITURE.—In answer to query No. 1, in your issue of May 20, I would state for the information of A. H. that pure linseed oil (raw oil) is used for walnut furniture, applied with a brush. Some prefer, however, the red furniture oil, as it gives the wood a darker appearance. If it is to be finished with copal varnish, the oil should be allowed to dry perfectly; then two or three coats of varnish should be applied for the purpose of filling the pores or grain of the wood. After which the article must be rubbed with fine or worn out sand paper to get a smooth surface. Then apply two or three coats of varnish, and rub down and polish or flow as necessary. Care should be taken to let each coat of varnish get perfectly dry and hard before putting on another.—H. L., of N. Y.

POUNDING OF PISTON.—Your correspondent "S. E." in issue of May 20th, asks what makes his piston pound. I set up an engine once that was troubled with the same difficulty, and afterwards spent a large amount of time and some money in trying to remedy the trouble. The company that made the engine, made the cylinders a little longer, giving more clearance, and consequently more steam room at each end, and we never had any more trouble from that source. Our company was striving to be too economical in cast iron, and also trying to waste as little steam as possible in "cushioning," as it is called, but always afterward gave plenty of clearance to the pistons.—C. H. C.

POUNDING IN STEAM CYLINDER.—S. E. asks "what is the cause of the knocking in the cylinder?" I have known valves in steam closets to knock, and sound as though the trouble were in the cylinder. I suspect, however, that the trouble of which S. E. complains, is that the crank is ahead of the steam pressure at the beginning of the stroke, when the governor valve is hard down, so as not to admit sufficient steam to start the piston in time for the crank. This can be obviated by setting the eccentric ahead. If his engine be of short stroke and large cylinder, and set high from the bed plate, and pounds when the governor valve is up, giving full steam, S. E. may depend on it that the bed plate is too weak.—S. G. D., of Pa.

M. E. Y.—Some medicines appear to operate in a peculiar way upon the retina of the eye. For example: Dr. Rose, of Berlin, has described a sort of color blindness, in respect to blue colors only, produced by taking a dose of santonine. After the effect of the medicine has subsided, the natural power of the eye to distinguish blue returns.

MILLSTONE.—J. A. P. asks "why his new run of millstones will not do more work?" The fact is that the way his stones are dressed brings the grinding circle similar to that of a thirty inch run of stone. A run of 30 inch stones, revolving at the same speed at which he runs his four foot stones, will give the same results. The best way for him to get out of his trouble, is to take the dress entirely out of both stones, and put in the dress used by the best mills in the United States, namely: Begin every land, at the skirt of the stone, from two to three inches wide, and run every land to a point at the pitch or draft line, being sure to give the lands a true wedge taper from skirt to draft line. This, he will notice, gives the furrows about an equal width from skirt to draft line. Crack the stone on line with the back of the land, which will let the cracking run out on a feather edge.—S. G. D., of Pa.

DRILLING GLASS.—If R. A. P., who asks how the holes in large electrical machine plates are drilled, wishes to drill them for himself, he can do so by making an instrument like a fiddle, or bow drill, and using in place of the drill, a piece of brass tube of the required size, then fastening a thin board tightly over the glass, with a hole in it directly over the spot to be drilled, and large enough to let the tube turn freely in it. Then by putting emery and water in the hole, and after working the drill a little while, a hole will be ground through the glass, leaving a round piece in the center, the size of the bore of the tube. A drill can be made of a piece of wood, an inch in diameter or smaller, turned smallest in the center, with another piece fastened to the top, with a screw, for a handle, and the tube driven into the bottom. A bow can be made of wood.—A., of N.Y.

DRILLING GLASS.—I have had occasion for several years to drill holes in glass from the thickness of common plate to that of an inch, and of various sizes, and have always found satisfactory success with a common machinist's drill, lubricated during the process with oil of turpentine. With the drill properly tempered and run at suitable speed, the cutting is done as rapidly as in drilling steel.—J. E. B.

PRESERVING FLOWERS.—Seeing in No. 21, of current volume, that a correspondent wishes to know how to preserve flowers, so as to keep their natural colors, I send the desired information. Take of white wax, paraffin, or any other waxy substance, any desired quantity; place it on the fire, and bring it almost to a boil. Then take the flowers singly, or in bouquets, and plunge them into the melted wax for a moment; take out and drain. I have also seen flowers preserved with their natural color, by immersing in a thin solution of gum arabic. A lady friend of mine has flowers which were preserved by the wax method three years ago, and they have the same natural appearance they had when they were gathered. H. W. B., of N. J.

MILLSTONE.—The trouble with J. A. P.'s millstone is too much draft, which keeps the face of the stones scant of wheat, and they become smooth in a short time. Let him put in 13 quarters in the stone and 3 furrows to each quarter. This will equalize the draft, and his burrs will grind well.—J. F., of Mass.

MILL STONES.—To make a stone grind fast, make the furrows at least ⅜ of an inch wider at the eye than at the skirt of the stone, with the inclined plane uniform the entire length. The furrows should have, as nearly as possible, the same draft, which can be done by increasing the number of quarters with a less number of furrows. Then crack the face very finely, and keep it sharp. After this, increase the motion of the stone.—H. T. S., of Pa.

H. W. G., of Mich.—We know of no American journal specially devoted to astronomy. The *Journal of the Franklin Institute* publishes much interesting astronomical matter.

LEATHERS FOR VISE JAWS.—In your issue of May 27th, C. A. W. asks what to use for securing leather to vise jaws. If he will use beeswax, he will have no difficulty whatever.—T. A., of N.Y.

DISSOLVING MICA.—"M." wishes to know how to dissolve, and hold in solution, mica. Mica, which is essentially a silicate of lime, is, like most other native silicates, entirely insoluble in any menstruum whatever, excepting by decomposition, when of course it is no longer mica, and is not held in solution as such.—C. L. R. S., of D. C.

