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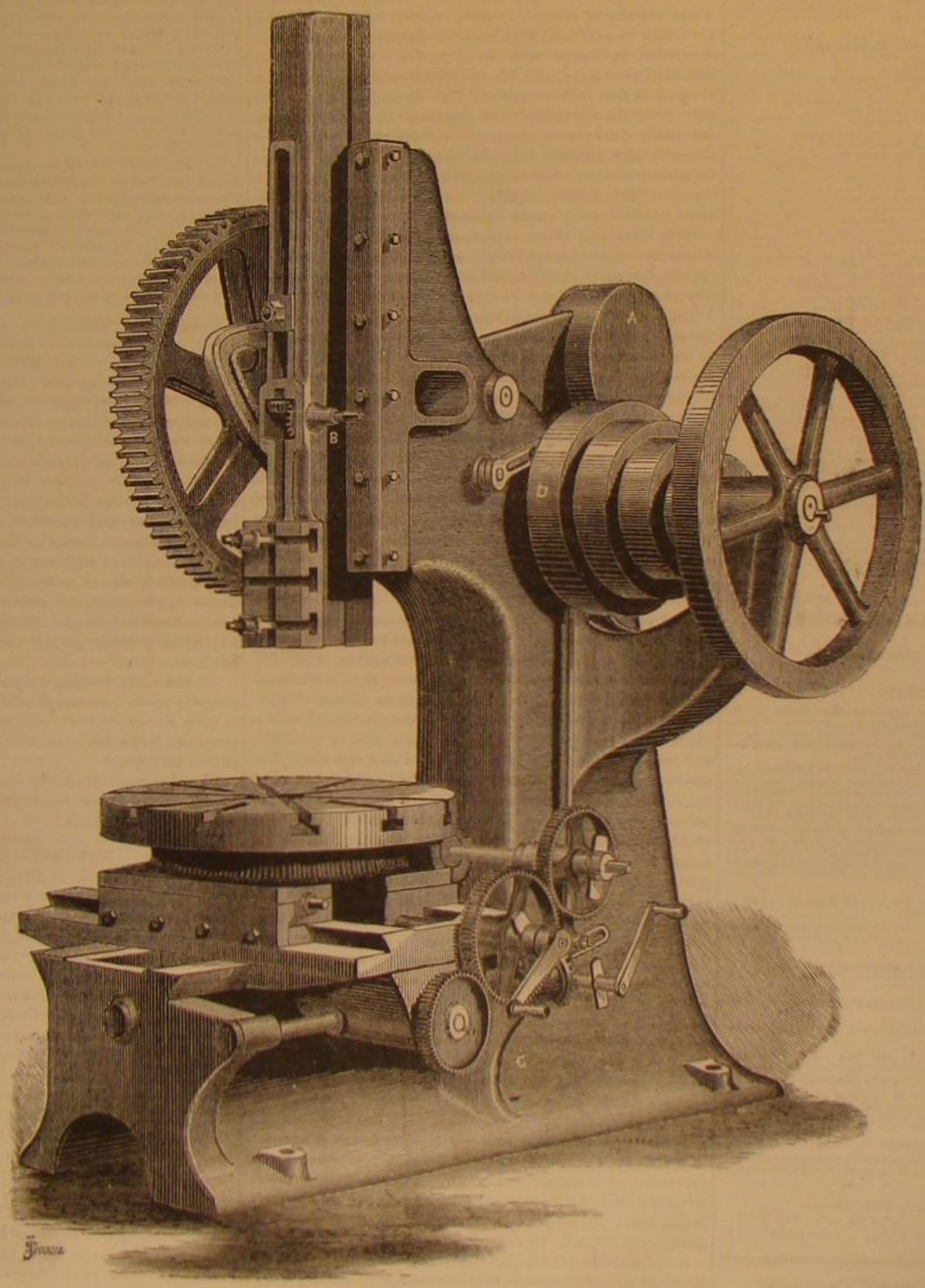
SLOTTING MACHINES.

We illustrate herewith a recently constructed slotting machine, the work of Messrs. New & Co., of Nottingham, England. It is a tool of great strength and admirable design, and embodies several improvements which enable the workman to keep all the operations of the machine immediately under control It will be seen that the tool is fitted with a compensating balance, A, to the ram, acting in any position the ram may attain. It steadies the stroke and takes up any back lash that may be in the slide and connections. One end of the compensating balance lever is formed into a slot, carrying sliding blocks from the crank pin, giving the quick return and adjustable stroke. The link connecting the lever to the ram is fixed at the extreme end of the lever, which insures an almost direct vertical thrust without any side pressure. This arrangement relieves the ram slide of considerable friction, and thus effects a direct saving in wear and tear. The ram is provided with a bearing of exceptional length, so that it may be well and steadily directed in its stroke. A full stroke can be given, or a short stroke, close to the table or farthest from it. The screw for adjusting the hight of the ram is worked from the front side at the bottom of the slot, B, for convenience. The machine is so arranged that all the movements, C, for the slide and tables may be worked from he side of the machine at which the workman stands, where are also placed the fly wheel and driving cone, with gearing at the opposite side. This arrangement has the double advantage of placing all the movements and adustments to the machine within the convenient control of the workman, who has therefore no occasion to keep moving from the front to the back of the machine, and from back to the side, and then to mount on the table to adjust the ram, as in the ordinary machines, when setting work for operation. A further and most important advantage is that the machine can be placed as conveniently to the line shafting for driving as an ordinary lathe, the cone, D, being in parallel position to the shafting, and not at right angles, as in the ordinary way, where the cone is at the back of the machine. There is also ample provision made for varying the slide feed motions from one to ten teeth; and the circular table is provided with a simple and improved canting motion, so as to give a fixed and correct strip in key-way slotting. The proportions of the whole machine have been carefully considered in design and detail.



NEW ENGLISH SLOTTING MACHINE.

Chinese Acrobats.

A party of Chinese tumblers, lately introduced into the Chinese theater, San Francisco, are indeed marvels in their line. A number of athletic Mongolians appear, stripped to the waist, and begin a sort of combat on the stage. At first the fighting appears to be promiscuous; but six or eight finally ally themselves against one man and try to overcome him by springing against him and striking him full in the breast with the soles of their feet. He meets this curious mode of attack by standing like a statue, while the others fall heavily upon the floor. A number of tables are next brought out and piled one above the other until a hight of about twenty feet is obtained. A performer, whose weight is no less than 150 lbs., mounts them, and, springing in the air toward the floor and the stage, strikes both feet with a heavy thud upon the bare breast of a man standing about ten feet from the foot of the tables, throwing him violently to the floor. How a man can sustain such a blow is a mystery. Again the agile acrobat ascends to the top table, and, springing upwards, turns a somersault, while all the tables, except the lower one, are suddenly taken away. Upon the only table left he falls with a force apparently great enough to break every bone in his body; but he leaps up again immediately and turns back handsprings across the stage. Again he climbs to the top of the tower of tables, while a second lies down upon a table a few feet from the base of tower. Turning a somersault in mid-air he falls upon the other body, the two breast to breast, and bounds off again with a second somersault. Other acrobats climbed to various altitudes and fell upon the stage, alighting square upon their backs with a force which was astonishing. These feats are all executed by men in a semi-nude condition, so that there is no chance for padding their clothes. While the Americans in the theater applaud, the Chinese make no demonstrations of approval, but sit looking stolidly on. The managers informed the reporter of the San Francisco *Call* that the tumblers are trained from childhood, and become habituated to the terrible concussions only by years of practice. He added that many are killed in training, or maimed for life. None of their feats are graceful, but simply indicate a tremendous amount of strength, nerve, and endurance.

A New Method of Finishing Photographs.

"In the first place, enamel your print, as enameling, though not absolutely a *sine quâ non*, is a decided advantage. We will suppose this has been effected, the subject having been printed in an oval. Now let a mask be constructed, of eight-sheet cardboard, of sufficient size to entirely cover the enameled and mounted picture, with margin to spare; glue a piece of sand paper on one surface, rough side out, and when dry cut out an aperture of the exact dimensions of the picture to be finished, taking care the edge is accurate and smooth; adjust this paper die, so to speak, on the face of the enameled picture, and apply pressure. Passing them through an ordinary rolling press answers the purpose well. The result is that the parts in contact with the sand paper surface are roughened or rendered matt, offering a pleasing contrast to the polished surface of the picture, and in this consists the novelty.

"Paper lace and various textile and other fabrics can be substituted for sand paper, or a metal plate could be engraved to produce any pattern. Many substances will suggest themselves to the experimentalist, and variety of ornamentation can be easily devised by altering the shape of the mask. For my own part I prefer sand paper to most other substances. Any degree of fineness of surface may be got by this means, and by slightly shifting the position of the mask and putting through the press after each alteration.

"I think that ornamentation, when produced by merely altering the texture of the surface, is of a much more refined character than when gold or color is applied for the same purpose. The plan here described has been found thoroughly workable with little trouble and less expense, as one sand paper mask will impress a great number of surfaces, and its renewal is most easily managed. All I can say to photographers, more than this, is to advise them to—try it."—*Edward Dunmore, in the British Journal of Photography*

Alleged New Cereal.

A new cereal has been grown in the State of Oregon, and thus far no one has been able to classify it; for while it bears a general resemblance to wheat, yet its stalk, mode of growth, and heavy filaments cause it to be taken for rye or barley by the most experienced farmers. The grain was originally discovered in the stomach of a wild goose, by a farmer. From seven to ten stalks spring from one root, and attain a hight, when ripe, of four and a half to five feet. They are very thin, compact, of a bright straw color, and extremely hard, as if they contained a large quantity of silex.

THE thread on a ¾ inch gas pipe will sustain a weight of 5,000 lbs., ½ inch, 7,000 lbs., and ¾ inch, 9,000 lbs., so that chandeliers cannot readily be shaken from their supports.

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ETHERIC FORCE AND WEAK ELECTRIC SPARKS.

It was long ago observed that, under certain conditions—for example, when a large number of sparks succeed each other from the conductor of an electrical machine or from a Leyden jar—a spark sometimes appears which differs in a marked degree from ordinary electric sparks. It is less intense in illuminating power, less loud, produces a weaker sensation, and, when the space over which the spark passes is not too small, the center of the spark appears dark. The distinguished investigator, Professor Reiss, who first succeeded in producing these sparks at will, calls them "weak sparks."

The apparatus used by Professor Reiss consisted of a Holtz machine with a 15 inch plate, electrodes 11½ inches apart, and two small Leyden jars, the inside coatings of the jars being in communication with the electrodes and the outsides with each other. After the machine had been put in full action, the rotation of the disk was lessened and the positive electrode gradually withdrawn from the negative one. At first a stream of strong sparks passed between the electrodes, becoming less numerous as the distance increased. When the electrodes were about an inch and a half apart, weak sparks appeared, with an occasional strong spark, as many as a hundred weak ones to a single strong one. On separating the electrodes still further, strong zigzag sparks appeared, and with further separation the electricity was dissipated in the star and brush forms. Occasionally weak sparks are produced with a single jar, but not, as yet, at will.

The characteristic of the weak spark is an exceedingly small momentary flash broken by a perfectly dark spot, variable in size and in position, but always nearest the negative electrode. The negative part ends in a sharp point, the positive in several points, and is often bent aside, the two parts seldom lying in a straight line. The color of the spark is reddish; and though far weaker than the strong spark, its light is intense enough to be visible in full daylight. The sound of the weak spark is as unlike the cracking noise of the strong spark as that is unlike the sound emitted by the brush discharge, making it possible to distinguish weak sparks by ear even at a considerable distance. Another remarkable peculiarity of the weak spark is the narrow range which the adjustable electrodes may have while producing them. Strong sparks, brushes, and the glow may be produced with variable distances between the electrodes, but not so with weak sparks. Professor Reiss speaks of producing with his machine strong sparks, varying as much as five inches in length, but weak sparks appeared only when the electrodes were separated 21 or 22 lines. A few weak sparks were also obtained both above and below the electrodes, together with a large number of strong sparks, indicating that, in order to obtain weak sparks, not only is a certain electric density required, but also a particular arrangement of the density on the electrodes.

From these and other experiments, Professor Reiss concludes that the weak sparks present a new (that is, newly recognized) form of electric discharge, a form relating especially to discharges of the least electric density.

These observations are of special interest just at this time, inasmuch as the phenomena in question were at first thought by us to correspond with those to which Mr. T. A. Edison applies the name etheric force. The truth is that the two sets of phenomena are distinct and apparently unrelated.

Thus far all attempts to generate the Edison "etheric force" by means of an apparatus such as Professor Reiss employed have been fruitless. It has been produced only by means of an interrupted current from several electropoion cells, using a vibrator magnet or an electro-magnet operated on by an ordinary telegraph key, the current following a wire connected with the core of the magnet or with a piece of metal within the magnet's sphere of influence. The force manifests itself as a spark when the wire is rubbed against a piece of metal; when a body of metal, as a stove or gas pipe, is connected with the wire and touched by a piece of metal, as a knife blade; or when two carbon points are brought in contact in a dark box, one carbon being connected with the wire leading to the magnet, and the whole apparatus being carefully insulated to exclude inductive electricity. Sparks are also obtained when the conducting wire is rubbed by a lead pencil or a piece of metal held in the hand, and even when the wire is rubbed by its own free end. The conducting wire does not require to be insulated. It may be led through water, wound around large bodies of metal, or trailed along the ground, yet the sparks appear. One rainy night Mr. Edison led the wire from the vibrator out of doors, across the sidewalk, up and down the block in the gutter, through which a torrent of water was pouring, thence by an alley way to the rear of his laboratory, and thence up stairs to the floor above, where the sparks were distinctly seen between carbon points in a dark box. (This box was illustrated in our last number.) On another occasion the vibrator was connected by means of a wire with the general system of gas pipes of Newark, whereupon signals were transmitted, without other connection, to his house in a distant part of the city. These experiments, however, do not prove that any "force" traversed the wire or the gas pipe, as the force might, by short circuit over the table, have reached the carbon points.

The hypothesis that etheric force, so-called, may be a new or hitherto unrecognized mode of electric action is supported by the appearance of the spark, which resembles that of galvanism of moderate tension; by its preference for metallic conductors; by its rapid motion, its velocity for short distances being practically instantaneous; by its being resisted, though but slightly, by electric non-conductors.

It differs from electricity—especially inductive electricity, to which its sparks were at first attributed—in that its sparks are different in appearance and effect. They scintillate, and require the actual contact of the points at which they appear. It differs from electricity in general in its entire independence of polarity. It does not require a circuit. It does not require insulation. It will not charge a Leyden jar. It fails to affect chemical compounds which are extremely sensitive to electricity, as, for example, iodide of potassium. It has no effect upon electroscopes or galvanometers. It is not felt upon the tongue, and causes no contraction in that most sensitive of all tests, a galvanoscopic frog. In DR. BEARD's experiments, the force was passed through a frog, causing no contraction; yet the same frog contracted in response to a galvanic current from one cell, after it had overcome a resistance of over one million ohms, or about 75,000 miles of telegraph wire. This absence of chemical and physiological effect is probably owing to the extreme facility with which the force traverses the substances experimented with: meeting little or no resistance, the force passes on unchanged where electricity would be wholly or partially transmuted into some other mode of motion, resulting in chemical or physiological action. Substances which strongly resist the passage of electricity—glass, hard rubber, etc.—have much less influence upon "etheric force:" so much less that such non conductors of electricity may be practically regarded as good conductors of the new force.

Enough has been said to show that Professor Reiss and Mr. Edison are pursuing two widely different lines of investigation. So far from being identical, the phenomena are at variance in every particular: the cause of the one being statical electricity of low tension, and the cause of the other—etheric force, as Mr. Edison calls it—being, if not a new and distinct phase of force, as he suspects, at least a new and hitherto unstudied phase of electricity. In either case, Mr. Edison will rank with the most fortunate and eminent of scientific discoverers.

Since the above was written, Mr. Edison has sent us the following note in relation to the galvanoscopic frog experiment:

To the Editor of the Scientific American:

I have ascertained that the slight contractions in the legs of a galvanoscopic frog, upon the passage of the etheric current through it, were not caused by electricity, but by the transmission of mechanical longitudinal vibrations by the electrical vibrator over the conducting wire, as was proved by a tuning fork and by a resined pad. In fact the tuning fork, during vibration, would produce contractions when held one inch away from the frog. When the etheric current was passed through the wire and frog, without the transmission of mechanical vibrations, not the slightest effect was produced, although the frog exceeded in delicacy any of those previously tested.

