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IMPROVED SHINGLE AND HEADING MACHINERY.

We illustrate herewith three improved machines for shingle manufacture, which, though they have been before the public for several years, have, during the period since their introduction, been made the subject of numerous improvements, so that, at the present time, they are now offered in highly perfected form.

Fig. 1 represents Evarts' patent twelve block rotary shingle machine. Upon each of two sides of a frame, about seven feet square, is placed an upright shaft. These shafts each carry a horizontal saw, and above the saws a circular carriage, some eight feet in diameter, is mounted. The carriage is divided into twelve spaces, into each of which a block, to be cut into shingles, is placed while the carriage is in motion, new blocks being supplied as fast as the first ones are cut up by the saws. It is stated that twenty thousand shingles per hour can thus be made. The carriage is driven by two friction rollers, which cause a uniform and steady feed, and prevent back lash. The motion is positive and continuous, there being no springs or other gear to get out of order. The dogs are simply weights raised by an inclined plane to drop off the end and fasten the block while the saw is passing through.

But one man is required to place the bolts within the revolving carriage, while a boy can easily remove the slabs from the opposite side. This is done without delay or danger, as the bolts are free except when the saw is passing through them. The work produced is smooth; and as the tables are stationary and not tilted to produce taper when the apparatus is once adjusted, the shingles produced subsequently are exactly alike.

The machine is claimed to saw at least double the shingles of an ordinary two-block machine, and quadruple the shingles of any hand-fed one-block apparatus. If only half the capacity of the machine is required, or a production of from 65,000 to 75,000 shingles per day, but one saw need be used.

The apparatus is made to saw shingles from 16 to 18 inches in length, and is further claimed to saw up closer and make fewer clip shingles than any other device of like nature

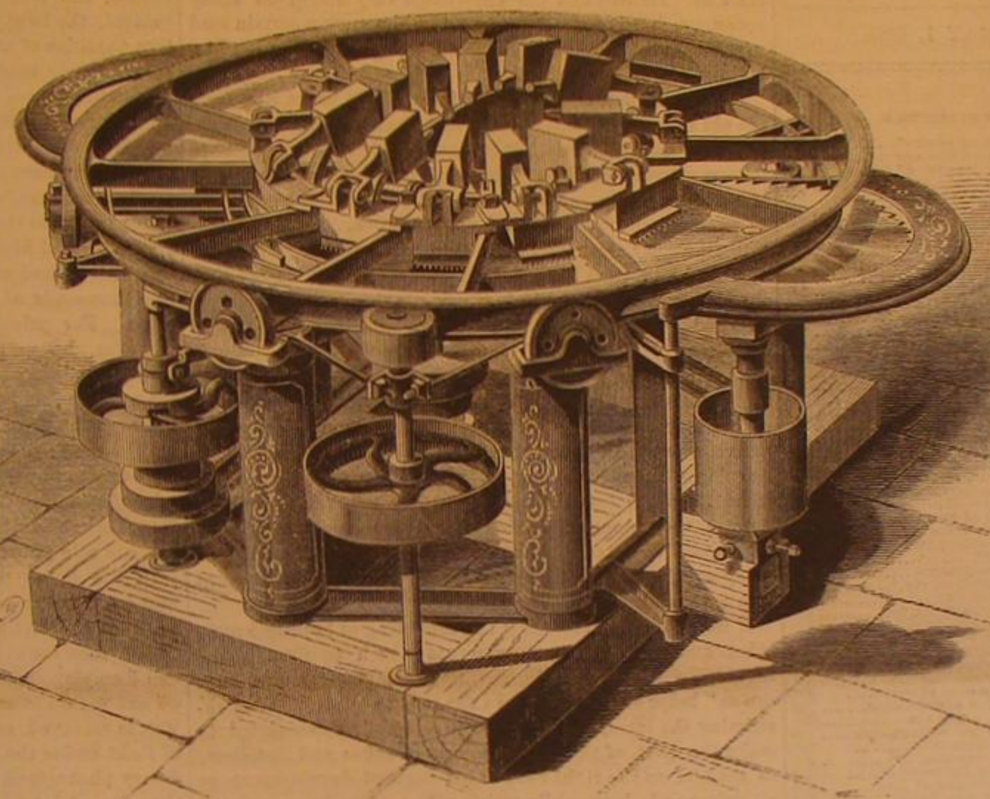
The Evarts hand-feed one-block machine, which is represented in the second engraving, has one saw shaft, and a reciprocating carriage operated by hand. Eccentrically geared automatic feed works are added, so that the feed may be either automatic or by hand, as the user may desire. Perfectly tapered shingles, of any required thickness at top or butt, can be made from 16 to 24 inches in length and up to 15 inches in width. No extra fixtures are required for sawing oak and other heading, it being possible, by suitable arrangements, to saw oak thick at the top and thin at the heart.

The machine is made with saws from 36 to 48 inches. The 36 to 40 inch saws are used principally for shingles, and the larger sizes for sawing heading, fruit box stuff, and other boards, up to 30 inches in length. The capacity of the apparatus is from 25,000 to 30,000 shingles per day in good pine or cypress timber, and from 8,000 to 12,000 pieces of heading.

The third figure represents Low's patent shingle and barrel head sawing machine, a light running and portable apparatus, easily attached to any kind of power, and excellently suited for shingle and flour barrel head work. The saw is arranged in a vertical position, so that the bolt gate or carriage moves in a similar direction. The gate is counterbalanced and has a head block to hold the bolt, which is fed out over the saw, and then depressed while the latter cuts off a shingle. The bolt then rises, and a similar movement of the feed pushes it outward in place for another cut. The saw does not have to be removed from the machine to be gummed or filed, and it does its work with the grain of the timber, requiring no countershaft to run it. The dogs are set but once for each block. The capacity of the machine is from 20,000 to 30,000 shingles per day.

In addition to the foregoing, the manufacturers, Messrs. C. S. & S. Burt, of Dunleith, Ill., produce every kind of machine necessary for a complete outfit for making shingles and heading, including dog saws, saw bolting apparatus, knife or wheel jointers (double or single), knot or saw jointers with one or two saws, different styles of bunching machines, etc.

For further particulars regarding these various devices, address the Messrs. Burt, as above.



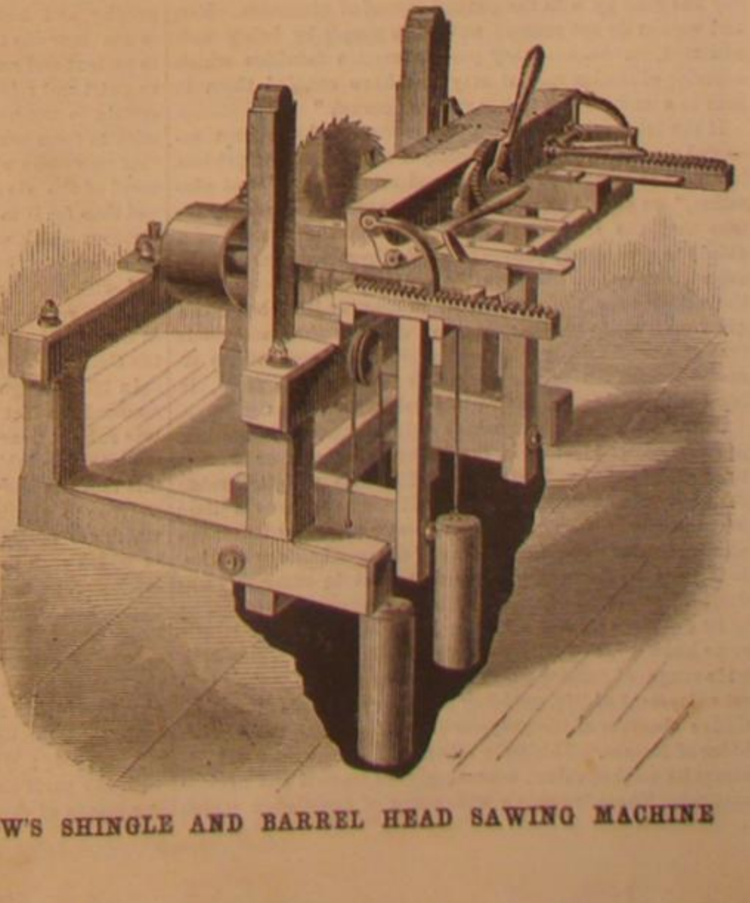
EVARTS' ROTARY SHINGLE MACHINE.

Venus.

The Italian observers at Maddapore, in Bengal, to which party the eminent spectroscopist Tacchini belonged, besides observing all four contacts, ascertained an important fact respecting the atmosphere of Venus. The ring around the planet, which in the former transits, as in the present one, was visible around Venus both on and off the sun, indicates in the spectroscope that the atmosphere contains aqueous vapor.—*Nature.*

WHEN the stoves are taken down, see that the pipe openings in the wall are protected by good tin covers. Don't stuff rags in

EVARTS' HAND FEED SHINGLE MACHINE



LOW'S SHINGLE AND BARREL HEAD SAWING MACHINE

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NEW YORK, SATURDAY, MAY 1, 1875.

Contents.

(Illustrated articles are marked with an asterisk.)

THE MONEY VALUE OF EDUCATION.

Says an English writer, whose remarks have been widely quoted in this country: "There was a time when what is generally understood as a good education had a pecuniary value of some importance both to men and women; but its day has gone by with the general spread of education. Men and women do not succeed nowadays simply by being well educated, but because they possess certain faculties which superior education may or may not have enabled them to turn to a more or less remunerative account."

If the favor with which these assertions have been received among us betokened merely a widespread scepticism in regard to what is "generally understood to be a good education," we should have no objection to make. It is only too true that the traditional culture, which the schools aim chiefly to give, rarely proves of much direct pecuniary value, even where it does not have the contrary effect of unfitting the recipient for the conflicts of productive life; but it is a grievous error to suppose, as many do, that the same holds true of what is really good education: an error that has already done much mischief, and is likely to do more, in leading the rising generation to despise instruction.

So far from having its money value lessened, education, properly so-called—that is, the fitting of the man or woman to meet the demands of modern life—has a higher value than education ever had before. There never was a time when proper culture gave a man greater power or better opportunities for gathering to himself the good things of life. It is quite another thing to say that what is commonly understood as a good education fails to prove so advantageous to its possessors. Not all knowledge is power; nor is the same knowledge equally powerful at all times. There is a wide range of culture which merely fits a man for the highest enjoyment of life, enabling him simply to be an appreciative observer of the progress of humanity and the vicissitudes of Nature. This adds value to life, but does not increase its market value; accordingly we leave it out of this account. There is again a wide range of knowledge which simply puts a man on a level with his neighbors, and therefore conveys no relative advantage, though the lack of it might prove a serious disadvantage: a range of knowledge which necessarily widens with the general spreading of education.

For instance, among illiterate people, the man who has penetrated the mystery of letters may gain thereby a signal superiority, as in mediæval Europe. The exercise of the arts of reading and writing under such circumstances brings him money: at least they may secure to him the "benefit of the clergy" in case of necessity, not, as often supposed, the unsubstantial benefit of being prayed over when condemned to death, but complete exemption from civil trial and conviction. With us, where nearly everybody reads and writes, these arts are relatively of lower value.

A few years ago a tolerable knowledge of arithmetic, with a good handwriting and some acquaintance with the art of keeping accounts, was a certain passport to profitable employment. The useful art of bookkeeping was then a mystery to the multitude, and therefore had a considerable money value in the markets. To-day, when nine boys out of every ten are more or less familiar with these elements of a business education, and too large a proportion vastly over estimate the importance of them and expect to thrive by them alone, such knowledge gives a young man no special distinction. He will find the knowledge very useful on many occasions; but it will rarely prove to him such a certain road to fortune and fame as the business colleges would have him believe.

In like manner, the trumpery information to be had from the old style school books once had a certain money value. However useless in itself, it at least enabled the possessor to "keep school" and flatter himself that he belonged to a learned profession. Now that such knowledge is as common as common schools, its special value is gone.

Shall we say, from facts like these, that the money value of a good education is declining? Not at all; but merely that the elements of a practical money-making education have changed. Given these elements, with sufficient force to use them, and there is no end to their money value.

Of course this does not imply that the scholar of little force will always be able to compete successfully with the untaught or, more properly, self-taught man of superior native talent. An ounce of mother wit is worth a tun of learning without wit to-day as it was when the proverb was coined. nevertheless the man (whether naturally weak or strong) with proper education is sure to surpass a man of corresponding force without such education, other conditions being equal. Everything hinges, however, on what we regard as a good and proper education.

If we dignify by that term the veneering of hearsay knowledge and useless accomplishments which so often passes for culture, then it is right enough to say that "a good education" helps one very little in the battle of life. But restricting the term, as we ought, to a training calculated to make the most of the child's powers of sense and intellect, to set him on the right road to his highest development as a thinker and doer, while making him actively acquainted with the best results of human effort, especially in the department to which his life work is to be directed—then, we say, the money value of a good education is immensely greater than ever before.

To circulate unqualified condemnations of education is about the worst thing our newspapers can do. Perhaps the best is to insist continuously on a closer adaptation of school work to the needs of the times, and the encouragement of out of school work fitted to make our youth apt and skillful and intelligent as productive workers.

PHOTO-MECHANICAL PRINTING.

There is perhaps no more inviting and fruitful field for scientific discovery and invention than in the line of photography, and but little attention to the subject is required to convince one that this field is fast yielding up its treasures to patient and successful investigation. Though the sun is as swift and reliable as time itself, it is too slow and too uncertain to command the full confidence of the artists who wish to form permanent impressions of the varied objects that now come within the scope of the photographic art. Instead of the slow method of waiting for the sun to shine, and then for it to transfer from a negative, one by one the pictures which will continually fade by the action of light, this work can now be done by the ordinary printing press and with durable carbon printer's ink. Yet the results thus speedily reached are not like the cheap woodcuts that issue in almost fabulous numbers from the press, but have more the character of the finely cut lithographic pictures.

In 1839 Mungo Ponton, a chemist of Bristol, Eng., announced the fact that sized paper, treated with a bichromate, was subject to an alteration, by the action of light, which rendered insoluble the sizing which the paper contained. In this fact lies the germ of all the processes of which it is our purpose to speak. The following are some of the many which are modifications of this principle: Carbon printing, in which each picture is itself a sheet of gelatin of required thickness, permeated with the coloring matter, and each impression is made by the direct agency of light; photo-lithography, in which the transfer is made on stone by means of gelatin; photo-zincography, which differs from the last by using zinc instead of stone; photo-galvanography, in which a sheet of gelatin—with the parts not acted on by light swollen by water—is made to serve as a basis of electrotyping; Woodburytype, in which a sheet of gelatin—with the parts unacted on by light washed away—is used as a means of obtaining, by hydraulic pressure, a metal mold. This mold is filled for every impression with gelatin containing coloring matter, and the print is really an embossing, so to speak, of colored gelatin on the paper. From the impression on the metal—which is an alloy of zinc and antimony—these types are printed on prepared paper, by a small hand press resembling the printing press.

In 1855 M. Poitevin, a French engineer, discovered that bichromatized gelatin, acted on by light, had the properties of a lithographic stone, and might be used as such. Since the parts on which the light has acted are impervious to water, upon moistening the plate some of it will be dry, some wet; and where light partially acted, it will be part dry and part wet. Now, as oil and water repel each other, by putting grease upon this plate, it will adhere entirely to the dry parts—those which were exposed to light,—partially to those under partial light, and not at all where it took up moisture. And now, by rolling over this plate a cylinder of lithographer's ink, the plate is ready to make a lithographic print. This idea, with modifications in its mode of application, has its representatives in various processes now employed. Among these we will briefly notice only two.

Mr. Joseph Albert, court photographer of Munich, has shown great ingenuity in perfecting what is now called the Albertype process. He commenced in 1868; and after numerous experiments for fixing, to the plate on which it is spread, the film of gelatin from which the pictures are printed, the happy thought occurred to him to use the sensitive qualities of the chromic gelatin itself for a cement. He consequently used a plate of glass, spread upon it a coating of gelatin, then—while the front surface was protected by an underlayer—exposed the back or glass surface to light, which rendered it insoluble; and hence adhesive to the plate in presence of water. He hardened the sensitive surface by chrome alum, chlorine water, and other coagulating solutions; and to make it as tough and hard as possible, he spread several films one upon another, hardening each in its turn till he had made a sensitive plate so hard and durable that thousands of impressions could be printed from one plate. For printing the impression transferred under a negative, he uses a lithographic press and the ink commonly made to accompany it. After this, no washing, toning, etc., is necessary, but the picture is complete when it leaves the press. Any kind of paper and any colored ink may be used; titles, descriptions, dates, etc., can be printed at the same impression; and one negative can be stereotyped *ad infinitum*. The Photo-Plate Printing Company, of New York, and the Albertype Printing Company, of Boston, are sole proprietors of this patent.

In the heliotype process, some perfectly flat surface is first coated over with wax; upon this is then poured a hot solution of gelatin, after which bichromate of potassa is added, then burnt alum or tannin, to make the surface fine and durable. After it has hardened, the sheet is stripped off and set up in an achromatic chamber to dry. Then the wax is removed, and the sheets are ready for the reception of light under the ordinary photographic negative in the ordinary photograph printing frame. The sheet of gelatin is then forced by pressure under water upon a flat plate of metal; and when the water has been pressed out, it is ready for printing in any ordinary printing press. Several thicknesses of ink are used, and for the deepest shades a little oil is added, which will adhere only to the deeper shadows. The plate must be kept moist in printing; and if moistened with colored water or Indian ink, a picture resembling a Rembrandt or Indian ink picture can be obtained.

These two processes, with that of the Woodburytype briefly mentioned above, have lately been used with great profit and satisfaction by Mr. Alex. Agassiz and others, for representing natural history specimens, in the Illustrated Catalogues of the Museum of Comparative Zöology, Zöological Results of the Hassler Expedition, etc. The negatives of these plates were all taken by Mr. A. Lowell, as they are ordinarily made for silver prints. By each of these processes very satisfactory results were secured, as well in regard to expense and correctness of plates as in their general execution. And the prospect is cheeringly encouraging that, ere long Natural Science will find in photography one of her most profitable allies. The expense of plates representing results of the naturalist's investigations has long been a serious hindrance to the advancement of Science; for a correct figure is often more expressive and instructive than pages of verbal description. By these methods, the cost of a quarto plate, including paper, mounting, lettering, etc., and exclusive of the negative, is only ten or fifteen cents per copy; and this is hardly more than the mere cost of lithographic press work, to say nothing of the artist's drawings on stone. The Woodburytype is a little more expensive and cumbersome than the other two, because, on account of the method of preparing the plate from which the impression is taken, it must be mounted for protection. Notwithstanding this, it will not preclude its use, for its pictures have a remarkable resemblance to good silver prints, with all their brilliancy and sharpness.

Another very important advantage those methods have over lithography is in their greater accuracy. By them the original sketches of investigators can doubtless be reproduced, and "subsequent observers will be better able to judge of what has actually been seen, and not of what has actually been added by the pencil of the artist who copies original drawings on stone." Mr. Agassiz finds it less trouble and expense to employ the carbon processes, even when it necessitates occasional visits to New York and Philadelphia, than to superintend, in the Museum itself, the lithographic plates. Again, Mr. Agassiz says: "On account of time required to complete a large number of plates, either as engravings or lithographs, it would be utterly impossible to issue so great a number of plates within the period required for permanent photographs." From a lithographic plate only about 500 good impressions can be taken, but here they can be made by thousands. It will also be of great advantage in copying plates from monographs, or valuable pictures of any kind which are out of print or otherwise inaccessible.

IMPROVEMENTS AT THE MOUTH OF THE MISSISSIPPI.

The long discussion relative to the most practicable method of improving the mouth of the Mississippi, so as to render the same passable to vessels of deep draft and thus to open the river ports to direct ocean traffic, was virtually terminated by the granting of an appropriation by the last Congress, for the construction of a system of jetties at one of the passes through which the stream enters the Gulf. The plans involving canals, which have been strenuously advocated by many eminent engineers, are therefore for the time at least set aside, and to Captain J. L. Eads, an engineer now widely celebrated for his successful construction of the St. Louis bridge, has been entrusted the task of causing the mighty current of the Father of Waters literally to undo its own work and to break down the barrier which itself has created.

The Delta of the Mississippi is formed of narrow strips of land, mostly low lying banks, through which the river winds until it makes its exit to the Gulf by a number of narrow passes. In some of these channels, previous attempts have been made to deepen them by dredging, with but partial success, however, as a single flood has been known to carry down sufficient sediment to fill them to their original depth; and the current besides, emptying into the open water at the mouths, speedily lift at that point bars of blue clay, surmountable only by light draft ships. The gist of Captain Eads' plan will now be readily apprehended when it is regarded as shifting the point of deposit of these barriers from the shoal water at the entrance of one pass, out into the deep water where filling up by natural causes is impossible. By this means the river current is to be made to cut out and scour its own channel across the present bar. To do this, it is obvious that the banks of the pass must be extended, so as to lead the stream far enough out; another section of conduit, as it were must, be added, and this is now to be formed of the submarine dykes or jetties.

The materials of which these structures are to be composed are willow twigs bound in bundles, termed by engineers "fascines," eight or ten feet in length and about as many inches in diameter. A large number of fascines at a time will be lashed together to form rafts, the first of which will be from seventy-five to two thousand feet in width, the largest rafts being sunk in the deepest water. The rafts will next be towed to the proper point, there loaded with stones, and submerged, and thus the work will continue, one raft being sunk above another until the surface is reached. Each line of rafts will be narrower than the one below it until the upper course will not be more than ten feet wide. The two walls which will thus be constructed will be prolongations of the banks, and between them will form a channel with sloping sides. In the course of time, the interstices of twigs and stones will fill with sand and mud, so that eventually two solid submarine levees will be produced. Very little pile work, it is said, will be required except perhaps at the head of South Pass, which is the outlet at which the jetties are to be built, in order to provide for the proper regulation of the volume of water in the new channel at various stages of the river.

Captain Eads has already begun his surveys, in which work, together with the making of the necessary contracts for materials, labor, etc., the summer will be consumed. The first raft, it is expected, will be sunk by the beginning of October next.

MOTION ON A MOVING BODY.

For the last few months we have been receiving queries from all sections of the country, something like the following: "If a train is moving at the rate of sixty miles an hour, and a cannon on the train is fired, giving the shot a velocity of sixty miles an hour, will it leave the train, or just drop down at the mouth of the gun?" We have once or twice attempted to explain the matter in our correspondence columns, but our remarks seem either to have been overlooked or misunderstood, and we must try once more to stop this stream of inquiries by satisfying the inquirers. Our remarks may also be useful in giving some of our readers more correct ideas about rest and motion than they possess at present.

The dwellers on the surface of the earth are carried through space so smoothly that many of them doubtless forget that the earth is revolving on its axis with a velocity, at the surface, of more than 1,000 miles an hour, and moving in its orbit at the enormous speed of about 68,000 miles an hour. They know, however, that they can set up a target on the surface of the earth, and pierce it with a shot that has much less than the velocity of the earth, whether the shot be fired in the direction in which the earth is moving or the contrary. It is easy to see, then, that if a ship or train is put in uniform motion, and the same experiment is tried, it will give a similar result. The reason, too, must be obvious after a moment's reflection. Everything on the ship or train being carried along with it, an additional velocity will evidently move it away from the position that it formerly occupied, to some other position on the moving body.