TO KILL BEDBUGS.—Use a strong alcoholic solution of corrosive sublimate, carefully.—C. L. R. S., of D. C.

T. D. T., of ——.—By consulting catalogues of industrial books, you will find many excellent works on electroplating, which will give you a part of the information you desire. We insert your other question in our query column.

S. W. S. of Ohio.—There is no accepted standard for the threads of bolts in this country. There ought to be, and we have often urged the adoption of such a standard, but our machine shops are each a law unto themselves in this matter as yet. The standard for gas pipes is as follows:

Diameter inside.	Threads to the inch.	Diameter inside.	Threads to the inch.
⅛	27	1	11½
¼	18	1¼	11½
⅜	18	1½	11½
½	14	2	11½
¾	14		

For all diameters above this, 8 threads per inch is the standard.

C., of Ala.—We do not believe copper was ever tempered to be as hard as good steel, although there are historical traditions of a lost art of this kind. To be able to harden copper like steel, might perhaps be of service to modern industry, but we do not see how copper could be advantageously substituted for steel in any of the purposes for which the latter is now used.

B. H. B., of Miss.—Glass water pipes have been tried, but there are many practical difficulties in their use, for domestic service. Your article on the subject is declined with thanks.

S. G. S., of N. Y.—The thing for you to do, if your eyes are giving out, is to apply to a competent oculist for advice, and, if need be, remedies.

BOILS.—I have recently got rid of eleven or twelve troublesome boils by taking a teaspoonful, in water, of the following mixture, before every meal: 2 grains bichloride of mercury, 2 drams iodide of potassium, 2 ounces sirup of sarsaparilla, 2 ounces water. The boils were gone before I had taken half the medicine.—D. B., of N. Y.

Recent American and Foreign Patents.

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

HAY AND COTTON PRESS.—This improvement consists in a combination of T-shaped pawl plates, double racks, levers, etc., designed to inform an improved mechanism for actuating the followers of hay and cotton presses. It can be applied to all presses in which the follower bar works in slots. Invented by Eugene Bock, of Greenvale, N.Y.

CULTIVATOR.—This invention presents a novelty in this class of agricultural implements, namely, that it makes the two outside plows or teeth adjustable as to their distance from each other, the adjustment being made by the operator as desired for varying width of rows of plants, while the cultivator is in motion and use. This is done in the following manner: The two inside plows are attached to the front ends of beams, which are pivoted to the central and principal beam of the cultivator in such a way that they extend obliquely forward. A chain extends from the front end of each of these branch-pivoted beams, at nearly a right angle to, and under, a pulley fixed to the central plow beam, and thence to the front end of the plow handle on the side next the beam. The plow handles are pivoted to upright supports near their middle. When the end of either of the plow handles is depressed by the hand, the other end is raised, pulling the chain and drawing the plow attached to the chain inward toward the central and principal beams; or by depressing both handles at once, the operator may draw both these plows inward, narrowing the width of land cultivated whenever the plants on one or both sides of the cultivator are endangered. As soon as the handles are relieved of pressure, the position of the pivoted beams branching forward and outward obliquely, causes the resistance of the earth to push them outward and take up the chains as fast as the latter are slackened. This ingenious device is the invention of Leander Walker, of Victoria, Texas.

MEAT SAFE.—August Knoche, St. Louis, Mo.—This invention provides for constant circulation of air through meat safes, the ventilation secured enabling the meat to be longer kept in good condition. The safe is made preferably square in its horizontal section, and of any suitable hight. The air enters a perforated side of a lower chamber, protected from flies by gauze, and, passing out through a perforated side opposite the first, ascends a flue to the perforated side of an upper chamber, thence through this side, and across the upper chamber; and through another perforated side into a flue which extends up to, and over the top of the upper chamber, and opens into a chimney or funnel communicating with the external atmosphere. The flues are made the entire width of the safe.

FOLDING SETTEE.—This is made with cross-legs, pivoted together, like the folding seats and chairs now in use; but the inventors have added an improvement, consisting in hinging the back to the back rail, upon which the canvas, leather, or other flexible seat is nailed. Strap braces extend from the ends of the front seat rail to the tops of the side posts of the back, and, when attached, hold the back at the proper angle with the seat for comfort; but when released, the back may be folded down, and the whole settee so folded together as to occupy very little space, a great desideratum in settees used in public halls, churches, etc. Invented by William C. Adams and William B. Mahew, of West Tisbury, Mass.

SPRING BED BOTTOM.—A rectangular frame supports a long spring bar on each side of the bed; to the middle of each of these bars is bolted a plate, under which the ends of two inclined spring bars are inserted, their inclination being adjusted by wedge-shaped blocks placed under them, near the lower ends, and resting on the first named bars. Cross bars connect these inclined bars at each end of the bed, and on them longitudinal spring slats are placed, to support the mattress. A slat frame is pivoted to the supporting upper frame thus formed, the frame extending from the pivots toward the head of the bed, and occupying a space somewhat more than one third that of the principal frame. This is inclined and held at any desired angle by braces, so as to raise the upper end of the bed higher than the foot. Invented by Manasseh W. Farber, of Mount Pleasant, Iowa.

WASHING MACHINE.—This is the invention of William C. Marr and Joseph S. Maughlin, of Onawa City, Iowa. It consists in a hollow drum, made by joining two disks with cross bars, with spaces between them. Every alternate bar projects inwardly. The drum has a door in the side for putting in and taking out the clothes, and on one of the disks is formed a rubbing surface, to be used for hand rubbing when requisite. The drum is made for attachment to common washtubs, by means of suitable devices. It is turned by a crank, and the agitation of the water through the openings and through the clothing cleanses without rubbing the goods to be washed.