Further experiments in other directions have been made which resulted in rendering the phenomenon more inexplicable. An uninsulated wire proceeding from the source of power (highly insulated, of course) was taken into the street and laid in the gutter around a whole block, and back into my laboratory by another door, and up to the floor above the one where the generator was. Excellent sparks were drawn from that end of the wire, although the ground the wire laid on was wet, it having rained all night.

THOMAS A. EDISON.

Newark, N. J., December 8, 1875.

TO ENGINEERS.

With the opening new year, we have the satisfaction of being able to command in our SUPPLEMENT a greatly increased amount of space—no less than sixteen large pages every week—to be devoted, as heretofore announced, to scientific topics of the greatest value and utility to our readers.

We especially purpose to make the ENGINEERING DEPARTMENT of the SCIENTIFIC AMERICAN SUPPLEMENT as full, complete, and valuable as possible: to this end we invite Engineers to send us for publication, whenever they can, full copies of engineering plans, with detailed drawings and specifications, of new engineering or mechanical enterprises, mechanisms, and public and private works, of notable character or design. These we shall engrave and publish when possible, giving due credit to the parties who favor us.

All plans and drawings should exhibit the scale to which they are made; and care should be taken in the specifications to give, accurately and fully, all principal dimensions. Papers thus forwarded to us will be carefully preserved and returned on request.

The amount of fresh and important engineering information furnished by our SUPPLEMENT in the course of the year will be very extensive.

POWERFUL EXPLOSIVES.

The recent disaster at Bremenhaven, Germany, in which so many persons lost their lives, calls public attention to the great danger attending all explosive preparations in which nitro glycerin is the active ingredient.

Dynamite, called giant powder (infusorial earth and nitro-glycerin), dualin (sawdust saturated with nitro-glycerin and saltpeter), lithofracteur (dynamite with coal, soda, saltpeter, and sulphur), vulcan powder (a product similar to litho-fracteur), rend-rock, and many other compounds before the public under various names, which derive their explosive force from nitro-glycerin, are especially dangerous, and should not be allowed to be stored or transported, except under special conditions; for although, when freshly made, they are not so liable to explode by friction or slight concussion as the terrible liquid to which they owe their potency, they are all of them exceedingly sensitive to decomposition, excited by change in temperature which is followed by generation of heat, and is the forerunner of spontaneous combustion.

Professor Draper, in one of his works on popular science, states that Nobel was led to the experiments from which resulted dynamite by the fearful explosions of nitro-glycerin at Aspinwall, San Francisco, Sydney, North Wales, and elsewhere; and he adds that M. Guyot, a French chemist, has shown that the nitro-glycerin may exude from its absorbent, and, saturating the paper of the cartridges and boxes, reassume the state in which it is readily exploded by a slight blow.

Nitro-glycerin has a sweet, pungent, aromatic taste, but produces a violent headache if placed upon the tongue or even allowed to touch the skin at any point; thus those working with it or its compounds suffer excruciating pain. It also freezes at a very high temperature (39° to 40° Fah.); and before being used in winter, it has to be thawed out in order to explode it. This operation, on all the compounds alluded to, causes the nitro-glycerin to exude, and if they

are not quickly used, decomposition is liable to set in. And if once the absorbent yields up its nitro-glycerin, and the compound becomes moist, it will explode by a slight jar or shock. (See W. N. Hill, "On Certain Explosives.)

At this time, when engineering operations of vast extent are in progress and in contemplation, it is useless to expect that the employment of such materials, dangerous as they are, will ever be discontinued; and it becomes the duty of scientific men to look for some more controllable explosive. Such a preparation is found in pulp-compressed gun cotton, whose density is 62 lbs. per cubic foot, and it is considered six times as strong as gunpowder.

Vast strides have been made in improving this material by Professor Abel, of England, in the last few years; and his patent process enables him, it is stated, to manufacture it with perfect safety, and to transport and explode it in a wet state, and even store it under water without deterioration.

The English War Department recently appointed a special commission, composed of nine well known officers and gentlemen, to inquire into the whole system of manufacturing, storing, and using the different known explosives. In arranging the substances in the order of relative danger, they gave them thus: Nitro-glycerin, gunpowder, dynamite, lithofracteur, and, lastly, compressed gun cotton. "The investigation," writes a member of this special commission to the London *Times*, in April of this year, "was entered upon with a certain amount of prejudice against gun cotton, arising from the catastrophe which occurred at Stowmarket in the year 1871. A careful inquiry into the circumstances, however, conclusively showed that it was not the result of accident, but that it was caused by the wilful and malicious act of some person, possibly not aware of the grave consequences of this criminal proceeding." . . . "I feel," the writer continues, "that any one who will read the able and exhaustive report of Major Majendie, R.A., on this subject, must arrive at this conclusion;" and he further adds that "the improved gun cotton is manufactured by an entirely wet process throughout, the last stage being the formation of disks or short cylinders of various diameters by hydraulic pressure, in which state they contain 18 per cent of moisture, which is increased by the addition of water to 25 per cent, for the purpose of securing uniformity and a larger margin of safety, and because the gun cotton in this state can still be exploded, but only under special conditions applied by an expert. This fact was not known till some time after the date of the explosion referred to, it then being the practice to dry the disks and to store and transport them in that condition. In that state gun cotton cannot be exploded by any collision, however violent, even by a rifle bullet fired into it; nor even inflamed, unless it is enclosed in strong hermetically sealed cases, so that it might be transported by railway if some simple precautions were taken. In the damp state, as exclusively offered for transport, and without the appliances alluded to above, it cannot even be ignited, much less exploded, either by a spark, by heat, by friction, or by a collision, even if it resulted in the extreme case of the contents of a locomotive fire box being emptied upon a truck full of gun cotton; while, if exploded surreptitiously, it must be the act of a skilled malefactor, provided with the necessary appliances of dry gun cotton, waterproof materials, special detonaters, patent fuze, or electrical apparatus, and thoroughly acquainted with the *modus operandi*."

The result of the English investigation caused England, Germany, and France to adopt the use of gun cotton for torpedoes, submarine mining, and in the water shell, the two former governments manufacturing their own, while France has made a large contract with a company (manufacturing under Abel's process in England) to supply it. Walter N. Hill, chemist to the U. S. Torpedo Station, Newport, R. I., in his "Notes on Certain Explosive Agents," in speaking of gun cotton, says: "By the method of Abel, a perfect washing is obtained; and in addition, the material is prepared in a form convenient to use and yet perfectly safe. For blasting, demolitions, torpedoes, etc., the pulp-compressed gun cotton is an admirable agent. Wet compressed gun cotton is the safest of all explosive agents; it is not liable to be fired by a spark or a flame, nor affected by blows, friction, or other rough handling. The transportation of gun cotton presents no special difficulties, since there is no danger of leakage, neither is it sensitive to blows. In England, many of the railroads transport it as readily as other freight."

In selecting an explosive, and considering its advantages and disadvantages, too often the health of the employees is taken least into consideration. The smoke from gunpowder is deleterious in the air of mines, and the headache caused by the fumes of nitro-glycerin, or even by touching it or any of its compounds, must be most injurious to the health. Dr. Angus Smith, F.R.S., in his report to the English Parliament, says, in reference to gun cotton, that, owing to its freedom from smoke: "In every trial in which the effect on the senses, or the breathing, and, as far as we can judge, on health, was considered, gun cotton has come off with the highest character. I feel much confidence in speaking thus highly in its favor."

The value of life and health should be considered by all those who have it more or less intrusted to their power, as in the case of mining operations, where the owners or managers decide upon what explosive shall be used on their works; and in this age of progression and enlightenment, we feel justified in calling attention to Professor Abel's much-needed invention, which has been tested and vouched for by so many high authorities

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ON November 15, 90 miles of new railways were opened in Italy, including that from Tuoro to Chiusi.

THE PLUMBER'S HARVEST TIME.

Now is the season of gloomy forebodings for the luckless city tenant. A very large number of houses in this city have been built simply to sell; and while their construction is frequently bad, the owners often insist upon putting in plumbing that is perhaps a shade worse than anything else. We have seen nearly a whole ceiling drop in a new house, because a plumber had forgotten to make a connection between a waste pipe and a bath tub. This is a specimen of a state of affairs in which constant trouble with the water arrangements is to be expected, and which cannot be guarded against even by average care. The occupant may find that his street pipe will freeze early in the winter; and if he seeks a reason, he will discover that the builder, in cutting into the rock which underlies very many New York up-town streets, has only blasted out the cellar, and the authorities have made a trench in the street deep enough for the mains; but the intervening ridge of rock between the dwellings and water mains is left, because it was expensive to remove it. The supply pipes are curved up over it to reach the house, and, of course, the uppermost part of the curve is far within the frost line of the ground, and sometimes close to the surface; and the freezing of that pipe is a necessary consequence. Another favorite plan of builders is to supply three houses from one connection to the main, a cheap dodge to avoid tapping the large pipe and ripping up the street for each house. The central house has a straight pipe, and the houses on each side have branches therefrom. The beauty of this is that, when the central pipe freezes near the main, three households are deprived of water instead of one.

With good plumbing work throughout a house, there is no reason for serious results of accidents, if the occupant will take proper precautions to prevent them, or if, in event of casualties happening, he inform himself as to what invention has done since last winter to help him out of his dilemma. The simplest way to prevent pipes freezing when water is abundant is to let the water run in a fine stream constantly from one of the faucets. If there is a strong head of water in the upper stories, open the kitchen faucet wide at night, and drain all the pipes through the house above, shutting off the water from the street for a few minutes during the operation. In this way, the house pipes, being empty, cannot freeze; and the water, turned on again, will maintain a constant circulation from the main to the faucet, which, as before stated, should be left partially open. There is usually a stopcock located near the kitchen sink, which can be turned so as to prevent the water re-ascending above the kitchen floor. If the house is warmed with a furnace, and stands between other occupied houses, the chances of the pipes in the walls being frozen is very slight; but if the house next door is empty, and the pipes are carried up on the wall through which no heated chimneys run, then freezing is quite probable.

When a pipe from the street freezes, the range fire should be at once extinguished, as otherwise the water back will either blow up, or be burnt out: in the former case serious damage is possible. Last winter, the plumbers dug up the streets, and built fires over the supply pipes, and went through other operations, which generally resulted in a bill of from eighty dollars to one hundred dollars. At the present time, if an invention which we recently examined prove as useful as appearances indicate, the cost of such proceedings will be greatly reduced. The apparatus is a small steam boiler, heated by a pan of charcoal beneath it. The hot water—not steam, as in this machine a constant supply of water against the ice is found to thaw the same quicker, paradoxical as the fact may appear—is forced into a small rubber tube, the end of which has a metallic tip, and around which stout copper wire is spirally wound. This wire is held in a coil in a rotating wire cage, and freely unwinds as it is pushed into the pipe. When the end meets the ice, the pushing by hand is stopped, but is continued by an ingenious spring arrangement. By the spiral wire the tube is literally screwed into the ice, which is softened and melted before it by the continual stream of hot water issuing from the end of the pipe.

We might add that there is still an excellent field for invention in other devices of the same description; and at the same time we might suggest, to inventors already in possession of similar patented apparatus, that now is the time to bring them to the notice of the people.

THE ANALYSIS OF COW'S MILK.

The universal complaints as to the quality of the milk sold in cities, which is almost universally diluted with water, make the diffusion of knowledge on the subject of great importance to the public health.

There is an instrument used called a lactometer, which is nothing but an hydrometer, such as is used to ascertain the strength of distilled liquors, etc.; but for use in milk it is specially graduated from 1,000° to 1,050° or thereabouts, and it indicates the specific gravity of water, in which it sinks deepest, at 1,000°, and that of the heaviest milk at 1,032°. The specific gravity of milk may vary from 1,026° to 1,032°; if it is less than 1,026°, it is certainly diluted with water, and if above 1,032°, it has been thinned of its cream, as the presence of cream makes the average gravity of the milk lighter. Therefore, if milk is skimmed and watered both, the lacto meter gives no satisfactory indication; and it is surprising that the instrument has not been rejected by practical persons long ago.

Unfortunately, there is no test by which the quality of milk can at once be correctly determined. The comparative transparency may be considered to be a better test than the gravity, as it will show if the milk has been skimmed, as well as if it has been diluted with water, but its indications are only approximate. A better way is to let the milk settle, at a moderate temperature, in a tall cylindrical glass; in 24 hours the cream will have collected on the top to the thickness of one fifteenth part of the hight of the milk, if the milk is pure; if the milk has been skimmed or diluted, the cream layer will have less thickness. This operation, however, takes 24 hours before any result can be arrived at; besides, it indicates only the quantity of the butter, and not the proportions of the other ingredients, nor the presence of adulterants; so that a regular chemical analysis is the only reliable method.

The best analytical method is that of Brunner, which takes only 25 minutes to accomplish. The milk is placed in a glass vessel, and the gross weight of milk and glass is ascertained with a good balance; then 60 or 90 grains of the milk is poured into a shallow metallic capsule of about 2½ inches diameter, the exact quantity being determined by ascertaining the diminution of weight of the glass vessel and its contents. Then 450 grains of pure fine quartz sand is added, which, however, must have been cleaned from dirt and fine powder by rubbing in a sieve; and the sand and milk are mixed with a small spatula, so that the milk is absorbed and the whole appears like a uniformly moist sand. Then the capsule, with sand and spatula, is again weighed, and evaporated on a water bath at 212°, being continually stirred; after fifteen minutes, the capsule is removed and cooled, and the loss of weight ascertained. It may be well to heat the capsule again for 5 minutes, so as to see if any further loss of weight can be observed; but this will rarely be found to be the case. The loss will be the amount of water contained in the milk, and this must be no more than 78½ per cent. Good cow's milk contains from 77 to 78 per cent of water; and if more than 78½ per cent, say 79 per cent, is found, it is certain that the milk has been watered.

But as refinements in the art of adulteration may have taught the addition of solids, such as sugar, boiled starch, etc., the next test is to correctly ascertain the amount of butter. For this purpose, 300 grains of the milk is mixed with half its weight, 150 grains, of charcoal powder, previously cleaned from dust in a sieve; the mixture is dried by moderate heat (from 150° to 160° Fah.), and then placed in a glass tube about 2 feet long and of ½ inch diameter, drawn out at its lower end to a narrow opening, which is closed with a plug of cotton, to prevent the charcoal from falling through. The tube is then suspended in a vertical position, and about 450 grains of ether, or of sulphide of carbon, is poured in; this will flow out at the bottom, charged with all the dissolved butter. To secure a complete dissolution of the butter, the ether is poured back through the charcoal in the tube once or twice, and finally 450 grains pure ether is added in small portions, to wash away the remaining butter-charged ether; and at last a mixture of 1 part ether and 3 parts alcohol is passed through. All these fluids are collected together and evaporated in a porcelain dish, and the butter obtained is measured by weight. It should not be much less than from 3½ to 5 per cent of the milk employed; for 300 grains of milk, it should be from 10 to 15 grains. But milk will vary as to butter perhaps more than as to other ingredients; and it may be considered certain that a proportion of butter of 2 or even 2½ per cent indicates certainly that the milk has been skimmed, while a proportion of 3 per cent leaves it doubtful whether the milk is pure or has been tampered with.

When the amounts of water and butter in the milk are found to be normal, it is scarcely necessary to ascertain those of the casein and milk sugar, the tests for which are not so simple. The quantities should be nearly 4½ per cent of casein and 4 per cent of milk sugar. The other ingredients are chiefly calcium phosphate, 0·23, and potassium chloride, 0·14 per cent; and phosphates of magnesium and iron, with chloride of sodium, are each present in quantities of 0·04 per cent or less.

It is evident that, if adulterants have been added to conceal the dilution with water or the skimming, the above described analysis will show them, either by an excessive quantity of dry residue or by a deficient quantity of butter.

DANGEROUS PLAYTHINGS.

Another factory for the manufacture of toy torpedoes has exploded. The circumstances of the disaster are of no moment to any one except the unfortunate victims, and the owner, who is fortunate in escaping similar mutilation. Notwithstanding the average boy's devotion to snap and bang, it may be questioned whether the pleasure afforded by playthings of the explosive sort is anything like a sufficient recompense for the risk attending their production, storage, and use. It has been suggested that the sale of such things should be prohibited and their possession made punishable by fine. The suggestion is sensible and timely. The Centennial year, with its intensifications of Fourth of July fervor, is upon us, and the popular demand for fireworks threatens to be excessive. It would be a good thing for the country at the beginning of its second century to put away such childish things, and adopt a less dangerous mode of manifesting the spirit of jubilation, political or other. Surely our inventors ought to be able to devise a simple contrivance to serve as a substitute. It is worth trying for, as a public benefaction as well as for the millions that are in it!