This disposes of the first part of the question, and now we will consider what is necessary, in order to make a body leave the ship or train. Probably some of our readers have seen Mr. Hale's entertaining story of the "Brick Moon," which was projected into space with such velocity that it never returned to the earth. Many more of our readers, no doubt, have experienced some of the difficulties of leaving a moving body, as, for instance, a car: because, as we explained some time ago, the car had put them in motion, and so there was a liability of their being dashed back again violently if they attemped to jump directly from the rear of a train moving at high speed. Now of course the train is not going to be more considerate of the shot in a cannon than it is of a human passenger, so that, unless the powder drives it back faster than the train is moving forward, it will not leave the gun. It is scarcely necessary for us to say that the case supposed by our correspondents is a purely imaginary one, since a train or a ship does not move with perfectly uniform velocity, and neither does a shot from a cannon. Considered in this light, the subject is of no practical importance, and our only reason for referring to it in this prominent manner is to call attention to the principles involved, which are both interesting and useful. We do not propose to discuss this question of the cannon and the train any further, and beg that our readers will send us no more communications on the subject, as we have not room even for all the valuable and instructive letters that we are constantly receiving.

WHAT IS THE CAUSE OF TIDES?

There are occasional fallacies which, in some mysterious way, gain credence in the minds of men till they finally become accepted as unquestioned facts. Among these may be mentioned the oft-repeated proverb: "It is always darkest just before day," and the commonly accepted explanation of the rising of light bodies in a denser medium. It is not true that smoke, heated air, balloons, etc., rise because of their lightness, and then the air rushes in to take their place; but the air, being heavier, seeks by gravity the lowest place, and in so doing crowds up the lighter bodies. Water is said to contract down to a few degrees of the freezing point, and then to expand in changing to ice; but it is probable that the molecules are drawing closer to one another all the time, and that the apparent expansion is because the crystals of ice do not fit together exactly, and hence leave between them interstices filled with air, and thus occupy more space.

And it is quite possible, if not probable, that the common explanation of tides furnishes still another illustration. With sufficient credulity, the explained cause of the tide on the moon's side of the earth may be accepted as somewhat satisfactory: but there is room for reasonable doubt as regards that of the tide opposite the moon. This luminary is said, in the first case, to draw the water away from the earth, and in the second, to draw the earth away from the water. This is considered possible because the nearer object will be influenced more by the moon's attraction than the more distant object, and this difference of attractive force, as exerted on the stable earth and the unstable water, is said to produce the tides as we observe them. Attraction varies inversely as the square of the distance. If we represent the force with which the moon draws the earth by ten, the force with which it attracts the water on the opposite side of the earth will be about nine and two thirds. This latter force is not diminished by the intervening earth, and tends to draw the water toward the moon. The earth, by its attraction, holds the water to its surface, and its influence is not lessened when the moon acts upon it. As both these forces tend to draw the water opposite the moon toward that luminary, we would reasonably expect a low, rather than a high, tide at that point. It is said that the water remains behind by its inertia. But as the moon acts constantly upon the earth, and gradually upon any one point of its surface, the inertia of the water would be overcome at least as soon as that of the solid earth, and probably sooner, as the water is more free to yield to the influence of attraction.

Again, the theory rests on the supposition that the attraction of the moon gives the earth a daily motion toward itself; but this cannot be strictly true, for, if so, the earth and moon would be continually approaching each other, and we would live in constant fear of a collision, whereas they maintain a uniform mean distance between them. In opposition to this, it is argued that the deviations from the tangential motion of the earth in its orbit are precisely those which the earth would move through if falling toward the attracting body unaffected by any other impulse. Whether this is satisfactory, each must decide for himself.

The sun also exerts upon the earth an influence tending to produce tides, which is about two fifths as great as that exerted by the moon. The sun's real attraction, of course, is much greater than the moon's, but, on account of its greater distance, the difference between its influence on the earth and on its aqueous envelope is less. From the sun's influence, we would expect a tide to follow the sun, as one is said to follow the moon, and differ from it only in being smaller; and when the sun and moon are in quadrature, we should expect, according to theory, that there would be four tides in a day: two caused by the moon and two by the sun, whose major axes would be at right angles to each other. When the sun and moon are in conjunction, we have the highest tides, because both act together and in the same direction. When they are in opposition, we should expect the lowest tides because they act in opposite directions and each tends to counteract the effect of the other. But in fact this combination also appears to produce spring tides.

If the tidal wave is caused by the moon, and follows her as she apparently makes a complete circuit of the earth in about 25 hours, it must travel at the rate of one thousand miles per hour, and this is hardly reconcilable with its mildness and harmlessness in dashing upon the shore, nor with Mr. Airy's law for the velocity of tidal waves, which makes it the "same as that which a free body would acquire by falling from rest, under the action of gravity, through a space equal to one half the depth of the water." The Pacific Ocean is estimated to average 440 fathoms in depth, and according to this rule the velocity would be less than 200 miles per hour; or, by a slight change in its application, the rule would make the average depth of water over the whole surface of the earth more than twelve miles. The tidal theory supposes the anomalous condition of an interrupted ocean enveloping the whole globe. Again, if the moon or sun causes the tide, we would expect an observable uniformity in the direction and velocity of the tidal wave from the eastern borders of the Atlantic and Pacific Oceans to their western borders; but on the contrary, it is acknowledged by orthodox believers in the lunar and solar cause of tides that we have little or no clue to the course or rate of travel of the ocean tide. Even for the North Atlantic, which is constantly alive with commerce, no connection has yet been discovered between tides of the opposite coasts.

The tide on either side of the earth does not rise on the vertical between the earth and the attracting body, but, under favorable circumstances, about three hours behind it; and when these are not favorable, the retardation may be almost indefinitely prolonged. The reason of this is said to be that the inertia and friction of the water, and other causes, prevent its rapid change of form; and although the elevating force is greatest under the vertical, it still continues to act in the same direction, and with but little diminution of force, for some hours after the passage of the moon. But, strange to say, when the influences of the sun and moon are combined to overcome this friction and inertia, the interval between the meridian passages of these luminaries and the spring tide is longest of all. The retardation so varies with the depth of the sea, form of the basin, interruption of the land, etc., that confessedly no regular progressive movement of the tide wave can take place except in the unfrequented Southern Ocean. This, together with the acknowledged want of observed connection between the tides on the opposite coasts of the North Atlantic—though here subject to constant inspection—leads to the conclusion that the belief, respecting the movement of the tidal wave around the earth from east to west, is based on conjecture rather than positive demonstration. On the other hand, there are some reasons for the supposition that this wave moves in the opposite direction Mr. John Wise, who suggests some of the objections mentioned above, claims that it moves from west to east, and is due to the action of the earth's centrifugal force, just as water is thrown forward on the surface of a rapidly revolving grindstone. In substantiation of this, he says: "The first authenticated records we have of this centrifugal wave rolling round the earth, from west to east, are given in the log of the clipper ship Sovereign of the Seas, in her remarkably short passage of eighty-three days from the Sandwich Islands to New York, in 1853, in accordance with Maury's chart furnished by our government. This ship made 16½ knots an hour in her easting for four consecutive days while riding this great centrifugal wave in her doubling of Cape Horn. And in the same year, by the same directions, the sailing ship Flying Scud made equally good castings, and made as much as 449 miles in one day, taking advantage of this fact of the great tidal wave." These statements would seem to necessitate the progressive movement of the water as well as the wave, for their explanation. But it is generally held that the water itself has little or no real forward motion.

Mr. Wise also claims that there are not two distinct daily tides in the Southern Ocean, nor at all intertropical points; and that where two appear, they are due to gurgitation and regurgitation of the water, occasioned by its forcible contact with the shores between which it oscillates, and may be influenced by the fact that the equator of the earth is an ellipse and not a perfect circle. He assigns, as the cause of their regularity, what Herbert Spencer calls the rhythm of motion, and says: "They have their elucidation in, and are manifestly referable to, that harmonious pulsation of Nature which exhibits itself in the throbbing of the heart, in the motion of the blood, the vibration of sound, the 'nodding' of the poles of the earth, in all mechanical movements, and in the measured cadence of the waterfall as it rises and falls in its musical rhythms."

That most of the objections cited herein have their stereotyped answers is not denied. But it will doubtless be conceded that there is some reasonable doubt as to their correctness, and that strict science, which rests on facts and not on theories, would not be injured by a careful revision of this whole question. With this end in view, we close our remarks as we began, with the honest query: What is the cause of tides?

Cambridge, Mass. S. H. TROWBRIDGE.

Coughing.

The best method of easing a cough is to resist it with all the force of will possible, until the accumulation of phlegm becomes greater; then there is something to cough against, and it comes up very much easier and with half the coughing. A great deal of hacking, and hemming, and coughing in invalids is purely nervous, or the result of mere habit, as is shown by the frequency with which it occurs while the patient is thinking about it, and its comparative rarity when he is so much engaged that there is no time to think, or when the attention is impelled in another direction.

A GELATINOUS substance frequently forms in sponges after prolonged use in water. A weak solution of permanganate of potassa will remove it. The brown stain caused by the chemical can be got rid of by soaking in very dilute muriatic acid.

The New York Tribune Building.

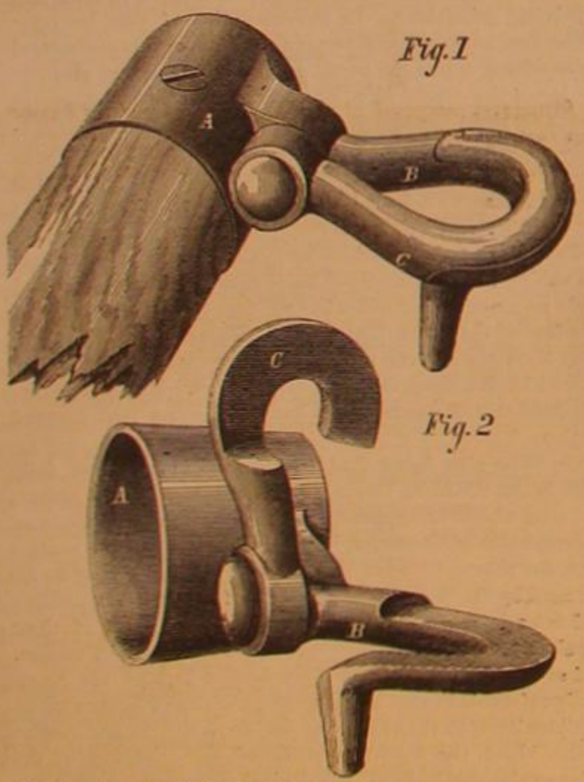
On April 10, the 34th anniversary of its commencement, the New York *Tribune* opened the doors of its new offices to the public. The structure is of great hight and immense solidity, and is built of brick laid in cement, with dressings of stone and granite. The finial on the clock tower is 260 feet above the sidewalk, surmounting a building containing sub-cellar, basement, nine stories, and attic. The walls of the lower portion, sustaining the great weight of the masonry, are 5 feet 2 inches to 6 feet thick. The building is claimed to be absolutely fireproof. No wood is used in its construction, except for floorings, doors, and window frames; and the wooden floors are mere plankings laid over solid cement. No iron pillars are used, masonry being employed on each floor to carry the superstructure. The floors are ingeniously constructed, being flat arches of hollow concrete blocks, resting at the ends on flanged iron beams; they are made of plaster of Paris, coke dust, and the hydraulic lime of Teil. When the whole building is complete, it will certainly be an exceedingly handsome and commodious structure.

A Hoe web press is already at work in the new press room, and has a capacity of 16,000 complete copies per hour. The composing room is fitted up for one hundred compositors, and the editorial and other offices are intended to be models of comfort and convenience. Speaking tubes are used for intercommunication, and pneumatic tubes convey papers and documents between the editors' room, the counting room, and the composing room; and the elevators and heating and ventilating apparatus are all of the most modern design. The pneumatic tubes are operated by a blower placed in the basement of the building, similarly to those in the Western Union offices, an illustration of which we recently published.

SMITH'S IMPROVED WHIFFLETREE HOOK.

This is a simple device for attaching the trace to the whiffletree, and consists of a pair of sister hooks, which are arranged to open to receive the trace, and which, when closed, prevent the trace from becoming accidentally detached under any circumstances.

Fig. 1, in the engraving, shows the hooks closed, and Fig. 2 the same open. A is the ferrule, which is secured to the whiffletree in the usual manner. The lower half, B, of the hook is in one piece with the ferrule, and has a downward projecting lug on the end, as shown. The upper half, C, is pivoted sidewise to the lower half, but is bent in opposite direction to the latter. Both parts are recessed at their overlapping front portions, to form, when together, as in Fig. 1, an eye for the ring of the trace. In attaching the latter, the eye is first placed over the part, B, and carried back to the rear; the upper part is then brought down, and the trace pushed forward over both.



This device, the inventor informs us, has given general satisfaction wherever used. It offers no open hook in which the reins are apt to get caught, and yet allows of the attaching or detaching of the traces in the shortest possible time. It certainly is a very simple and ingenious appliance for the purpose intended.

Patented through the Scientific American Patent Agency, February 16, 1875. For further particulars relative to sale of entire right, or with regard to manufacturing on royalty, address the inventor, Mr. O. J. Smith, Wauwatosa, Milwaukee county, Wis.

Consumption of Wood in France.

The *Independence Belge* gives some curious statistics relative to the consumption of wood in France. A large quantity of soft wood is used for making toys, and to give an idea of the magnitude of this trade it will be sufficient to take one article alone, children's drums, of which in Paris alone 200,000 are sold every month. The total number made annually in France is estimated at 30,000,000, while a considerable quantity of wood must be consumed to supply 60,000,000 drumsticks

A CURIOUS OCULAR ILLUSION.

It is generally believed that the minute striæ which appear upon diatoms, under the microscope, are in reality an assemblage of hexagons, as the striæ resolve themselves into an assemblage of such figures when subjected to higher magnifying powers. M. Nachet, the celebrated French microscopist, describes, in a recent number of *La Nature*, an odd optical illusion which, he states, accounts for the figures on the diatoms appearing as hexagons, when, in reality, they are spherical in shape.

The reader can see for himself, from the diagrams given herewith, that M. Nachet's conclusion is without doubt correct. The large circular dots in Fig. 1 are drawn as nearly as possible in positions similar to those of the supposed hexagons on a very beautiful diatom, called *pleurosigma angulata*. If the figure be looked at for a moment, especially through the eyelashes, that is, with the eyes nearly closed, the circles will instantly appear as hexagons. This effect is all the more striking in Fig. 2, which is the same reduced by photo-engraving. Fig. 3 is a negative reproduction of Fig. 2, by the same process. The curious effect of irradiation is noticeable by comparing the last two diagrams, the white circles, though of exactly the same size, appearing much the larger.

Fig. 1

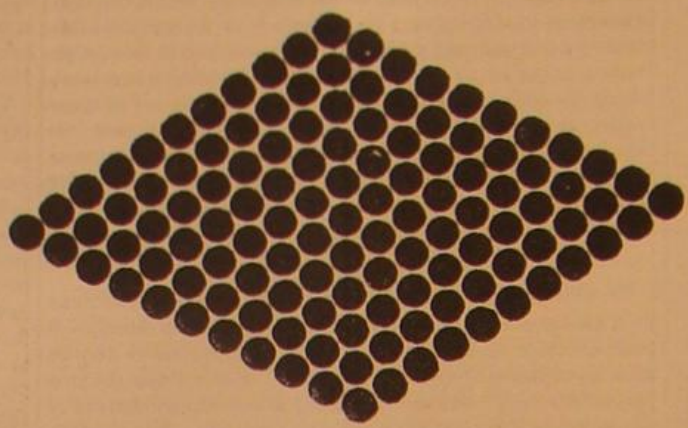


Fig. 2

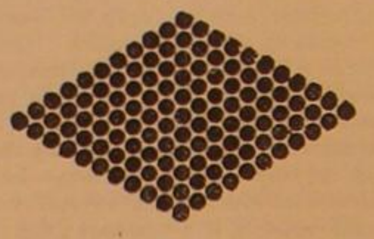
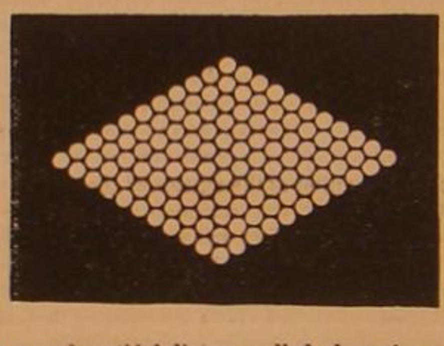


Fig. 3.



Pure Sulphate of Nickel.

The salts of nickel employed in the electro-deposition of that metal are prepared from commercial nickel, which is an alloy of nickel, copper, and iron, with traces of arsenic, containing from 40 to 90 per cent of actual nickel. The author's process consists of four operations: Solution of the crude metal in acids; precipitation of the copper by iron; peroxidation of the iron, and conversion of the metals into sulphates; precipitation of the iron by carbonate of baryta, and crystalization of the sulphate of nickel. The nickel is first dissolved in seven to eight times its weight of aqua regia; the solution is evaporated almost to dryness; the residue is re-dissolved in water, using about five times the weight of the nickel employed. A little arseniate of iron remains insoluble, and is removed by filtration. Metallic iron, preferably small nails, is introduced into the hot liquid, to about the weight of the nickel employed. It is stirred from time to time to detach the copper from the iron. As soon as a piece of bright iron, introduced into the liquid, is no longer coated with copper, this process is complete. The whole is thrown on a filter, and washed repeatedly. The copper is then collected by sifting it under water, in a sieve coarse enough to let pass the coppery metallic powder, but retain the iron. The copper is dried, and is then marketable. The filtrate now contains merely nickel and iron. The latter is peroxidized, either by a current of chlorine, or by treatment with nitric acid. Sulphuric acid at 66° Baumé is then added, in the proportion of 2 parts to 1 of nickel employed, and the whole is evaporated to dryness to expel nitric and hydrochloric acids. The dry residue is re-dissolved in water, a part sometimes remaining insoluble, consisting of sub-sulphate of iron. From the solution the iron is thrown down by means of carbonate of baryta (artificial precipitated). This carbonate separates the iron as sesquioxide, and forms at the same time insoluble sulphate of baryta, without acting upon the sulphate of nickel. The last traces of arsenic are thrown down along with the sesquioxide of iron. The precipitation is effected by gradually adding a slight excess of carbonate of baryta to the liquid, slightly heated, but not so as to exceed 50° to 60° Fah. It is complete when a further addition of carbonate occasions no effervescence, and does not become covered with peroxide of iron. Pure sulphate of nickel then remains in solution. It is separated from the precipitate by filtration, and the filtrate is evaporated till a pellicle appears on the surface, when it is set aside to crystallize.—*M. A. Terreil.*

A Varnish from Vulcanized Rubber.

The following description of a method of making a varnish from vulcanized rubber is taken from the *Moniteur Industriel Belge*. In answering questions relating to the dissolution of vulcanized caoutchouc, we have repeatedly doubted the possibility of so doing. The present process, however, seemingly includes burning out the sulphur, etc., and then dissolving the residue. If any of our readers practically test the recipe, we should be glad to learn the result.

The fragments of vulcanized rubber are deposited in a deep earthenware pot, which is closed by a tightly fitting cover and deposited on burning coals for about five minutes. During this period care must be taken not to open the vessel, as the vapor is highly inflammable. On removal, the mass is examined by pushing a wire into it to see that it is uniformly melted; and if this be the case, it is at once poured out into a large, well greased, shallow tin pan, and left to cool. When hard, it is broken into small pieces, placed in a bottle with benzole or rectified essence of turpentine, and there thoroughly shaken and stirred.

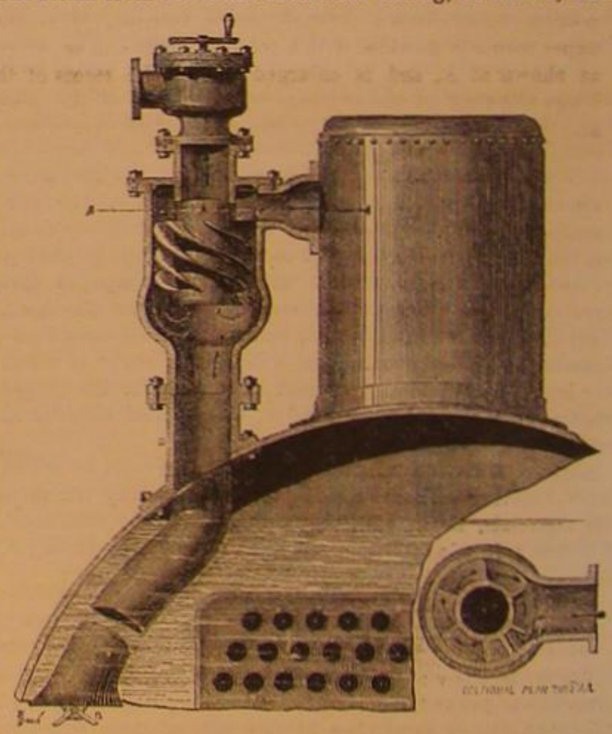
The dissolution then takes place, and after a brief rest the clear liquor which forms the varnish is decanted from the impurities which settle at the bottom.

STOCKLEY'S IMPROVED ANTI-PRIMER.

Hundreds of our readers have to complain of inefficient working done by steam engines, and of damage to cylinders (in the bore and to the heads) and pistons, all being caused by water working over into the engines in the steam. Dry steam is an absolute necessity to the engineer who desires to work economically, both in consumption of fuel and wear of his machinery.

Mr. J. Stockley, an engineer employed in the Wallsend coal district, England, has invented an appliance for securing dryness of steam, and it has, we are informed, been already applied to several marine engines with marked success

A fixed case or pipe, C D, is put on the boiler, as shown. The steam from the dome enters the casing, as shown, and



the theory is that the helix within C causes the steam to assume a whirling motion, by which the water is expelled by centrifugal force, and falls down D into the boiler, while the now dry steam, pursuing the course shown by the arrows, rises and escapes through the stop valve above. The action will, we think, be readily understood. Flap valves, to prevent the water rising, are inserted in the pipe, C D. This invention appears to have given excellent results in practice, and it is no doubt designed on sound principles.

An Excursion to the Mediterranean.

The memorable cruise of the Quaker City, so comically described in Mark Twain's "Innocents Abroad," is to be repeated; and those who have wished to "do" Europe, after the manner recounted by that genial humorist, will this summer be offered an excellent opportunity for so doing. Mr. George F. Duncan, himself one of the original Quaker City travelers, proposes to charter a steamer and secure about 100 passengers, whom he will conduct to nearly every point of interest in the Mediterranean. The ship will sail on about the 1st of June, and the cruise, which includes visits to the Holy Land, Egypt, etc., besides affording abundant time for rambles inland on the Continent, will terminate with the arrival of the travelers back in New York on about the 10th of November. The cost of the trip will be $1,500 currency for each passenger.

This is an excellent chance to see a large amount of the world for little money. The reader will find further particulars in the advertisement on another page

WHIPPLE'S IMPROVED CLOTHES DRYER.

The device illustrated herewith will doubtless meet a ready welcome from laundresses, inasmuch as it tends to obviate the use of the stationary clothes line. Instead of the clothes being carried out to the line and there secured, requiring the person to emerge from a warm room, often into cold and blowy weather at the risk of incurring illness, the garments, through the present invention, are secured to lines on a simple frame, which last is then transported bodily out of doors, and set up—an operation requiring but a few seconds. The wooden frames, 5½ feet high by 4 feet wide,

are neatly strung with metallic line, the total length of the latter being about one hundred feet. At the upper left hand corner, as shown in the engraving, a hinge joins the two frames, but in such a manner as to admit of their lower portions being thrown outward, as represented. The other upper corner is provided with a recessed hinge and set screw, as shown at A, and is enlarged below, the recess of the hinge allowing of the entrance of the shank of the screw and the consequent joining or loosening of the parts as desired.

When set up, the clothes, after being wrung out, are attached, and the entire device is then carried to the drying ground and left there until the clothes are dry. This is of much convenience, since it allows of the transporting of frozen garments directly to the fire without requiring their being torn loose from the lines at the risk of injuring them, and admits of the clothes being carried immediately to shelter in case of a sudden shower.