APPARATUS FOR UNLOADING HAY.—Alexander Smith, Hoosick Four Corners, N. Y.—This invention consists essentially of a sling, of canvas or other material, which is to be spread over the wagon rack before the hay is loaded, to be hoisted by derricks. The sling is made of two triangular pieces of the material used, the lower bases of which triangles are joined to wood bars, so arranged that they can be hinged together, and unhinged when the load is raised so as to dump it on the mow or stack. The sling is patented by itself, and also in combination with other devices for carrying the load to the desired point where it is desired to dump it, etc.

FLAX THRASHING AND SEPARATING MACHINE.—This is the invention of James Boyce, of Muncie, Ind. Two or more pairs of rollers, with spiral grooves, are employed to crush the bolls of the flax, one roller in each pair being made to travel faster than the other, by suitable gearing, so that a rubbing as well as crushing action is obtained; and each succeeding pair runs at higher speed than the preceding pair, so that the flax is drawn out and spread, in order to subject all the bolls to crushing and rubbing. The reversed spiral flutes also give a sort of shearing motion, which assists to crush and break the bolls to pieces. A supplementary roller for crushing such bolls as escape the action of the other rollers, and an attachment of shaking riddles and a fan blower, complete the combination.

HYDROCARBON VAPOR BURNER.—This burner is designed for the consumption of naphtha. From a suitable cap, to attach the same to a lamp or a gas burner, rise metal tubes for wicks (the inventor prefers three of these tubes). The wicks lead to a cap at the top, provided with an apparatus for conducting the heat downward to the wicks, and generating the vapor. A peculiar arrangement of orifices is also claimed in the patent, by which, the inventor states, a better illuminating effect is obtained. Invented by William E. Bartlett, of Newburg, N.Y.

HAY RAKE.—This improvements consists in a new method of raising the rake head and rake frame, by a new combination of well known devices. J. George Lockwood, West Davenport, N.Y.

SHARPENING HORSESHOE CALKS.—A heavy pedestal supports a jointed frame, with a system of gearing belts and pulleys which, by the turning of a winch, drives a small emery wheel. The machine is set near a horse, whose foot being raised, the calks are held on the wheel and sharpened, while an assistant turns the winch. Patented by Geo. W. Lane, of Chichester, N.H.

RIDING PLOW.—Benaiah C. Hoyt, Fort Atkinson, Wis.—This invention consists of improvements upon a former invention, patented by the same inventor, September 2, 1856. The plow is one upon which the operator rides. The action of the mold board is supplemented by a complementary concave disk, which formerly turned on a fixed pivot, but in this instance is attached to a shaft which revolves. The machine is easily adjusted for running on level ground, or when a wheel runs in the furrow, maintaining the plow in either case in its proper vertical position. Other improvements provide for increased durability in parts, which have hitherto been subjected to great wear.

FOLDER AND TUCKER.—Thomas Manchester Farrand, Skowhegan, Me.—This is a neat, and apparently very efficient device for folding tucks in shirt bosoms and the like, which cannot be explained without diagrams. It is attached to the table of sewing machines by a clamp screw, in the ordinary way; it occupies but little space, and its design is very neat.

CLOTHES CLAMP.—This is a clasp of non-corrosive wire, bent something in the form of a twisted W, which, when sprung upon a clothes line, gripes it with considerable force. It is a cheap substitute for other devices hitherto used for the same purpose. Invented by Christian L. Poorman, Bellaire, Ohio.

MACHINE OYSTER SHUCKER.—George Holtzman, Baltimore, Md.—This invention relates to a machine that is provided with a socket and jaw for crushing the points or jaws of oyster shells while still closed; and with a rest and spring holder to support the oyster after the point of the shell has been thus crushed, and a sliding knife for opening the shell while thus supported; and with a blade connected with a standard by a universal joint for cutting the oyster out of the shell after it has been thus opened.

SPINNING HEAD.—John W. Chappell, Berlin, Mich.—The object of this invention is to dispense entirely with condensers and jacks, which is accomplished by combining the spinning head, carding cylinder, and winding spool in a novel and peculiar manner.

SEWING MACHINE MOTOR.—D. A. Constable, and John F. Riggs, St. Joseph, Mo.—This invention has for its object to either accelerate or retard the speed of a sewing machine motor, by means of blades hinged to radial arms, which project from a hub that is driven by the motor, the retardation of the speed of the latter being effected by opening the blades so as to cause them to present more of their surface to the air, and thus produce a greater resistance, and the acceleration of speed being effected by closing the blades so as to diminish that part of their surface against which the air acts.

Official List of Patents.

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FOR THE WEEK ENDING MAY 30, 1871.