THE lagging of steam pipes was lately considered by the *Société Industrielle de Mulhouse*, France. The president, M. Forey, acknowledged that cork was a good non conductor of heat, but it was costly. The most efficacious covering, says M. Forey, consists of straw laid lengthwise, about 1 inch thick, round the steam pipes, tied with string, and covered with tarpaulin or cloth tarred after fixing.

IMPROVED VERTICAL WOOD-BORING MACHINE.

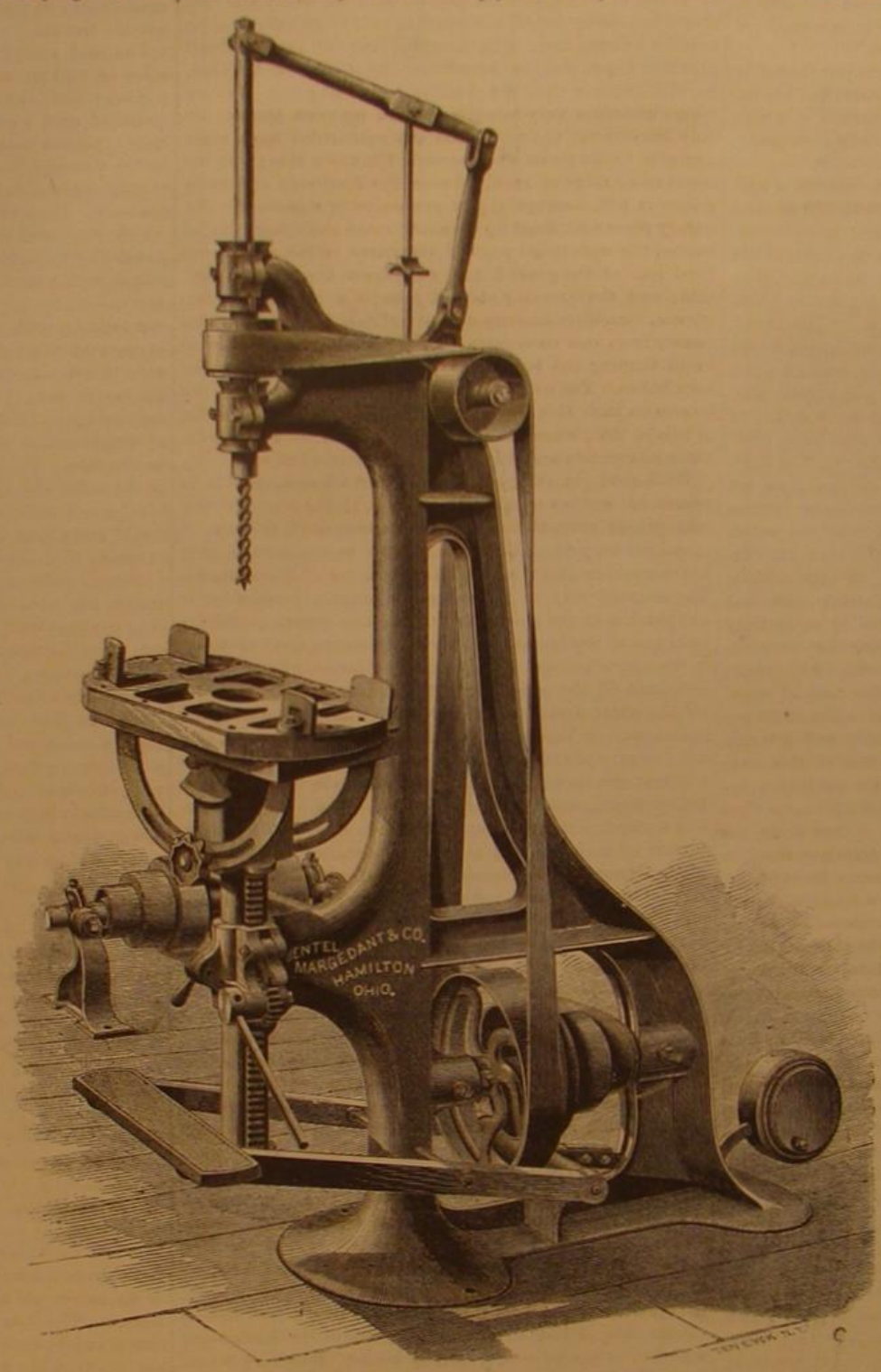
We recently published an engraving and description of a wood-boring machine of English manufacture. The apparatus was a good representation of superior English workmanship, and therefore the improvements included in its construction may be fitly contrasted with those embodied in the latest similar machine of American make, of which we now give an excellent engraving. The points of difference show, we think, a preponderance of advantages on the side of our own production, of which the reader can judge for himself by comparing the description of the English machine already published with that which follows:

The American has a frame strongly constructed of a hollow column, heavily braced by I-shaped web ribs, and a broad base, well calculated to resist jarring and trembling. The table is also strongly made, and is adjustable to any angle or position. It can be raised and lowered by means of a rack and pinion, turned on its axis, and can be tightened at any length by a simple turn of the handle, which closes a long split bearing. The table proper can be inclined at different angles, and the upper part may be moved out or in, revolved, and adjusted. A cone pulley of three steps enables the operator to run the machine at three different speeds, for large, medium, or small sized machine augers. It has a commodious self-returning treadle, which requires very little power to bring the auger bits to the necessary depth.

Holes can be bored, at any angle, from ¼ of an inch to 3 inches diameter, and from ½ of an inch to 12 inches depth. An adjusting stop on the connecting rod gages the depth of the hole. The rests on the table can be adjusted for straight, square, oval, circular, and bent work. The idler pulleys (which are frequently a source of trouble in such machines) do not need re-adjusting for different hights of the countershaft from the machine. The manufacturers direct special attention to the facility with which a number of holes, with variations of angle, can be accurately bored. In the slots of the radius brace one or two stops can be inserted in such a way that the table can be swiveled from a horizontal plane to either side; and, as the table slides forward and backward, and can be turned on its axis, it is obvious that, in a piece of timber, a number of holes can be bored which differ in angle and place without moving the work about. The machine is adapted for boring short as well as long pieces of material, and will do the work, it is claimed, with great ease and rapidity. The countershaft with cone pulley, as shown in the engraving, may be set on the same floor with the machine, or attached to the ceiling, so that the belt may pass from either side, in an inclined direction or perpendicularly. The tight and loose pulleys are of 9 inches diameter, 3½ inch face, and should make 350 revolutions per minute.

The machine obtained the first premium at the Cincinnati Industrial Exposition.

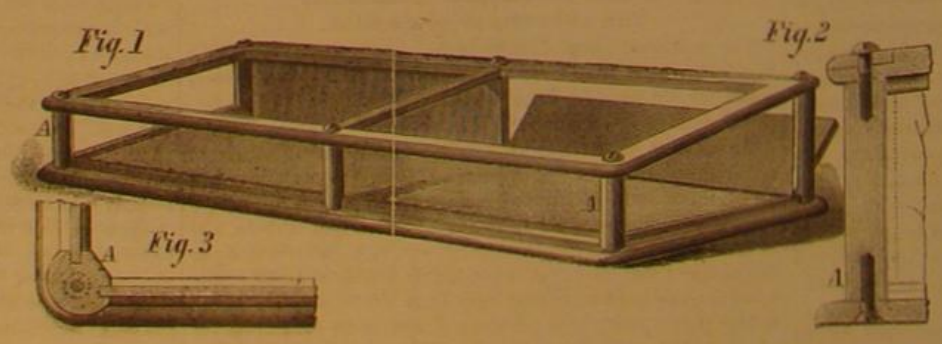
Patent applied for through the Scientific American Patent Agency. For further particulars address the manufacturers, Messrs. Bentel, Margedant & Co., Hamilton, Ohio.



VERTICAL WOOD-BORING MACHINE.

IMPROVED SHOW CASE.

There exists, at the present time, among those who purpose exhibiting goods at the coming Centennial, an increasing demand for simple and portable devices adapted to holding articles while displaying the same to good advantage. It is probable that there will be a very large number of small exhibits, in the shape of the handiwork of individuals or of specimens and samples of various productions, which must be well protected from possible handling. For neat show cases, after the style of construction of that here illustrated, there should be a ready market, as many exhibitors will find it no small convenience to be able to box up their show cases with their goods, and thus be assured that their display will be well secured and arranged.



HASENRITTER'S SHOW CASE.

The advantages of the invention, which is represented in perspective in Fig. 1, are that it is composed of a number of easily detachable pieces, which allow of its being packed into small compass, and which, when set up, form a strong case, the joints of which cannot work loose through the effects of dampness.

As shown in the sectional views, Figs. 2 and 3, the posts, A, are attached to the bottom of the case by screws, and in their sides grooves are formed to receive the ends of the panes of glass. On the under side of the top and on the upper side of the bottom are fastened small strips, which also have grooves to receive the edges of the glass, and besides serve to brace the posts in position. The top is also attached to the posts by screws, and by removing it the glass may be easily disengaged, the doors which are hinged to the rear part of the bottom taken off, and the whole case thus separated into several portions. The device thus constructed, it is claimed, may be more cheaply and easily made than those not constructed to take apart. The case may be made of any shape—upright, octagon, or round. The posts and strips can be produced in long pieces, like molding, and polished and finished before being cut. The bottom may be molded with a "frizzer," and the top made with machinery similar to that used for manufacturing sashes. The case may be taken apart and cleaned or repaired without disturbing the contents. If preferred, instead of screws being used to connect the top and bottom to the posts, pegs may be made through the latter, and bolts passed through and set up with fancy nuts outside. This would give a still stronger joint.

Patented August 31, 1875. For further particulars regarding sale of patent or portions of same, address the inventor, Mr. Robert H. Hasenritter, Hermann, Gasconade county, Mo.

AN alloy for locomotive whistles which will give a good clear sound is made of copper 80 parts, tin 18, and antimony 2.

Stick to Your Business.

There is nothing which should be more frequently impressed upon the minds of young men than the importance of steadily pursuing some one business. The frequent changing from one employment to another is one of the most common errors committed, and to it may be traced more than half the failures of men in business, and much of the discontent and disappointment that render life uncomfortable. It is a very common thing for a man to be dissatisfied with his business, and to desire to change it for some other, which, it seems to him, will prove a more lucrative employment; but in nine cases out of ten it is a mistake. Look round you, and you will find among your acquaintances abundant verification of our assertion.

Here is a young man who commenced life as a mechanic, but from some cause imagined that he ought to have been a doctor; and after a hasty and shallow preparation, he has taken up the saddle bags only to find that work is still work, and that his patients are no more profitable than his work bench, and the occupation not a whit more agreeable.

Here are two young men, clerks; one of them is content, when his first term of service is over, to continue a clerk till he shall have saved enough to commence business on his own account; the other can't wait, but starts off without capital, and with a limited experience, and brings up, after a few years, in a court of insolvency, while his former comrade, by patient perseverance, comes out at last with a fortune.

That young lawyer, who became disheartened because briefs and cases did not crowd upon him while he was yet redolent of calf-bound volumes, and had small use for red tape, who concluded he had mistaken his calling, and so plunged into politics, finally settled down into the character of a middling pettifogger, scrambling for his daily bread.

There is an honest farmer who has toiled a few years, got his farm paid for, but does not grow rich very rapidly, as much for lack of contentment mingled with his industry as anything, though he is not aware of it. He hears the wonderful stories of California, and how fortunes may be had for the trouble of picking them up: mortgages his farm to raise money, goes away to the land of gold, and, after many months of hard toil, comes home to commence again at the bottom of the hill for a more weary and less successful climbing up again.

Mark the men in every community who are notorious for ability and equally notorious for never getting ahead, and you will usually find them to be those who never stick to any one business long, but are always forsaking their occupation just when it begins to be profitable.

Young man, stick to your business. It may be you have mistaken your calling; if so, find it out as quick as possible, and change it; but don't let any uneasy desire to get along fast, or a dislike of your honest calling lead you to abandon it. Have some honest occupation, and then stick to it; if you are sticking types, stick away at them; if you are selling oysters, keep on selling them; if you are at the law, hold fast to that profession; pursue the business you have chosen, persistently, industriously, and hopefully, and if there is anything of you it will appear and turn to account in that as well as or better than in any other calling; only, if you are a loafer, forsake that line as speedily as possible, for the longer you stick to it, the worse it will "stick" you.

Animal Intelligence.

A retriever dog, whose owner was working in the garden of the Bath Institution, lately killed a favorite cat, a frequenter of the same grounds. Having committed the unprovoked murder, the dog deliberately took the cat in his mouth, carried it some distance, dug a deep hole behind some bushes, and, after depositing the cat therein, carefully replaced the earth; and had he not been observed, there would have been no evidence of the crime. Shortly after, the dog lost his life by poison, probably a penalty for the offence.

In the neighborhood of Bath, a gentleman possesses a pair of carriage horses, one of which evinces more than ordinary intelligence when his own ends have to be served. If the horse hears, even in the distance, the very first movement of a mowing machine, he connects the sound with fresh grass, and at once taps with his hoof at the boarding of the stall to summon the coachman for a supply. At first this is done

gently, but if time passes he imperatively demands attention, or it is doubtful if the stable would contain him. The coachman lives adjoining the stable, and, much to his discomfort, the horse sometimes has imaginary wants during the night, and repeats the some process; and at whatever hour this occurs, the coachman is under the necessity of getting up to attend to him.—*Nature.*

SCIENTIFIC AND PRACTICAL INFORMATION.

SOUND MADE VISIBLE.

A sound writer, called an opeidoscope, is a new invention. On the end of a two inch tube is pasted a piece of thin rubber or tissue paper. In the center of this is fastened a piece of looking glass, one eighth of an inch square. Hold this end in the sun and the other end in the mouth, and sing or speak in it. The ray of light reflected from the mirror falling a white surface describes curves and patterns differing for every pitch and intensity, while the same conditions give uniform results.

BROMOFORM IN COMMERCIAL BROMINE.

Reyman found a specimen of bromine to be contaminated with 10 per cent of some foreign substance boiling from 176° to 329° Fah. He found it to consist largely of bromoform, and he recommends to test every specimen of bromine for bromoform. Too small a percentage of bromine in water saturated with bromine (as well as the characteristic odor of bromoform, which is particularly strong when the bromine is mixed with a solution of iodide of potassium), and the separation of iodide, which can be decolorized by hyposulphite of soda, are sure proofs of the presence of bromoform in bromine.

PRINTING INK THAT CAN BE BLEACHED.

The ordinary printing ink, as our readers well know, is made from the finest kind of carbon, namely, lamp black, mixed with oil, and is proof against air and all bleaching agents. The only method by which it can be removed from the paper on which it has been printed is mechanical. In the manufacture of white paper from old newspapers, the difficulty of removing the ink is considerable. We learn from *Dingler's Journal* that Kircher and Ebner have invented a new kind of iron ink for printers' use, which resembles our writing inks. Iron is dissolved in some acid, such as sulphuric, muriatic, or acetic, and one half of the solution oxidized by nitric acid, after which the two portions are mixed and the black proto-sesquioxide precipitated by means of soda or potash. This precipitate is filtered out, well washed, and mixed with equal parts of a solution of tannic and gallic acids, which produces a beautiful blue black or pure black pigment. This pigment is well washed and dried, and then mixed with linseed oil varnish, forming an excellent ink for letter press as well as for lithography, wood cuts, and steel and copper plate printing.

Paper printed with this ink can be bleached by putting it into a bath of pure water to which 10 per cent of caustic soda or potash has been added. It is left there 24 hours; then put into a rag engine, cut fine, the pulp thrown on a cloth and allow to drain, washed with clean water to which 10 per cent of hydrochloric, acetic, or oxalic acid has been added, digested 24 hours, and again used for making paper.

HYDROSULPHITE OF SODA IN THE INDIGO VAT.

Dr. Reimann, in his *Färber Zeitung*, gives the following account of his observations on the use of the new hydrosulphite of soda indigo process, during his tour through Belgium. At Verviers it is in successful use, effecting a large saving of indigo. In Simonis's dye house, 12 lbs. of indigo are saved on every 40 lbs. Peltzer has had like success. The only disadvantage is that the process is patented in France, Belgium, and the terms on which the patentees allow dyers to use it are exorbitant. It has not been patented in Germany, and dyers there are free to make use of it, reaping the whole advantage without any expense, and yet it seems not to be in use there.