The apparatus is readily converted into an ordinary clothes horse by loosening the screw, A, and securing the hinge, which joins the left hand corner of one frame to the right hand lower corner of the other.

For further particulars, address the manufacturer, Mr. D. B. Chapman, New London, Conn

The Recent Life-Saving Dress Trial in England.

We mentioned recently the remarkable performance of Captain Paul Boyton in making his way to land after having jumped overboard from the steamship Queen, while that vessel was yet two and a half miles distant from Cape Clear, through the support of a life-preserving dress, to exhibit which was the object of his transatlantic voyage. A storm arising, the efficiency of the invention was put to a severer test than the wearer contemplated; but though he was kept in the water some seven hours, during which period he traveled thirty miles, Captain Boyton reached shore in safety, and this despite a terrible buffeting from the breakers.

Since his arrival in England, Boyton has given several exhibitions of the life-preserving capabilities of his dress in the Thames river, attracting large crowds of people, as well as the examination of the Royal Humane and other societies

The latest test to which the invention has been subjected is certainly a crucial one; and although its wearer failed to accomplish completely the task which he had set himself, sufficient, nevertheless, was done to warrant the pronouncing this device to be certainly one of the most efficient of life-preserving apparatus yet produced. Captain Boyton undertook to float from Dover to Boulogne, crossing the English Channel and accomplishing a distance of over fifty miles, within one day. The darkness of the night and inclemency of the weather, coupled with an error on the part of his pilot in not directing him a straight course, prevented the fulfilment of the undertaking; but as it was, the swimmer, after remaining in the water fifteen hours and reaching a point within eight miles of his destination, emerged with clothes dry, temperature of body lowered but one degree, pulse at eighty, and fully capable, according to medical opinion, of remaining afloat at least six hours longer. A repetition of the effort will undoubtedly bring success, though to all practical purposes the same has already been achieved. The credit, however, must in no slight measure be awarded to Captain Boyton's powers of endurance, as it is evident that, while the dress furnished buoyancy for the period above named, it had nothing to do with the rapid propulsion of the individual over the water.

We notice that several of our contemporaries fall into the mistake that the invention is a very recent one. This is not the fact, since it is nearly six years ago that it was patented through this agency, by its inventor, Mr. C. S. Merriman, both in the United States and in most of the foreign countries. In our issue of January 14, 1871, a fully illustrated description of the device appeared, together with an account of its successful exhibition off the Battery in this city.

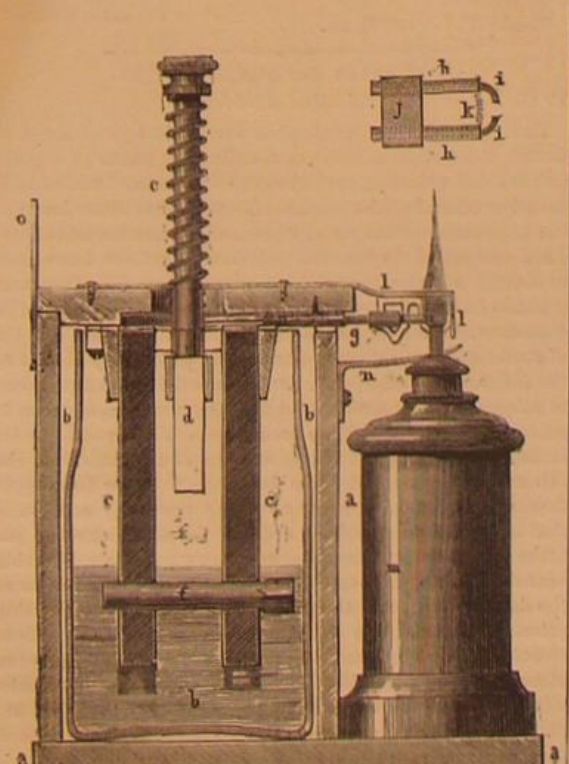
The efficiency of the invention now being proved, it remains to see how long before the steamship companies will defer its adoption. The objection of occupying valuable space cannot be urged against it, inasmuch as it can be folded into the compass of an ordinary overcoat; nor is its cost, probably, to be compared with that of much more common and more elaborate life-preserving apparatus. With the record of its qualities now well known, it certainly appears that the knowledge of such a means of safety being on board would do much to lessen the terrors of the sea to the traveling public, and at the same time, as a necessary consequence, to increase the receipts of steamship lines.

IMPROVED ELECTRIC LAMP LIGHTER.

The lamp-lighting device shown in our illustration is called "the electro-catalytic lamp lighter, and is brought out by Messrs. Voisin & Dronier, of Paris, France. It resembles, in its general features, the well known Döbereiner apparatus, in which hydrogen gas is used to heat platinum sponge. In this case, the igniting material is a thin platinum wire, heated to glowing by an electric current passing through it, and thus igniting a wick, the lower part of which is immersed in benzine which continues to burn until extinguished. Fig. 1 shows the apparatus in sectional side elevation, and Fig. 2 shows the igniting wire in its actual size.

The glass vessel, *b*, is placed in an inclosing casing or box, and is provided with a galvanic element attached to the detachable top, the long carbons, *c*, reaching down into a solution of bichromate of potassa and diluted sulphuric acid, which fills the vessel, *b*, up to a certain point. A zinc plate, *d*, is suspended between the carbons by a sliding spring-acted rod, *e*, guided in a perforation at the top, and depressed by a button at its upper end; so that, when depressed, the zinc plate is immersed in the solution till it comes in contact with a lateral carbon connecting stop, *f*. At the under side of the lid of the vessel are applied two parallel copper wires, *g*, in contact with the sliding rod and the carbons, for transmitting the electric current (produced by the immersion of the zinc) to the igniter at the outside of the casing.

The igniter (Fig. 2) is composed of two copper tubes, *h h*, placed on the ends of the wires, *g*. The copper tubes are laterally connected by an insulated brace sleeve, *j*, and have, at their front end, small rods, *i*, which approach each other. These small rods are connected by the spiral platinum wire, *k*, which is protected against injury by a perforated guard piece, *l*, attached to the lid and extended over the igniter. The length and resistance of the platinum wire



have to be determined in proportion to the galvanic element, and if the wire is of proper length, it will be heated brightly when only one fourth of a square inch of the zinc is immersed in the solution. The lamp, *m*, which is filled with benzine, is placed in front of the apparatus so that the wick is just below the platinum wire, but does not touch it. The lamp is attached to the base of the apparatus, and can be refilled by unscrewing the top part, the wick being held by a forked guide piece, *n*, in the exact position required for ignition.

The whole apparatus can be hung by the ring, *o*, to the wall, or applied in any other suitable manner. The battery solution is sufficient for about 500 ignitions, while the galvanic elements allow about 15,000 before renewal is required.

A NEW LOCKING BOLT.

In the annexed engraving we illustrate a new and simple locking bolt, such as is used for connecting fish plates with railroad rails, irons of railroad bridges, and for like purposes. The novel feature is a mortise made near the outer end of the bolt and through the same, in which two arms or dogs, A, in the sectional view, Fig. 2, are pivoted to a common center, B. Between the arms is arranged a U-shaped spring, which throws them outward. In pushing the bolt through the aperture, and in applying the nut, the arms are easily shoved into the mortise; but when the nut is in place, as in Fig. 1, the arms are thrown out by the spring, their

Fig. 1.

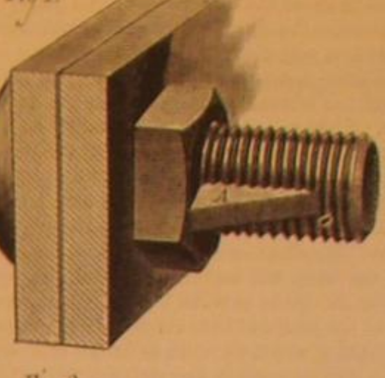
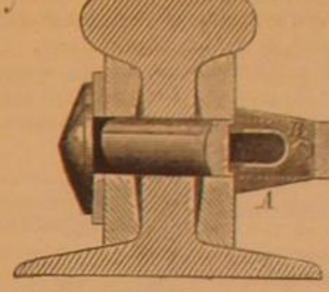


Fig. 2.



square shoulders thus locking the nut. The device was patented January 20, 1874, to Mr. J. C. Tiffany, of Portsmouth N. H

Riveted Structures.

Structures composed of several parts must mainly depend, for their strength and stability, upon the joints or means of connection between them. Thus, in a wrought plate girder, the riveting becomes a very important element of strength, and no correctness of mechanical design or sectional area of parts will avail, if one of the joints happens to be defective or weak. Every joint should, in fact, be equally as strong, at the least, as the material or parts connected, for it is very clear, if it were not so, the sectional areas of the plates or pieces would only be partially called into requisition, and, in fact, the structure would be no stronger than its weakest joint, or its stability would be measurable by the strength of its joints. Taking, for example, a cylindrical boiler, its effective strength to resist the pressure of steam would only be that of its weakest riveted joint, as we are all occasionally made aware of under the distressing circumstances of boiler explosions. This point, in fact, cannot be too strongly insisted upon, for it is obvious that, in constructing such works, there is a tendency to regard the general form, and not every detail; or in other words, the joints and minute connections are only thought of collectively. In every structure required for active stability or strength, the details require equal attention and care to that of the general design. As regards iron plates or boiler plates, it is known they have less tensile strength than the same iron made into bars. This is due chiefly to the process of rolling iron into plates of such thinness; and it is also found that a boiler plate is less tenacious across the fiber than in its direction; its greatest strength being about 20 to 22 tuns per square inch, while its least strength in the transverse direction is about 19 tuns per inch of section. In making cylindrical boilers, therefore, it is evidently desirable to put the plates in their strongest direction round the boiler, so that the transverse pressure, which is always the greatest, should have the strongest direction of the plates. It is seldom found that boilers give in their longest direction, and a cylindrical boiler is calculated to have about double the strength in that direction to what it has transversely under a given uniform pressure of steam. The circular or cylindrical form of boiler is the strongest, and has superseded the rectangular form with flat surfaces. It is easily seen that a circular form is the best for resisting uniform pressure. For the plates, though wrought iron is commonly used, steel is rapidly coming into use. The relative strengths of iron and steel are as follows:

Iron................................	50,000 lbs.
Steel................................	90,000 lbs.

From which it is seen that steel has nearly double the strength of wrought iron. The recent boiler explosions which have startled the public will, we believe be the means of introducing to a greater extent than hitherto the claims of steel for boiler plates. Let us further examine the conditions of strength in boiler construction; and first as regards the materials and joints: We may here casually refer to the advantage that would arise, in reducing the risks of the calamitous accidents we are constantly hearing of, if periodical tests were instituted by government authorities by the application of hydraulic or steam pressure of double the usual working pressure.* It is very evident that the strength of a boiler depends, first upon the resistance to tearing of the plates, and secondly upon the resistance to shearing of the rivets. New plates may tear along the line of rivet holes, or by the detrusion of the pieces of plate between the holes and the edge of plate. In this case, the resistance is measured by the shearing strength of the plate per square inch, multiplied by the number of pieces detruded or pushed out. We have already shown that the tenacity of boiler plate is about 20 tuns per square inch. As regards rivets, the shearing strength may be taken as the same; 22 tuns is considered the average, however, for best Yorkshire iron. We have next to consider how the riveting can be made to equal in strength the plates, so as to obtain the greatest amount of strength from both. This is usually done by making the rivet equal to twice the thickness of the plate. Then the pitch or distance from center to center of rivets must be considered, as it is very clear, if this distance is not sufficient to make the plate between two rivet holes as strong as the rivet itself, no advantage is gained, as the least resisting will give. Thus, in a single riveted joint, the breadth should be at least equal to three diameters of the rivet, and the pitch should also be three diameters. The plates at the lap joint are double, hence are equal in strength to the rivet; and the distance from the rivet hole to the edge of the plate must be one diameter, hence the whole width of the joint from center of the rivets will be three diameters, as above stated. There must, it will be seen, be a diminution of the effective strength of the plates in thus riveting them together, equal to the amount of metal punched or drilled out, which is one third. This diminution in the strength must be carefully considered, and precautions taken to lessen it as much as possible, either by increasing the number of shears to which a joint is liable, or by drilling the holes. Thus, a double shear rivet is considered twice as strong as a single shear one; and to make the joints equally strong the single shear joint should have twice as many rivets as the other. Fig. 1 shows

Fig. 1.

Fig. 2.

Fig. 3.

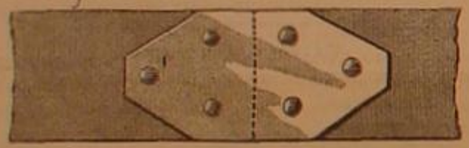


Fig. 4.

a double shear rivet, and Fig. 2 a single one. When plates are in tension, the aggregate shearing area of the rivets on each side of the line of joint, multiplied by the safe strain to shearing per inch, should equal the total working strain on the plates. In some joints, as in girder plates, the collective shearing area of the rivets should be nearly equal to the effective plate area. In practice, the rivet area is made about $\frac{1}{10}$ greater, to compensate for any inequality in the strain. "In steel plating," observes Mr. Bindon Stoney, "the rivet area of the rivets in steel should be one third greater than the nett area of the plates, but the heads of steel rivets are very apt to fly." Mr. Hodgkinson deduced from experiments that the "strength of plates, however riveted together with one row of rivets, was reduced to about one half the tensile strength of the plates themselves; and if the rivets were somewhat increased in number and disposed alternately in two rows, the strength was increased from one half to two thirds or three fourths at the utmost. For the relative strengths the following may be taken:

Strength of an unpunched plate, 100; strength of a double riveted joint, 66; strength of single-riveted joint, 50. Punching, it would appear, reduces the tensile strength of iron to a greater degree than the entire area of metal punched out. It has been stated that drilled plates are 15 per cent stronger than punched ones. The preceding remarks apply to girder and boiler riveting. We give here the rules adopted by boiler makers. For plates less than ½ inch thick, the diameter of rivet equals twice the thickness of the plate. For plates more than ½ inch thick, the diameter of rivet equals once and a half the thickness. The pitch of single joints equals 2½ to 3 diameters, and that for double joints equals 3½ to 4 diameters. The lap for single joints equals 3 diameters, and that for double joints 5 diameters, of the rivet. While in boilers the distance between the holes and edge of plate is 1 diameter, in girders it is seldom less than 1½ times diameter of rivet, and the pitch varies from 2½ to 5 or 7 inches. Some joints, as in girder work have covers or plates riveted on one or both sides; these covers should equal in strength the plates. See Fig. 3, which shows an economical arrangement of tension joint. Another resistance must be noticed, which tends to increase that of the riveting, namely, that due to the contraction of the rivets when cooling. This frictional resistance does not, however, when added to the rivet's resistance, quite equal that of the plates, though much stress is placed upon it by engineers.

Various ingenious devices have been proposed to obtain a uniform strength both in the plates and joints. Oval rivets have been suggested, in which a greater area is left between the holes by putting the narrowest part of the rivet in line with the joint, the longest diameter being placed in the other direction. Thus a ¾ inch round rivet may, as far as its strength goes, be transformed into an oval one of the same area of section and strength; but the hole being reduced in the direction of the joint or weak line of the plate, greater advantage would result, because the plate could be made so much stronger. Oval holes may as easily be drilled as round ones, and it is not improbable this mode of riveting will supersede the ordinary kind for boilers before long.

Sir W. Fairbairn proposed rolling the plates with thicker edges along the rivet holes so as to approximate the strength of both; this, too, is a feasible suggestion. Another equally good plan is to arrange the plates and joints diagonally, the joints being at an angle of 45° with the axis of boiler. By this plan the strength of the boiler is increased considerably, according to Mr. W. R. Browne, in the ratio of four to five.

In good boilers the joints that have to resist the greatest strain, the circumferential, are double-riveted, while those subject to longitudinal strain are single-riveted. Even this precaution, however, does not make the joints so strong as the plates by a ratio of one fifth.

* Testing by steam would be, however, rather hazardous

Correspondence.

The White Streak in Silk.

To the Editor of the Scientific American:

I am aware that manufacturers have been more or less troubled with the appearance of a white streak on machine twist, and that dyeing by the ordinary process for silk would not color it. It is alleged that it may arise from not thoroughly washing the material from soap; or it may arise from dead wood, or from adulteration, or from a parasite or fungus. That it is not soap, every dyer knows. That it is not a parasite or fungus is evident, because an ordinary thread of twist contains about 15 threads as reeled, and each thread about 5 as spun by the worm, so that the aggregate is 75 threads. Were it a parasite or fungus, it would be a spot only on 1 thread of the 75, and the other 74 threads would wrap round it, and it would be lost to view. No silk made on mills where the spindles are run with leather belts and the silk is taken up on shaft bobbins, and is not stretched on the stretchers now in use, ever developed the so-called white streak.

That it is a vegetable substance is shown by the fact that the process for dyeing cotton, flax, or woody fibers colors it; but the process for silk, wool, feathers, or other animal substances will not color it.

The friction rolls on spinning mills are continually wearing, by friction with the silk. The bands are whipped and worn, at the knots, into fine threads flying around the spindle; the wood rolls of the stretcher are constantly wet and softened, and are subject to friction, giving off fine particles. All these latter are taken up more or less by the thread; and it is from this source the trouble must be looked for.

I would like to confirm the statement that it is found on raw silk by boiling and dyeing; then if the streak remains, I will admit that there is something in the theories of adulteration, parasite, or fungus. LEWIS LEIGH

Mansfield Center, Conn.

A Remedy for Potato Blight.

To the Editor of the Scientific American:

Having read a communication from Mr. Lyman Reed, of Boston, some months since, concerning the cause of the potato rot, and referring the process to the action of microscopic parasites attacking the tubers, I devoted some spare hours to the verification of his view, which, with some modifications, I am compelled to indorse. My investigations have been conducted with an instrument magnifying 800 diameters (640,000 times), assisted by a dissecting microscope giving 50 diameters, for the preparation of sections and the isolation of specimens. My method has been to procure specimens of the different varieties, and, having carefully cleansed them, to subject them to gentle heat for 96 hours or more, then to submit them to a careful examination. The ova of the insects seem to occupy the interior layer of the cuticle of the tubers, and pass rapidly into larval state under the proper thermal condition. I have no doubt that they commence that histolytic process that ends in the destruction of the tuber; but I doubt whether there is any genetic connection between the fungi developed on the stalks in the course of the degeneration, and the larvæ, in which the degeneration primarily starts. The fungi are very likely independent structures resulting from the deposition of spores from the atmosphere, on vegetable tissue already in the course of dissolution from other causes. Indeed, I may say that from actual examination I am assured that such is the case, and that, as a general rule, vegetable tissues develop microscopic fungi in the process of breaking down, where similar spores deposited on healthy tissue would remain undeveloped.

I have made drawings of the larvæ mentioned by Mr. Reed, in their various stages, and, what is more important, have tested them with various re-agents. Tested with weak solution of sulphuric acid, they become very active for a few minutes, then fall into a torpid state, but finally recover. Substantially the same effect is produced by alcohol. Ordinary whale oil attacks them virulently in the larval state, but not so virulently in the less developed stages. Kerosene oil is still more fatal to them in the larval state; but unless a considerable quantity is absorbed they gradually recover, and the younger the larvæ the less readily they yield to the action of kerosene. In some experiments prosecuted last summer on what are generally known as apple tree worms, the same rule held good. Sperm oil and kerosene were both destructive to the fully developed larvæ, but very inefficient when applied to the undeveloped ova. After thoroughly testing the potato larvæ in their various stages, with solutions of nitric, muriatic, sulphuric, and oxalic acids, then with alcohol, sperm oil, and kerosene, and with various alkalies, and finally with iodine tincture, I was forced to the conclusion that the remedy was not to be sought in this direction, and tried a combination of one part of carbolic acid to thirty parts of common whale oil, with unerringly destructive results, both as respects the larvæ and the ova.

If you will permit me, on a subject of such importance, through your universally read journal, I will take the liberty of announcing that a bland solution of carbolic acid in common whale oil or kerosene is the scientific remedy for the rot. The best way to use it would, I think, be to dip the potato, just before planting, in the solution, which is very inexpensive and very easily obtained. I may add that my experiments convince me that carbolic acid in this bland solution in no way impairs the germinal activity of the tuber; but, by way of certainty, let me recommend your farmer readers to first try the experiment on a few hills this spring, and, if successful, to adopt it as a remedy for the blight.

I will, should you signify that it would be agreeable to you, be glad to give you full details of my investigations, accompanied with drawings of the insects in different stages, and descriptions of structure and manner of development from the egg, of which I have copious notes: according always to Mr. Reed the full honor of first discovery.

New York city. FRANCIS GERRY FAIRFIELD.

The Flow of Water in the Suction Pipes of Pumps.

To the Editor of the Scientific American:

In reply to your many correspondents who ask about (and are pleased to commend) my recent article (in "Practical Mechanism") on the subject of pump suction pipes, I would say that the result of my experience has been that, by allowing the flow of water through suction pipes to be 300 instead of 500 feet per minute, the following increase in the ratio of efficiency of the pump is attainable, and carefully conducted tests show it to be correct: Under a 27 feet lift, 15 per cent; under a 15 feet lift, 7 per cent; under a 5 feet lift, 2 per cent.

I account for this increase of efficiency as follows: Since the area of a circle increases as the square of the diameter, the friction of the water is, proportionally to its volume, less in the larger pipe. The check given to the upward movement of the water (in the suction pipe) by the pump piston (when it reverses its motion at the end of the stroke, and before the suction valve has had time to close) is experienced to a less degree upon the larger than upon the smaller body of water contained in the suction pipe. The larger suction pipe holds a proportionally larger supply of water close to the pump barrel, and serves in the same way as does a steam chest to a steam engine, to increase the volume of the supply. The increased efficiency, due to the application of an air chamber to the suction side of a pump, is in part, if not wholly, due to the same principle. The presence of air in communication with the suction pipe is neither desirable nor obtainable in a continuously working pump, because the water in time absorbs all the air, and fills the chamber which contains it. That vessel may therefore be more correctly termed a supply reservoir. In the experiments referred to above, there was one bend or elbow in the suction pipe immediately outside the pump barrel, and the water was received into a reservoir in the pump and directly beneath the suction valves, which were of rubber and of the kind known as griddle valves. They were as large in area as the barrel of the pump; the reservoir referred to was about two thirds as large in cubical contents as the pump barrel, and (as a consequence) but very little difference in the ratio of the efficiency of the pump was observable, whether the suction pipe was supplied with an air chamber or not, excepting at the 27 feet lift test, at which the application of the air chamber increased the efficiency about 3 per cent. The number and radius of the bends in a suction pipe affect the efficiency of the supply of water to a serious degree, as the greater their number, and the less the radius of each bend, the larger should be the area of the suction pipe. These conditions are, however, so variable that but little would be added to our present knowledge upon the subject by making tests, unless under a multiplicity of those conditions.

I stated, in the article on pumps, that "all pumps throw less water than their capacity, the deficiency ranging from 20 to 40 per cent, according to the quality of the pump. This loss arises from the lift and fall of the valves, from inaccuracy of fit or leakage, and in many cases from there being too much space between the valves and piston or plunger." To this latter remark, I would now add that, in cases where the defect referred to exists, I have increased the efficiency of the pump as much as 25 per cent by simply filling in the vacant space with lead, first boring a few holes in the metal for the molten lead to run in, so as to prevent the lead from moving when cold. It is of vital necessity to keep the space between the pump plunger or piston and the valves as small as possible, filling in all corners and allowing only room sufficient to allow the latter to open to the necessary distance. JOSHUA ROSE.

279 West 12th street, New York city.

SAWDUST, mixed with any resinous substance, cut in small cakes and dried, makes good fire lighters, and saves kindling wood.

PRACTICAL MECHANISM.

BY JOSHUA ROSE.

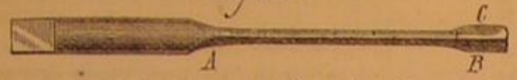
NUMBER XXII.