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115,264.—BOBBINS.—J. Adams, W. A. Tolman, Richmond, Ind.
115,265.—FIREPLACE FENDER.—C. C. Algeo, Pittsburgh, Pa.
115,266.—CAR STARTER.—Arthur Amory, New York city.
115,267.—NAIL MACHINE.—Daniel Armstrong, Chicago, Ill.
115,268.—SCALE.—S.C.Baker, Altoona, J.Root, J.Case, York, Pa.
115,269.—HAND STEREOSCOPE.—A. Beckers, New York city.
115,270.—HOT AIR FURNACE.—J.M. Blackman, Decorah, Iowa.
115,271.—SPINNING MULE.—Wm. Bond, Windsorville, Conn.
115,272.—WASHING MACHINE.—Nathan Booth, Cheshire, Ct.
115,273.—CLAMP FOR THILL COUPLING.—W. Boyd, Hartford, Ct.
115,274.—PULP MACHINE.—James Bridge, Augusta, Me.
115,275.—VISE.—H. V. Brown, Warren, Ill.
115,276.—WASHING MACHINE.—J. Brown, W. Manchester, O.
115,277.—GLOVE.—R. D. Burr, Kingsborough, N. Y.
115,278.—ENAMELED METAL.—G.A.Burrough, Providence, R.I.
115,279.—CONVERTER.—Henry Chisholm, Cleveland, Ohio.
115,280.—TRACTION ENGINE.—J.H.Clapham, New York city.
115,281.—BENDING METAL.—W. and H. Cooley, Toronto, Can.
115,282.—HEMMER.—D. H. Darby, Mendon, Ill.
115,283.—FLASK.—H. W. Dee, London, England.
115,284.—GRAIN BINDER.—C.G.Dickinson, Poughkeepsie, N.Y
115,285.—SURGICAL INSTRUMENT.—E. Dithridge, Pittsburgh.
115,286.—KEYED INSTRUMENT.—H. Downes, New York city.
115,287.—MATRICE.—R. E. Draper, Sacramento, Cal.
115,288.—WORK HOLDER.—H. Eddy, N. Bridgewater, Mass.
115,289.—URN STAND.—W. J. Evans, New York city.
115,290.—LATHE SPINDLE.—L. R. Faught, Philadelphia, Pa.
115,291.—DIE STOCK.—L. R. Faught, Philadelphia, Pa.
115,292.—HOISTING APPARATUS.—R.L. Fitch, Sing Sing, N.Y
115,293.—POLISHING ORE.—I. W. Forbes, La Porte, Ind.
115,294.—PULVERIZED ORE.—I. W. Forbes, La Porte, Ind.
115,295.—STAMP BATTERY.—I. W. Forbes, La Porte, Ind.
115,296.—VALVE.—I. W. Forbes, La Porte, Ind.
115,297.—VALVE.—I. W. Forbes, La Porte, Ind.
115,298.—VALVE.—I. W. Forbes, La Porte, Ind.
115,299.—VALVE.—I. W. Forbes, La Porte, Ind.
115,300.—VALVE GEAR.—I. W. Forbes, La Porte, Ind.
115,301.—STEAM ENGINE.—I. W. Forbes, La Porte, Ind.
115,302.—COFFEE ROASTER.—J. Galloway, Webster, Ill.
115,303.—STEAM TRAP.—I. E. Giddings, Springfield, Mass.
115,304.—STANCHION.—W. C. Gifford, Jamestown, N. Y.
115,305.—BLASTING FURNACE.—L. S. Goodrich, Waverly, Ten
115,306.—PACKING BOX.—A. Gregg, Watertown, Mich.
115,307.—WHIFFLETREE.—A. J. Griggs, Pittsburgh, Pa.
115,308.—SOLDERING APPARATUS.—J. Gulden, Keyport, N.J.
115,309.—WIRE ROPE.—A. S. Hallidie, San Francisco, Cal.
115,310.—WIRE ROPE.—A. S. Hallidie, San Francisco, Cal.
115,311.—HORSESHOE.—W. H. Halsey, Philadelphia, Pa.
115,312.—CREASING LEATHER.—B. R. Hamilton, South Deerfield, and S. Swan, Conway, Mass.
115,313.—TURPENTINE BOX.—W. B. Hamilton, N. Orleans, La.
115,314.—TELEGRAPH REPEATER.—C.H.Haskins, Chicago, Ill.
115,315.—LAMP BURNER.—H. W. Hayden, Waterbury, Conn.
115,316.—HUB.—P. Heoter, R. Vietor, Grand Rapids, Mich.
115,317.—WAGON AXLE.—J.H. and P. Hermann, Tell City, Ind.
115,318.—TRIGONOMETRICAL APPARATUS.—E. A. Hickman, Independence, Mo.
115,319.—ANIMAL POKE.—James Hopkins, Akron, Ohio.
115,320.—WASH BOILER.—M. L. Horton, Windsor, Vt.
115,321.—DUMPING CART.—J. B. Hulbert, Hermon, N. Y.
115,322.—STOVE LEG.—H. A. Humphrey, Milwaukee, Wis.
115,323.—CHURN DASHER.—W. F. Jones, Easton, Kansas.
115,324.—CHUCK.—Wm. Kerr, Jr., Boston, Mass.
115,325.—WASHING MACHINE.—B. Kinne, Syracuse, N. Y.
115,326.—GLASS JAR.—W. M. Kirchner, Pittsburgh, Pa.
115,327.—DIGESTER.—W. F. Ladd, New York city.
115,328.—HAND SAW.—O. H. Langdon, Homer, N. Y.
115,329.—LAMP.—H. H. Laughlin, Philadelphia Pa
115,330.—CATCH.—G. C. Lawton, Algona, Iowa.
115,331.—FLOUR BOLT.—F. B. Lewis, Tiffin, Ohio.
115,332.—MUSIC STOOL.—J. R. Lomas, New Haven, Conn.
115,333.—SLIDING DOOR.—T. M. Lyons, New York city.
115,334.—EXHAUST.—P. W. Mackenzie, Blauveltville, N. Y.
115,335.—ELEVATOR.—John Macomb, Chicago, Ill.
115,336.—BAG TIE.—C.P. and W.H.Markham, Rogersville, N.Y
115,337.—CENTERING MACHINE.—E. McNiel, Groton, N. Y.
115,338.—BOILER.—F. Meyer, New York city.
115,339.—VENTILATOR.—B. F. Miller, New York city.
115,340.—EAVES TROUGH.—R. B. Miller, Utica, N. Y.
115,341.—LOCK FOR SASHES.—W. Miller, Boston, Mass.
115,342.—LUBRICATOR.—A. Millochau, New York city.
115,343.—CAR TRUCK.—G. F. Morse, Portland, Me.
115,344.—DRAINER.—P. W. Neefus, New York city.
115,345.—DOOR MAT.—P. W. Neefus, New York city.
115,346.—HORSE COLLAR.—James Nellis, Ypsilanti, Mich.
115,347.—TASSEL.—James Norman, Brooklyn, N. Y.
115,348.—GROOVING MACHINE.—H. J. Noyes, Ashtabula, O
115,349.—LETTER BOARD.—J. H. Palm, Mansfield, Ohio.
115,350.—VAPOR BURNER.—G. T. Parry, Philadelphia, Pa.
115,351.—WATCH.—E. H. Perry, Boston, Mass.
115,352.—GARDEN IMPLEMENT.—A. A. Porter, Griffin, Ga.
115,353.—WASH BOILER.—C. W. Powell, Yalesville, Conn.
115,354.—WIRE FASTENING.—H. W. Putnam, Bennington, Vt.
115,355.—WASHING MACHINE.—L. Putnam, Worcester, Mass.
115,356.—TELEGRAPH RELAY.—C. Rathbone, Albany, N. Y.
115,357.—BAGATELLE.—M. Redgrave, Cincinnati, Ohio.
115,358.—PINCH BAR.—Abram Reese, Pittsburgh, Pa.
115,359.—STOVE.—H. R. Remsen, Newtonville, N. Y.
115,360.—BOAT DETACHING.—I. A. Richards, Middletown, Ct.
115,361.—FREEZER.—Moritz Rosenstein, Boston, Mass.
115,362.—WATER WHEEL.—R. R. Royer, Ephratah, Pa.
115,363.—TOBACCO PIPE.—W. G. Ruge, Holstein, Mo.