CAVING OF A COAL MINE.

AT Wilkesbarre, Pa., recently, the walls of a large coal mine caved in. Fortunately the miners were notified of approaching trouble, and all escaped. Huge boulder are said to have been thrown out of the mouth of the tunnel by the compressed air as if they had been pebbles, and the shock of the crash was like an earthquake. The hollow chambers re-echoed the dismal sounds, and, taken altogether, the scene was one calculated to intimidate the heart of the hardiest miner in the land.

Where to Look for Arsenic in Cases of Poisoning.

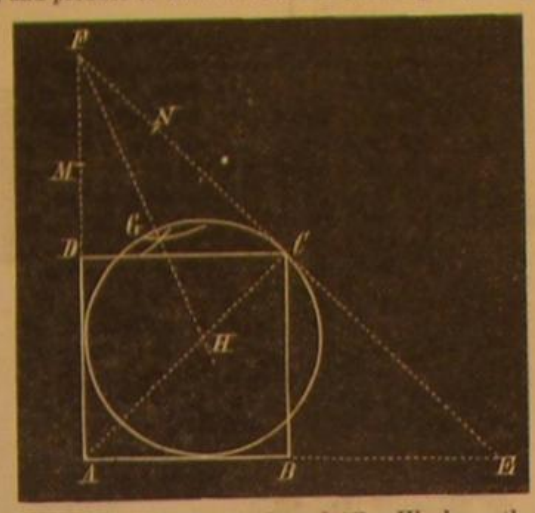
Observations of great toxical importance have lately been made by Scolosuboff (*Soc. Ch.* August, 1875) with reference to the distribution of arsenic in the tissues of animals in cases of poisoning. Contrary to general belief, he finds the arsenic specially condensed in the nervous tissues. The experiments were made with dogs, rabbits, and frogs. Dogs bear large doses of arsenic readily, taking without difficulty fifteen to eighteen times the quantity which, weight for weight, would be fatal to man. A bulldog took for thirty-four days gradually increasing quantities of sodium arsenite in his food, rising from 0·075 grain to 2·2 grains a day. The results of the poisoning were acute and quite marked. Calling the amount of arsenic found in 0·22 lb. of muscle 1, that in the same weight of liver was 10·8; brain, 36·5; spinal cord, 37·3. A dog of 24½ lbs. weight was killed by subcutaneous injection of sodium arsenite, in 17 hours. The arsenic from the brain gave a decided reaction, that from the spinal cord was less, while in the liver and muscles only traces could be detected.

A GEOMETRICAL PROBLEM.

A correspondent recently proposed a neat little geometrical problem, which has been investigated with interest by several correspondents. We give the problem and solution in full.

Problem.—A square being given, it is desired to draw a circle passing through an arch and tangent to the two opposite sides.

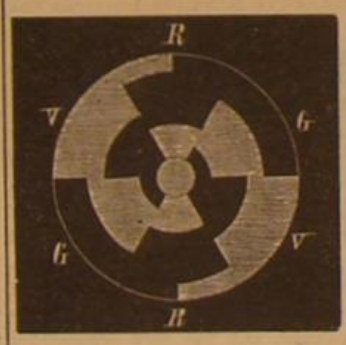
Let A B C D be the square, and let the circle be required to pass through the angle, C, and be tangent to the sides, A D and AB. Draw the diagonal, CA; it is evident that the center must be in this line, as every point in it is equidistant from the sides, AD and A B. Draw a line perpendicular to AC, and produce it until it intersects, through C, the prolongations, AE and AF, of AD and AB. We have then a triangle, FAE, of which the sides, AF and AE, are equal, and in which we have only to inscribe a circle, according to the well known rule of bisecting the sides. The line, AC, bisects already the right angle in A, and by bisecting the angle at F, by the arcs at G, drawn from the points, M and N, as centers, on the line, F G, we obtain (by the intersection of this line with the line, AC) in H the center of the circle, of which HC will be the radius. The circle drawn with this radius will of course pass through the angle, C, of the square; and being the inscribed circle of the triangle, AEF, it will be tangent to all its sides, and therefore to AD and AB, the sides of the square, ABCD.



AN ADDITION TO THE NEW CHROMATROPE.

BY HENRY MORTON, PH. D.

Since writing the notice of the new chromatrope which appeared in your journal for November 27, I have made a modification in one of the disks, which gives a very pleasing effect and considerably increeses the range of illustration of the instrument.



Taking the disk already described as illustrating Dr. Young's theory of color, and which consists of six sections, two each of red, green, and violet, I stopped them out by pasting over the glass a piece of black paper cut out in the manner shown in the accompanying engraving. The letters outside represent the colors of the adjacent sectors, R for red, etc., and the shaded portions are those where the glass is uncovered, the solid black indicating the opaque paper.

When the disk, so prepared, is rotated in the usual way, we have the following effect: In the center we have a circle of white produced by the union of all three colors; next to this a circle of red, the green and violet being here stopped out; next to this again a circle of yellow produced, by the union of red and green, the violet only being here obscured; then a circle of green, then one of blue, then one of violet, and lastly one of purple.

A similar method may be applied to the demonstration of the fallacy of Sir David Brewster's theory, which assumes red, yellow, and blue as the subjective primaries.

Pneumatic Telegraph Tubes.

The Western Union Telegraph Company is about to lay pneumatic tubes between the main office of the company and the Broad Street office in this city. Already the pipes and valves have been completed, and the engine is under way. If the weather proves favorable, it is the intention to have the tubes in working order by January 1, 1876. There will be two tubes, each of which will consist of a lead pipe having 2½ inches inside diameter, encased in iron pipe having an interior diameter of 3 inches, the latter being designed as a protection to the lead. The cylinders of the air pumps for compressing and exhausting the air in the tubes have a diameter of 35 inches. Messages from the main office will be dispatched by means of compressed air through one of the tubes, while those to be returned to the central office will pass through the other tube by exhaust air, the engine, pumps, and valves all being placed in the central office. The carriers are made of gutta percha, covered with felt cloth, the forward end being sufficiently enlarged to fill the tube and thus prevent the passage of air in either direction beyond the carrier. It is estimated that the time occupied in sending a message from the central office to the office in Broad street, distance about ¼ of a mile, will be about 25 seconds, while the arrangements will be such that one carrier, if necessary, can immediately follow another.

Useful Recipes for the Shop, the Household, and the Farm.

A thin film of tin may be applied to iron wire, to give the same the appearance of silver. The wire is first placed in hydrochloric acid, in which is suspended a piece of zinc. It is afterward placed in contact with a strip of zinc in a bath of tartaric acid 2 parts dissolved in water 100 parts, to which are added tin salt 3 parts and soda 3 parts. The wire should remain for two hours in this bath, and then be polished.

The following will give a good idea of the relative strength of various substances: Made from the best steel, a rod ¼ inch in diameter will sustain before breaking 9,000 lbs.; soft steel, 7,000 lbs.; iron wire, 6,000 lbs.; good iron, 4,000 lbs.; inferior bar iron, 2,000 lbs.; cast iron, 1,000 to 3,000 lbs.; copper wire, 3,000 lbs.; silver, 2,000 lbs.; gold, 2,500 lbs.: tin, 300 lbs.; cast zinc, 160 lbs.; cast lead, 50 lbs.; milled lead, 200 lbs.; box or locust wood, 1,200 lbs.; toughest ash, 1,000 lbs.; elm, 800 lbs.; beech, cedar, white oak, pitch pine, 600 lbs.; chestnut and maple, 650 lbs.; poplar, 400 lbs.

A useful rule for converting the weight of one metal into another is as follows: Wrought iron into cast iron, multiply by 0·928; into zinc, by 0·928; into steel, by 1·010; into brass, by 1·082; into copper, by 1·144, and into lead, by 1·468.

The following may be used for reckoning the shrinkage of castings in inches in a foot, except where otherwise noted: In locomotive cylinders, $\frac{1}{16}$ inch; pipes, ⅛; girders, beams, etc., ¼ in 15 inches; engine beams and connecting rods, ⅛ in 16 inches; in large cylinders, say of 70 inches diameter, 10 feet stroke, the contraction of diameter is ⅛ inch at top; ¼ at bottom; in length ½ in 16 inches. In thin brass, the shrinkage is ¼ inch in 9 inches; in thick brass, ¼ in 10 inches; in zinc, ¼ in a foot; in lead, $\frac{5}{16}$; in copper, same; in bismuth, $\frac{3}{16}$; and in tin, $\frac{5}{32}$.

Molesworth gives the following rules for warming and heating buildings by steam: When the external temperature is 10° below the freezing point, in order to maintain a temperature inside of 60°, one superficial foot of steam pipe is needed for each 6 superficial feet of glass in the windows; the same for every 6 cubic feet of air escaping for ventilation per minute; the same for every 120 feet of wall, roof, or ceiling; 1 cubic foot of boiler is required for every 2,000 cubic feet of space to be heated. A one horse power boiler is sufficient for 50,000 cubic feet of space.

An easy way to drive screws into hard wood is to file a flat about ¼ inch long on the side of the screw beginning at the point. This cuts the wood and forms a thread in the same way that a tap does. The screw follows and holds well.

Dies for use in stocks should be made as follows: Supposing the dies to be for use on bolts of an inch diameter, first fit them to the stocks, then place between the faces a piece of $\frac{3}{16}$ inch steel; fasten the whole in the stocks and drill a hole the proper size for a tap of the correct pitch, but 1½ inches in diameter. Then tap the hole with a 1½ hub or tap having a thread on it of the requisite pitch, taking care to give the dies a full thread; then cut out the clearance places, etc. Dies made thus will cut steadily, easily, and true, and are not liable to break. The advantage of this plan is that the dies will cut in the center of their width, the sides of the threads serving as a guide at the very first cut taken, which would not be the case were they cut by an inch hub or tap.

Condensed Beer.

Mr. Lockwood describes, in the *Journal of the Society of Arts*, his patent solid or condensed beer. Beer is taken at its best condition; its alcohol is separated and saved by a method of gentle distillation *in vacuo*, and the residue is condensed in a vacuum pan, like milk; when finished, it is enclosed in hermetically sealed packages, the alcohol first being added to it again, and acting as a preservative. The fermentation, which was present in the beer when it was taken, is suspended by the heating, and the condensed beer remains sound in this condition, apparently for any length of time, as some exists that has now been kept for nearly two years. When re-made by adding water, it is not wort, but real beer, having all its flavor and alcoholic strength, and lacking only effervescence, which can be quickly imparted by reviving the suspended fermentation for a short time in order to develop sufficient carbonic acid gas to give it the required briskness; or it is fit to drink immediately, if charged with carbonic acid gas, like aerated water.

"The Times" on Sewer Gas.

The New York *Times* gravely objects to the plan of venti lating sewers by connecting them with the draft of furnaces The remedy is "obviously defective," it avers; "if for no other reason, from the fact that under certain conditions a furnace does not bake and thus disinfect this air."

Consequently "each furnace would be an ingenious machine for scattering through the house the most deadly gases. And though, when in full blast, the heat of the furnace would destroy their morbific properties, yet on a mild day, with a low fire, we should have sewer gas, pure and simple, through the whole house."

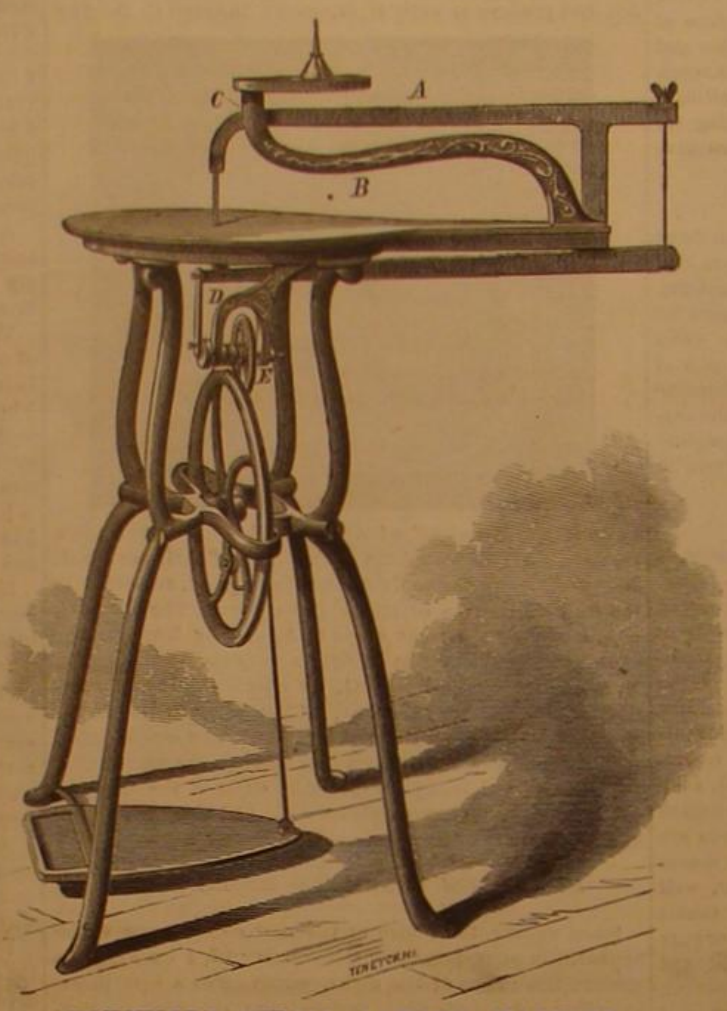
For ingenious misapprehension, the paragraph we have quoted could scarcely be surpassed. It seems incredible that one could be so dull as to suppose that an eminent "scientific authority" would propose to supply our hot air chambers from the sewers; but the *Times* seems to have achieved that distinction: which shows how needful it is to be explicit in making even the most simple and self-evident propositions. Had the high scientific authority taken the precaution to stipulate that the sewer gas should pass into the fire and not into the air pipes, the opposition of the *Times* might not have been aroused.

IMPROVED SCROLL SAWING MACHINE.

Another one of those small and comparatively inexpensive machines, which are so useful to amateurs and for general light woodworking purposes, is illustrated in the annexed engraving. It is a new foot-power scroll saw, the advantages of which are principally to be found in an improved and simplified construction.

The table is provided with a horizontal rear extension to which the reciprocating saw frame, A, is pivoted. The arrangement of the frame will be readily understood from the illustration. The connecting screw rod, at its rear end, serves to draw the front extremities of the arms apart, thus tightening the saw clamped therein. To the rear of the extension, a curved arm, B, is attached, which carries a plate conveniently located for holding the oil can and necessary tools. Arm, B, has a slotted recess at C, which serves as a guide for the upper bar of the saw frame. A band spring may be interposed between said bar and the arm, to assist the upward motion of the frame and prevent the contact thereof with the upper part of the recess. Beneath the table is a short arm, D, and a slot therein guides in similar manner the lower bar of the frame. This arm is extended downward and is forked to hold the shaft, E, of the gear which receives motion from the wheel and treadle shown. A small fly-wheel on shaft, E, assists the rotation of the same, and the crank disk and rod on the front end form the connection with the saw frame, and impart reciprocating motion to the same. The arrangement of the legs with the table is obvious from the illustration, and forms a rigid and substantial support. The machine is adapted for fret sawing, and for the cutting out of brackets and similar ornamental wooden articles.

Patented through the Scientific American Patent Agency. For further information relative to sale of royalties or of patent, address the inventor, Mr. Jerome H. Plummer, 1,276 Pacific street, Brooklyn, N. Y.



PLUMMER'S SCROLL SAWING MACHINE.

Activity is Not Always Energy.

There are some men whose failure to succeed in life is a problem to others, as well as to themselves. They are industrious, prudent, and economical; yet after a long life of striving, old age finds them still poor. They complain of ill luck. They say fate is always against them. But the fact is that they miscarry because they have mistaken mere activity for energy. Confounding two things essentially different, they have supposed that, if they were always busy, they would be certain to be advancing their fortunes. They have forgotten that misdirected labor is but a waste of activity. The person who would succeed in life is like a marksman firing at a target; if his shots miss the mark, they are a waste of powder. So in the great game of life, what a man does must be made to count, or it might almost as well have been left undone. Everybody knows some one in his circle of friends, who, though always active, has this want of energy. The distemper, if we may call it such, exhibits itself in various ways. In some cases the man has merely an executive faculty, when he should have a directive one; in other language, he makes a capital clerk, for himself, when he ought to do the thinking of the business. In other cases what is done is not done either at the right time or in the right way. Energy, correctly understood, is activity proportioned to the end.