HAND TURNING.—FORGING DRILLS.

Here it will be as well to give instructions as to how to forge the drill. First heat the steel wire slowly, otherwise the extreme point will become heated before the rest of the drill; and bear in mind that the steel must not be made hot enough to scale, that is to say, it may be made to a bright red but not in any case to a yellow heat, for at that heat it will become what is called burnt, by which the virtue of the steel will be destroyed, and it will fall to pieces when struck by the hammer. But there is a stage of overheating in which the steel, while not sufficiently burnt to cause it to crumble in forging, will yet be sufficiently deteriorated to nearly destroy its value as a cutting tool, and the only way to avoid this evil is to heat the steel slowly and evenly to a bright red.

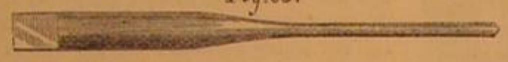
In forging the steel down to the required size, hammer it square, that is, forge it into a square bar to prevent it from becoming hammered hollow, or splitting, as it is almost sure to do if hammered all over its circumference; and take care at first to forge the point least, so as to leave a body of metal there which will tend to prevent the steel from splitting. By following these directions, the shape of the drill, when forged down to the required size and ready to be rounded up and finished, will be as shown in Fig. 62.

Fig. 62.



The corners of the square part, from A to B, may then be hammered down, making the stem round; and the bulbous end, C, may then be forged to the required finished size. A side view of such a drill is shown in Fig. 61, and Fig. 63 presents an edge view.

Fig. 63.



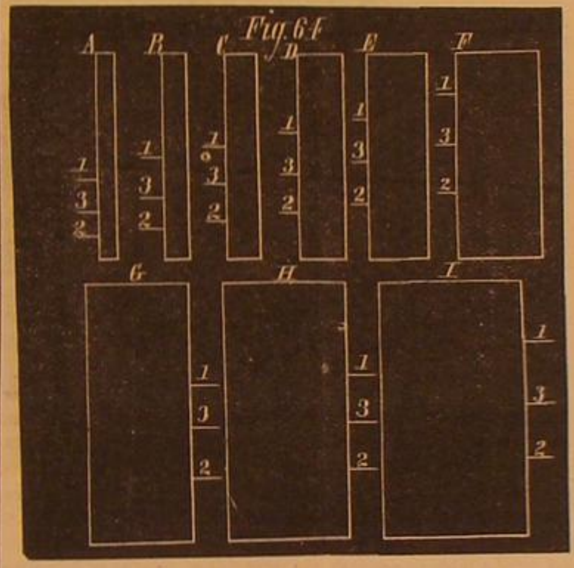
HARDENING AND TEMPERING.

Our next duty is to harden and temper the cutting end of the drill. Steel is said to be hardened when it is as hard as it is practicable to make it, and to be tempered when, after having been hardened, it is subjected to a less degree of heat, which partly but not altogether destroys or removes the hardness. The degree to which this tempering is performed, or in other words the degree of the temper, is made perceptible and estimated as follows: By heating a piece of steel to a red heat (not so hot as to cause it to scale), and then plunging it into cold water and allowing it to remain there until it is cold, it will be hardened right out, as it is termed, that is, it will be made hard to the greatest practicable degree. If it is then slowly reheated, its outer surface will, as the temperature increases, assume various shades of color, commencing with a very light straw color, which deepens successively to a deep yellow, red, brown, purple, blue, and green, which latter fades away as the steel becomes heated to redness again, when the effects of the first hardening will have been entirely removed. It becomes apparent, then, that the colors which appear upon the surface of the steel denote the degree to which the tempering or resoftening operation has taken place. Having then by practice ascertained the color which denotes the particular degree of hardness requisite for any specified tool, we are enabled to always temper it to that degree, sufficiently near for all practical purposes. It is undoubtedly true that, if the conditions of tempering which will be laid down in all our instructions are (for want of sufficient experience in the operator) varied, the colors will not present, to positive exactitude, the precise degree of temper: the difference being that, if the color forms very rapidly, the tool may be left of a lighter color; and that if the colors form very slowly, the tool may be left of a slightly deeper hue. The difference in temper, however, as compared to the color, will in no case be sufficient to be perceptible in ordinary tool practice, and need not, save under circumstances requiring great minuteness in the degree of temper, be paid any attention to.

When a tool (such as a drill) requires to be tempered at and near the cutting edge only, and it is desirable to leave the other part or parts soft, the tempering is performed by heating the steel for some little distance back from the cutting edge, and then immersing the cutting edge and about one half of the rest of the steel, which is heated to as high a degree as a red heat, in the water until it is cold; then withdraw the tool and brighten the surface which has been immersed by rubbing it with a piece of soft stone (such as a piece of a worn-out grindstone) or a piece of coarse emery cloth, the object of brightening the surface being to cause the colors to show themselves distinctly to indicate the state of the steel. The instant this operation has been performed, the brightened surface should be lightly brushed by switching the finger rapidly over it; for unless this is done, the colors appearing will be false colors, as will be found by neglecting this latter operation, in which case the steel after quenching will be of one color: and if then wiped, will appear of a different hue. A piece of waste or other material may of course be used in place of the hand. The heat of that part of the tool which has not been immersed will become imparted to that part which was hardened, and, by the deepening of the colors, denote the point of time at which it is necessary to again immerse the tool and quench it altogether cold.

The operation of the first dipping requires some little judgment and care; for if the tool is dipped a certain distance and held in that position without being moved till the end dipped is cold, and the tempering process is proceeded with, the colors from yellow to green will appear in a narrow band, and it will be impossible to directly perceive when the cutting edge is at the exact shade of color required; then again, the breadth of metal of any one degree of color will be so small that once grinding the tool will remove it and give us a cutting edge having a different degree of temper or of hardness. The first dipping should be performed thus: Lower the tool vertically into the water to about one third of the distance to which it is red hot, hold it still for about sufficient time to cool the end immersed, then suddenly plunge it another third of the distance to which it is heated red, and withdraw it before it has had time to become more than half cooled. By this means the body of metal between the cutting edge and the part behind, which is still red hot, will be sufficiently long to cause the variation in the temperature of the tool end to be extended in a broad band, so that the band of yellow will extend some little distance before it deepens into a red; hence it will be easy to ascertain when the precise degree of color and of temper is obtained, when the tool may be entirely quenched. A further advantage to the credit of this plan of dipping is that the required degree of hardness will vary but very little in consequence of grinding the tool; and if the operation is carefully performed, the tool can be so tempered that, by the time the tool has lost the required degree of temper from being ground back, it will also require reforging or reforming.

The distance a tool requires to be heated and dipped at the first dipping, and the distance to which the transient dipping should be performed, vary so much with the substance of the metal that a definite idea can only be obtained by an



illustration, as shown in Fig. 64, A, B, C, etc., representing pieces of steel, either round or square, the line marked 1 being the distance to which the steel is made red hot, the line 2 (in each case) representing the distance to which the first dipping should be made, and the line 3 representing the distance to which the sudden and transient plunging should be performed.

Having tempered our drill according to these rules, to a dark purple, our next operation is to grind it. The flat sides of the cutting end should be ground on that side of the stone on which the latter is running from you, the faces being ground to a gradual level, of which the extreme point is the thinnest part. The thinner the point is, the more easily the drill will enter the metal, and, but for the liability of its breaking, it might be ground almost to a sharp edge. The correct thickness cannot be determined because it increases with the size of the drill; but a very little practice will enable the artisan to estimate it for any size of drill.

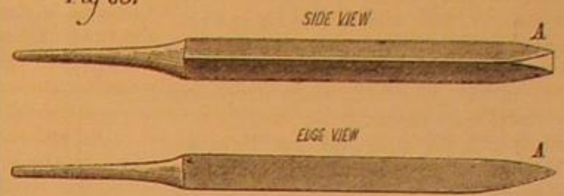
The angle of one cutting edge to the other varies with the kind of work upon which the drill is to be used, the rule being that, for ordinary work, a right angle will suffice; but for drilling sheet metal a more acute angle should be employed, so that the drill will emerge from the work gradually: otherwise, when, by reason of the point having emerged, the drill is released from the pressure necessary to force it into the metal, the remainder of the cutting edge will enter the metal very readily, and, taking an excessive cut, will twist or break the drill. For this reason the drill should be fed to its cut very slowly after its point has come through. Care must be taken to grind the drill so that the point is in the exact center of the diameter, otherwise the drill will bore a hole larger in diameter than itself; and the angle of the cutting edge should be equal on each side of the point, or else one cutting edge only will perform any duty. The angles should be ground with the grindstone running towards you, the flat side of the drill being rested upon the grindstone rest. When the drill is placed in the lathe ready for operation, it may easily be made to run true by tapping it lightly with a hammer.

Small drills may be run very fast in the lathe, which will cause them to cut freely, and to drill the hole straight; if, however, the metal to be drilled is unusually hard, the speed must be reduced.

SQUARING THE ENDS OF THE WORK.

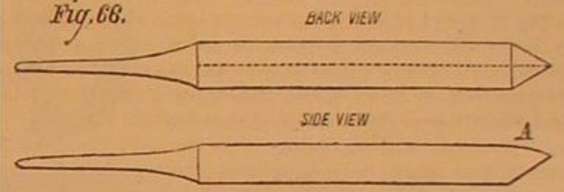
The work being centerdrilled, it must be placed in the lathe, with a driving dog on one end, the back center being screwed up only just so tight that the work may be moved by the fingers, and yet it must have a firm bearing against the lathe centers. The hand rest should then be placed as close to the work as possible without touching it, when the ends of the work must be trued up. The object of first truing the ends is to prevent the centers in the work from wearing on one side more than the other, as they would do if one side of the end face of the work was, at either end, higher than the other. The operation is called "squaring the ends" and is performed with a side tool, of which there are two kinds, both being made of three-cornered (or three-square, as it is generally termed) steel, the only point of difference being in the manner of grinding them. A worn-out saw file is an excellent thing to make a side tool of, because the teeth grip the rest and prevent the tool from slipping. It is not necessary to soften the file at all, but (for either kind) merely to grind it as shown in Figs. 65 and 66. A being in each case

Fig. 65.



the cutting edge. The tool shown in Fig. 65 has two cutting edges, one of which rests upon the hand rest while the other is cutting, which does not in any way damage the edge but causes the tool to hold very firmly to the rest, and hence to turn very true. It possesses the further advantages that it cuts very freely, and that its point can, by reason of its thinness, approach much nearer to the center of

Fig. 66.



the work without coming into contact with the lathe center. Except for heavy work, it is by far the best tool in every respect, nor would the other have been presented at all, save that it is very largely employed when it is required to perform heavy duty. Both of these tools are slightly rounded in the length of their cutting edges, and are kept sharpened from the end about half an inch back.

If their cutting edges are smoothed by the application of an oilstone, they will give a very clean and smooth polish to the work. The rest should be set at such a hight that the cutting edge of the tool is slightly above the horizontal center of the work; and the tool should be so held that its side face stands nearly parallel with the end face of the work, the cutting edge being held slightly inclined towards the work, which will give to the tool edge the necessary clearance. Any excess of this inclination renders the tool liable to turn out of true, and destroys its cutting edge very rapidly. Having squared each end of the work, it must be taken from the lathe, and the burr left by the turning tool around the center filed off, when the work will be ready to countersink, that is, to bevel off the edge of the hole made by the centerdrilling, and thus to form a recess in which the lathe center will fit. And here it becomes necessary to explain one of those fine points for which the purely practical man is apt to sneer at the theoretical workman. Nine out of ten practical men will countersink by simply centerpunching, or else neglect the operation altogether, and force up the back center of the lathe and thus wear a countersink in the work. The wear and damage caused to the lathe center is sufficient condemnation of this system, unless it be applied to work that requires to be reduced in size regardless of its being either true or uniform, and this should be done in a lathe used only for such work. Countersinking by centerpunching will answer very well for jobs that require sufficient work to be performed on them at each end to give them time to wear and fit the center; and as this is nearly always the case, this system is considered sufficient for all practical purposes. It is, however, mechanically incorrect, because (even supposing the artisan to be able to grind the centerpunch true so far as roundness is concerned, and true in its bevel with relation to the bevel of the lathe center), unless he holds the centerpunch so that the center line of its length is dead true with the center line of the work, the countersinking will be deeper on one side of the work than on the other, and hence will throw the work out of true. It will, however, right itself after running a little time in the lathe. Now it is quite true that the amount to which the work will thus be thrown out of true is very slight, and (as stated) soon rights itself; but even when the end of the work running on the still or dead center has worn itself true, it must be turned end for end in the lathe before the other end will become true. Then, again, when there are many pieces of work to countersink, that operation may be as quickly performed by means of the square center as with the centerpunch, while the square center will cut true and uniform. The only possible claim that countersinking by centerpunching can possess is the saving of the time required to place the square center in the lathe; for after it is once placed there, the operation may be as quickly performed in the one case as in the other.

Countersinking by the square center is performed by making the square center the running center of the lathe, and by feeding the work up to it by the back lathe center, as described in the instructions upon centerdrilling.

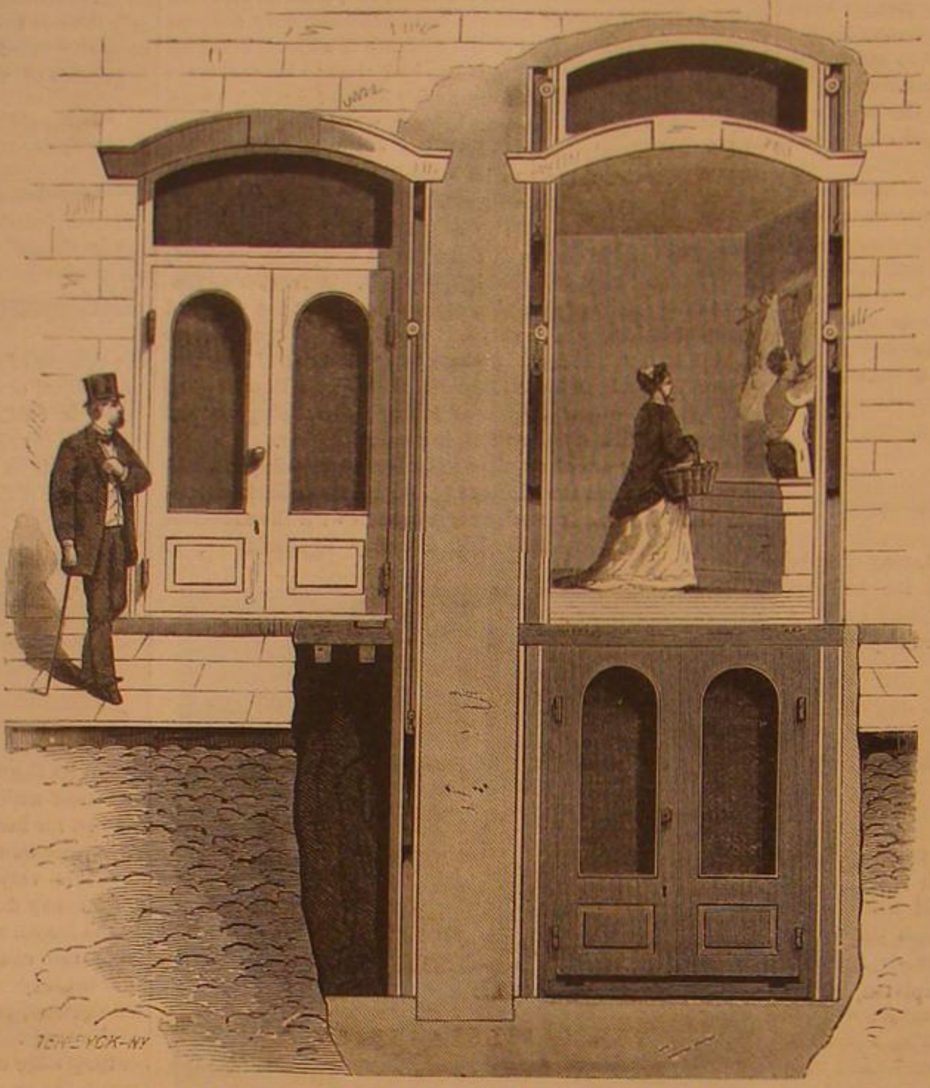
MOVABLE FRONTS FOR BUILDINGS.

We illustrate herewith a method of throwing open, if need be, the entire front of an apartment, which, in view of the approaching warm weather, is quite timely, since it is applicable to a number of cases readily suggested. Our artist has represented the device applied to a butcher's store, to which it is especially suited, inasmuch as it allows of doors and windows being slid completely out of sight, leaving nothing but the pillars or other necessary supports of the building above, and so affording thorough ventilation, broad access, and every opportunity of displaying stock. It might also be arranged in the edifices used as summer concert gardens, so as to leave, on warm nights, merely the roof and its sustaining posts: or in country houses, which thus could be opened so as to allow of the thorough circulation of the air. The additional advantage is also presented of doors, framework, and windows being put altogether out of the way, and protected from danger of breakage, while, at the same time, always remaining ready for prompt return to their places.

In Fig. 1 the door and fan light are shown in their usual locations. Both, however, are hung in framework, which traverses guide rails, which extend up and down toward the story above and into the basement or cellar. The frames are suspended by cords which pass over pulleys into the hollow side pillars, and which sustain counterweights, by which the balancing of the frames and their contents is effected. Thus arranged, the door, as shown in Fig. 2, may be pushed downward into the cellar, while the fan light may be raised into the wall of the upper story. When the door frame is down, a foot plate is laid upon the sill, over the opening, so that the latter is covered and concealed. The foot plate is also similarly located when the frame is up, in order to prevent the same being lowered when the doors are shut, except by first removing the plate.

The doors and fan light are hung and may be used in the ordinary manner, and the arrangement of the device for windows or portions of the wooden wall of a light building is precisely similar. If desired, the weights may be omitted, and the raising and lowering effected by suitable gearing. Also any desired locking devices may be added for holding the frames in either position.

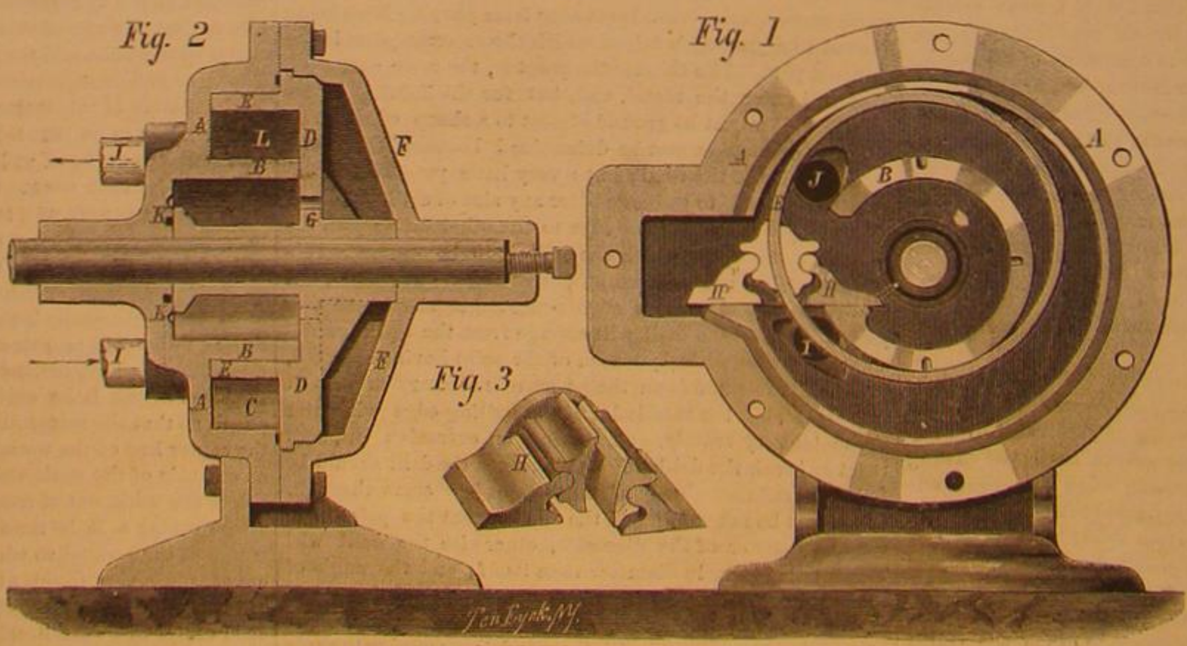
The invention was patented January 26, 1875, to Mr. John Murphy, of Fond du Lac, Wis., who may be addressed for further particulars.



MURPHY'S MOVABLE FRONTS FOR BUILDINGS.

IMPROVED ROTARY PUMP.

In the annexed illustrations we present sectional views of a new rotary pump, in the construction of which there are several novel features which will render it of especial interest to the mechanical reader. Of these perhaps the one most prominent is that of the entire capacity of the pump cylinder being utilizable, instead of merely the annular portion without the eccentric ring, as is commonly the case. Both compartments, exterior to and interior of the ring, are filled and emptied at every revolution, and this whether the speed be fast or slow, as it will be seen, further on, that the motion, and consequently the operation, of the machine is essentially positive. Stuffing boxes are avoided by rendering the apparatus self-packing, and by suitable construction the working parts are balanced, equalizing the pressure on all portions. It is claimed further that the pump delivers a steady stream, forcing the same, without leakage, to any desired hight, and this without necessitating the machine s being driven at the high velocity peculiar to many rotary pumps. The volume of water discharged under all conditions is stated to be exactly proportionate to the power and speed applied.



BAGLEY & SEWALL'S ROTARY PUMP.

In Fig. 1 is shown a vertical longitudinal, and in Fig. 2 a transverse, section. In the latter illustration, A is a portion of the casing, on the interior of which is cast the ring, B, the depth of which is greater than the outer portion of casing. The other side of the cylinder is formed by the disk, D, Fig. 2, to which the shaft is rigidly attached. To D is attached eccentrically a ring, E, some portion of which is always in contact with the casing, A, and also with the ring, B, at a point exactly opposite, so that the ring is really the piston of the pump, since the whole disk, D, is rotated by the shaft. The equalization of stream is effected by the center ring, B, being deeper than the outside casing, A, so that the cubic contents of annular spaces, C and L, on inside and outside of the eccentric ring, E, are the same. Bolted to casing, A, and covering, D, is an outer case, F, in a socket in which the shaft end abuts. Holes, G, through portion, D, allow the water to fill the space between D and F, thus balancing the movable portion by equalizing the pressure on both of its sides.

Referring next to Fig. 1, it will be observed that the piston ring, E, is held in the sliding abutment, H. A perspective view of the latter is given in Fig. 3, from which it will be readily understood that the movable tumblers adjust themselves to the eccentric ring, as the revolution of the same imparts to the abutment a to-and-fro motion on its seat. The water enters at the port, I, and, as the piston ring rotates, is forced before and between the same and the casing, around to the upper portion of the latter, and finally out of the port, J. As the piston ring rotates, it soon forms a space between its inner periphery and the fixed ring, B, into which the water from port, I, freely enters, filling the interior of the piston, finally to be forced out by compression between said piston and the fixed ring. In Fig. 1, it will be seen that the port, I, is half open to the space outside of the piston ring, and at the same time is also opening into the inside space. The shaft, as shown in Fig. 2, abuts in a socket within which its extremity comes in contact with a set screw, by means of which the bearing against the casing at K is brought up to compensate for wear. At this bearing, it is claimed, all leakage is prevented by a circular groove in the seat, which groove, by a channel, communicates with the suction port. Any escape is thus drawn into the last mentioned orifice.

Among the other advantages claimed may be noted simplicity, ready accessibility of parts without necessitating breaking connection with any of the pipes, and interchangeability of the various portions. The pump is further stated to be especially useful for thick liquids, and to be adapted to brewing, tanning, wrecking, and a large number of other purposes. The wear, we are informed, is very slight; and as it takes place on the surfaces in such a manner that abrasion from one compensates for the same on another, the parts always maintain their relative positions.