115,364.—Fastening.—A. P. Seymour, Hecla Works, N. Y.
115,365.—Hydraulic Disk.—T. Shaw, Philadelphia, Pa.
115,366.—Wagon Gearing.—J. Shoulder, Scottsville, N. Y.
115,367.—Removing Sediment.—A. J. Simmons, Indianapolis, Ind.
115,368.—Gage.—D. W. Simmons, Lynn, Mass.
115,369.—Carbureting.—Byron Sloper, St. Louis, Mo.
115,370.—Shot Gun.—Dexter Smith, Springfield, Ill.
115,371.—Bedstead.—George Smith, Stratford, Canada.
115,372.—Wringer.—H. E. Smith, New York city.
115,373.—Igniting Gas.—W. H. Smith, New York city.
115,374.—Fly Net.—William Sohier, Boston, Mass.
115,375.—Drying Paper.—W. H. Soley, Philadelphia, Pa.
115,376.—Harvester.—J. Souder and E. Miller, Litiz, Pa.
115,377.—Mold.—Carl Stadelmann, Pittsburgh, Pa.
115,378.—Extracting Tar.—J. D. Stanley, Baltimore, Md.
115,379.—Sewing Machine.—D. E. Stearns, Berea, Ohio.
115,380.—Paddle Wheel.—J. M. Story, Cincinnati, Ohio.
115,381.—Envelope Machine.—H. D. and D. W. Swift, Worcester, Mass.
115,382.—Envelope Machine.—H. D. and D. W. Swift, Worcester, Mass.
115,383.—Desk.—L. and W. F. Sylla, Elgin, Ill.
115,384.—Polishing Stick.—G. C. Taft, Worcester, Mass.
115,385.—Lantern.—A. E, Taylor, New Britain, Conn.
115,386.—Life Preserver.—B. W. Taylor, Henderson, Ky.
115,387.—Breaking Hemp.—T. Tebow, Lexington, Ky.
115,388.—Bagging.—Theodore Tebow, Lexington, Ky.
115,389.—Water Wheel.—W. J. Thompson, Springfield, Mo.
115,390.—Stirring Malt.—W. Toepfer, Milwaukee, Wis.
115,391.—Printing Press.—W. H. R. Toye, Philadelphia, Pa.
115,392.—Steam Heater.—C. W. Trotter, Rochester, N. Y.
115,393.—Bobbin Winder.—J. W. Vaughan, New York city.
115,394.—Car Coupling.—J. B. Vedder, Gloversville, N. Y.
115,395.—Boiling Sugar, etc.—I. Vest, New Iberia, La.
115,396.—Wagon Jack.—J. Wagner, Lancaster Co., Pa.
115,397.—Smut Machine.—T. Wallace, Chicago, G. W. Hyde, Joliet, Ill.
115,398.—Vapor Burner.—T. Ward, Columbus, O., H. C. Hunt, Chicago, Ill.
115,399.—Carpet Sweeper.—O. H. Weed, Boston, Mass.
115,400.—Steam Engine.—P. L. Weimer, Lebanon, Pa.
115,401 —Planing Machine.—S. Whitesides, De Pere, Wis.
115,402.—Curtain Fixture.—W. C. Wilcox, Waltham, Ms.
115,403.—Stop Motion. P. Wilson, J. Hunter, Manchester, N.H.
115,404.—Furniture.—W. H. Windsor, Little Rock, Ark.
115,405.—Horseshoe Calks.—E. D. Withers, Parkton, Md.
115,406.—Movement.—Jacob Woolf, Burr Oak, Mich.
115,407.—Worm Remedy.—A. E. Wright, Hamlin, N. Y.
115,408.—Table Sink.—John Wylie, Bethel, Conn.
115,409.—Ice.—Albert Albertson, Jersey City, N. J.
115,410.—Adjuster.—S. A. Alexander, Sunbury, Pa.
115,411.—Harvester. A. Anderson, L. Johnston, London, Can.
115,412.—Flour Bolt.—E. D. Auchey, Manheim, Pa.
115,413.—Spiral Spring.—T. Baggott, Baltimore, Md.
115,414.—Sand Papering.—J. Barker, Chicago. Ill.
115,415.—Pruning Shears.—A. Barling, West Chester, Pa.
115,416.—Wash Board.—H. H. Bellows, Brooklyn, N. Y.
115,417.—Refining Sugar.—R. W. Bender, Boston, Mass.
115,418.—Balance.—G. W. Bishop, Saratoga Springs, N. Y.
115,419.—Scale.—William Black, Baltimore, Md.
115,420.—Gage.—R. C. Blake, Cincinnati, Ohio.
115,421.—Spike Extractor.—J. A. Bogert, Jersey City, N.J.
115,422.—Boots.—A. O. Bourn, Providence, R. I.
115,423.—Steam Heater.—Noah Bowen, Columbus, Ohio.
115,424.—Axle.—A. J. Bower, Albion, Ill.
115,425.—Propeller.—R. B. Boyman, London, England.
115,426.—Sinker Wheel.—H. C. Bradford, Providence, R. I.
115,427.—Corn Cultivator.—G. D. Brown, Lebanon, Ill
115,428.—Transposing Board.—J. M. Bruner, Roanoke, Ohio.
115,429.—Turpentine.—C. J. T. Burcey, Black Rock, Conn.
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115,432.—Rivet.—W. Butterfield, Boston, Mass.
115,433.—Car Coupling.—W. Callow, J., Baltimore, Md.
115,434.—Propeller.—W. D. Chapman, Theresa, N. Y.
115,435.—Spinning Head.—J. W. Chappell, Berlin, Mich.
115,436.—Motor.—D. A. Constable, J. F. Riggs, St. Joseph, Mo.
115,437.—Cooking Apparatus.—J. G. Cooey, St. John, Canada.
115,438.—Surface Gage.—W. F. Cornell, Adrian, Mich.
115,439.—Drawhead.—D. P. Cory, J. Crane, Jr., Crawford, N.J.
115,440.—Renovator.—B. F. Cramer, Tyrone, Pa.
115'441.—Saw.—T. C. Craven, Philadelphia, Pa.
115,442.—Drop Lights.—J. Cunningham, W. Meriden, Conn.
115,443.—Rolling Leather.—J. G. Curtis, Warren, Pa.
115,444.—Furnace.—M. A. Cushing, Aurora, Ill.
115,445.—Lock.—G. L. Damon, Cambridge, Mass.
115,446.—Seasoning Wood.—E. Davee, Marshall, Ill.
115,447.—Gas Joint.—C. Deavs, New York city.
115,448.—Latch.—J. L. Devol, Parkersburg, West Va.
115,449.—Axle Box.—D. H. Dotterer, Philadelphia, Pa.
115,450.—Tackle Block.—E. Doty, Janesville, Wis.
115,451.—Tapping Nuts.—J. N. Durrell, Dunkirk, N. Y.
115,452.—Driven Well.—J. Edson, Boston, Mass.
115,453.—Wagon Coupling.—A. Fassett, Sterling, Ill.
115,454.—Wagon Seat.—A. Fassett, Sterling, Ill.
115,455.—Watch Case.—W. Fenimore, Philadelphia, Pa.
115,456.—Show Stand.—W. Fisher, New York city.
115,457.—Wood Pavement.—M. Flanigan, Detroit, Mich.
115,458.—Lamp Chimney.—S. W. Fowler, Brooklyn, N. Y.
115,459.—Cultivator.—C. Furst, Chicago, Ill.