IMPROVED SAW FILE GUIDE.

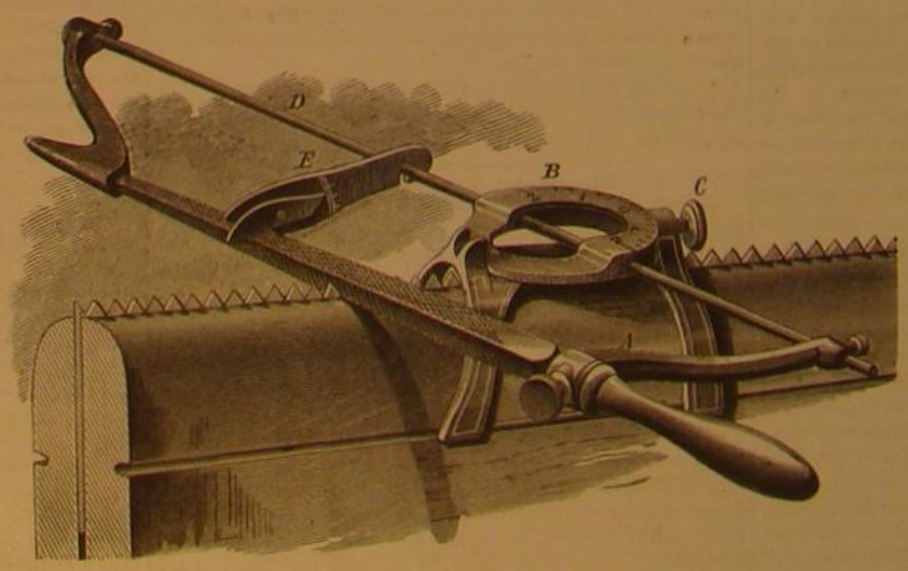
The annexed engraving represents a new apparatus for guiding the file, during the operation of filing saw teeth, in such a manner that exactly the same pitch and bevel shall be imparted to each tooth. This is done by suitable indicating devices below described, which also admit, on the saw being refiled, of forming the teeth with the same pitch and bevel as in the beginning.

The saw is secured in a wooden clamp as shown, and held in a vise. The clamp has grooves on each side and extending its entire length, these serving as guides for rods on the lower part of the frame or saddle, A. The latter may be freely moved along the grooves, and is by them maintained in uniform position as regards the saw.

The sliding frame holds a graduated circle, B, by means of lugs on one side and a set screw, C, on the other. The guide rod, D, passes through apertures in the circle as shown. It will be seen that the latter can be adjusted so that any mark on its periphery coincides with a fixed mark on the frame, and thus the file, which is connected with guide rod, may be set so as to impart any desired bevel to the teeth, this being denoted by the graduations on the circle. The file is supported in the arms attached to the guide rod, its end being inserted in a hole in one and a screw clamp holding it to the other. By loosening the screw, the file may be turned so as to give any desired pitch to the saw teeth. At E is an indicator of simple construction, which shows the pitch at which the file is set, and thus allows of easy resetting to the same inclination at any future time, as when using a new file or another corner of the same tool.

By some changes in a part of the device, this guide is made applicable to circular saws, in which case the guide rods, sliding in the grooves of the clamp, are made of proper curve.

The invention is quite simple; and we believe it will prove a very useful and handy implement for mechanics, since by its aid the not very easy operation of saw-filing is greatly simplified. In fact it is only necessary to set the guide at the proper pitch and bevel, and leave an apprentice or boy to do the manual work.



ROTH'S SAW FILE GUIDE.

Patent now pending through the Scientific American Patent Agency. For further information, address the inventor, Mr. Elias Roth, New Oxford, Pa.

New Use for Rats.

Rats are not generally supposed to be of any particular use in the economy of Nature, unless it be to eat up refuse, make a noise, or haunt the subterranean cavities of large cities. A telegraph inspector in England has, however, upon a recent occasion, proved that the rat as an operator in case of broken wires may be turned to good account. It was necessary, says the *Popular Science Monthly*, to overhaul a cable of wires inclosed in iron tubes. A certain length of the cable had to be taken out of the tube, and the men commenced hauling at one end, without having taken the precaution to attach to the other a wire by which it might be drawn back after inspection and repairs. The question arose how the cable was to be restored to its proper place. The inspector invoked the aid of a rat catcher, and, provided with a large rat, a ferret, and a ball of string wound on the Morse paper drum, he repaired to the opening in the tube. The flush boxes were opened, and the rat, with one end of the string attached to his body, was put into the pipe. He scampered away at racing pace, dragging the twine with him until he reached the middle of the pipe, and there stopped. The ferret was then put in, and off went the rat again, until he sprang clear out of the flush box. One length of the cable was thus safe, and the same operation was commenced with the other; but the rat stopped short a few yards from the pipe, and boldly awaited the approach of the ferret. A sharp combat ensued, but after sundry jerks at the string the combatants separated, the rat making for the other extremity of the pipe, carrying the string through and relieving the inspector from his anxiety.

The Electro-Magnetic Mallet.

Dr. Edwin T. Darby, in a paper read before the Pennsylvania State Dental Society, states that the priority of invention of this useful implement belongs to Dr. William G. A. A. Bonwill; but a contest is pending between this gentleman and Mr. George F. Green, who claims the priority. The practical uses and value of the instrument are set forth by Dr. Darby as follows:

"It is purely automatic in its action. Its power or force is entirely distinct from anything physical or individual, except the will of the operator and the touch of his educated finger. No more physical force is required to manage it than would guide a pen or hold a pencil. The dentist may stand or sit at his chair hour after hour, and feel no greater fatigue than would naturally result from restrained position or concentrated thought. One who has not used it, nor become thoroughly accustomed to it, can little understand the vast amount of physical force others are saving themselves by its use. It was my fortune to obtain one of the first, nearly or quite four years ago; and although great improvements have been made upon it since, I look back upon those four years of comparatively active duty, feeling that I should at times have given way, and perhaps been obliged to abandon my practice, but for the assistance which the electric mallet has rendered me. So great is my appreciation of it, and so confident am I of its great value, that I fear, were I obliged to discontinue its use, I should fall far below that standard which, as we justly claim, should characterize the operators of the present day.

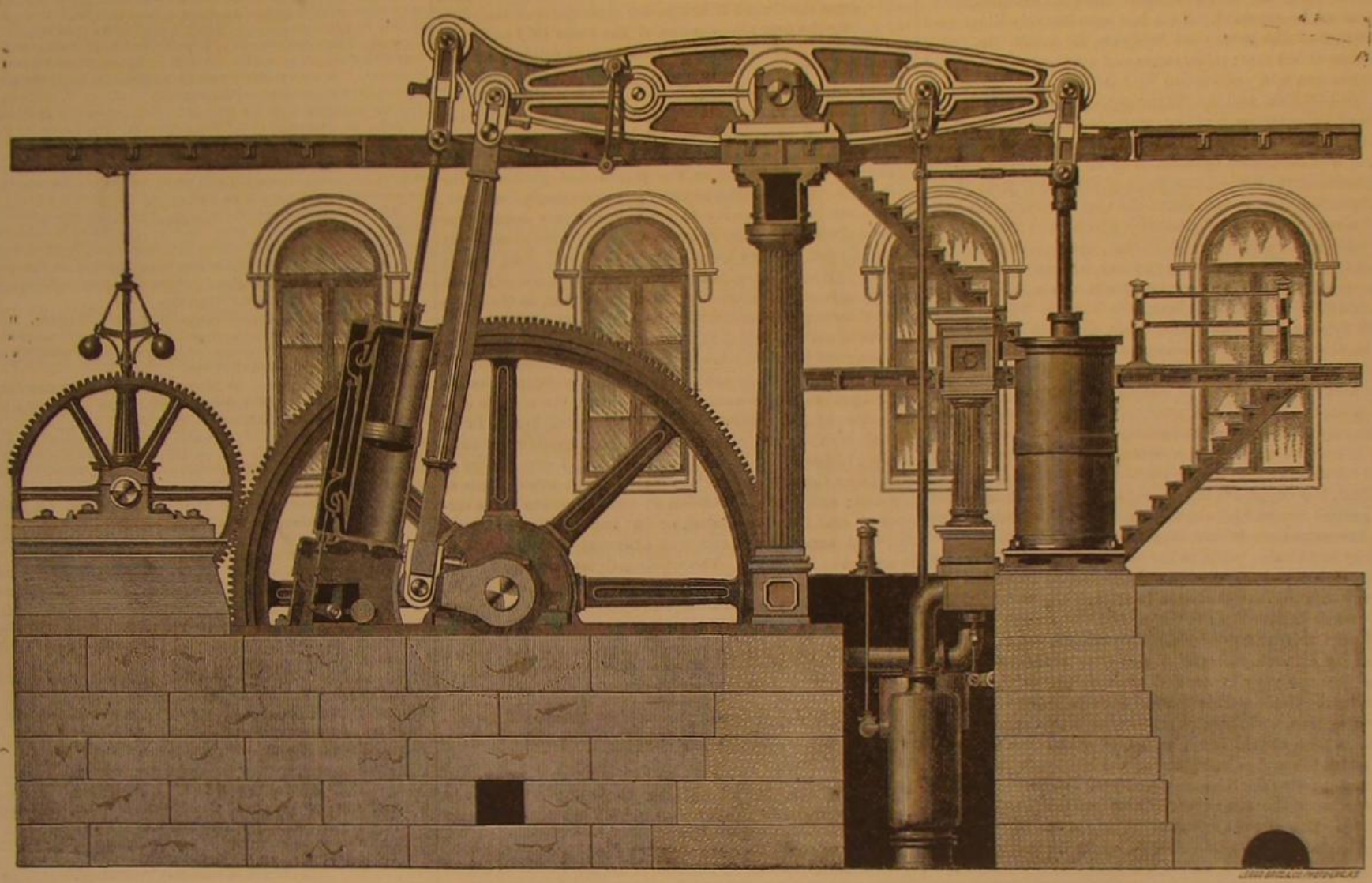
"Nor is a labor-saving instrument only: it is a time saving invention. Seneca taught that time is the only thing of which it is a virtue to be covetous. Too lightly, as a rule, do we estimate the value of time in our operations; our field for usefulness is limited. Our course or stadium has its bounds at no distant future; and he who is most successful, who accomplishes most for himself and for those who seek his services, is he who knows best the value of each moment, and systematizes his work and adds to his appliances such things as help him to expedite his operations—never sacrificing quality for quantity, excellence for rapidity. The length of time required to thoroughly pack the gold in most cavities is lessened at least one half by the aid of the electric mallet. I profess not to have acquired that degree of manipulative skill that enables me to fill all cavities with lightning-like rapidity, but in the great majority of instances one eighth of an ounce of foil can be thoroughly consolidated in from 60 to 70 minutes. The inventor, I believe, professes to do the same in 30 or 40 minutes. The instrument when in use makes more or less noise, and the sensation upon the tooth is peculiar, and suggests pain, if it does not actually produce it. One of the best arguments in proof of its painlessness is the fact that our patients not unfrequently go into a deep sleep and awake to find the operation nearly or quite completed. The blow produced by the electric mallet is sharp and quick, and does not jar the tooth like the hand mallet or the Snow and Lewis automatic. The operator must be skilled in its use, otherwise he may allow the mallet to strike the filling several times in the same place, whereas but one blow is needed. My own experience and observation has been that less injury to the tooth and lining membrane has followed the use of the electric mallet than formerly attended the use of the hand mallet or even hand pressure.

"The instrument as now made requires little or no adjusting, and with care may be used for years without the least expenditure for repairs. The total loss per week is not more than ten or fifteen cents; and if the battery is thoroughly cleansed once in ten days, which may take fifteen or twenty minutes' time, and can be done just as nicely by an office boy or student, it is all that is required in that direction. I know of no better battery than a three or four celled Bunsen, with well amalgamated zincs. They can be used for years by simple replacing a zinc which may in time become eaten, or a carbon which may have gradually dissolved. More easily managed than steam or water power, electricity has made its way into our profession, and is daily performing for those who use it a service which entitles it to a rank among the most useful of our motors."

AQUAFORTIS, applied to the surface of steel, produces a black spot; on iron, the metal remains clean.

COMPOUNDING STEAM ENGINES.

The controversy as to the possible economy of compound engines has been long ago settled; and the advantages of the additional cylinder and piston to be operated by the steam exhausted from the first engine, have been proved beyond any doubt. But the economy is not derived, as some of our correspondents seem to think, from using steam twice; for whether the steam passes through one cylinder or forty, the difference between the pressure of the steam at its entrance to the first cylinder and its final exhaust into the atmosphere is the sole power which the engine can exert. The low pressure, larger cylinder added to an engine, while it discharges its steam at a lower tension, creates a certain amount of back pressure in the first or smaller cylinder; and there is, therefore, no positive gain of power in a compound engine. But the larger cylinder enables that little understood and most important property of steam, its elasticity, to be much utilized; so that it may be said that the additional cylinder is equivalent in result to a very effective cut-off.



COMPOUNDED BEAM STEAM ENGINE.

A great many engines in England have recently been converted into compound engines, and the methods of doing this are numerous, and their merits are widely discussed. A novel arrangement, designed by Messrs. J. Bagshawe and Son, of Batley, Yorkshire, England, is represented in the annexed engraving, and there are several features in it which deserve notice. One is that the change involves the addition of a high pressure cylinder, the engine being of the condensing type. The cylinder is 13 inches in diameter and of 56 inches stroke; and it is so inclined that its piston is parallel with the connecting rod when the crank is exerting its maximum power. The old cylinder was 23½ inches in diameter and of 46 inches stroke. Other advantages claimed for this system of compounding are the attainment of great steadiness in working, and an almost complete avoidance of strain on the foundations. It is stated that, since the additional cylinder was added, the engine has been run with no caps on the bearings which carry the beam on the pedestal; and no deviation from regularity in working could be detected, the two pistons, by their contrary motions, keeping the whole engine steady.

Petroleum Gas.

The attempt to manufacture a good substitute for coal gas from petroleum has been made by at least a hundred different persons within the last five years, as the records of the Patent Office prove. That nearly all these attempts have been made with no knowledge of the chemistry of gas-making is equally apparent from the processes for which patents have been claimed: most of them being based upon the well known fact that atmospheric air, when passed through petroleum, especially the more volatile parts of it, becomes saturated with its vapor, and burns readily with a clear bright light. Most of these inventors seem to have concluded that in reaching this result they have produced a substitute for coal gas, and their inventions have been pushed into the attention of both the consumers and the manufacturers of gas with much energy. We have no desire to condemn their processes, which are excellent in their place, but it is a mistake to imagine that a simple carburetted air is valuable to the manufacturers of gas, either as an enricher or a substitute for coal gas. The time is not very distant when a large majority of the gaslight companies now using coal exclusively will use some petroleum in connection with it to increase its candle power, and to enable them to more completely utilize all the gas-making power of coal; but this result has been much retarded by the mistaken notion that the addition of a petroleum vapor to a coal gas was all that was necessary. We speak of this now because the attention of the whole gas-making fraternity has just been again called to the subject of petroleum gas, in the discussions of the American Gaslight Association at its recent meeting in New York.

We know from correspondence with many gas manufacturers in different sections of the country that nothing but a fear of being drawn into large expenditures for new plant, without positive guarantee of success, prevents the introduction of petroleum gas. We have no axe to grind in furthering the interests of any special process, but for the benefit of the petroleum trade we wish to see the best process adopted. This we feel certain must be a process that yields, not a vapor—easily condensible and rapidly deteriorating by passage through long stretches of pipe—but a fixed gas, not more liable to these objections than the average coal gas. It must also be a process that utilizes the maximum gas-producing power of the petroleum. The quantity of gas and its candle power which it is possible to get from a given quality of petroleum can be ascertained with as much exactness as the same things concerning a tun of Westmoreland coal, and it will be found far easier to reach the maximum in using petroleum than in using coal.

But while seeking in this way for the best process, care should be exercised not to adopt one that claims to do too much. We have seen statements of the results obtained by some processes in which the gas claimed to have been made from given quantities of petroleum would actually weigh more than the petroleum itself. We should look with distrust on such processes.

"There is nothing that succeeds like success," and this is the last and best test that should be applied to a petroleum gas process. If one can be found already in successful operation, which has met and overcome the objections which theory forgets but practice discovers, that is certainly the best one to adopt.—*American Manufacturer.*

Practical Spiritualism.