Patented October 6, 1874, to L. D. Green. For further particulars address the manufacturers, Messrs. Bagley & Sewall, Watertown, N. Y.

Steam as a Fire Extinguisher.

An interesting experiment with Sanderson and Proctor's patent fire extinguisher was recently made in Lower Aspley Old Mill, Huddersfield. The apparatus depends for its effectiveness on the efficiency of steam as a medium for extinguishing fire; and although this is used in many mills, there are some people who doubt its suitability for this purpose. Therefore both points came to the test in the trial. The self-acting arrangement consists of a number of thermometers, which serve as contact makers in an electric circuit, and the apparatus proper, which turns on the steam valve by releasing a pin on the wheel, and permitting the weight attached to the same to turn it round. Contact can be made at any given temperature, the fire simply raising the mercury in the thermometer to the desired point. Lower Aspley Old Mill, which has been used in the woolen trade, is at present empty, and in a condition highly favorable to be burned down from the quantity of oil, grease, and dust deposited on the floors, walls, pillars, and elsewhere. A quantity of firewood and shavings had been placed on the floor of the bottom room, which measures 75 feet x 22 feet x 14 feet high. The fire was lit exactly at half past three, producing immediately a large body of flame, and not quite a minute elapsed before the apparatus turned on the steam. For the next two minutes the fire continued to burn unchecked, but then it became less, and in another two minutes no more flame could be seen. When the steam, which was 40 lbs. in the boiler, had been going into the room for fifteen minutes, it was turned off and the door opened; but a well known crackling inside told that the fire was burning up again, so the door was closed, and steam turned on for twenty minutes longer; this was quite sufficient to remove every trace of fire, and, after the room had been aired for about half an hour, the whole of the interior was perfectly dry, and no trace of moisture could be detected, a circumstance which may be easily explained, and one of great importance to machinery in rooms where steam has been used as an extinguisher. When we say moisture, we exclude one or two pools of water in a low part of the floor. An artificial wooden floor upon which the fire had been placed was very slightly charred in one place, and the quantity of firewood burned was very small. The trial was so far a success, both as regards the apparatus and the agency of steam as an extinguisher.—*Engineer.*

Sulphur as a Fire Extinguisher.

Les Mondes suggests that brimstone should be carried on board every ship for use in case of fire. Half a hundredweight (30 kilos.) of brimstone would be sufficient to abstract the whole of the oxygen from 3,531 cubic feet of air, thus rendering it unfitted to support combustion. In a closed space, like a ship's hold, the sulphurous gas produced by the burning of the brimstone would penetrate where water from the decks could not be brought to bear, and the density of the gas would prevent its rising or spreading if care were taken to close the hatches carefully with wet sails, etc. It is suggested that the brimstone should be made up in the form of large matches, the ends of which could be passed through scuttles prepared for them in the decks or bulkheads in case of need. It is asserted that $4 or $5 worth of brimstone would be sufficient to stifle and annihilate all traces of combustion in an air space of 35,000 cubic feet

New Property of Glycerin.

R. Godeffroy, on examining a chemically pure glycerin, found that when heated to 302° Fah. it took fire, and burnt with a steady, blue, non-luminous flame, without diffusing any odor or leaving a residue. The glycerin had the specific gravity 1·2609. This property enables glycerin of lower specific gravity to be burnt by means of a lamp wick.

GROWING ORCHIDS.

The orchids are among the most recent popular claimants for the attention of the florist and the amateur, and there are some varieties which can be raised with very little trouble and expense, as a large proportion of the entire class require but a moderate degree of heat. The species are very numerous, and are found all over the world, this country being, however, but sparingly represented among them. The best known of the American kinds is probably the showy orchid (*orchis spectabilis*, of Linnæus); this is found from New England to Kentucky, and beautifies the wooded hills in the month of May. The large, round-leaved orchid (*platanthera orbiculata*) spreads its foliage on the ground, and the white orchis (*p. dilatata*) bears a wand-like spike of whitish flowers. Both these kinds are common in our Northern States. Perhaps, however, the most beautiful of our native sorts is the great purple orchis (*p. peramœna*, Gray), with its large, showy flowers. It grows freely in moist spots in the West and South.

As a rule, all orchids require plenty of moisture, and the beautiful English specimen shown in our engraving is elevated in a bed surrounded by spars of wood, serving to keep the roots well supplied with air, and to surround them in a water-bearing mass of moss or other vehicle.

New Form of Concrete Foundations.

At Glasgow harbor, the foundations for a 60 tun crane have been put down on a new principle by Mr. Deas, engineer to the Glasgow Harbor and Clyde Navigation.

The quay wall itself is carried on triple groups of 12 feet cylinders. The crane seat rests on twelve concrete cylinders, 2 feet 4 inches thick and 12 feet external diameter, in three rows of four each. The four front cylinders were made in pairs, and the middle and the back rows singly, the last two rows being joined together by tongues of brickwork. The cylinders were made in wooden frames, in rings about 30 inches deep. They are composed of a mixture of five of gravel to one of Portland cement, and were ready to lift and set in position after being made about three weeks.

The cylinders sit each on a cast iron shoe, on which, after being set in the trench, brickwork in cement was built to a hight of 5 feet. On the top of this the concrete rings were placed, and jointed together with strong Portland cement mortar. The bottom of the trench in which the shoes were placed close together was about 3 feet above low water level. After the building of the cylinders on the shoes was completed, they were sunk, by means of Milroy's patent excavators, until the bottom of the shoes reached the depth of 32 feet below low water level, or about 52 feet below quay level, about 100 tuns of cast iron rings, of the same shape as the concrete rings, being required to force each cylinder down. The cylinders were then cleaned out by the excavators to the level of the bottoms of the shoes, and filled with Portland cement concrete, the lower 9 feet of the front cylinders being composed of five of gravel to one of cement, all the other concrete used in filling being nine to one. The diamond spaces between the cylinders were also cleaned out to the same level, and filled to the top of their cylinders with concrete, five to one.

THE SOLANUM CRINITUM.

This is one of the handsomest of all the plants known as sub-tropical, when grown in warm sheltered spots. According to the *Revue Horticole*, this plant was introduced to Paris gardens in the year 1862, and is a native of Guiana. It is, in addition to its fine size and dignified port, a plant of remarkable beauty, owing to the texture of its leaves, which are covered with a deep rich velvet of tender green color, with violet veinings set with spines. So very remarkable a plant deserves to be cultivated as an indoor plant where the climate will not permit of its being grown out of doors.

Panoramic Photographs.

M. J. F. Plucker, of the Belgian Photographic Association, contributes to the *Bulletin* an ingenious method of producing panoramic prints from two or more negatives. The negative must be taken so as to include, at the edges where the junction is to be made, a portion of the subject in common. This portion is printed from one of the negatives upon a slip of paper, which is divided in the center with a penknife. The two halves are then attached to the negatives in such a manner as to exactly cover the portion it is intended to "stop out" of each, a piece of opaque paper, the size of the negatives used, being also gummed on for the purpose of protecting the sensitive paper, which is not covered by the negative. The first negative is placed in a printing frame large enough to hold the number of negatives intended to be combined, and, after printing, the extremities of the line of junction are carefully marked with a pin point. Negative No. 2 is then introduced and brought into register with the pin holes. This may be done either by holding the frame up to the light, or by resting it on the edge of a table, a lamp being placed on the floor. Having secured the register, proceed to print in the usual way, repeating the operation for each different negative.

Magnetization of Steel.

The magnetic strata are limited to a certain thickness, which they can never exceed. This limit varies in different steels. It is very great in those which are soft, and diminishes as the proportion of carbon augments and as the temper is harder. For certain bars which the author has studied it is $=0m\,4$; but he has specimens where it is below

THE CATTLEYA TRIANIÆ.

1-10 m.m. The latter only receive what might be called a superficial magnetic coating, the thickness of which it is not possible to augment by increasing the intensity of the current. But if the depth of the magnetization diminishes along with the magnetic conductibility, the intensity of the magnetism increases. It follows that the quantity of magnetism is subject to two causes of inverse variation—the depth which increases, and the intensity which lessens, as the conductivity increases.—*M. J. Jamin.*

Everlasting Perdition.

A reward of two hundred and fifty dollars is offered in London, for the best essay of moderate phamphlet size, advocating an address by the House of Commons to the Queen,

SOLANUM CRINITUM.

in favor of the revision of the services of the State Church, so as to exclude the threat of Everlasting Perdition against those of Her Majesty's subjects who do not believe in that doctrine. Essays are to be sent in before May 1st of the present year addressed to Rev. R. Spears, 37 Norfolk street, Strand London.

Uses and Properties of Salicylic Acid.

Salicylic acid is prepared from the oil of wintergreen, the latter obtained from the *gualtheria procumbens*, a trailing plant common all over this country and widely known as the wintergreen, tea berry, partridge berry, and deer berry, by boiling the oil for a few minutes with a solution of caustic potash: in this operation wood spirit is liberated, and on the addition of an acid salicylic acid is precipitated. Thus obtained, the cost of the substance has been high. Although its existence has been familiar to chemists, through its little or no utilization, it, in common with a very large number of other organic compounds, has been but slightly known outside of the laboratories. At the present time, however, there is a prospect of the acid coming into wide general employment through the recent discovery, of M. Kolbe, Professor of Chemistry at the Leipsic University, that it can be fabricated from carbolic acid, which discovery has been already put in practice on a large scale by M. Van Heyden of Dresden.

M. Kolbe has found that, while salicylic acid can be produced from carbolic acid, it, on decomposition by heat, regenerates the latter, and, further, it partakes, in common with carbolic acid, of the power of killing the inferior organisms which determine the phenomena of fermentation and of putrefaction.

Salicylic acid is in fact a powerful antiseptic, and, from its harmlessness and freedom from odor and taste, appears to be more valuable, in a considerable degree, than carbolic acid. Its properties are well shown in the following brief summary of M. Kolbe's experiments: Beer yeast, which, as is well known, determines the alcoholic fermentation of sugar, is totally inert on a solution of glucose to which one one-thousandth part of salicylic acid has been added. Ground mustard, when treated with tepid water, yields a strong piquant odor of mustard, but becomes completely odorless if a small portion of the acid be previously added. The acid also hinders emulsin, or the ferment of sweet almonds, from acting on the amygdalin and transforming it into essence of bitter almonds.

A very small quantity of salicylic acid retards considerably the spontaneous coagulation of milk. A quart of beer containing 15·4 grains of the acid and exposed to the air does not become sour, nor does the least vestige of the cryptogamic vegetation peculiar to spoiled beer show itself. Eggs plunged for one hour in a solution of the acid, and in no manner treated otherwise, were found perfectly fresh after three months' exposure to the atmosphere. Meat powdered over with the substance is prevented from spoiling for weeks. To prepare for use, the meat is merely washed to disengage the acid, as the savor of the latter is very slight and by no means disagreeable. This is a remarkably valuable property, and one which will doubtless find profitable utilization in transporting beef from Texas to the Northern States, or from Australia and South America to Europe.

Dr. Thiersch, of Leipsic, has investigated the uses of salicylic acid as applied to surgical dressings. When placed upon cancerous sores and ulcers in a powdered state, it hinders the putrid odor and produces no inflammatory symptoms. The impregnation of tow dressings and of bandages with the substance is found to be attended with excellent results, though it is curious here to remark that the acid is absorbed and afterwards found in the urine. The application of the acid to treating contagious maladies, such as typhoid and cholera, has as yet not been made the subject of experiment; but now that the properties of the substance have brought it prominently before the scientific world, there is little doubt but that the most extended investigations into them will shortly follow. It is already in use in the surgical wards of Roosevelt Hospital in this city, as a dressing for wounds, ulcers, etc., in the proportion of one drachm to sixty-two and a half fluid ounces of water.

Apparatine.

This is a new substance said to give excellent results when employed for preventing incrustation in boilers, besides being useful where gelatin and gelatin-like substances are required. It was discovered by Mr. H. Gerard. It is a colorless and transparent material obtained by treating starch, fecula, farina, and any other amylaceous substances with a caustic alkali. Hitherto it has been found to be best made with potato starch, treated with a ley of caustic potash or soda, the following being the most suitable proportions, and best method of preparing the apparatine: 15 parts potato starch are put into 76 parts water, and kept in a state of suspension by stirring, when 8 parts potash or soda ley at 26° Baumé are to be added, and the whole thoroughly mixed. In a few seconds the mixture suddenly clears, and forms a thick jelly, which is then beaten up vigorously, and the longer the operation is continued the better the quality of the apparatine. It is in this state a colorless, transparent substance, slightly alkaline to the taste, but devoid of smell, and of a stringy, glue-like consistence.

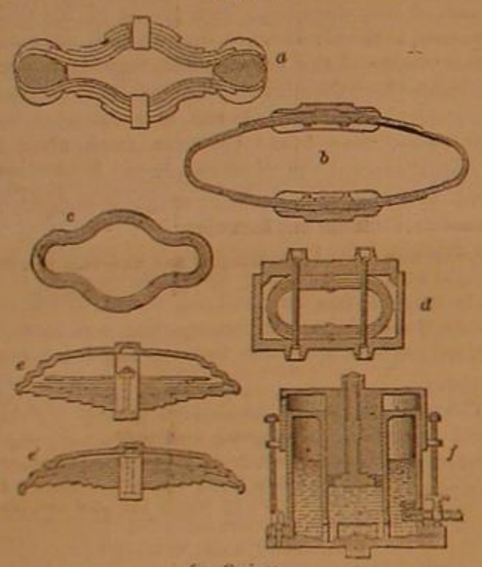
exposed to the air it dries slowly, but without decomposing; and even when heated to dryness, although it thickens and swells, it continues as unchanged as when air dried. When dried in thin sheets it resembles horn, but is more flexible, and may be folded back upon itself without breaking. For sizing textile goods of all kinds, silks, woolens, cottons, etc., apparatine is said to be admirably adapted, imparting to them a smoothness which hitherto has been found unattainable. When once applied to the goods and become dry, apparatine appears to be virtually insoluble. as three or four washings in hot water have been found to exercise little or no effect upon it, so that it may be used for all purposes in which glue or gum is required. Diaphanous or coarsely woven fabrics, when dressed with apparatine, are rendered stiff and rigid, like a sheet of metal; and the new gum may be used as a thickening in calico printing. It will be understood that we have indicated only a few of the uses of this valuable substance, which, it will be seen, is comparatively cheap. It is necessary to keep it in airtight vessels to prevent it becoming dry, unless it is used up as soon as made, for although it does not dry very rapidly when in bulk, it is not easily rendered soluble when it has once become hard. To prevent incrustation in steam boilers, the apparatine may be placed in the boiler or be added to the feed water in the tank, but the best results have, we believe, been obtained by placing it in the boiler direct.

CAR AND CARRIAGE SPRINGS.

We continue below our series of extracts from Mr. Edward H. Knight's "Mechanical Dictionary,"* selecting for the present paper a variety of interesting engravings relating to the various types of springs in use upon railway cars and on ordinary vehicles.

Car springs may be classed as elliptical, pneumatic, torsional, rubber and steel, rubber, steel, and air, spiral, helical, circular plate (plane, corrugated, and segmental), square plate, and bow. In the engravings which follow, the parts and structures are so evident that only a short description of each will be given. In Fig. 1, *a* is a double elliptic spring, the bearing of the end leaves of which are so shaped that, as

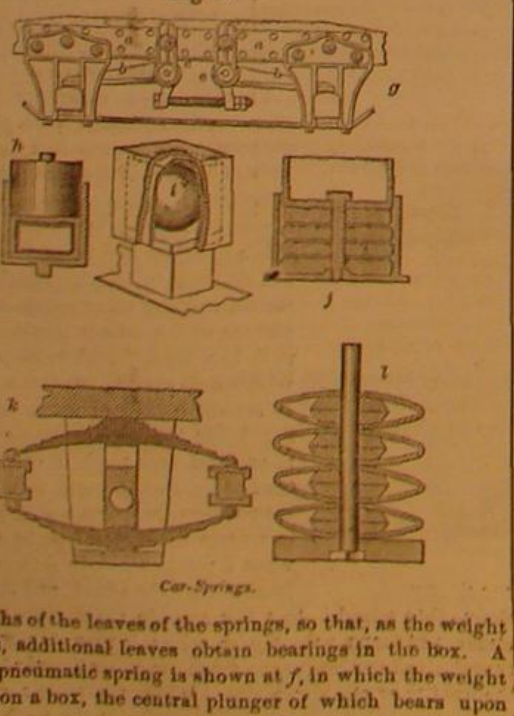
Fig. 1.



Car-Springs.

the spring bends beneath its load, additional leaves receive a bearing upon the ovoid bars. *b* is an elliptic spring, the principal leaves of which are made of a continuous plate wound around. Auxiliary plates, above and beneath, extend the area of bearing of the boxes. *c* represents a single plate wound around a mandrel. It is designed to be used with upper and lower bars, as at *b*, or in a box, as at *d*. *d* shows an elliptic spring in a box and a follower above, upon which the weight is imposed. Long bolts secure the follower. *e* is a series of plates which, when under others, assume the form, *e'*. The box above has a series of steps beneath adapted to

Fig. 2

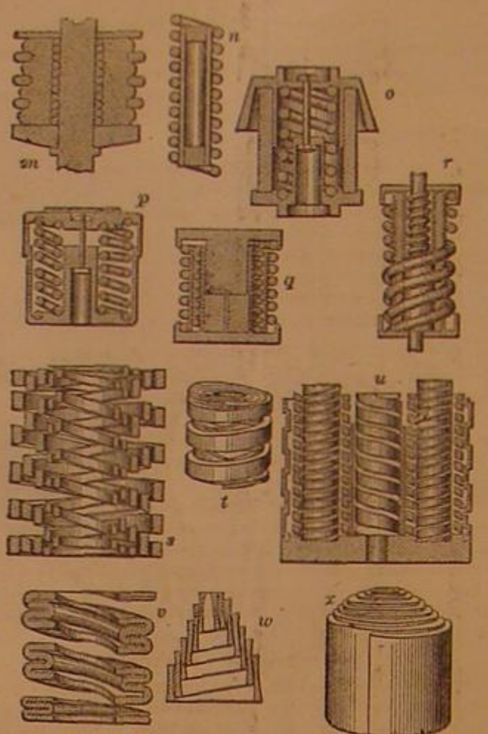


Car-Springs.

the lengths of the leaves of the springs, so that, as the weight increases, additional leaves obtain bearings in the box. A form of pneumatic spring is shown at *f*, in which the weight bears upon a box, the central plunger of which bears upon water, which transfers the pressure to a body of air imprisoned below.

In Fig. 2, *g* is a torsional spring. The weight of the truck comes on spring rods having arms, *b*. The torsional pressure is brought upon the rods, and by them transferred to the axle boxes. *h* is a pneumatic spring consisting simply of a rubber air cushion beneath the box. *i* is a hollow india rubber ball in a box with a polished interior. *j* represents a number of rubber disks in a box beneath a follower. *k* is a combination of steel elliptic springs with auxiliary rubber blocks at the ends. *l* has concavo-convex plates fitted upon a spindle with interposed vulcanized india rubber disks.

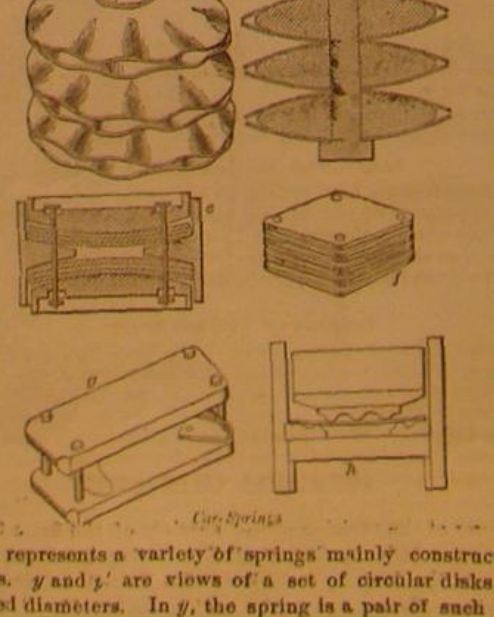
Fig. 3.



Car-Springs.

In Fig. 3 a cylinder of vulcanized rubber, with an interior coil to keep it from binding against the spindle, and an exterior spiral coil to keep it from spreading too far, is shown at *m*. In *n* air is inclosed in a rubber tube, which is enveloped in a steel spiral. *o* has an india rubber cylinder inclosing a spiral spring, and a bolt to limit the extent of the upward movement of the cover. The rubber expands into the flanged rim. *p* has a spiral steel spring contained in an annular case. *q* represents a pair of concentric spiral springs on the respective sides of a dividing cylinder. In *r* there is a combination of spiral and rubber springs, with telescopic tubes to form walls. *s* is a concentric arrangement of several spiral springs coiled in alternate directions. *t* shows a closer coil of the same general construction but of different proportions. In *u* each set has a pair of spirals, concentrically arranged, diversely coiled, and inclosed in a cylindrical sheath. *v* is a steel plate folded and then bent into a spiral form around a mandrel. *w* is a volute or helical spring, the inner fold of which, being projected in the line of its axis, is made to sustain the load. *x* is another helical spring shown in elevation.

Fig. 4.

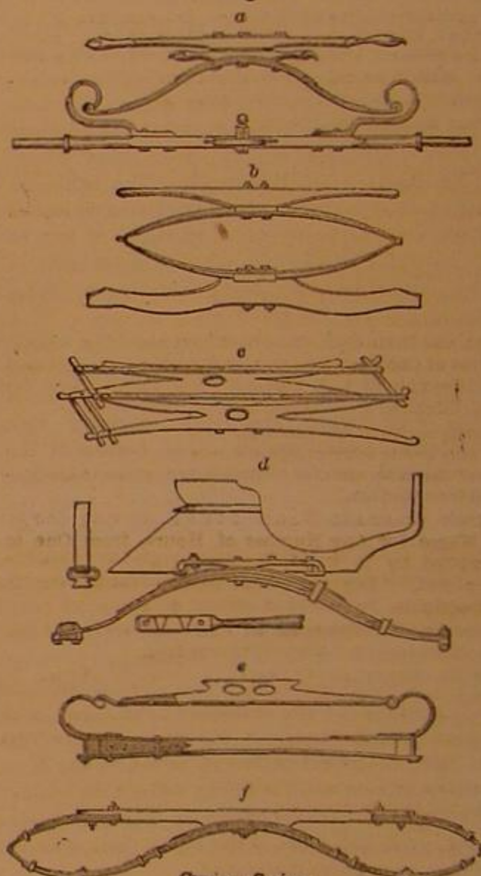


Car-Springs.

Fig. 4 represents a variety of springs mainly constructed of plates. *y* and *y'* are views of a set of circular disks of graduated diameters. In *y*, the spring is a pair of such series; in *y'*, two pairs of the same are allied. *z* has annular disks arranged in pairs and united by a rod. *a* has segmental plates alternating with flat plates in groups, the whole in a box under a follower. In *b* the spring is composed of a pile of circular plates, corrugated radially and arranged round a stem. In *c* the plates gradually increase in length upward and downward from a middle diaphragm. The bearings are on the ends of the longer and outer plates. Rubber springs are placed between the movable top and bottom plates of the case and the spring plates. *d* has several pairs of concavo-convex radially corrugated plates, and between the plates of a pair is a disk of vulcanized rubber. *d'* is a sectional view of the same. In *e*, a box has several metal plates compressed from opposite directions and shortened between bearings as they are bent. *f* has square plates curved diagonally and fastened together at the corners, thus forming alternate pairs, which bear upon each other at the corners and diagonally through the centers; the bearing points of the plates are changed by being lengthened and shortened when the spring vibrates. *g* has square, rhombic, oval, or circular plates bent bow-shaped and placed between bolsters. In *h* the plates are so disposed between the bearing surfaces that, when the weight increases, the load is transferred to points nearer the mid-length, so as to shorten the portion of spring involved in the support.