115,460.—Medical Compound.—G. H. Goltry, F. W. Hogarth, Port Allegheny, Pa.
115,461.—Dryer.—F. W. Goodale, J. J. Brennan, Danbury, Conn.
115,463.—Packing.—A. H. Hall, T. Locher, Sacramento, Cal.
115,464.—Alarm Baton.—J. F. Haskins, Fitchburg, Mass.
115,465.—Reeling Machine.—W. P. Hatch, Lincoln Center, Me.
115,466.—Lamp Burner.—H. W. Hayden, Waterbury, Conn.
115,467.—Coffeepot.—J. Heberling, Mt. Pleasant, Ohio.
115,468.—Cooling Beer.—J. M. Heiss, Baltimore, Md.
115,469.—Thread Cutter.—J. J. Henry, Baltimore, Md.
115,470.—Railway Switch.—B. Hinkley, Troy, N. Y.
115,471.—Roof.—I. Hodgson, W. H. Brown, Indianapolis, Ind.
115,472.—Ceiling.—I. Hodgson, W. H. Brown, Indianapolis.
115,473.—Leather.—J. Hodskinson, Salem, Mass.
115,474.—Oyster Shucker.—G. Holtzmann, Baltimore, Md.
115,475.—Pavement.—W. W. Hubbell, Philadelphia, Pa.
115,476.—Stove.—J. G. Hunt, Cincinnati, Ohio.
115,477.—Steam Heater.—A. L. Ide, Springfield, Ill.
115,478.—Valve Motion.—S. Ingersoll, Brooklyn, N. Y.
115,479.—Safe.—G. H. Ireland, Somerville, Mass.
115,480.—Cutting Nails.—C. F. Johnson, Jr., Owego, N. Y.
115,481.—Clock.—G. A. Jones, New York, H. H. Warner, Bristol, Conn.
115,482.—Grate Bar.—J. Jones, Rochester, N. Y.
115,483.—Firearm.—B. F. Joslyn, New York city.
115,484.—Staining Wood.—J. M. Keller, Evansville, Ind.
115,485.—Bedstead.—M. Lally, East Palestine, Ohio.
115,486.—Washing Coal.—G. Lander, New York city.
115,487.—Skate.—B. M. Lank, Oswego, Kan.
115,488.—Comb and Brush.—T. Lanston, Washington, D. C.
115,489.—Photograph.—W. A. Leggo, Montreal, Canada.
115,490.—Mold.—W. A. Leggo, Montreal, Canada.
115,491.—Wringer.—J. Makechney, Trenton, N. J.
115,492.—Head Block.—H. R. Martin, Hillsborough, N. H.
115,493.—Boots.—W. May, Binghamton, N. Y.
115,494.—Cabinet.—H. W. McAllister, Chicago, Ill.
115,495.—Fire Plug.—J. McClelland, Washington, D C.
115,496.—Churn Dasher.—J. W. McClure, St. Louis, Mo.
115,497.—Wheel.—J. McCreey, Springfield, Ill.
115,498.—Cartridge.—I. M. Millbank, Greenfield Hill, Conn.
115,499.—Saw Frame.—H. S. Miller, Philadelphia, Pa.
115,500.—Saw Frame.—H. S. Miller, Philadelphia, Pa.
115,501.—Indicator.—F. Millward, Cincinnati, Ohio.
115,502.—Ordnance.—A. Moncrieff, Culfargie, Scotland.
115,503.—Rock Drill.—D. Morrison, Portland, Me.
115,504.—Felly Plate.—F. B. Morse, Plantsville, Conn.
115,505.—Distributer.—J. A. Morton, New Orleans, La.
115,506.—Gas Burner.—H. B. Meyer, Philadelphia, Pa.
115,507.—Car Coupling.—W. Nichols, Centralia, Ill.
115,508.—Loom.—A. Nimmo, Philadelphia, Pa.
115,509.—Hinge.—E. D. Norton, Cuba, N. Y.
115,510.—Car Chair.—W. Palmer, New York city.
115,511.—Napkin.—E. Parrish, Philadelphia, Pa.
115,512.—Vermin Compound.—A. E. Pearl, Mansfield, Conn.
115,513.—Buckle.—J. Peckham, New Haven, Conn.
115,514.—Dumping Car.—A. Peteler, New Brighton, N. Y.
115,515.—Grate.—J. F. Phelps, Huntsville, Ind.
115,516.—Sewing Machine.—D. T. Pittenger, Trenton, N. J.
115,517.—Car Coupling.—A. Porter, Irving, Ill.
115,518.—Electromagnetic Machine.—J. W. Powell, New York city.
115,519.—Galvanic Battery.—J. W. Powell, New York city.
115,520.—Horshoe Machine.—D. L. Pruner, Bellefonte, Pa.
115,521.—Insulator.—H. Read, Jersey City, N. J.
115,522.—Car Coupling.—W. Rickards, Jr., Franklin, Pa.
115,523.—Grain Drill.—J. L. Riter, Brownsville, Ind.
115,524.—Lamp Wick.—H. T. Robbins, Hyde Park, Mass.
115,525.—Harrow.—Wm. E. Robbins and George Enderton, Sterling, Ill.
115,526.—Cultivator.—C. F. Ruggles, Henderson, Ky.
115,527.—Lamp Shade.—Edward Russell, Waterbury, Conn.
115,528.—Lamp.—Marks Samuels, San Francisco, Cal.
115,529.—Needle Wrapper.—C. Schleicher, Schœnthal, Prus.
115,530.—Pitching Casks, etc.—L. Schulze, Baltimore, Md.
115,531.—Tree Box.—E. O. Schwagerl, St. Louis, Mo.
115,532.—Ax Handle.—J. M. Sears, Vandalia, Ill.
115,533.—Car Heater.—Joseph Shackleton, Rahway, N. J.
115,534.—Shade Roller.—C. D. Shrieves, Philadelphia, Pa.
115,535.—Buckle.—E. A. Smith, D. L. Smith, Waterbury, Conn.
115,536.—Burial Case.—E. T. Smith, J. S. Winston, New York.
115,537.—Plow.—G. M. Smith, Pittsburgh, Ind.
115,538.—Gang Saw Mill.—H. F. Snyder, Williamsport, Pa.
115,539.—Car Seat. C. Stevenbanks, J. Quinn, Wilmington, Del.
115,540.—Stove Leg.—D. Stuart, L. Bridge, Philadelphia, Pa.
115,541.—Auger.—James Swan, Seymour, Conn.
115,542.—Document Case.—C. S. Trevitt, Washington, D. C.
115,543.—Subsoil Plow.—R. Themar, Brand Brothers, Sheboygan, Wis.
115,544.—Clothes Line Housing. A. Turnbull, New Britain, Ct.
115,545.—Weather Strip.—A. M. Ulmer, Philadelphia, Pa.
115,546.—Firearm.—F. Von Martini, Frauenfeld, Switzerland.
115,547.—Diarrhea Medicine. R. A. Walton, Shawneetown, Ill.
115,548.—Cartridge.—C. S. Wells, Springfield, Mass.
115,549.—Axle Gage.—D. C. Wetsell, Carrolltown, Pa.
115,550.—Bracket.—J. M. Whiting, Providence, R. I.
115,551.—Water Wheel.—T. Whitmore, Waterloo, Iowa.
115,552.—Churn.—J. B. Williams, Glastenbury, Conn.
115,553.—Seed Drill.—G. W. Millner, Charlottetown, P.E.I.
115,554.—Photograph Paper.—J. L. Winner, Elizabeth N.C.