Dr. E. P. Miller, an intelligent physician of this city, has become an avowed and ardent advocate of the "spirituality" of the Eddy tricksters of Vermont. The doctor is so certain of the heavenly power of one of the Eddy female performers that he has publicly offered a challenge or test exhibition, under a wager of $5,000, that her "manifestations" are genuine, and agrees to leave the matter to the decision of a committee of twelve persons, to be mutually chosen by himself and the acceptor of the challenge. Mr. W. Irving Bishop, of this city, has accepted the challenge, undertakes to prove that the woman is a fraud, and further, agrees to reproduce all the "materializations" and "manifestations" that she may produce, without any spiritual assistance whatever. He says he has been to Vermont and learned the art completely. He suggests that $5,000 shall be deposited by each party, the winner to donate that amount to some designated charitable institution. Now, Doctor, down with your ducats.

A Gastronomic Curiosity.

We dare say that there are a great many people who, if asked whether they could or would partake of so toothsome a dish as a broiled quail on toast once a day for a month, would stare at the questioner in astonishment and express an earnest desire to be afforded the opportunity. And yet we can positively venture the assertion that not one person out of a thousand would continue the diet for a fortnight. This is not because of the quantity of meat, because any one's ordinary dinner aggregates an immensely larger amount, nor is it due to a surfeit of one particular kind of food, for roast beef might be eaten every day for a year with relish. The difficulty lies in the flavor of the meat. Delicious as it is as an occasional delicacy, if it be eaten daily for ten days or thereabouts, it becomes excessively nauseating. The flesh seems to acquire a rank and bitter flavor; and if the diet be persisted in, the stomach revolts and rejects the food. Why this should be so, we have never heard scientifically explained; but it is probably due to some medicinal effect of the meat which shows its results, through regular dosing, just as do some kinds of physic, which, if taken once or twice in small quantities, are imperceptible to the system, but which, if administered regularly in the same amounts for lengthy periods, act powerfully on the constitution.

Be this as it may, an individual named O'Donnell, who lives in Madison, Ind., has brought himself into notice by accomplishing the hitherto unparalleled feat (on a wager) of eating thirty quails in as many consecutive days, and this without any inconvenience or disgust. The case has attracted some attention from the medical fraternity, and sundry individuals are making Mr. O'Donnell's marvelous stomach the subject of extensive bets. It is now reported that he is to undertake the delectable task of repeated and prolonged meals of raw oysters and brown sugar: a process which might fitly terminate in a gastric malady which would annihilate the much abused stomach and its owner at the same time.

Milk Diet.

"I find by experience," says Dr. E. N. Chapman, "that lime water and milk is not only food and medicine at an early period of life, but also at a later, when, as in the case of infants, the functions of digestion and assimilation have been seriously impaired. A stomach taxed by gluttony, irritated by improper food, inflamed by alcohol, enfeebled by disease, or otherwise unfitted for its duties, as is shown by the various symptoms attendant upon indigestion, dyspepsia, diarrhœa, dysentery, and fever, will resume its work, and do it energetically, on an exclusive diet of lime water and milk. A goblet of cow's milk, to which four tablespoonfuls of lime water have been added, will agree with any person, however objectionable the plain article may be, will be friendly to the stomach when other food is oppressive

and will be digested when all else fails to afford nourishment. Of this statement I have had positive proof in very many cases.

"The blood being thin, the nerves weak, the nutrition poor, the secretions defective, and excretions insufficient, the physician has at hand a remedy as common as the air, and as cheap, almost, as water. In it all the elements of nutrition are so prepared by Nature as to be readily adapted to the infant or the adult stomach, and so freighted with healing virtues as to work a cure when drugs are worse than useless."

[For the Scientific American.]

Expansion and Contraction by Change of Temperature under Great Strain.

It is well known that metals expand or contract by the rise or descent of temperature, according to coefficients found by careful experiments and laid down in the books; but it appears that the amount of this effect of heat and cold can only be correctly determined beforehand in cases where the metals are under no great strain of extension or expansion. If this is the case, a deviation from the accepted coefficients must be expected. This has been forcibly illustrated in the case of the great steel bridge in St. Louis, Mo., with its arches of 500 feet; calculations and allowances were made for expansion and contraction by heat and cold, through a range of 140° Fah., and the difference to be expected in the elevation of the center arch of the upper chord above the City Directrix, from the hottest day of summer to the coldest day of winter, was calculated to be about 18 inches. Ever since the completion of the bridge, the hight of the center piers of the top chords of the arches above the City Directrix has been noted almost daily, at temperatures which have ranged from 92° to 15° Fah.; and it was found that, between the temperatures of July 20 (the hottest day of last summer) and January 9 (the coldest day of last winter), there was a difference in heat of 106° Fah., and a difference in hight of 0·692 feet, or nearly $8\frac{5}{16}$ inches. The actual effect upon the structure, it will be observed from this statement, is much less than the calculated effect (which, for a variation of 106°, should have given a difference in hight of nearly 14 inches) The difference is explained to be due partly to the protection afforded by the roof of the bridge, and partly to the fact that the iron work is painted white, thus lessening the absorption of heat.

But we observe that, in the case of the Victoria Bridge, at Montreal, the expansion in summer and contraction in winter is in perfect accord with the calculation; in this bridge, however, the expansion is only longitudinal, and is not counteracted by any strain; while in the case of the St. Louis bridge the expansion has to overcome the immense strain exerted by the weight of the structure itself and the load upon the arch, which increases as the secant of the angle which the chords, drawn from the center, make with the perpendicular; so that for an arch with slight elevation in the center, the strain becomes very great, and often surpasses the actual weight many times. This strain has to be overcome by the expanding iron, and there is no wonder that it cannot fully overcome it on the St. Louis bridge, of which the weight is very great, the arches being among the longest in the world.

In constructing the Niagara suspension bridge, the amount of extension of the wire cables by heat was taken as the basis of a calculation of the amount of sinking of the center of the bridge in summer, and its elevation by the contraction of the cables by cold in winter, and it was here also found that this elevation by contraction was less than the calculation gave ground to expect; for here the material acts under an immense strain, which counteracts the contraction of the cables to a certain extent, in the same manner as the extension of he steel arches in St. Louis is counteracted by the strain.

X.

Ostrich Farming.

The cultivation of the ostrich for its feathers is becoming quite an important industry in Algeria and also at the Cape of Good Hope. A well conducted ostrich farm requires plenty of space, proper pasturage, water, and shelter for the birds in stormy weather. The principal food given to the young is lucern, with thistles and tender herbs, and grasses indigenous to the country. Old birds are fed on more matured shrubs and plants, the leaves of which they strip off with their beaks, and also on Indian corn. A healthy bird a week old is worth $50; at three months it is worth $75; and at six months or more, $150. Feathers are plucked from the ostrich when a year old, and each year's crop is worth about $35. At five years, the breeder begins to pair his birds, each yielding from eighteen to twenty-five eggs in a season. An ostrich chick is about the size of a small barnyard fowl, and begins to pick up food as soon as hatched. In spite of its bad reputation, the ostrich is found to be an exemplary parent, both the cock and hen sitting on the eggs, turn about. It is said that, when a nest full of eggs has been laid, the old birds invariably place one or two of them outside the nest, to be reserved as food for the chicks when hatched. They are thus frequently given a fair start in life, in a state of nature, miles away from a blade of grass or other food. In confinement it has not been found necessary to make such provisions for the chicks, as they thrive excellently well on tender herbs. The young ostriches are generally tame, and to a certain extent tractable; but as they grow old they are apt to evince a sourness of temper anything but agreeable to those who have them in charge. As they are liable to sudden fits of jealousy, resulting in furious conflicts, the old birds have to be kept in separate paddocks surrounded by wire fencing.

As the feathers are picked, they are sorted according to their quality and purity of color. The pure whites from the wings are called bloods; the next quality, prime whites; after which come firsts, seconds, and so on. The tail feathers are less valuable. Bloods are rated at from $200 to $250 a pound in the wholesale market. The lowest grades fetch less than $1 a pound. The quality of the feathers produced by tame birds is fully equal to the best collected from wild birds, and the general average is much higher. Notwithstanding the losses and disappointments incident to a new and largely experimental enterprise, ostrich farming has been found an agreeable and profitable industry.

Spontaneous Combustion of Coal.

In his address recently delivered to the Newcastle-on-Tyne Chemical Society, the president, Mr. Pattinson, made the following observations on the subject of the spontaneous combustion of coal in ships: "There has lately been a considerable increase in the number of cases of fire arising from this cause. From statistics collected by Mr. R. Cooper Rundell, and given by him in a report to the Underwriters' Association of Liverpool, it appears that, taking the number of vessels carrying upwards of 500 tuns of coal which have sailed from the United Kingdom for ports south of the equator during the first nine months of the years 1873 and 1874, the number of casualties from spontaneous combustion was 23, or about 2 per cent of the total number of vessels, in 1873, and 50, or about 4 per cent, in 1874. The statistics further show that the fires are not confined to one kind of coal, but have occurred in most, if not all, kinds exported from all parts of the United Kingdom. The theory which attributes spontaneous combustion to the presence of pyrites in the coal is consistent with the recently increased number of cases, if we consider that, owing to the extraordinary demand for coals and the high price of labor, the coals were more likely to be shipped without being so carefully freed from brasses or iron pyrites in later years than they were formerly. On the other hand, Richters has pointed out that, in the kinds of coal he experimented with, the coal which contains most pyrites is not that which is most liable to spontaneous combustion; and his researches have shown that atmospheric air is rapidly absorbed by coal, and that the oxygen thus absorbed probably afterwards combines with the organic constituents forming carbonic acid and developing heat. In all probability the heat which gives rise to spontaneous combustion is developed both by the oxidation of iron pyrites as well as by the oxidation of the carbonaceous constituents of the coal; and that in the holds of vessels, where large cargoes of coal lie unventilated, or but imperfectly ventilated this heat accumulates, and may ultimately be high enough to set fire to the cargo. The whole subject requires further investigation, and the royal commission now formed will, no doubt, not only elicit valuable information as to the causes of these sad disasters, but also suggest means of preventing them."

TIMELY SUGGESTIONS.

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NEW BOOKS AND PUBLICATIONS.

THE ELEMENTS OF GRAPHICAL STATICS, AND THEIR APPLICATION TO FRAMED STRUCTURES, with Numerous Practical Examples, together with the Best Modes of Calculation and New and Practical Formulæ. By A. Jay Du Bois, C. E., Ph.D. With an Atlas of 32 Plates. Price $5. New York city: John Wiley & Son, 15 Astor Place.

We recently reviewed Dr. Du Bois' first volume on the graphic method as applied to problems in statics, and commented on the value of the system in all calculations of strength of construction, strains on materials, etc. The volume now before us contains an extended series of examples, many of them involving the higher mathematics, all of which are treated by the graphic method. To the labors of German scholars and engineers we are mainly indebted for the elaboration and completion of this system of representation and diagnosis of the many difficulties which occur in the engineer's practice; but we do not hesitate to give Dr. Du Bois the whole credit for his laborious and successful attempt to render popular this useful branch of practical mathematics. The two volumes are complete in themselves, and are very handsomely gotten up. We commend them to the attentive perusal of the engineering profession.

LABOR IN EUROPE AND AMERICA, a Special Report on the Rates of Wages, the Cost of Subsistence, and the Condition of the Working Classes in Great Britain, Germany, France, Belgium, and Other Countries of Europe, and in the United States and British America. By Edward Young, Ph.D., Chief of the United States Bureau of Statistics. Washington, D. C.: Government Printing Office.

Dr. Young's volume contains an immense mass of information, and is a creditable contribution to the pyramid of statistics, the compilation and publication of which are among the manias of contemporary politicians. The book commences with the expulsion of Adam from the Garden of Eden, traces the labor question down to the time of Jacob's seven years' servitude to Laban, gives some minute details of the condition of the working classes of Egypt and Assyria and dilates largely on the history of Europe in the feudal ages; then the subject is pursued into comparatively recent times, and carried down to the reign of George III. The facts as to the recent condition of the peasantry and laborers in Europe are very voluminous, and have been procured with great expenditure of labor; and the advantages enjoyed by the American artisan in busy times are fully displayed. But this information, which should be the most valuable part of the work, is only carried down to 1872—1873, and is silent as to the causes of the existing stagnation, and the deplorable condition of our working classes at present. The book is chiefly useful as an historical work, as it throws no light on the labor questions of the year 1875.

THE DYNAMICAL LAW OF HORSE POWER OF STEAM BOILERS. By John W. Nystrom, C. E. Price 25 cents. Philadelphia, Pa.: J. Pennington & Son, 127 South Seventh street.

Our readers are familiar with the difficulty of rating a boiler at its proper horse power, and the frequency with which we have to reply to our anxious correspondents that there is no formula for the horse power of a boiler. Mr. Nystrom has addressed himself to the subject, and now publishes some valuable rules and formulæ, from which we hope shortly to make some extracts that will be of use and interest to engineers and the public generally.

THE SCIENTIFIC MONTHLY, a Magazine devoted to the Natural Sciences. Volume I, No. 2. Price $3 a year. Toledo, Ohio: E. H. Fitch, Editor and Proprietor.

A valuable addition to our contemporary scientific literature. Dr. Fitch is well known as an enthusiastic naturalist and an able writer, and his name will be a guaranty for the excellence of the new serial, of which the number now before us is a promising specimen.

THE AMERICAN JOURNAL OF MICROSCOPY AND POPULAR SCIENCE. Volume I, No. 1. Fifty cents a year. New York city: Handicraft Publication Company, 37 Park Row.

This first issue of a monthly publication gives indications of an excellent and useful periodical, which will, we believe, disseminate practical information on the most fascinating of studies in natural history. We wish for its success and large sale.

STRENGTH OF BEAMS UNDER TRANSVERSE LOADS. By Professor W. Allan, formerly of Washington and Lee University, Lexington, Va. Price 50 cents. New York city: D. Van Nostrand, 23 Murray and 27 Warren streets.

Another valuable contribution to engineering literature. It is No. 19 of Mr. Van Nostrand's *Science Series*, a collection of manuals uniformly excellent and remarkably cheap.

THE IRONMONGERS' DIARY AND TEXT BOOK. Issued by the Proprietors of the "Ironmonger." London, England: Cannon street.

A very useful diary, supplemented some tables and rules especially valuable to all dealers in hardware and similar goods.

JACKSON & TYLER'S CATALOGUE OF HARDWARE, TOOLS, AND SUPPLIES. Baltimore, Md.: 16 German street.

A handsome and elaborate trade catalogue, well illustrated.

DECISIONS OF THE COURTS.

United States Circuit Court---Southern District of New York.

COPYRIGHT CASE.—DAVID BANKS *et al. vs.* JOHN E. MCDIVETT *et al.*

[In equity.—Before Shipman, J.—Decided October 29, 1875.]

MOTION FOR PROVISIONAL INJUNCTION.

The rights and duties of compilers of books which are not original in their character, but are compilations of facts from common and universal sources of information, of which books, directories, maps, guide books, road books, statistical tables, etc., are the most familiar examples, are well settled.

No compiler of such a book has a monopoly of the subject of which the book treats. Any other person is permitted to enter that department and make a similar book; but the subsequent investigator must do so for himself from the original sources, which are open to all. He cannot use the labors of a previous compiler, "*animo furandi*," and save his own time by copying the results of the previous compiler's study.

Provisional injunction issued.

[*E. Ellery Anderson*, for complainants.
Reed and *Drake*, for defendants.]

United States Circuit Court--- District of Massachusetts.

PATENT LATHE.—BAXTER D. WHITNEY *et al.*, COMPLAINANTS, *vs.* ROLLSTONE MACHINE WORKS *et al.*, DEFENDANTS.

[In equity.—Before Shepley, J.—Decided October 27, 1875.]

Shepley, J.:

Complainants claim under Letters Patent granted to William D. Sloan, March 31, 1857, No. 16,936, extended for the term of seven years from March 31, 1871, and also under Letters Patent to Baxter D. Whitney, August 7, 1860, No. 29,534, extended for the term of seven years from August 7, 1874. Defendants are manufacturing automatic lathes for turning and finishing irregular forms like those described in Letters Patent granted to Cheney Kilburn, dated November 22, 1857, No. 26,192.

Complainants, having commenced proceedings in equity for an injunction and account, now ask for a preliminary injunction.