Numerous modifications and applications of the foregoing examples might be shown, but the above give a sufficiently clear idea of the various devices now in use. While on the subject of springs, however, it will be interesting to note a few of the appliances adapted to carriages, some of which will be found in Fig. 5.

Fig. 5.



Carriage-Springs.

At *a* semi-elliptical springs are exhibited, which are hung upon the ends of C springs attached to the axles. In *b* the usual elliptical springs are between the bolster and axle. Elastic wooden springs at *c* connect the axles and also support the bed. At *d* semi-elliptical springs couple the axles. At *e* a bolster is hung upon C springs, and at *f* is shown a system of curved springs, with three points of connection to the bed and two to the axles.

* Publishers, J. B. Ford & Co., New York city.

Mr. S. R. Wells.

We notice with much regret the death of Mr. Samuel R. Wells, a well known phrenologist and publisher of this city. Mr. Wells was born in 1820, and was educated as a physician; but subsequently becoming deeply interested in phrenology, he devoted himself thereto, delivering lectures and writing many works on the subject, the principal of the latter entitled the "New Physiognomy." He was associated for some time with Messrs. O. S. and L. N. Fowler. Later, however, he conducted his business alone, and with considerable success.

Mr. Wells was a man of many scientific attainments, a progressive thinker, and a firm advocate of temperance and a proper observance of the laws of health. Works on these topics, by various authors, were frequently issued by him, and the principles of the same strongly maintained in the *Phrenological Journal*, of which he was the publisher and founder. He died on April 13th, after an illness of ten days, and of an attack of pneumonia, followed by other diseases.

A very ingenious application of electro-metallurgy has recently been brought before the notice of the Society of Arts. It consists in the application of a coat of silver, by means of electro-deposition, on natural leaves and flowers. By this means very delicate ornaments are produced, since the precise form and texture of the natural leaf is preserved under the thin silver film.

Rubbing warts, night and morning, with a moistened piece of muriate of ammonia, is said to cause their disappearance without pain or a scar resulting.

Apple Gases.

Bender has experimented with ripe apples and obtained gases from them in the following proportions: 31·07 per cent carbonic acid gas, 68·93 per cent nitrogen gas. He believes that a fermentation is produced at the time of ripening, from which fermentation the carbonic acid gas results.

THE way to wash silk is to spread it smoothly upon a clean board, rub white soap upon it, and brush it with a clean hand brush.

NEW BOOKS AND PUBLICATIONS.

A NEW MONETARY SYSTEM, THE ONLY MEANS OF SECURING THE Respective Rights of Labor and Property, and of Protecting the Public from Financial Revulsions. By Edward Kellogg (from his work on Labor and Capital). Edited by his Daughter, Mary Kellogg Putnam. Fifth Edition. By mail $1.50, free of postage. Philadelphia, Pa.: Henry Carey Baird & Co., 406 Walnut street.

This book contains many original ideas on the subjects of banking and currency, and gives forth many panaceas for the evils of poverty, hard work, and short pay. We do not think it will convert any one to the belief that the laws of Nature and of supply and demand can be successfully abrogated by special legislation, however specious such law-making may be; but as the production of a sincere and very discursive thinker, the volume demands the attention of students of its subject, which is daily growing in importance to the future of this country.

UNITED STATES HARDWARE AND METAL TRADES' DIRECTORY, comprising a Complete List of the Manufacturers, Importers, Wholesale and Retail Dealers, Commission Merchants, etc., in the United States and Territories. Price $6.00. Boston, Mass.: Greenough, Jones, & Co.

This book is a most useful compilation, and appears to contain all the information stated in its very comprehensive title. The various trades, including agricultural implement makers, bell founders, boiler makers, engine builders, plumbers, and every other branch of the metal-working business, are arranged alphabetically by States, business headings, towns, and names. Much labor and care have evidently been spent on the work, which appears to be authentic in every particular.

THE METRIC SYSTEM OF WEIGHTS AND MEASURES. By J. Pickering Putnam. New York city: Hurd and Houghton.

Mr. Putnam places the advantages of the decimal or metric system before his readers with much clearness and force; and although the two sides of the question are very generally understood, it is well to keep the subject before the public. If ever the nations adopt any uniform system, there is little doubt that the French plan will be the basis of it; and of this, even the opponents of that system are tolerably well convinced.

WOODEN AND BRICK BUILDINGS. WITH DETAILS, CONTAINING ONE Hundred and Sixty Plates of Plans, Elevations, Views, Sections, and Details of Various Structures. With Specifications, Forms of Contract, Schedule of Prices, etc. Published Under the Direction of A. J. Bicknell. Volume II. New York city: A. J. Bicknell & Co., Architectural Publishers.

We recently reviewed this handsome work, on the issue of the first volume; and have now to acknowledge the receipt of Volume II, which completes one of the most useful and valuable works on practical architecture ever issued from the press.

WAGGENER'S STANDARD WAGES TABLES, showing Computations of Wages for Any Number of Hours, from One to Sixty. Compiled by D. B. Waggener, Author of "Book-keeping Simplified," "Improved Trial Balance Book," etc. Price $1. Philadelphia, Pa.: D. B. Waggener & Co.

A complete ready reckoner for all wages calculations, compiled with great care and arranged in a most convenient form.

A SERIES OF AMERICAN CLINICAL LECTURES. Edited by E. C. Seguin, M.D. Volume I, No. 3. Containing "Pneumo-Thorax," by Austin Hunt, Sr., M.D., Professor of Medicine at Bellevue Hospital Medical College. Price 40 cents. New York city: G. P. Putnam's Sons, Fourth avenue and 23d street.

This continued publication is likely to prove of special value to students of medicine, and the various essays are especially intended to be trustworthy guides to practice. Not only are the views of the lecturers given *in extenso*, but the latest authoritative opinions on the therapeutics and pathology of each case are combined in each issue, which is complete in itself.

THE POPULATION OF AN APPLE TREE. By A. S. Packard, Jr., Editor of "The American Naturalist," Author of "Guide to the Study of Insects," etc. Price 25 cents. Boston, Mass.: Estes and Lauriat, 143 Washington street.

A valuable contribution to popular entomological science, deserving to be read by all cultivators of fruit.

THE GLACIAL EPOCH OF OUR GLOBE. By Alexander Braun. Price 25 cents. Boston, Mass.: Estes and Lauriat.

We have here a very readable account of the much vexed question of the glacial theory, which is pointedly written and well illustrated.

SIXTH ANNUAL REPORT OF THE STATE BOARD OF HEALTH OF MASSACHUSETTS. Boston, Mass.: Wright & Potter, 79 Milk street.

THE RESOURCES AND MANUFACTURING CAPACITY OF LOWER FOX RIVER VALLEY, APPLETON, WISCONSIN. By A. J. Reid, Editor of the "Appleton Post." Appleton, Wis.: Reid & Miller.

MISCELLANEOUS ROLLING MILL INFORMATION. No. 10. Pittsburgh, Pa.: J. L. Lewis.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]
From March 9 to March 29, 1875, inclusive.

AXLE BEARINGS, ETC.—E. D. Murfey, New York city.
BOBBIN WINDER.—M. Cook, Ashfield, Mass., *et al.*
BOOT TIPS.—E. Maynz, Boston, Mass.
BRAKE, SIGNAL, ETC.—J. Y. Smith (of Pittsburgh, Pa.), London, England.
BUTTON NEEDLE, ETC.—G. Norwood, Boston, Mass.
BUTTER TUB.—C. B. Sheldon, New York city.
COFFEE PULPING MACHINE.—W. V. V. Lidgerwood, Morristown, N. J.
FORMING PULP INTO BOXES, ETC.—S. Wheeler *et al.*, Albany, N. Y.
GAS BURNER.—J. Ellis, Lynn, Mass.
GRINDING MACHINERY.—C. Van Haagen, Philadelphia, Pa.
HOSIERY SEWING MACHINE.—W. Pearson, Philadelphia, Pa.
INJECTOR.—S. Rue, Philadelphia, Pa.
MOTOR.—J. M. Cayce, Franklin, Tenn.
MUSIC BY ELECTRICITY.—E. Gray, Chicago, Ill.
PAPER BOX MACHINE.—P. B. Machine Co., Cleveland, Ohio.
PHOTOGRAPHIC PLATE.—H. Hill *et al.*, Worcester, Mass.
RAILWAY WHEEL.—R. N. Allen, Hudson, N. Y., *et al.*
ROLLER SKATE.—G. Pettitt, Oakland Point, Cal.
ROTARY ENGINE.—W. V. V. Lidgerwood, Morristown, N. J.
SCREW GEAR AND STEERING APPARATUS.—D. N. B. Coffin, Newton, Mass.
SCREW MACHINERY.—C. M. Spencer, Hartford, Conn.
SOAP.—S. S. Lewis (of Boston, Mass.), *et al.*, London, England.
SPINNING HEMP, ETC.—J. Good, Williamsburgh, N. Y.
STEAM ENGINE, ETC.—G. B. Dixwell, Mass.
STOCKING SUPPORTER.—A. H. Cramp, New York city.
TELEGRAPH.—M. Gally, Rochester, N. Y.
UMBRELLA.—U. G. Steinmetz, Philadelphia, Pa.
WEFT STOP MOTION.—T. Isherwood, Westerly, R. I.
WOOD PLANER.—D. L. Toppan, Somerville, Mass., *et al.*

Recent American and Foreign Patents.

Improved Bucket Ear.

James D. Field, Blue Rapids, Kan.—This bucket ear is constructed of a continuous piece of sheet metal, which is folded with a central rib, that is perforated for the bail, the side plates being attached to the bucket.

Improved Machine for Shearing Metal.

John Walsh and James Dutot, Newton, Iowa.—This device is so constructed that, by a down pressure, the lever will exert a constantly increasing force upon the jaw, and act upon the principle of the knuckle joint. The lower jaw hangs loosely on the fulcrum pin, with the outer end resting on a wedge. This wedge is moved back and forth, to open and close the shears, and act only on the lower jaw.

Improved Wagon Brake.

Lewis B. Morgan, West Liberty, W. Va.—The invention relates to that class of automatic wagon brakes wherein the weight applies the brakes through a sliding reach, and consists in combining with the ordinary brake lever and axle an end-slotted reach with an end eye, a rod, lever, and arc rod.

Improved Car Coupling.

Charles Hobzner, Louisville, Ky.—The invention relates to that class of car couplings in which no pin or link is used but a pivoted hook, that passes over a shoulder of the opposite car, and couples automatically. The invention consists in a lever upheld at its rear by a spring support, a push bar having a crosspiece supported by springs, and in a peculiar device by which the cars may, with great facility, be uncoupled from the car or from either side.

Improved Bedstead Fastening.

Louis Guienot, Baltimore, Md.—The object of this invention is to provide a fastening for bedstead rails and all kinds of frame work which are to be detachably connected. It consists in a short bolt having at one end a screw thread and nut, and a squared end to receive a wrench, and at the other a right angular groove. Said bolt is placed longitudinally in one portion of the frame, and is held therein by the said nut, which engages with the side of a recess, the grooved end of the bolt entering a detachable plate in the other portion of the frame work, which is provided with a lug or extension which moves in the said groove, and, when the bolt is turned, draws and locks the two portions of the frame securely together, the nut serving to tighten the devices as they may from time to time require it.

Improved Plow.

B. S. Benson, Baltimore, Md.—The invention consists in combining with a plow a set of wheels placed at an inclination to a vertical plane and provided with a groove upon their peripheries, which receives and runs upon the projecting edge of the unplowed ground.

Improved Ash Sifter.

Frederic Anthes, New York city, assignor to Theodore Wenk and Samuel Leber, of same place.—The invention relates to connecting the sections composing the body of the sifter to the circular ends thereof by means of slotted lugs and clamping bolts, also to the construction whereby the removable door section of the sifter is attached and held in place. By this construction the various parts of the sifting cylinder can be very easily and quickly put together and taken apart, and the sifter can be cheaply made.

Improved Spring Bed Bottom.

Edward P. Bennett, Elkland, Pa.—The present invention relates to new and useful improvements in spring bed bottoms, and consists in springs attached to the head and foot boards, having eyes which hold rods, and in a series of solid spring slats, slotted at the ends to receive the rods, the said rods being divided or split, and having central springs.

Improved Neck Tie.

Alden J. Adams, New York city.—The object of this invention is to prevent the slide of a cravat from slipping down while the said cravat is being worn. It consists in the combination of a flap, provided with a hook and eye or other fastening with the body of the slide.

Improved Wardrobe Bedstead.

Robert G. McClure, Jamestown, O.—This consists of straps for the purpose of holding the bed, and preventing it from bulging when turned up, the same being stiffened in the middle, while their ends remain flexible, and are provided with loops that fasten over knobs on the side boards of the bed bottom.

Improved Cloth-Shearing Machine.

Isaac L. Holmes, Saco, Me.—The first part of this invention consists of an automatic feed-regulating apparatus, whereby the cloth is delivered to the machine, so that it has a uniform tension while passing through it, not subject to the unequal pulls and strains common to the cloth when drawing into the machine. The second part consists of an automatic contrivance, whereby the revolving cutters are stopped by a seam when it approaches them, and allowed to rest until the seam passes, and then set in motion again, as it passes away from them, to protect the cutters from the effects of the extra thickness of the seam, and to prevent the seam from being cut. The third part of the invention consists of the bed pieces of the stationary knives pivoted to the frame, so that these knives can be readily swung up away from the revolving knives to facilitate the cleaning of the latter of the oil and emery used in sharpening them.

Improved Casting of Steel-Faced Anvils.

John Donovan, Carpentersville, Ill.—This consists in a wire loop in the horn of the plate, for keeping it in place in the mold, and in constructing the face plate concave on the side receiving the iron, to compensate for the greater shrinkage of the iron in the middle

Improved Railroad-Car Truck.

Alonzo Gilman, Lewiston, Idaho Ter.—This invention consists of the application of one double flanged wheel and one plain or flat rimmed wheel to the same axle of a railroad car truck. It also consists in an alternate arrangement of these wheels on adjacent axles so that both rails are utilized, and the cars are kept properly on the rails.

Improved Barrel Barrow.

James Harding Brown, Porter's Mills, Wis.—This is an improved barrow for carrying barrels and other things, which may be used as a wheel barrow or as a hand barrow. It may be expanded or contracted to adjust it for carrying a larger or a smaller barrel, as may be required, and the side bars and braces locked in place when adjusted. The said wheel can be conveniently attached and detached, as required, and the side bars and braces locked in place when adjusted.

Improved Car Axle Lubricator.

John D. Imboden, Richmond, Va.—The invention consists in a detachable wire frame, having elastic sides that press a woven fabric or other absorbent to each side of the journal, thus supplying the lubricant and wiping the journal at the same time. The great merit consists in the facility with which it may be applied to any journal box and removed therefrom.

Improved Paper Dryer.

Jonathan Hatch and Guilford Smith, Windham, Conn., assignors to Smith, Winchester & Co., same place.—Each side is provided with girders, which support the cylinders and fans. These cylinders each have two heads, which consist of a hub and a spider, each being made separately and fastened together. The advantages claimed in this manner of making these heads are, first, to prevent breakage in the shrinkage in casting; secondly, to admit of lightening the several parts; thirdly, to facilitate the construction of said heads and hubs. The longitudinal rails, which connect the cylinder heads, are stayed by internal rings. Wire is wound spirally over the cylinders and fastened with a cap piece. These cylinders are revolved in a steady and uniform manner, gear wheels being attached to the hubs at one end, which engage with each other.

Improved Cotton Chopper.

Theodore C. Burnham, Waco, Tex.—The chopper knives are attached to rods which project rearward and inward, so that their inner ends may meet or slightly overlap at an angle. By operating an arm, the knives may be held back and prevented from cutting, when desired. A spring is made of such a strength as to hold the knives to their work under ordinary circumstances; but should said knives strike anything they cannot cut, the spring will yield and allow the knives to swing back and pass the obstruction.

Improved Bird Food Holder.

Samuel E. Tompkins, Sing Sing, N. Y.—This is a griping tongs for holding sugar lumps, bread, cuttle bone, pieces of fruit, and the like, with a griping stand or foot adapted for temporarily attaching it to the wires of the cage, so as to hold the food permanently.

Improved Distance-Measuring Instrument.

William F. Harrsch, Chicago, Ill.—The invention consists of two reflectors, of which one is placed stationary on a suitable frame under an angle of forty-five degrees, in front of the object glass of the telescope, extending to the hight of the center line of the same. The other pivoted reflector is mounted on a sliding piece, which moves under suitable angle to the line of sight along a scale on which the distance is indicated by a pointer of the pivoted reflector at the point where the reflected picture and the real object, seen by the upper half of the telescope above the stationary reflector, fall exactly into one.

Improved Harvester.

Charles D. Shrader, Lancaster, Wis., assignor to himself and Allen R. Bushnell, same place.—This is an attachment for the platforms of grain harvesters, for the purpose of facilitating the work of the binders. It consists in a sweep operated to compress the gavel against the rear side of the platform.

Improved Mangle.

Henry Tamms, Bartlett, Ill.—This consists in a weighted pressure box, with central shafts, which is connected by slotted and fulcrumed levers and connecting rods with crank wheels, operated by an intermeshing cog wheel, for imparting reciprocating motion to the press box by the continuous rotation of a hand crank wheel, so that one person may readily work the mangle and tilt the weighted box, while another feeds the clothes rollers to the same.

Improved Game Board.

Owen A. Gill, New York city.—This invention consists of a disk, which is balanced on a central bottom handle, and provided with indentations or cup-shaped recesses and different obstructions for rendering the playing of a ball thrown from a revolving wheel into these holes more difficult and hazardous.

Improved Cording Attachment for Sewing Machines.

Hamilton C. Jones, Brooklyn, N. Y.—The lower part of the presser foot is provided at one side with a beveled recess, which guides the cords on a level with the foot without the cords being acted upon by the presser foot, and impeding the regular stitching to the fabric. A sheet metal guide plate slides in grooved guides at the top of the presser foot, and may be laterally adjusted thereon, to be locked and retained for guiding any thickness of cord to the needle by a spring arm with a hook edge snapping into grooves of the presser foot. The side flange of the guide plate is provided with a folding front extension, which is bent in the shape of a flat tapering tube, by which the cord and fabric are gradually folded, and thereby more easily fed.

Improved Car Wheel.

Samuel Baldwin Chapman, New York city.—The wooden tread is made by gluing together pieces of veneering placed obliquely to each other and obliquely to the wheel, so that the exterior surface of the sections which form the tread will be endwise of the grain, and then turned off outside and in. This tread is made in two sections, having between the sections a steel ring, which will resist the wear while affording a much greater degree of traction than can be obtained from an entire metallic tread. A metallic band surrounds a heavy rubber ring which surrounds the hub. The rubber ring acts as a cushion to give the wheel flexibility, and to relieve the rolling stock of concussions.

Improved Millstone Dress.

Jefferson Carvill and John Caven, Kingston, Minn.—The middle portion is arranged about an eighth of an inch lower than the face, but rising in concave shape up to the level of the inner margin of the face. This recess may, of course, be dressed out from time to time, as the stone wears away; but in order to save the labor of so dressing it, it is proposed to construct the part separate from the other, and arrange it in a recess, with adjusting screws to lower it away from time to time, as the face of the stone wears.

Improved Traveling Cap.

Adolph Schwarz, New York city.—This consists in the introduction of a connecting piece across the opening for the face, by which the eyes and mouth are left uncovered, but the nose and cheeks protected.

Improved Device for Moving Railroad Cars.

Benjamin F. Phelps, Kansas City, Mo.—The object of this invention is to provide means for moving cars on railroads; and it consists in a lever slotted at the lower end, having a friction wheel in the slot and a crab pivoted to its end. It also has a removable fulcrum composed of two bars attached to its sides, to the lower ends of which fulcrum bars a self-adjusting crab is attached.

Improved Sewing Machine Shuttle.

John G. Nichols, New Eureka, Kan.—This invention consists in a sewing machine shuttle which is so constructed that a perfect tension of the thread is obtained by a tension device, occupying but little space, within the shuttle body, the threading operation being also performed with greater ease and celerity than in the shuttles heretofore constructed, by dispensing with guide eyes, and using, instead, notches and slots into which the thread can be readily entered.

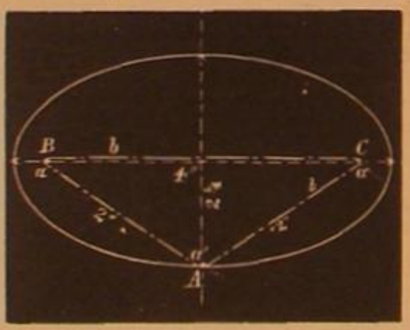
Improved Can for Mixing Paint.

Walter W. Thayer, New York city.—This invention consists of a can with a hollow handle, forming a receptacle for the mixing liquid. The handle communicates by a vent hole and issuing orifice, which are closed and opened by a hinged spring valve, with the mixing can for admitting the required quantity of liquid to the color. The marking brush is placed after use into a side sleeve of the handle and recess of the can, while the paper with the direction to be marked is secured by a spring holder to the can.

Notes & Queries

F. O. B. should consult a physician.—R. J. W. will find directions for gilding on furniture on p. 347, vol. 31.—S. A. T. will find directions for frosting glass on p. 264, vol. 30. Canvas can be preserved from mildew by the method described on p. 90, vol. 31. A black dressing for leather is described on p. 171, vol. 32.—W. S. O. will find a recipe for walnut stain on p. 90, vol. 32. Nickel plating is fully detailed on p. 171, vol. 30.—C. A. H. will find that a method of casting iron free from airholes was described on p. 409, vol. 31.—Y. will find directions for making concrete gravel walks on p. 50, vol. 32.—A. B. M. will find that the induction coil and its operation have been fully described on p. 362, vol. 31.—E. B. M. will find a description of the type writer on p. 79, vol. 27. Shaving soap is described on p. 251, vol. 32. For gold ink, see p. 21, vol. 26.—W. M. W. will find recipes for hair wash on pp. 267, 333, vol. 31.—T. B. S. will find directions for preserving natural flowers on p. 266, vol. 31. M. T. D. will find directions for removing hair from the face on p. 229, vol. 28.—S. E. will find directions for casehardening iron on p. 69, vol. 31.—D. P. will find details of a remedy for foul water in wells on p. 59, vol. 32.—M. F. will find recipes for Worcestershire sauce on pp. 241, 281, vol. 26.—R. O. B. can mold rubber by following the directions on p. 363, vol. 30.

(1) G. A. W. says: I noticed in your issue of March 27 a method for marking out ovals, which is good as far as the description goes, but a great many mechanics do not know how to set the two pins to put the string around to make the oval of a given length and width. The following rule will be found simple and correct: If you wish to mark out an oval 4 inches in length, and 2¼ inches in width, mark out the length and width thus:



Take one half the length (2 inches) and measure from A, 2 inches, striking the line of the length at B and C; then set pins at A, B, and C, tie your string, b, around them; then pull up pins at a', and use the pencil as you describe.

(2) L. A. W. asks: 1. What is magnetism? A. Magnetism is the power which certain bodies called magnets have to attract iron. Magnets are of two kinds, natural and artificial. Natural magnets consist of the ore of iron called magnetic or lodestone. Artificial magnets are made generally of steel, and are magnetized by rubbing against other magnets. No substance is indifferent to the magnet, though iron is most of all affected by it. 2. What is the difference between animal magnetism and electricity? A. There is no known connection between animal magnetism and electricity. If any exists, it has yet to be proved.