REISSUES.

4,399.—Evaporating Brine.—S. D. Gilson, Syracuse, N.Y.—Patent No. 108,701, dated Oct. 25, 1870.
4,400.—Printing Press.—R. M. Hoe, S. D. Tucker, New York city.—Patent No. 84,627, dated Dec. 1, 1868.
4,401.—Radiator.—Wm. Steffe, Philadelphia, Pa.—Patent No. 80,883, dated Aug. 11, 1868.
4,402.—Stencil Plate.—E. L. Tarbox, New York city.—Patent No. 8 ,032, dated Aug. 11, 1868.
4,403.—Division A.—Tap for Oil Packages.—A. Warth, Stapleton, N.Y.—Patent No. 110,612, dated Dec. 27, 1870.
4,404.—Division B.—Tap for Oil Packages.—A. Warth, Stapleton, N.Y.—Patent No. 110,612, dated Dec. 27, 1870.
4,405.—Crib for Horses.—Henry Eddy, North Bridgewater, Mass.—Patent No. 36,297, dated Aug. 26, 1862.
4,406.—Washer.—J. H. Gridley, Washington, D. C.—Patent No 62,488, dated Feb. 26, 1867; reissue No. 4,354, dated Apr. 25, 1871.
4,407.—Channeling Rock.—E. G. Lamson, Shelburne Falls, Mass.—Patent No. 58,435, dated Oct. 2, 1866; reissue No. 3,366, dated April 13, 1869.
4,408.—Adjustable Dasher for Vehicles.—G. M. Peters, Columbus, Ohio.—Patent No. 102,315, dated April 26, 1870.
4,409.—Circular Saw Mill.—S. R. Smith, Cincinnati, O.—Patent No. 16,454, dated Jan. 20, 1857; extended 7 years.
4,410.—Railroad Turn Table.—A. J. Wight, W. L. Meeker, Newark, N.J.—Patent No. 104,388, dated June 14, 1870.