The patent of Cheney Kilburn has expired by limitation, and has not been extended. It was prior in date to the patent of Baxter D. Whitney, but from the affidavits and others documentary evidence it would appear that application of Whitney and the invention of Whitney each antedated the invention and application of Kilburn.

The defendants manufactured machines under the Cheney Kilburn patent, during the term for which the letters patent were granted, and have continued to manufacture the same machine since the patent expired. During the original term of the Kilburn patent no proceedings were instituted by Whitney or his assignees against Kilburn, or the defendants, or any other persons manufacturing, vending, or using the invention described in the specifications of his patent. More than five years since one of complainants notified a party making use of the Kilburn machine that he should treat it as an infringement of the Whitney patent, and should at some then future time endeavor to put a stop to the manufacture. This notice appears to have been communicated to the defendants. They continued the manufacture openly under a claim of rights, and published circulars with an engraved cut of their machine, and a claim that the Kilburn patent antedated the complainants, and have continued, with the knowledge of the complainants, to advertise and manufacture the same machines. No attempts have been made by the complainants to enforce their supposed rights against the defendants until the filing of the bill in this case.

From the evidence to be found in the *ex parte* affidavits, and from a comparison of the two machines, I am satisfied, for the purposes of this hearing, that the Kilburn invention embraces all substantial elements and combinations of the Whitney invention, and that the Whitney invention antedated that of Kilburn; but upon the state of facts exhibited in the record in this case, after the complainants have submitted for so long a space of time to the manufacture and use of the Kilburn machine without enforcing their rights by proceedings at law or in equity, they have lost the right to invoke the summary process of the court by an injunction *pendente lite*, but must await the decree of the court upon a final hearing, when the rights of the parties can more accurately be determined, before summarily putting a stop to a manufacture, which, commenced under the sanction of letters patent, has so long continued without interruption. The complainants do not show any adjudication sustaining the validity of their patent, nor, as against the Kilburn patent or these defendants, do they prove any such public acquiescence or exclusive possession, or any such diligence on their own part, as would entitle them to invoke the *fruitworn remedy* of a preliminary injunction.

Motion for preliminary injunction overruled.

[*Rice* and *Pratt* for complainants.
D. H. Merriam and *F. L. Wakefield* for defendants.]

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]
From October 26 to November 18, 1875, inclusive.

ALLOY.—O. Holden, New York city.
AUTOGRAPHIC PRINTING.—T. A. Edison, Newark, N. J.
BLIND RACK PULLEY.—N. Thompson (of Brooklyn, N.Y.), London, Eng.
BOILER FLUE.—L. B. Halsey *et al.*, New York city.
CARBURETTING AIR.—E. J. Daschbach, Pittsburgh, Pa.
CARDING FEED APPARATUS.—G. S. Harwood, Boston, Mass.
CAR SPRING, ETC.—W. H. Porter, Bridgeport, Conn.
DETACHING HORSES.—J. W. Glover, Mount Savage, Ky.
DIETETIC FOOD.—C. Morfit (of Baltimore, Md.), London, England.
ELECTROMAGNETIC MACHINE, ETC.—D. F. Kimball, New York city.
EMBOSSING LEATHER, ETC.—R. Lee (of Philadelphia, Pa.), Huddersfield, Eng.
ENGINE, ETC.—C. C. Wolcott, Washington, D.C.
EXCAVATOR.—P. H. Stryker, New Brunswick, N. J.
FARE REGISTER.—G. Lander, Pittsburgh, Pa.
FILTER, ETC.—F. Clibborn, Philadelphia, Pa., *et al.*
FLOODWAYS.—J. H. Morrell, New York city.
FOG HORN.—F. Brown, New York city.
HARVESTER.—S. Johnston, Brockport, N. Y.
HOSE PIPE COUPLING.—A. J. Morse, Boston, Mass.
HULLING GRAIN.—G. L. Squier, Buffalo, N. Y.
HYDRAULIC DREDGE.—W. H. Newton, Chicago, Ill.
KNITTING MACHINERY.—C. J. Appleton, Elizabeth, N. J.
LAMP.—L. A. Presby, New York city.
LIFE-SAVING GARMENT.—T. Richards, Cleveland, Ohio.
MOTOR.—G. W. Manson, Washington, D.C.
ORGAN.—A. T. Rousseau, Boston, Mass.
PADLOCK.—W. Orr *et al.*, Brooklyn, N. Y.
PRESERVING MEAT.—J. M. Webb *et al.*, New York city.
PRINTING PRESS.—A. E. Redstone, Oakland, Cal.
PRINTING PRESS.—F. W. Griffith *et al.*, New York city.
QUOITS.—A. H. Cramp (of New York city), London, England.
RAILWAY VEHICLE.—H. D. Faulkner, New York city.
RAW HIDE SHOE TIP.—National Boot Tip Co., Boston, Mass.
ROWING GEAR.—W. Lyman, Middlefield, Conn.
SEWING MACHINE.—A. S. Dinsmore, Boston, Mass.
SPARK ARRESTER.—D. R. Proctor, Gloucester, Mass.
STEAM PUMP.—J. W. Blake, Jersey City, N. J.
STOP VALVE.—J. S. Long, Brooklyn, N. Y.
VENTILATION AND WATER SUPPLY.—J. H. Morrell, New York city.
WARPING MACHINE.—O. H. Moulton, Lowell, Mass., *et al.*

Recent American and Foreign Patents.

NEW CHEMICAL AND MISCELLANEOUS INVENTIONS.

IMPROVED REED ORGAN.

George Blatchford, Mitchell, Canada.—This inventor constructs a resonant chamber, in combination with an organ. The seat of the chamber commences at the front of the instrument immediately under the key board and key frame, and extends backward in proportion to the width of the instrument, with a back elevation proportionate to the elevation of the organ. The advantages claimed are an improved quality of tone; the tone is more easily harmonized with the human voice; greatly increased volume of sound; it removes or prevents that disagreeable quality of tone which so often characterizes reed organs.

IMPROVED MOTH TRAP.

Benjamin F. Daniel, Quincy, Fla.—Above the lower bee entrance is a sliding cover through an angular orifice, in which the moth enters after the bee entrance is closed. The insect is led by a tube into a compartment from which there is no access to the hive. The upper bee entrance is similarly arranged. This device is cheaply made, and claimed to be efficient and useful.

IMPROVED PIANOFORTES.

Ernst Gabler, New York city.—Two patents are here included. The new feature in the first invention is an improved agraffe bar, by which the sounding of the strings at the bridge of the wrest plank is obviated, a more prolonged, clear, and bell-like ringing tone obtained, and a rigid locking of the agraffe bar throughout its length by the pressure of the string plate and strings is produced. The bar is interposed between the wrest plank and the plate, and retained in rigidly fixed position by the plate as produced by the pressure of strings thereon.

The same inventor has also patented an isolating agraffe for grand and square pianofortes, by which the same results are obtained, and the annoying influence of the action of the hammers prevented from being transmitted to the string plate and wrest plank, while, at the same time a rigid connection of agraffe and string plate without screws is obtained.

IMPROVED REVERSIBLE LOCK BUCKLE.

Lyon Lewine, Brooklyn, N. Y.—This device is a buckle for trunk straps which holds the strap tightly until the latter is released. This is done by turning a disk with a key, thus freeing a pin against the straight edge of which the strap binds.

IMPROVED SUSPENDER.

William Stokes, New York city, assignor to himself and Henry Heath, Brooklyn, N. Y.—In this device the ordinary button strap passes through a slot in a metal case, and acts on a follower sustained by a spiral spring therein. The invention will probably be found more durable than the usual elastic webbing.

IMPROVED BRAIDED JEWELRY.

William W. Alden, Providence, R. I.—This inventor proposes a new style of gold jewelry, which he produces by braiding wire of any shape in cross section, by suitable machinery. He claims that very elegant ornaments can thus be cheaply and expeditiously manufactured.

IMPROVED CARBOY.

Alexander H. Fatzinger, New York city, assignor to himself and James McFarlane, North Bergen, N. J.—Many serious accidents have been caused by the breakage of carboys holding acids or corrosive chemicals, through careless handling. To obviate this danger, the above inventor has devised a carboy box, having a neck guard with corner recesses for securing the detachable lid, provided with vertical corner pieces. The carboy is carried by folding handles, that are retained in horizontal or vertical position along the encasing box by suitable bearing strips. When the carboy has been carried to its place of destination, or the contents emptied, the handles are swung down in vertical position along the box, so as to be out of the way.

IMPROVED TYPE-WRITING MACHINE.

Lucien S. Crandall, New York city.—The new features of Mr. Crandall's ingenious machine consist, mainly, in a vibrating platen and paper feed arranged in connection with a series of type bars. The latter are provided with more than one type, and operated by oscillated finger levers in such a manner that, according to the backward or forward motion of the same, two adjoining types are printed on a common center. These centers may be increased in proportion to the type by definite vibrations of the platen, produced by suitable mechanism. The latter is very simple and ingenious, and its manipulation would seem to be easy.

IMPROVED APPARATUS FOR DRAFTING TAILORS' PATTERNS.

Friedrich H. Ulrich, New York city.—This invention is based on the normal anatomical proportions of the different parts of a body, and includes a system of measuring that indicates the deviations from the normal form, the measures to be plotted by a series of squares corresponding to the proportions of the body. There is also an apparatus with graduated and adjustable parts, for defining and drafting said measures.

IMPROVED ELECTRIC GAS LIGHTER.

Octave A. A. Rouillion, Brooklyn, N. Y.—This consists of a couple of platinum wires for closing the circuit and producing the sparks for lighting the gas. The wires are corrugated or notched in any manner, and at the same time are so contrived that the act of bringing them in contact causes such movement of one on the other that the current is broken and closed several times by the passage of the roughened surfaces. By this means, numerous sparks are produced, making an efficient lighter.

IMPROVED PAPER WEIGHT.

Eduard Dressler, Gablonz, Bohemia, Austria, assignor to Alfred J. Ostheimer, Philadelphia, Pa.—This invention consists in a paper weight formed of a glass block having a rounded concavity in its lower side. The effect of the concavity is to refract the rays of light, and thus cause a picture cemented beneath to appear in relief.

IMPROVEMENT IN BELLOWS ATTACHMENT FOR ROCKING CHAIRS.

Edgar E. Sell, Charleston, S. C.—This is an ingenious way of making the motion of a rocking chair produce a current of air which fans the occupant, thus keeping him cool at the expense of little exertion. The device mainly consists of two bellows, the broad ends in opposite directions. Above these are bars, which are attacked to the rockers. Rocking forward compresses one bellows, and rocking back the other; and suitable tubing conducts the draft to the operator.

NEW TEXTILE MACHINERY.

IMPROVED LOOM SHUTTLE CHECK AND BINDER.

Seth Tebbetts Hurd, Gonic, N. H., assignor to himself and Thomas Sanderson, Lawrence, Mass.—This invention relates to a shuttle binder and other devices which serve as a substitute for the ordinary shuttle box; also, to the picker rod and to new connections between the binding finger shaft and the dagger shaft. Drawings are necessary to convey a clear idea of this mechanism. It will doubtless, however, be found as useful as it is ingenious.

NEW HOUSEHOLD ARTICLES.

IMPROVED CLOTHES POUNDER.

Ezra Crowell, Belfast, N. Y.—This inventor improves the device patented by him December 22, 1874, by making the piston hollow, with an opening in its side and perforations in its lower head, and providing it with a movable band, having a corresponding opening in its side, to adapt it to operate as an automatic soap applier when the machine is in use.

NEW AGRICULTURAL INVENTIONS.

IMPROVED TOOL FOR BENDING BALE HOOKS.

Benjamin R. Springsteen, Schodack Lanking, N. Y.—This is an improved tool for manufacturing, in rapid and convenient manner, the wire hooks used by farmers for baling hay, straw, etc. It is used for twisting the wire blank, and is provided with a raised shaping piece, and bending jaws back of the same, which are pivoted to a base plate that is hinged to the main piece, to be swung over the raised part for imparting the final hook shape.

IMPROVED ADJUSTABLE SACK HOLDER.

Henry W. Clark, Red Bluff, Cal.—This inventor improves upon the device patented by him July 27, 1875, so as to render the semicircular spring that receives the edge of the sack easily removable, to be replaced by one larger or smaller in accordance with the size of the sack.

IMPROVED HORSE POWER.

George W. Gordon, Beverly, Ohio.—The improvement relates to the construction of a winding drum with teeth, in combination with a lever and rod for adjusting the drum to bring it into or out of engagement with an arm or arms projecting from a rotary shaft to which the sweep is attached. The advantage of this arrangement is that the horse can be constantly traveling, so as to avoid the delay and labor of stopping and starting.

IMPROVED GRAIN DRILL.

James C. Daman, Elk Point, Dakota Ter.—The upper ends of the plates which govern the discharge openings for the seed pass out through holes in the hopper, and are secured to a shaft, so that by rocking the latter the discharge openings may be opened and closed. Upon one end of the shaft is placed a pawl, which is secured in place adjustably. The engaging end of the pawl is held down upon the teeth of one or the other of two ratchet wheels by a spring. One of the ratchet wheels is made smaller than the other. The larger ratchet is designed for feeding oats, barley, and the other larger grains, and the smaller ratchet for feeding wheat and other smaller grains. When the machine is in use, spring plates open wide enough for the desired quantity of seed to pass out, and then close and yield enough for the pawl to pass a tooth of the ratchet wheel. The feed with either ratchet is regulated by loosening the set screw and adjusting the shaft to give the plates an opening sufficient to pass out the desired amount of seed. An index is marked upon the pawl and shaft, to gage the desired amount of seed to be dropped.

IMPROVED HORSE HAY RAKE.

William H. Ryer, Margarettville, N. Y.—The dischargers or clearers, for forcing the hay out of the rake teeth when the latter are raised, are reinforced in their connection with the axle by metal supports, to prevent the breaking of them at the junction with the axle. The rake head is pivoted to the axle at the top and in the vertical plane of the axis of the wheels, and the teeth are arranged so that the points run directly under the connection with the axle, and are thereby more accurately gaged by the wheel to uneven ground.

IMPROVED REVOLVING DROPPER.

John Johnson, Perry, Ill., assignor to himself, William T. Smith, and Thomas H. Ward, of same place.—This is an improved dropper for reapers, so constructed that it may be revolved from beneath the cut grain, to allow it to drop to the ground without being disarranged and tangled. The mechanism for this purpose is new and ingenious, and mainly consists of a vibrating apron and revolving double apron in connection with suitable levers and holding devices.

IMPROVED FURNACE FOR DESTROYING INSECTS.

William F. Woolsey, Breckenridge, Mo.—This furnace destroys insects by burning them with a heated furnace in a furrow plowed in the ground around the field from which the insects seek to escape, the furnace being drawn while heated along the furrow, in which the insects have been arrested in their escape by the furrow being contrived, in form and condition of its surface, so that they cannot get out after getting in. The furnace consists of a little boat-shaped sheet metal contrivance formed in cross section to correspond with the form of the furrow, and provided with a fire grate, draft, and escape passages, and also with a deflector in the upper and middle portion to cause the heat to act on the sides, so as to throw it off upon the sides and bottom of the furrow to the best advantage as the furnace is drawn along the furrow.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED CAR COUPLING.

Thomas A. Watson, Bentonville, Ark.—In this device there is a drawhead with coupling link secured thereto, to be coupled by the sliding pin of the opposite drawhead. The latter is provided with a forward curved arm, and is dropped by the contact of the same with the drawhead. The curved and spring-acted arm rests on a shoulder of a top extension of the drawhead, and slides in a slot of the same.

IMPROVED GAS APPARATUS.

John H. Eichholz, Brooklyn, N. Y., assignor to himself and Horace A. Green, N. Y. city.—The aim here is to supply a simple, cheap, and efficient small portable apparatus for the manufacture of illuminating gas of hydrogen and the vapor of hydrocarbon substances, to enable consumers to find ready and cheap apparatus for making their own gas. The device consists of a furnace and oven made of a sheet metal case and fire brick lining, in which are retorts for the oil in one set, and another set for steam, contrived in a simple way, for graduating the heat to the different substances, according to the progress of the work.

IMPROVED FLUID METER.

Berthold Huber, Brooklyn, N. Y.—This is a fluid meter composed of a circular flexible pipe and a roller, the roller being pushed around on the pipe by the fluid in passing from the inlet to the outlet, and serving to indicate each pipe full of fluid. It includes a contrivance of the pipe so that the roller may travel on a level way all around, and an arrangement of the roller by which to connect the recording mechanism in a simple way.