(3) I. H. asks: 1. How can I obtain the different colors of gold in electroplating? A. Make a mixture composed of 3 parts nitrate of potash, 1½ alum, 1½ sulphate of zinc, 1½ common salt. Add enough water to form a paste, which is put on the articles to be colored. Place them on an iron plate over a clear fire until they attain a nearly black heat, and then plunge them in cold water. Different hues may be had by varying the mixture. 2. Is there anything I can put in my silver solution that will prevent it from stripping? A. Clean the articles well and electroplate them slowly; and then the silver will not strip off.

(4) M. A. G. asks: Is there any kind of lamp in which I can burn kerosene oil, that will be safe if left to burn in a shop all night? A. Use a large lamp of glass, having a proportionally small burner, and good kerosene oil, and you will have no difficulty.

(5) A. H. H. asks: 1. What is the principle of the lightning arresters used on telegraph lines? A. A metallic plate is connected to the line and another to the earth, the two plates being separated by a thin insulating material. The principle upon which the arrester works is that the tension of the atmospheric electricity is so high that it will leap across the insulating substance between the two plates, and then pass off to the ground, while the regular current will stick to the wire. 2. Can you give your readers a table showing the electromotive force of the principal forms of battery now in use on telegraph lines? A. The electromotive forces of the various batteries are as follows: Daniells', Minotti's, Callaud's, Gianty's, and Hill's, 1·079 volts; Marie-Davy, 1·524 volts; Léclanché, 1·48 volts. Faure's carbon battery, 1·765; Grove, 1·812; Bunsen, 1·964; electropoin fluid (bichromate of potash), 2·028 volts. Grenet (chromate of potash) single element, 1·015 volts.

(6) M. W. M. asks: How can I magnetize *a steel tack hammer?* A. Draw it across the face of a strong electro-magnet in one direction.

(7) N. A. B. asks: How many methods are there of obtaining pure silver from silver coin, and what are they? I want the silver to plate with. A. Perhaps the best method for operations of this character on a small scale is the following: First dissolve your coins in nitric acid, and add muriatic until no further precipitate forms. Remove the liquid by filtration and wash the precipitate several times with hot water. Place the filtrate in a flask with some small pieces of zinc, and cover them with dilute sulphuric acid (1 to 4). When the zinc is completely dissolved, the metallic silver will be found in the bottom of the flask as a grayish black mass. The color is due to the fact of the silver being in a very finely divided condition. If you desire to use the silver in the metallic form (as an anode), all that is necessary is to melt it in a small black lead crucible, with a small amount of carbonate of soda.

(8) E. asks: What makes the wet end of a towel darker in color than the dry end? A. Less of the light is reflected from the wet towel, and more transmitted.

(9) G. W. H. asks: Are there any chemicals that change color in coming in contact with magnetized steel or other magnetized substance? A. We do not know of any.

(10) T. says: The accepted theory is that our earth was once a molten, incandescent mass. In support of this theory, among other phenomena, it is urged that the deeper the earth's crust is penetrated, vertically, the greater the degree of heat is developed. Now why is it that the further we penetrate the ocean, the less is the degree of heat attained? Will it be urged that the lower the temperature of water, the greater is its gravity? This is true down to 39°, but water at the bottom of the ocean, at the extreme depths that have been reached, shows a lower temperature than 39° Fah. A. What is urged is no objection to the theory of central heat, because the heat penetrates by conduction through the materials of the solid crust. But in the waters of the ocean this could not take place, owing to the free motion of its particles.

(11) E. E. M. asks: 1. Can an electro-magnet be constructed that will sustain a weight of 100 lbs., with one cell of a powerful bichromate battery? A. Yes. 2. How far will it attract a weight of 10 lbs. if it moved without friction? A. The attraction decreases as the square of the distance.

(12) D. McK. says: I want to make a small galvanic battery which, when I take hold of the wire, will give a considerable shock? What is the best method? A. You cannot get a considerable shock from a small battery except by passing the current through an induction coil. See p. 362, vol. 31.

(13) T. W. D. asks: 1. How is phosphide of lime made? A. Phosphide of calcium, commonly known as phosphide of lime, is obtained by the action of the vapor of phosphorus upon caustic lime at a high temperature.

1. How is balloon gas made? A. Either pure hydrogen, made by acting upon zinc or iron scrap with dilute sulphuric acid, or common illuminating gas (coal gas) is used for this purpose. 2. Will the gas from a kerosene lamp do? A. No. 3. How many square feet of gas will it take to raise a five lb. balloon? A. It will require about 140 cubic feet of coal gas, or about one half that volume of pure hydrogen.

How is gunpowder made? A. Saltpeter, sulphur, and charcoal are ground separately to powder, mixed, made into a paste with water, dried, and reground.

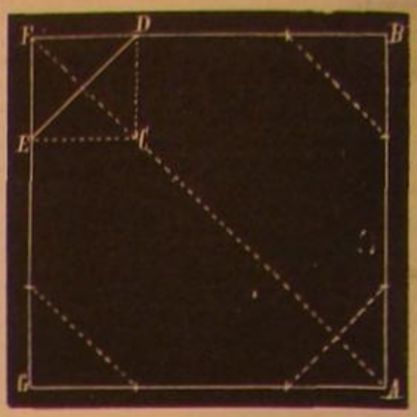
(14) H. S. asks: Would it improve the illuminating qualities of coal oil to mix a portion of sperm, lard, or other similar fixed oil with it? A. No. Use a better kerosene. It should not be volatile, and should have a high burning point.

(15) A. C. C. asks: Will you tell me what to put on glass so that I can take a photograph directly on it? A. The plate is first coated with an even film of photographic collodion, and is then placed in a bath of nitrate of silver for a short time. It is then transferred to the camera, and after exposure is washed, first with a solution of sulphate of iron, and then with a solution of hyposulphite of soda. It may be mentioned that it is utterly useless for one to attempt photography who has not devoted some time to the practical study of it. We would refer you to some work on the subject. If the back of the negative, obtained by the method as above described, be blackened, it will give to the plate, when looked at, the appearance of a positive picture.

(16) J. R. L. says: I want to make a preparation to use on black tobacco to prevent one lump from sticking to the other, and at the same time give the tobacco a good gloss. A. Try plumbago. Tinfoil cannot be dissolved so as to make it possible to add it to a mixture of oil and glycerin.

(17) C. G. D. says: I am manufacturing black writing ink from extract of logwood, bichromate of potash, prussiate of potash, powdered gum arabic, and water. After the ink is first bottled, there is a scum formed at the mouth of the bottle; but when this is removed there is no more formed. What is the cause of this? A. It is probably due to impurities in the materials used. Allow the ink to stand some time before bottling. Sulphate of quinine is sometimes used as a remedy.

(18) G. A. W. says: I have read the following directions for drawing an octagon in a given square: Make A C equal A B; then draw the square



C E F D, and line from D to E will be one side of the octagon. Proceed in the same manner in the other angles of the square A B F G. Is this a correct method? A. Yes.

(19) F. D. S. asks: Is there any chemical which I can mix with lard oil so as to retard or prevent oxidation when exposed to the air? A. No.

(20) P. S. G. asks: Is there any kind of coating suitable for umbrellas that will make the alpaca or gingham tops waterproof? A. Try the following: First sponge the cloth on both sides with a solution of 1 part sulphate of alumina in 10 parts water, then with a solution of soap, which is prepared by boiling 1 part light colored resin and one of crystallized carbonate of soda with 10 parts water, until the resin is dissolved. The resin soap thus formed is to be separated by the addition of common salt. This soap is then dissolved together with 1 part soda soap, by boiling in 30 parts water. After this last sponging, rinse in the rain.

(21) P. P. W. asks: How can I take the printed heads off an account book, so as to be able to write others in their stead? A. We do not know of any method by which this can be accomplished.

(22) J. G. C. asks: Is there any simple method by which an amateur in chemistry may ascertain the strength of a given sample of native black oxide of manganese? A. The commercial value of black oxide of manganese depends upon the proportion of chlorine which a given weight of it will liberate when it is heated with hydrochloric acid. This quantity of chlorine varies much in different samples, and is dependent upon the proportion of oxygen which the oxide of manganese contains in excess of that which is necessary to its existence as protoxide.

(23) J. E. C. asks: 1. Is there a liquid that will erase ink marks from paper, and leave the surface in a smooth state? A. Wash by means of camel's hair pencils, dipped alternately in solutions of cyanide of potassium and oxalic acid. 2. Is there any substance that will resist the action of mucilage when dry, except hard and vulcanized rubber? A. Yes. Most metals will do this.

(24) S. H. D. says: Located near Titusville, Pa., is an immense gas well, struck nearly 4 years ago by parties who were drilling for oil. When first struck, it was accompanied by a curious phenomena. The gas was led away from the mouth of the well by 4 pieces of tubing, and this tubing was coated with ice from $\frac{1}{16}$ to ¼ of an inch in thickness. This was with an August sun beating down on the pipes; small pieces of ice were also thrown out of the well with considerable force. Of course the pressure on the pipes must have been very great with such an immense volume of gas passing through them, and I should have thought the friction would have caused heat instead of the reverse. A. It is a well known fact that when a gas is allowed to escape from where it has been under pressure, it absorbs heat rapidly from surrounding bodies, and that this chilling effect is proportional to the pressure from which the gas is liberated.

(25) A. S. asks: How can I restore the polish to a nickel-plated stove which has been discolored by heat? A. Use chalk and chamois skin.

(26) C. A. B. asks: 1. What can I put in water to soften it? I have used sal soda, but it will color the clothes yellow. A. This may be accomplished either by boiling the water for some time, or by the addition of the proper quantity of clear lime water. 2. What is used to bleach clothes in a short time without injury? A. In bleaching cotton goods, the first operation consists in scouring them in a slightly alkaline solution, or, what is better, by exposure to steam. They are afterwards put into a basket and rinsed in running water. The immersion of cotton in an alkaline ley, however it may be rinsed, always leaves with it an earthy deposit. It is well known that cotton bears the action of acids better than hemp or flax; that time is even necessary before the action of them can be prejudicial to it; and by taking advantage of this valuable property in regard to bleaching, means have been found to free it from the earthy deposit by pressing down the cotton goods in a very weak solution of sulphuric acid, and afterwards removing the acid by washing, lest too long remaining in it should destroy the cotton. 3. Is there any way of polishing shirts, collars, etc., besides the ordinary irons? A. Put a bit of paraffin, the size of a hazel nut, in each bowl of starch.

(27) D. A. D. asks: Can you give me the method by which Berthelot was able to obtain alcohol by synthesis? A. By the formation of a solution of olefiant gas in oil of vitriol, which dissolves about 120 times its bulk of the gas, then diluting the mixture and submitting it to distillation. Small quantities of dilute alcohol are thus obtained with facility. Tritylic alcohol has been obtained by acting on tritylene in a similar manner.

(28) H. W. says: In your answer to A.C.R. you say that, if the first floor is set high up from the ground and is ventilated, the probabilities as to health are in favor of the house with no cellar. The fact is that a great many dwellings are built on solid and close foundations and without ventilation, and the real question is: Are they healthy? I think not. In Illinois, there were three settlements within visiting distance of each other, altogether containing about 30 families. One fall every family of the three settlements (with one exception) was sick with the prevailing fever of the season. The excepted household had an upper floor to their house (a half story) which was used for sleeping in by all the family, consisting of parents, 3 children, and a workman, and they all escaped the fever. All the rest of the inhabitants lived in one story houses, and of course slept and kept all the stores on one floor. In a house with a close solid foundation, we found that things would mold if left standing for a few days. Preserves, placed upon a top shelf, in a short time became moldy; out when placed in the second story, they all kept well. A barrel of flour was kept standing on the floor; when about two thirds used, the sponge failed to rise, and as a consequence we lost two bakings of bread, it not being fit to eat. The barrel and flour were then taken out of doors and placed in the sun, so that the air could circulate freely around and under it, and after standing thus about 6 hours, it was replaced on the floor and set on two strips of board one inch thick. By this means the flour was wholly restored and rendered good to the last. I could cite many other instances. A. All receptacles for foul air under or near a dwelling should be very closely attended to, and so opened as to be thoroughly ventilated, as the instances cited by our correspondent very fully illustrate.

(29) S. V. C. asks: If a student learns telegraphy on a Tom Thumb electric instrument, will he be able to work an ordinary railroad office instrument correctly? A. If a student learns to read well by sound, he can operate in any office where sound instruments are used.

(30) A. K. asks: Is the beech tree a negative or a positive pole, or is it a conductor of electricity? I lived for 25 years where one fourth of the timber was beech, and never saw one that was injured by lightning. A. The beech tree has no polarity; but it is a good conductor when green and full of sap.

(31) F. C. B. asks: How are those batteries made in which lead is one of the elements, and what is the solution? A. Similar to the Callaud, using sulphate of copper solution.

(32) C J. M. asks: 1. Can you give me directions for making a constant battery for ringing an electric bell occasionally on a circuit of 350 feet? A. Use any form of a sulphate of copper battery. 2. What size of wire, and how much, shall I use on the poles of an electro-magnet, to be operated with the above battery and circuit? A. Use 200 feet of No. 24 insulated copper wire.

(33) E. A. D. says: I wish to deposit copper on a very frail non-metallic substance. I cannot apply plumbago, nor use any composition in which phosphorus occurs. The application to render the article a conductor must be in a liquid state. Is there such an article? A. Have you tried soaking your model in melted paraffin, and then applying plumbago?

(34) A. F. B. asks: 1. What size of insulated wire will give the best effect on an electromagnet, with an iron core ¾ of an inch in diameter? A. It all depends upon what use you wish to put it to. 2. Would an electromagnet made of one bar, bent in the form of a U, be more powerful than one made of two bars, and the ends connected by an armature, other things being equal? A. No.

(35) J. E. M. says: 1. If I have two pairs of magnets, and one pair, placed at a distance of ¾ inch apart, will be drawn together, and the other pair will be drawn together if placed 1 inch apart: If both pairs were placed an equal distance apart, say ½ inch, would not the weaker magnets be drawn together with as great rapidity as the stronger? A. No. 2. If I were to place a permanent steel magnet without a keeper inside a hollow glass globe, and then exhaust the air from the globe, would the attractive power of the magnet remain exactly the same? A. Yes.

(36) J. W. McM. says: I have an electromagnetic machine. The battery consists of two zinc plates with a thin platinum plate between them, and the platinum plate has been destroyed by the acid. Would not a copper plate answer the same purpose? If so, should it be the same thickness as the platinum one, or thicker? The acid is dilute sulphuric. A. Copper will not answer; use a thin plate of silver.

(37) J. E. L. says: I have a hot air furnace which warms 16 rooms. It is set in brick double walls, the inside wall being 16 inches from radiator. I would like to sometimes draw the hot air from the hall; so I put a 10x14 register and a 9 inch tin pipe down to the bottom of the outside wall, and a damper in the outdoor cold air box. I closed the damper to see if it worked, but it did not; then I closed the registers, but I left 3 openings, and it will draw the air from the hall through one of the hot air registers. A. It is necessary to keep a free circulation of air between the rooms and hall; the air will then descend through the lowest register.

(38) C. W. E. asks: What substance is the best non-conductor of magnetism? A. We do not know of any.

(39) A. N. W. asks: 1. What is the most lasting and cheapest battery that I can work an alarm bell with, with No. 20 fine copper wire in a circuit of about 100 feet? A. Smee's or Léclanché's. 2. In using one of Grove's cells, if I take out the platinum plate and amalgamated zinc, will the mixture of the two acids impair the strength of battery? A, Slightly. 3. How long will one of Grove's cells last without being renewed? A. That depends upon how much it is used. 4. What is about the cost of a Rhumkorff's coil and condenser? A. From $300 to $500. 5. Can I make one myself without machinery to coil the wire on the core? A. Possibly, but it requires a good deal of skill and knowledge to make one, and you would probably find more economical to buy it.

(40) I. M. L. says: 1. I have a line 650 feet long of No. 12 galvanized wire, with 3 relays of 55 ohms each on the line. How many Hill's jars will be needed? A. Three. 2. With a line of a given length, with 3 relays of 55 ohms each, if I replace the relays with 3 of 100 ohms each, will it require more or less battery? A. Less.

(41) W. D. says: A fair trial of galvanized iron for roofs has had very unsatisfactory results in Canada. Under the contracting and expanding influence of heat and cold, the cross joints open, and leakage on the first thaw is the result. Even the gutters on mansard roofs part at all the joints, and have utterly failed for the purpose intended, to the great annoyance of those who have either recommended or used this material. One method has been to solder and rivet the joints, the rivets being about ¾ or 1 inch apart, but in spite of this the seam opens visibly. What is the remedy? A. In this vicinity, tin in small sheets is almost universally used for the purpose. The tin is clinched and soldered in the usual way. The smaller the sheets, the less the effect of the contraction and expansion on the joints. Galvanized iron is used for cornices and other molded work.

(42) A. M. S. says: I have a large Newfoundland dog who has a constant disagreeable smell. Can you tell me how to remove it? A. Wash him with carbolic soap.

(43) C. W. H. says: We have a copper tank, and an ordinary brick and cement cistern for holding water. The water in the copper tank is much softer than that in the cistern. The water in the cistern probably takes up some of the lime from the sides and bottom of the cistern. Can a cistern be covered with silicate of soda or with paraffin, and thus avoid the trouble? A. A coat of hydraulic cement will be the best remedy for the difficulty.

(44) H. F. N. asks: Is there any substitute for oil for drilling cast steel and wrought iron? A. Soapy water is sometimes used.

1. Is it an established fact that there should be no oil used in the steam chest or cylinder of an engine? A. No. 2. If grease is needed, which is the best, oil or tallow? A. Tallow.

(45) C. T. asks: Would any mechanical contrivance which supplied the power which kept it in motion be deemed perpetual? A. Yes.

(46) F. W. J. asks: What will weld iron and steel together without the aid of sand or borax? A. Brush clean with a wire brush frequently while heating, and when taken out to weld.

(47) J. P. says: 1. I have an engine of 3 inches bore by 4 inches stroke, and I am thinking of making a boat, 25 feet long x 4½ or 5 feet beam, with 2 feet depth of hull. I propose to make a boiler 4 feet long by 22 inches diameter, with a 13 inch flue running the whole length. I set my grate inside the flue to run about 16 inches back. Shell and flue are of $\frac{5}{16}$ inch, heads of ¼ inch, charcoal iron. What steam pressure can I carry? A. You can carry 75 lbs. of steam. 2. At what speed (in still water) can I run? A. Probably 6 or 8 miles per hour. The other engines you describe may answer for a boat 14 to 16 feet long. The inclination of shaft and position of propeller depend greatly on the design of the hull.

(48) W. H. S. asks: 1. In making hydrogen from sulphuric acid and zinc, for an oxyhydrogen light, will a plain bottle do for a vessel? A. Yes. 2. What is the proportion of commercial acid to water? A. About 18·5 per cent water.

(49) B. J. says: Please state the diameter of eccentric of engine described on p. 37, vol. 32. A. Five inches.

(50) W. W. D. asks: How large a boat could I run with side wheels 3 feet in diameter, and an engine of 8 inches stroke by 4 inches bore, with 60 lbs. of steam? A. From 25 to 30 feet long.

(51) W. F. H. asks: 1. How high can water be raised in a cast iron pipe, a vacuum being produced in top of pipe by the escape of steam, as in an ordinary steam siphon? A. From 20 to 25 feet. 2. What length of time is required to raise water to any given hight by such means, steam being at 75 lbs. pressure in boiler, and the pipe, through which the water is to be raised, of 30 inches diameter? A. Less than a minute, with plenty of steam. 3. Is this way of producing a vacuum economical? A. Not very.

(52) J. M. says: 1. I intend building a scow 90 feet long x 20 feet wide, with stern wheel. What size of engine would you advise me to get? A. An engine with cylinder 15x15 will do. 2. What size of stern wheel will be necessary, the above mentioned scow drawing 4 feet when light, and running at 6 miles per hour? A. One of from 8 to 10 feet diameter.

(53) C. D. P. asks: We wish to warm a church, 40 feet by 70 feet by 18 feet high, with a furnace in the basement. The smoke flue will run nearly horizontally for about 20 feet from the furnace, where it enters the perpendicular flue. What should be the dimensions of the horizontal smoke pipe and of the chimney? A. The smoke pipe may be 10 inches in diameter, and the chimney flue 12 by 12 inches.

(54) J. W. W. asks: To what depth can a diver descend in the Atlantic Ocean, using a diving bell? A. We could not fix the limit. It would depend on the weight of the bells and the capacity of the compressing pumps.

(55) J. J. H. asks: 1. By what standard are shot guns gaged? A.

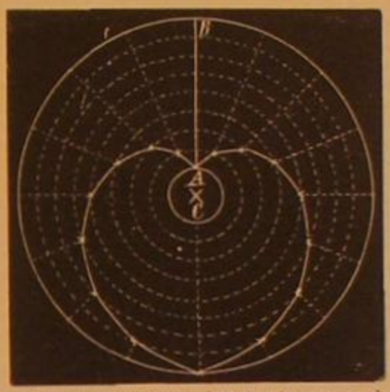
No. of gage.	Diam. of box in inches.	No. of gage.	Diam. of box in inches.
5	0·98	19	0·65+
6	0·92+	20	0·63+
7	0·89	21	0·63
8	0·84+	22	0·62+
9	0·80+	23	0·61+
10	0·79	24	0·61
11	0·76+	25	0·60+
12	0·75+	26	0·59+
13	0·73+	27	0·59
14	0·71+	28	0·58+
15	0·70+	29	0·57+
16	0·68+	30	0·57
17	0·67+	31	0·56+
18	0·66	32	0·55+

2. By what standard are shot numbered? A.

No.	Diameter in inches.	No.	Diameter in inches.	No.	Diameter in inches.
12	0·05	5	0·12	B B	0·18
11	0·06	4	0·13	B B B	0·19
10	0·07	3	0·14	T	0·20
9	0·08	2	0·15	T T	0·21
8	0·09	1	0·16	F	0·22
7	0·16	B	0·17	F F	0·23
6	0·11				

3. How are the qualities of gunpowder numbered? A. Each maker has his own standard. The United States standard is as follows: Musket, grains between 0·03 and 0·06 inches. Mortar, grains between 0·06 and 0·10 inches. Cannon, grains between 0·25 and 0·35 inches. Mammoth, grains between 0·60 and 0·90 inches.

(56) F. H. F. asks: Please give me a rule describing a heart cam that will give a perfectly uniform motion and at the same time be easily driven? A. Divide the length of stroke, A B, into any number of equal parts, and describe circles through the points of division, from C, the center



on which the cam turns. Divide the outer circle into twice as many equal parts as A B was divided into, and draw radii from the points of division. The points in which these radii cut the corresponding circles are points of the cam.

(57) A. L. F. asks: How many horse power will an engine of 18 inches cylinder by 3 feet stroke at 60 turns a minute, with steam cut-off at ¾ stroke, and pressure at 60 lbs. per square inch, give? A. This question can only be answered definitely by experiment. All we could do from the data sent would be to guess at the mean effective pressure. You can do this if you like, thus: Product of mean effective pressure in pounds per square inch×area of piston in square inches×speed of piston in feet per minute÷33,000 will give the horse power.

(58) J. H. K. asks: How can I find the logarithm of a number, say 25, without using a book of tables? A. The formula is as follows: Let a= any number. Then $\log.\left(\frac{a}{a-1}\right)=0·868589\times\left\{\frac{1}{2a-1}+\frac{1}{3\times(2a-1)^3}+\frac{1}{5\times(2a-1)^5}+\frac{1}{7\times(2a-1)^7}+\text{etc.}\right\}$ In the particular case mentioned, $\log. 25=0·868589\times\left\{\frac{12}{13}+\frac{1}{3}\times\left(\frac{12}{13}\right)^3+\frac{1}{5}\times\left(\frac{12}{13}\right)^5+\frac{1}{7}\times\left(\frac{1}{13}\right)^7+\text{etc.}\right\}$ You can work this out if you feel inclined; but we imagine that you will not care to use this formula for finding the logarithms of many numbers.