DESIGNS.

4,942.—Clock Front.—John A. Batchelor, New York city.
4,943.—Carpet Pattern.—R. Charlton, Liversedge, Eng.
4,944.—Carpet Pattern.—John Fisher, Enfield, Conn.
4,945.—Chain Pump.—Henry L. Fry, Cincinnati, Ohio.
4,946.—Showcase.—W. H. Grove, Philadelphia, Pa.
4,947.—Stove.—L. W. Harwood, Troy, N.Y.
4,948.—Clock Case Sash.—Elias Ingraham, Bristol, Conn.
4,949.—Bellows.—Alfred F. Jones, New York city.
4,950 to 4,952.—Carpet Pattern.—W. Kerr, Philadelphia, Pa.
4,953.—Oven Shovel.—Thomas Lyons, Hartford, Conn.
4,954.—Fruit Can.—John F. Merrill, Cincinnati, Ohio.
4,955.—Bed Quilt.—John U. Nef, Housatonic, Mass.
4,956.—Carpet Pattern.—John H. Smith, Enfield, Conn.
4,957.—Cellular Fabric.—Thomas Dolan, Philadelphia, Pa.
4,958 to 4,961.—Iron Mantel.—C. B. Evans, J. Carlisle, G. H. Burrows, Cincinnati, Ohio.
4,962.—Bracket.—H. Gilson, C. F. Southwick, Nashua, N.H.
4,963.—Center Piece in Ceilings.—E. Goutink, Detroit, Mich.
4,964.—Weatherboarding.—Jacob Jacoby, Johnstown, Pa.
4,965, 4,966.—Center Piece.—S. Kellett, San Francisco, Cal.
4,967.—Claw Bar.—John McMahon, Wooster, Ohio.
4,968.—Floor Cloth Pattern. V. E. Meyer, Lansingburg, N.Y.
4,969.—Spade.—Harrison Parkman, Philadelphia, Pa.

TRADE-MARKS.

290.—Flour.—S. H. Anderson & Co., Palmyra, Mo.
291.—Twist Tobacco.—R. W. Cameron & Co., New York city.
292.—Kerosene.—R. W. Cameron & Co., New York city.
293.—Fertilizer.—Charleston Mining and Manufacturing Co., Philadelphia, Pa.
294.—Carpet Lining.—George W. Chipman, Boston, Mass.
295.—Stove.—Comstock, Castle & Co., Quincy, Ill.
296, 297.—Furnishing Goods.—Fisk, Clark & Flagg, New York.
298.—Garter.—Amasa H. Pike, Somerville, Mass.
299, 300.—Razor.—Robert J. Roberts, New York city.
301.—Whisky.—Seltzer & Miller, Philadelphia, Pa.
302 to 304.—Ax. Douglas Ax Manufacturing Co., Douglas, Mass.
305.—Soap.—Charles E. Willetts, Chicago, Ill.

Inventions Patented in England by Americans.

May 9 to May 15, 1871, inclusive.

[Compiled from the Commissioners of Patents' Journal.

Cleansing Fabrics.—E. Bacon, New York city.
Cofferdam.—J. E. Walsh, New York city.
Cultivator.—M. Johnson, Three Rivers, Mich.
Fare Collecter.—J. B. Slawson, New York city.
Fertilizer.—G. T. Lewis, Philadelphia, Pa.
Governor.—R. K. Huntoon, Mass.
Mirror.—Florence Manufacturing Co., Florence, Mass.
Self-raising Flour.—G. Gray, Boston, Mass.
Traction Engine.—A. Campbell, R. Clark, Sacramento, Cal.
Weighing Machine.—F. A. & C. B. Allen, Mansfield, Pa.

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Cultivator.—Charles H. Sayre, of Utica, N.Y., has petitioned for an extension of the above patent. Day of hearing, August 9, 1871.

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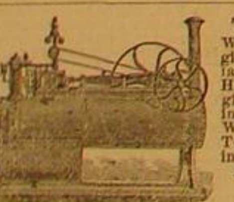

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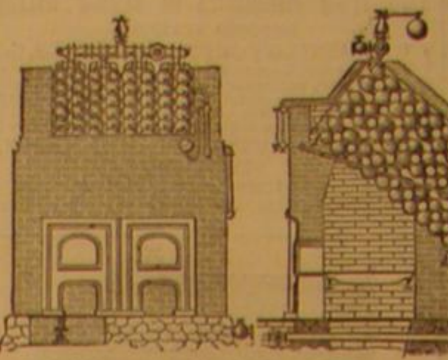

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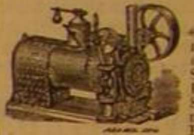

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