(59) A. L. K. says: 1. There is a sawmill with two engines and two sets of boilers, each set having an iron smoke stack 65 feet high x 56 inches diameter. One set of boilers have two flues in each, the other set are plain cylinders. All burn sawdust. The latter have good draft, but the other, in heavy weather, will not keep up steam well. The question is whether, if one of the exhaust pipes (7 inches in diameter) is inserted in the flue boiler stack, the draft will be improved. A. It is very probable that the change will improve the draft. 2. If so, at what distance from bottom should the exhaust enter the stack? A. Insert the pipe so that it discharges a little above the top of the boilers.

(60) F. J. asks: 1. What is the best size, form, and material for a boiler for an engine with cylinder ¾ inch diameter by 1½ inches stroke? A. Make it of copper, upright, with a flue in the center. 2. What is the best manner of heating? A. Use charcoal for fuel.

(61) J. P. asks: Will it require more power to drive a paddle boat, of two hulls, like the Castalia, than one large hull of the same draft and beam? A. It will take more power for the double hull.

(62) J. M. asks: 1. About what length, when folded up, would Peaucellier's parallel motion have to be to describe an arc of a circle of 5 feet radius? A. Between 7 and 8 feet long. 2. In what work are quarter twist belts illustrated? A. In Rankine's "Machinery and Millwork." 3. Are Rankine's works of any use to any one except those who understand algebra? A. In "Rules and Tables" scarcely any of the rules are expressed algebraically.

(63) C. P. says: Two pipes, the shells of which are of equal thickness, the diameter of one being one foot, the other one hundred feet, the pipes being filled from the top by forcing water in: which will burst first, and at what hight? A. If the material in the pipes is of equal strength throughout, the largest pipe will burst first, as the strength of a pipe to resist rupture varies inversely as the diameter; and it will burst at the bottom, as the pressure is greatest there.

(64) C. P. W. asks: Having had a controversy about balanced slide valves, I write for your opinion. If we place one valve, as usually used, over the ports of an engine, and make an exact duplicate and attach it to the other, the two valves being back to back, so that one will make a steam joint on the cover of the steam chest while the other makes a similar joint over the ports, will we have a balanced port? A. We think not, if you mean a perfectly balanced one.

(65) E. M. says: I have an engine with a 2½x5 inches cylinder, capable of running from 400 to 500 revolutions per minute. What should be the diameter and pitch of screw, and the length and width of a boat, for such an engine, and how much water ought she to draw? A. You can make the boat from 15 to 18 feet long, 5 to 5½ feet beam. Propeller, 22 inches diameter, with 2¾ feet pitch. Boiler, 2 feet diameter, 3 feet high.

(66) W. S. asks: Can water be injected in to a boiler above the water line? A. Yes. 2. And what is the lowest pressure by which an injector may be worked? A. This will depend upon the construction of the injector, several forms being in use.

(67) H. W. S. asks: 1. I am about to put in a turbine water wheel, using 75 inches water in a circular sawmill, under 16 feet head; the wheel will be 40 feet from the dam, and the water conducted to the wheel through a round tube of 3 feet internal diameter, the tube sloping down to the wheel. In closing the gate of the wheel suddenly, will the momentum or shock, caused by the sudden stoppage of the flow of water, strain or injure the tube, and will a safety valve be necessary near the wheel? A. In closing the gate with moderate speed, no safety valve will be necessary; but when the closure takes place instantaneously, you can provide a stand pipe, three or four feet high, containing air, which will act as a cushion. 2. Would the 3 feet diameter tube be large enough for a wheel using 75 inches water, under 16 feet head? A. Yes. 3. Would friction gear answer well to run an edging saw for edging stuff from 1 to 4 inches thick? A. Yes. 4. My neighbor has a turbine wheel 4 feet in diameter, venting 200 inches of water, under 17 feet head, taking the water through an incline tube of 3 feet internal diameter and 200 feet long; the wheel under this head is rated by the builder at 70 horse power, but with the gate wide open it will not run one run of stones. What is the matter with it? A. The wheel may be choked, or some of the parts jammed.

(68) F. W. asks: I am about to put up a greenhouse; and in constructing the sides and ends I propose to place, on the outside of the posts and studding, one inch plank, to this put on a sheeting of tar paper, and on this ordinary flooring. Will this answer the same purpose, in every respect, as putting the inch boards on the inside of the posts, the flooring on the outside, and fill in the space, of say 4 inches, with sawdust? A. The sawdust filling is likely to be the warmer of the two.

(69) L. R. B. asks: What power does the engine whose pitman is below the center of the axles exert on a locomotive? I claim that the engine whose piston is moving ahead and whose crank wrist is above the center of axles is the only one which is doing any service. A. The effect is the same, whether the crank is above or below the center.

(70) E. R. M. asks: 1. How can I make a battery that will last a good while without needing renewing, and be always ready for use? A. The Minotti is one of the best forms of battery for this purpose. 2. Of the ordinary liquid batteries, which is the most powerful? A. The Grove or Bunsen is the strongest.

(71) C. L. T. asks: How are letters placed on glass in street advertising by the calcium light? A. The plain letterings are painted or written, and the more elaborate ones are photographed, on the glass.

(72) T. A. P. asks: How can I construct a small and cheap camera obscura for sketching objects at short distances? I have a common two inch burning lens, and a plane reflector, 4 by 6 inches. Will these answer? A. These will answer the purpose very well. Take a small close box painted black on the inside, in an aperture in the top of which place your lens, and over this your reflector at an angle of 45°.

What is the best recipe for green ink? A. Digest 1 part of gamboge with from 7 to 10 parts of blue ink.

(73) J. E. B. asks: Where oils, reduced or cut with alcohol, are added to plain sirup, how can I prevent the mixture from becoming cloudy? A. The sirup does not dissolve freely in your oil and alcohol, and the remedy is not to add them.

(74) G. B. A. asks: What is the best preparation for rendering cotton fireproof? A. A solution of tungstate of soda is highly recommended.

(75) D. B. B. says, in reply to J. G. R., who asks how to construct a cheap oxyhydrogen blow pipe: Take a round piece of wood about 4 inches long and 1 inch thick, and two brass tubes about 6 inches long; to an end of each of the tubes attach a gun nipple. Bore holes in the wood obliquely, and of such a diameter that the brass tubes, when inserted, do not move easily. Bring the gun nipples to about three eighths of an inch apart. The bore of the gun nipple of the hydrogen tube must be the larger, so as to allow twice as much gas as comes from the oxygen tube to escape.

(76) A. W. L. says, in reply to W. S., who asks how to kill or drive off fleas and sand flies: Let him procure crude petroleum, just as it comes out of the wells, and apply it to those parts of the body which are exposed to the attacks; and he will not be much troubled by them, if he is even so much as molested. On Lake Superior, mosquitoes and sand flies (the latter so diminutive that they are scarcely visible) will not bite us when we have black oil, as it is termed, on our hands and faces; and it is a never failing remedy for the extermination (after one or two applications) of bugs from household furniture. Of course when used on the person the odor is not very pleasant; but in furniture it is not noticed after a few days have passed.

(77) D. R. K. says: H. S. C. asks how much fuel is required to melt 1 tun of iron. You answer: "Probably 2 or 2½ times the iron." We have an ordinary cupola, and we can melt 2 tuns iron with 800 lbs. Lehigh coal.

(78) M. W. M. says, in reply to H. B., who asks: Does the hair grow after death? Steele's "Physiology" says that the hair is said to grow after death. This is due to the fact that, by the shrinking of the skin, the part below the surface is caused to project, which is especially noticeable in the beard.

Minerals, etc.—Specimens have been received from the following correspondents, and examined, with the results stated:

C. D. H.—It is an impure quartz sand.—L. J. S.—It is similar in composition and properties to fuller's earth. Your clay was probably not of the same character as ordinary clay, which is a hydrated silica of alumina containing some oxide of iron. Other substances were most likely present. Lime could be mixed with clay so as to be impervious. But the hydraulic lime will only be of good quality when the lime and clay are mixed in proper proportions and calcined at a proper temperature. The wet soil you mention became pulverized owing to the loss of water on drying, which is taken up again on wetting, the cohesion of the substance being at the same time destroyed.—G. D. M.—It is partly decomposed muscovite, a variety of mica.—F. McC.—As to your specimen of cheese and the poisoning resulting therefrom, similar cases have been brought to our notice where persons have become sick after eating cheese, and pieces of cheese in character similar to that forwarded have been examined without yielding traces of ordinary poisonous bodies. It would facilitate an explanation of the unwholesome character of such cheeses if it were known whether the milk was of proper kind, or whether there was anything unusual in the process of cheese making. In some cases persons have been poisoned by drinking milk from a cow which had eaten plants capable of yielding poisonous principles, the animal itself being unaffected.—W. J. L.—No. 1 contained oxide of iron, alumina, and silica, with a small amount of carbonate of lime. Also lime, potash, and soda salts. The solubility of these salts imparts a saline taste to the powder. No. 2 differs from No. 1 in the absence of lime and alumina, and contains a trace of oxide of iron. It has a considerable amount of soda and potash salts, and also baryta. They exist partly in combination with sulphuric acid, as sulphates.

J. E. M. asks: What do cake bakers put in their icing to make it hold the shape?—J. S. B. asks: Is there a good recipe for the cure of chicken cholera?—J. A. Jr. asks: How do the English prepare and finish bone, producing a beautifully smooth surface?—J. R. S. asks: Can blindness in a horse, caused by having blind teeth, be cured?—H. E. W. asks: Is lime a year old as good for tanning as that made three months ago?—S. D. P. Jr. says: I have a new carriage from which mud has taken off the varnish in places. Can I restore the work to its original appearance without rubbing down and revarnishing?

COMMUNICATIONS RECEIVED.

The Editor of the Scientific American acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On the Earth and the Moon. By M. D. H.
On Botanical Classification. By J. W.
On Kaolin in America. By F. L. J.
On Frozen Water Pipes. By H. S. C. & Co., and by T. G. B.
On the Age of the World. By D. C. T.
On the Sun's Orbit and Rate of Motion. By J. H. G.
On the Flight of Birds. By R. O. D., and by F. G. F.
On a Sunset in Florida. By T. A.

Also enquiries and answers from the following.

F. A. L. Jr.—J. N. Q.—O. A. F.—S. T. W.—F. C.—G. A. B.—N. D.—S. P. W.—L. V. R.—E. C. T.—J. H.—C. W.—E. A. M.—G. W. M.—H. F. J.—P. S.—A. V. R. S. R.—C. S. P.—E. P. L.—M. B.—S. A. H.—C. F. H.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of enquiries analogous to the following are sent: "Whose feed water heater is the best? Who makes transparent rubber, for toy balloons, etc.? Who sells talking machines? Whose is the best method of shorthand writing? Who makes the best hydraulic elevators? Who makes a reliable rain gage? Who makes an effective caloric engine? Who sells milk-condensing apparatus?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

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Boiler, water heater, J. R. Lamb	161,522
Boiler, sectional steam, H. Whittingham	161,582
Boiler tube cleaner, C. Schmandt	161,558
Bonds, etc., machine for numbering, Bodel *et al.*	161,473
Boot and glove buttoner, G. Stackpole	161,548
Boot heels, constructing, E. N. Higley	161,511
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Boots, inserting fastenings in, G. V. Sheffield	161,449
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Breeching attachment, T. S. Hanchett	161,408
Brick machine, W. S. Wallace	161,580
Burner, lamp and gas, T. V. Keam	161,517
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Burner, gas generating, R. F. Clayton	161,327
Burner, vapor, S. S. Gray	161,336
Butter print, R. S. Williams	161,464
Candle holder, H. Smith	161,360
Cane juice, bleaching, J. M. Lescale	161,527
Car body, street, J. Stephenson	161,570
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Car door, freight, McCarty and Glenn	161,345
Car platform, street, J. Stephenson	161,569
Car spring, B. A. Clooney	161,326
Cars, street, J. Stephenson	161,565, 161,566, 161,567
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Carriage, hose, T. McCabe	161,425
Carriage, fifth wheel, R. W. McClelland	161,348
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Cartridge shell, N. C. Hunting	161,514
Cartridge shells, feeding, A. C. Carey	161,582
Carts, trough for coal, W. P. Patton	161,545
Churn, P. La Tourrette	161,525
Cistern supply regulator, T. Van Kannel	161,457
Clothes dryer, M. C. Griffeth	161,406
Clothes frame, C. T. Rowe	161,554
Coal hod, J. H. Murphy	161,433
Coal hod, C. F. Thomas	161,577
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Cradle, automatic, W. Kindermann	161,417
Cultivator, F. W. Tolley	161,456
Cup, seasoning, J. Coulthard	161,484
Cupboard and sink, combined, H. Cull	161,389
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Curtain fixture, O. Ellsworth	161,496
Curtain fixture, H. L. Hall	161,407
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Digger, potato, H. W. King	161,520
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Drilling rails, device for, J. H. Lakey	161,418
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Engine cut-off, D. H. Smith	161,451
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Excavator, M. E. Lasher	161,524
Faucet, beer, Miller and Powell	161,427
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Fenders, etc., feet for, F. S. Bissell	161,470
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Fire arm, magazine, R. S. Chaffee	161,480
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Fire box door ring, G. F. Chalender	161,481
Fire extinguisher, chemical, A. Gray	161,504
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Grain drill teeth, I. B. Sandusky	161,445
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Grain hulling, Wallace and Hyde	161,367
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Horse collar and hame, Schneider and Meek	161,446
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Lamp chimney attachment, H. Johnson	161,339
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Letter box alarm, J. Harrison	161,411
Lever, mowing machine, A. B. Conde	161,483
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Lock, combination, W. Baldwin	161,375
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Loom for weaving hair cloth, J. Paradis	161,437
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Ore crusher, D. Trumbull, Jr	161,456
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Pitcher, glass sirup, L. Wagner	161,364
Plane, bench, W. Johnstone	161,516
Planing machine, wood, J. Ross	161,444
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Plow, ditching, A. L. Harned	161,509
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Press, cider, D. F. Emry	161,397
Press, screw, W. H. H. Minge	161,539
Printing press, plate, J. Wilson	161,370
Propeller speed regulator, E. F. Boan	161,376
Protractor, A. H. Dodd (r)	6,355
Pruning implement, C. B. Cannon	161,381
Pump, Curtis & Russell (r)	6,357
Pump box, W. A. Spooner	161,563
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Pyrometer, B. Crawford	161,330
Quilter and corder, gage, G. Vincent	161,458
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Roofing tile, S. Mills	161,538
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Sawing machine, scroll, G. S. Young	161,585
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Sewing machine button hole, J. McCloskey	161,534
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Shovel, T. J. Blake	161,321
Shutter and blind fastening, C. H. Craig	161,329
Shutter fastener, C. Russell	161,556
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Shuttle mechanism, G. Crompton	161,488
Slicer and corer, apple, Slier & Brooks	161,359
Spinning ring die, Forchand & Wadsworth	161,334
Stamp, hand, J. Sigwalt, Jr	161,450
Steel, manufacture of, J. Eyquem	161,398
Stereotype block register, A. J. O'Shea	161,542
Stove, E. Smith (r)	6,363
Stove, magazine, E. Bussey	161,479
Stump extractor, W. H. Fulton	161,500
Sugar, manufacturing hard, F. O. Mathiessen	161,424
Table, convertible, F. A. Gilbert	161,502
Table, folding extension, A. W. Fay	161,497
Table implement, O. W. Taft	161,573
Thill coupling, A. W. Forwood	161,402
Thill coupling, J. Walker	161,366
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Tile molding machine, C. Diebold	161,391
Tippet and muff, combined, J. Engel	161,332
Tobacco machine, lump, D. W. De Forest	161,331
Towel rack, folding, J. T. Sherwin	161,560
Toy block, C. M. Crandall (r)	6,356
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Trap, fly, H. B. Earing	161,494
Trap, fly, D. E. Roe	161,554
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Vehicle bolster plate, W. J. Lewis	161,344
Vessels, spindle-shaped, W. L. & T. Winans	161,372
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Washing and wringing machine, J. H. Cook	161,328
Watch, J. R. Hopkins	161,513
Watch closing and indicating, D. Moore	161,429
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Well, filter, W. P. Powers	161,546
Well points, drive, D. A. Danforth	161,491
Wheel molds, forming gear, J. Clayton	161,385
Whip socket, J. M. Underwood	161,578
Windmill, J. M. Armour	161,318
Window sash, W. Kreitzer	161,312
Window screen, L. D. Lockwood	161,419

EXTENSIONS GRANTED

31,445.—Felly Machine.—C. H. Denison.
31,525.—Making Hoe Blanks.—N. Brand (Two patents.)
31,533.—Weighing Apparatus.—A. B. Davis.
31,534.—Scale Beams.—A. B. Davis.
31,546.—Polishing Bars, etc.—B. Lauth.
31,566.—Drying Fruits, etc.—M. P. Smith.
31,578.—Paper, etc., Folding Machine.—W. H. Milliken.
31,578.—Paper Folding and Printing Machine.—W. H. Milliken *et al.*
31,579.—Corn Planter.—F. B. Preston.

DISCLAIMER FILED.

31,578.—Paper Folding Machine.—W. H. Milliken *et al.*

DESIGNS PATENTED.

8,229 and 8,230.—Monument.—A. Lingemann, Port Huron, Mich.
8,231.—Stool Pedestal.—A. Merriam *et al.*, West Meriden, Conn.
8,232.—Pitchers.—T. B. Atterbury, Pittsburgh, Pa.
8,233 to 8,236.—Carpets.—R. R. Campbell, Lowell, Mass.
8,237 to 8,239.—Carpets.—E. Guiraud, New York city.
8,240 to 8,244.—Type.—C. E. Heyer, Boston, Mass.
8,245.—Type.—P. A. Jordan, Philadelphia, Pa.
8,246 and 8,247.—Oil Cloths.—H. Kagy, Philadelphia, Pa.
8,248.—Carpets.—C. S. Lilley, Lowell, Mass.
8,249 and 8,250.—Carpets.—D. McNair, Lowell, Mass.
8,251.—Tea Caddies.—W. T. Sherer, Chicago, Ill.
8,252.—Carpets.—C. W. Swapp, Lowell, Mass.
8,253.—Carpets.—T. J. Stearns, Boston, Mass.
8,254.—Towel Rack.—C. Ten Eyck, White House Station, N. J.
8,255 and 8,256.—Rubber Boots, etc.—A. R. Trotter, Providence, R. I.

TRADE MARKS REGISTERED.

2,319.—Washing Powder.—O. Corbett, Chicago, Ill.
2,320.—Loom Temple.—Dutcher Temple Co., Hopedale, Mass.
2,321.—Tobacco.—A. Gillender & Co., New York city.
2,322.—Cigars.—S. Jacoby & Co., New York city.
2,323.—Heaters, etc.—D. Mershon's Sons, Phila., Pa.
2,324.—Sheep Dip.—Redington & Co., San Francisco.
2,325.—Flour.—A. A. Tayler, Loudonville, Ohio.
2,326.—Bitters.—P. D. Van Ingin, Brooklyn, N. Y.
2,327.—Hose, etc.—Wannalanset M'f'g Co., Boston, Ms.
2,328.—Medicine.—J. C. Ayer & Co., Lowell, Mass.
2,329.—Silk Fabrics.—P. A. Daily & Co., N. Y. city.
2,330.—Coffees, etc.—J. M. Earle, New York city.
2,331.—Boots, etc.—Graff & Co., Philadelphia, Pa.
2,332.—Cotton Prints.—Hamilton Woolen Co., Southbridge, Mass.
2,333.—Cough Sirup.—Asile de la Providence, Montreal, Canada.
2,334.—Petroleum, etc.—Power & Co., London, Eng.
2,335.—Floor Cloths, etc.—F. Walton, Staines, Eng.
2,336.—Cider Mills.—Whitman Works, St. Louis, Mo.
2,337.—Atomizers.—Young *et al.*, New York city.

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CANADIAN PATENTS.

List of Patents Granted in Canada, March 23 to April 1, 1875.

4,536.—J. A. Pease, Boston, Mass., U. S. Lamp. March 23, 1875.
4,537.—L. Schwendler, Calcutta, India. Duplex telegraph. March 27, 1875.
4,538.—J. A. McMartin, Montreal, P. Q. Pump. March 27, 1875.
4,539.—Wm. Bell *et al.*, Guelph, Ont. Tubes for reed organs. March 29, 1875.
4,540.—J. H. Barbarick, Caxo, Me., U. S. Slate. March 31, 1875.
4,541.—E. W. Phelps *et al.*, Newark, Ohio, U. S. Harvester grinder. March 31, 1875.
4,542.—J. Sugden *et al.*, Lawrence, Mass., U. S. Horse check. March 31, 1875.
4,543.—T. Hodgson, Amherst, Nova Scotia. Circular saw guard. March 29, 1875.
4,544.—J. Smith, Brantford, Ont. Stove and grate heater. April 1, 1875.
4,545.—E. A. Hornbastel *et al.*, Guelph, Ont. Wood and metal tap. April 1, 1875.
4,546.—F. Marsh, Montreal, P. Q. Stop and waste cock. April 1, 1875.
4,547.—G. Morgan, Andover, N. H., U. S. Wedge cutter. April 1, 1875.
4,548.—G. B. Dixwell, Boston, Mass., U. S. Steam engine and boiler. April 1, 1875.
4,549.—I. Bridgman, Toronto, Ont. Railway cars. April 1, 1877.
4,550.—D. D. McMillan, La Crosse, Wis. Self-regulating gas burner. April 1, 1875.
4,551.—J. W. West, Boston, Mass., U. S. Spooling machine. April 1, 1875.
4,552.—J. Porth *et al.*, New York city, U. S. Nail machine. April 1, 1875.
4,553.—H. Bland, Liston, Eng. Sewing machine and accessories. April 1, 1875.
4,554.—W. A. Holwell, Montreal, P. Q. Sash regulator. April 1, 1875.
4,555.—F. Cuny *et al.*, Ottawa City, Ont. Scrubbing brush. April 1, 1875.
4,556 and 4,557.—I. De Witt, Grand Ledge, Mich. U. Washing machine. April 1, 1875.

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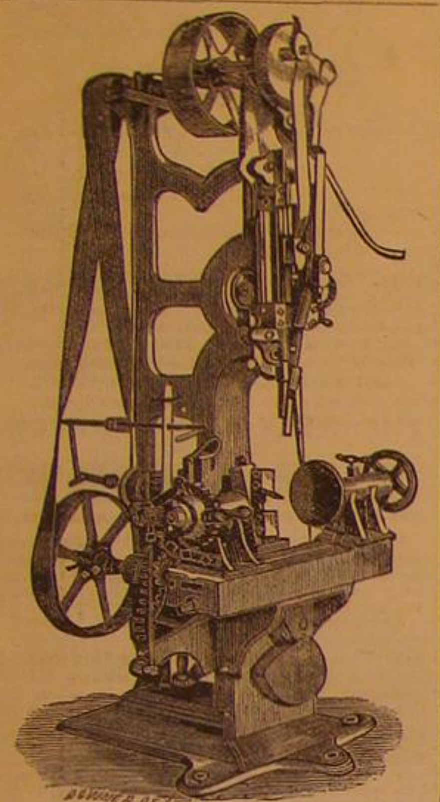

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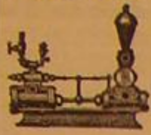

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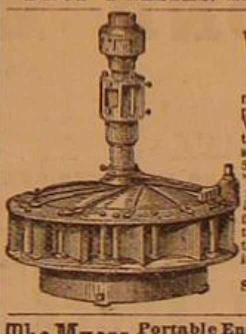

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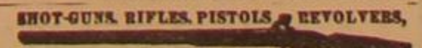

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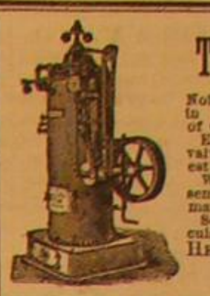

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