IMPROVED CAR COUPLING AND BRAKE.

Frank M. Campbell, Crow Wing, Minn.—This is a novel arrangement of self-coupling apparatus, also contrived for uncoupling without attention from the attendant, in case a car falls through or flies the track; and it also consists of a brake contrivance so connected with the aforesaid coupling that the brakes are let free by the coupling, and thrown on the wheels by a spring whenever the coupling disconnects.

IMPROVED GOVERNOR AND CUT-OFF FOR STEAM ENGINES.

Martin D. Miller, Oswego, Kas., assignor to himself and James T. Pierson, of same place.—A hollow revolving and reciprocating valve having spiral ports is placed in a case having similar ports, through which steam passes to the slide valve. The stem of the valve is suitably connected by gearing with the engine, and is also swiveled to a rack which by a pinion is governed by a friction gearing on the governor spindle. On the latter is a frame, carrying rollers which move on a concave plate through which the spindle passes, and which operate in such a manner that on the least change of motion of the engine the friction gearing is thrown into engagement and the valve thus suitably regulated.

IMPROVED COMPOUND FOR LINING MACHINE BEARINGS.

Lebbeus W. Lathrop and Theo. A. Weber, New York city.—We have recently examined the practical working of the new lubricating material, anti-frictionate, which we mentioned in one of our articles on the late Fair of the American Institute as being there exhibited. The substance is principally finely pulverized graphite, which heretofore has been mixed with other materials and formed into a mass, from which linings were made for the boxes. A recent improvement on the invention now does away with any compounding of materials, except in the cases of journals subject to the action of oil or water, and for ordinary use substitutes sheets of cloth and paper, to the surface of which pure graphite is attached by prepared glue. These sheets are cut into the required shape, and are fitted into the boxes as a lining. We have seen counter-shafting and machine tools thus fitted running at ordinary speeds, and spindles traveling at very high numbers of revolutions. No signs of cutting were visible, and the bearings were either cold or showed a barely perceptible warmth. The invention is cheaply made and applied, and apparently does all that is accomplished by more expensive solid lubricants, which require the drilling of holes in the boxes, and which are not, as a rule, proof against water or oil. Boxes exhibited to us which had been in use for several months showed a smoothly polished surface and no signs of wear within. The manufacturers are the Lathrop Anti-Frictionate Company, of 408 Bleecker street, New York city.

IMPROVED WATER WHEEL.

Samuel C. Lyons, Bennington, Vt.—In this device the buckets are curved to pass the water readily upward, and are provided at their upper ends with outwardly extending lips, to which an inverted conical rim is attached, which encircles the upper edge of the case. A top wheel is seated loosely on a support of the wheel shaft, and has arc-shaped buckets, so that the unspent power still remaining in the water may be utilized by setting the auxiliary top wheel in motion.

IMPROVED COMBINED COMPRESSION AND SWING COCK.

Willis L. Brownell, Brooklyn, N. Y.—This inventor proposes to improve the construction of the ordinary swing cocks by providing them with a screw or compression valve, to permit the shutting off of the water independently of the swing faucet, to prevent the said cocks from leaking.

IMPROVED CAR COUPLING.

James C. Mitchell, Lancaster, N. H.—When the cars are run together, the end of the entering coupling bar pushes back a coupling plate, which, as soon as the head has passed its lower edge, swings forward, so that the shoulder of the head may rest against the rear side of said edge and sustain the draft strain. The front side of the plate which is pivoted in the drawhead rests against suitable shoulders inside the latter.

IMPROVED WASTE PIPE TRAP.

Thomas Hudson, Brooklyn, N. Y.—This is an improved valve attachment for stench traps, the object of which is chiefly to allow instant admission of air to supply the smallest vacuum created by the tendency of traps to siphonic action, and to prevent the gurgling sound frequently produced in the common stench trap. An adjusting weighted valve is arranged in a vent in the trap, which is held closed by the weight, but opened by the formation of a partial vacuum.

IMPROVED STAGE PLANK AND CARRIER.

William S. Booth, Baton Rouge, La.—This is a frame on which a number of rollers are mounted. By suitable mechanism the rollers are rotated, thus carrying along any object which may be placed on a stage plank above them.

IMPROVED STEAM WHISTLE.

Henry B. King and Christopher McKiernan, Paterson, N. J.—The new feature in this device consists in inserting a detachable plate in the throat of the whistle, in which a gage is arranged for governing the amount of steam or air used.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

Notes & Queries

A. K. will find directions for bronzing brass castings on p. 283, vol. 31.—F. J. can put a gold lacquer on tin by following the directions on p. 130, vol. 32.—J. F. will find directions for frosting glass on p. 264, vol. 30.—R. N. will find directions for stereotyping on p. 363, vol. 30.——M. J. L. will find full directions for cleaning and coppering iron on pp. 90, 139, vol. 31. The book he mentions is published by Spon, 446 Broome street, N. Y.

(1) F. W. J. says: I have drawings of a punching press, intended to punch a hole ¼ inch in diameter, through sheet iron ⅛ inch thick. I do not think it will be powerful enough to do the work, and I would like to know what pressure is required. A. The pressure required will be about 2,500 lbs.

(2) C. H. asks: What size of boiler is needed to run a slide valve engine with cylinder 3¼x1½ inches? Kerosene is to be used for heat. Should the boiler be horizontal or vertical? A. Make a vertical boiler, 6 inches in diameter and 10 inches high.

(3) W. B. G. asks: Is there a proper speed for a turbine wheel of any given diameter, a speed at which it will do its maximum work with minimum of water or fall? How is such speed determined? What is the probable percentage of effective work which can be got from each unit of theoretical total power exerted by an ordinary wheel? Other things being equal, and the head of water the same, I suppose the power of a wheel to be as the vent space between the inner edges of the buckets, that is, with buckets equally spaced the comparative vent spaces will give comparative power of the wheels. By what rule can I ascertain the foot pounds of power exerted by a wheel of given amount of vent space (or of bucket surface) under a given head of water? I am working center vent 4 feet turbine wheels, in scroll cases and with gates of an area not half that of the venting space between the buckets. It seems to me that the gate first, and the case afterwards, throttle my power so that I get very much less than the same wheel would give me if gate and case were so large that every bucket would be acted upon alike by a solid column of water, and the wheel thus allowed to use as much as its venting spaces would pass? Is this so? A. Your questions cover pretty much the whole theory of turbines, and we could not answer them satisfactorily in our limited space. You will find the theory put in considerable detail in Rankine's "Treatise on the Steam Engine," Fairbairn's "Machinery and Mill Work," and Weisbach's "Mechanics and Engineering."

(4) J. V. says: It is argued that working two steam fire engines with a line of hose attached to each, and the other ends of the hose being attached to the arms of a Y, and both discharging from a nozzle ½ inches in diameter, screwed to 50 feet of hose fastened to the third arm of the Y, the pressure in the 50 feet of hose into which they are both working is nearly double that in either of the other hose pipes. I claim that pressure is about alike in the whole. Am I right? A. We think you have the right idea.

(5) H. M. H. says: I am building an ice-box, inside box 1 inch in thickness, composed of black walnut, and lined with zinc. The outside of this box I wish to cover with felting, ½ inch in thickness. The outer box is to consist of 1 inch in thickness of black walnut. Would this make a good family ice box? A. An air space of 2 inches thickness between the outer and the inner box is as good for the preservation of the ice as would be a packing with some filling like powdered charcoal or other material, but the space must be thoroughly airtight. Place the ice near the top, and the articles to be preserved lower; provide means to catch the drip from the ice—a sheet of zinc, perforated from below with holes to pass air down but not water, will do—and set a small pipe in the bottom to carry off the water. Make the lid of the box to contain an air space as well as the sides.

(6) Z. D. asks: If a man raises vertically a weight of 1,000 lbs., with the uniform velocity of 10 feet a second, by means of a cord and pulley, what would be the tension of that cord? In other words, what stationary weight would give the same tension to that cord, if fastened to a fixed point? Friction and weight of rope are not taken into account. A. Under the conditions stated, the tension of the cord would be about 1,550 lbs.

(7) J. K. says: 1. I wish to build an ice house to hold about a carload. I read your directions on p. 251, vol. 31, but the house will only hold 8 tuns. Could I make the interior, instead of 6 feet square, 12 feet square? A. When ice is well packed, the larger the mass the better it can be preserved from melting; a 12 feet cube has been known to keep two years. 2. What percentage is the melting in an icehouse constructed as stated? A. The percentage of melting will depend upon the climate, the length of the warm season, and the location of the house in regard to prevailing warm winds; but can be brought to a minimum by careful attention in opening and closing the doors, and regard to light, ventilation, and good drainage. 3. We can gather ice only 1 or 2 inches thick. Would it pay to fill the icehouse, and then use some freezing mixtures, as stated on p. 330, vol. 33? A. If you can procure ice 2 inches thick, you have only to store it in the coldest weather, pour water upon it as you store it, and it will freeze together in one solid mass.

(8) A. W. C. Jr. says: 1. I have a boat 20 feet long by 7 feet 6 inches beam, drawing 15 inches of water, and an engine 3 inches by 5 inches stroke. Is the engine large enough for the boat? It is a vertical engine, fitted with link motion. A. Yes. 2. What size of propeller do I require to drive the boat 6 or 7 miles an hour in still water? A. Twenty-two inches in diameter, and of thirty inches pitch. 3. Of what dimensions should the boiler be? A. Thirty inches diameter, 3½ feet high.

(9) F. L. says: I wish to ask some questions about an hydraulic air compress. 1. In the case of a supply pipe supplying water to the cylinders, does it make any difference in the power whether the supply pipe is larger or smaller, if the head and the size of the cylinder and piston remain unchanged? My impression is that the only difference whether it is 1 inch or 2 in diameter is that the machine would work faster with the large pipe. A. There would be no essential difference. 2. Does Keely get any greater pressure by having his supply pipe so small? A. The way he produces his pressure is carefully kept secret. 3. If the pressure on the lower piston is 2,000 lbs., what pressure per square inch would the air compressed in the air cylinders have? A. The pressure of the air per square inch would be equal to the pressure on the piston in lbs. divided by its area in square inches. 4. Given a cylinder and piston, say 10 inches in diameter, with 1,000 lbs. weight on the piston, the cylinders being set upright and filled with water, with a hole 1 inch in diameter at the bottom connected by a chamber by a pipe, with what pressure or force would the water issue from the inch pipe? Would it be 1,000 lbs. per square inch, or only the amount of 1,000 lbs. divided by the square inches in the area of the piston? A. The same as the pressure on the same area of the piston. 5. Would compressed air let in on the surface of the water (the top of the cylinder being closed) produce the same effect as if the pistons were present? A. It would, with the exception that some of the air might be absorbed by the water.

(10) J. P. C. asks: 1. Will a 10x10 inches cylinder with 60 lbs. steam turn a two-blade propeller of 4 feet diameter and 10 feet pitch, with 18 inch blades, 150 turns in a minute, or would it be advisable to use one of 8 feet pitch and make 200 turns? The boat is 33 feet on the keel and of 11 feet beam; she is 5 feet 6 inches deep. A. It would be better to reduce the pitch still more, and run the engine faster. 2. Would the boiler require more heating surface for the latter than the former, and how much for each? A. You should have a boiler with about 300 square feet of heating surface in either case.

(11) H. L. C. says: 1. I am building a small engine of 2 inches bore and 4 inches stroke. What material will wear the best for a cylinder, brass or cast iron? A. Brass will be best. 2. Will an upright boiler of the following dimensions be sufficient to work the engine up to half a horse power? Boiler is to be 12 inches in diameter and 30 inches long, set in an iron jacket 30 inches in diameter, with the firebox under the lower end of the boiler, and a spiral flue to carry the heat around the boiler before it could reach the pipe. This would leave 10 inches above the fire for a steam chamber. A. We think the boiler is of sufficient size. 3. Would it be safe to set the boiler down low, so as to leave only an inch or two above the fire? A. Yes.

(12) S. B. asks: What will remove stains from uncolored leather (saddle flaps) without injuring the leather? The stains are probably grease. A. Try a little warm naphtha.

(13) E. H. J. asks: How can I remove grease from a sealskin cap, which has worked into the fur by contact with the hair? A. Try a little warm naphtha or benzole.

(14) A. M. & S. ask: With what can we mix white paint for marking numbers on woolen clothing? The ordinary paint rubs off in the course of manufacture. A. Try the following: Macerate (in a mortar) oxide of zinc with sufficient gum dammar and turpentine to give the proper body. This, we think, will obviate the difficulty.

(15) J. M. B. asks: 1. Is the racing of marine screw engines attended with any considerable loss of fuel? A. Yes. 2. Is there a governor in use, which secures uniformity of motion in screw engines? A. We think not. 3. Do different depths of immersion cause the screw to race, or is it caused by its being lifted partly out of water? A. By being lifted partly out of the water.

1. Can as fine castings be made of bronze as of type alloy? A. No. 2. Are molds of plaster of Paris as suitable to cast small bronze work in as dry sand molds? A. Yes.

(16) A. M. says: A friend and I have an argument which we have agreed to leave to you for settlement. I claim that the ordinary 3-ported slide valve cannot be lapped so as to use steam expansively for more than ⅓ the length of the stroke (that is, steam to follow piston ⅓) without putting another valve on the back of the main valve, or putting another valve on a separate seat. My friend claims that the common single slide valve can be lapped and made to cut off at any portion of the stroke predetermined on, and can do it just as well (and not spoil the exhaust) as with the auxiliary valve; only, of course, it cannot be altered when once set. Which of us is right? A. You are.

(17) E. E. R. says: I notice that Mr. Sawyer, referring to Professor Tyndall's experiment, says that a person, on putting his ear close to the bar, can hear a click when the circuit is opened or closed. Now I have a line of telegraph of about 40 feet in open circuit, run by 2 cells of Lockwood battery. The wire is No. 12, copper. By placing my ear near either instrument, I can plainly hear the click when the circuit is broken, but not when it is closed. Why is this? A. Place the instrument on a sounding board. We think you will then be able to hear the click on closing circuit. With proper conditions, it can be distinguished both on opening and closing circuit.

(18) H. B. asks: What book could I get, to obtain information in electro-motive power? A. "Electricity and Magnetism," by Fleeming Jenkin, is an excellent little book.

(19) J. T. McL. says: The electricity produced on an engine, by the friction of a cross belt 100 feet long and 3 feet wide, is considerable. By holding one hand up within a foot or so of the belt, and with the other touching a gas jet with a copper wire, we can easily light the gas, even if the wire is held an inch from the jet. In some conditions of the atmosphere, it is very painful to walk bareheaded under the belt, although it is some 12 feet or more from the floor. A number of persons have received great relief from rheumatic and neuralgic pains and nervous headache by standing under this belt on zinc or glass plates. The question is this: Can I, with copper or other wire, collect a part of the electricity from the belt and convey it a quarter of a mile so as to utilize it? A. Yes, but it will cost more to do so than to generate electricity where it is wanted. An example of this phenomenon was illustrated in our issue of May 9, 1874.

(20) W. H. H. says: Some time since I ordered some short timber to be placed on some joists in my shop, and left. When I returned, I found it all placed on two joists; and I took one third off. Twenty-four hours afterward the joist broke. Why did it not break when all the timber was on? A. Time is an element to be taken into consideration in overcoming the strength of the fibers of timber. Two thirds of the load in this case was sufficient to break the joist in 24 hours after one third had been removed; but a much shorter time would have sufficed to break it with the whole load upon it.

(21) L. H. C. asks: Is there anything known which will ignite common burning gas by contact, besides, of course, electricity and fire? A. There are methods, other than those you mention, known to chemists, by means of which ordinary coal gas may be ignited. They are, however, without exception, open to so many objections that they are of little practical value. Metallic platinum, when finely divided, commonly called platinum sponge, has the property of condensing gases upon its surface. Thus, if a stream of pure hydrogen, or even carburetted hydrogen, be made to impinge on the surface of a little bulb of this sponge, its combination with the oxygen which it finds there causes the ball to grow red hot, and thus ignite the gas.

(22) J. B. L. says: I have made the telescope described in your paper about 18 months ago, and find it well worth the money and time taken to make it. Recently, while looking at the moon, I noticed that the edges, especially on the side towards the sun, had a wavy appearance, such as heat makes in ascending through air. A. Warm and cool layers of air in the atmosphere bend the rays of light from their true course. Thus it is that high powers cannot be used except on very rare occasions.

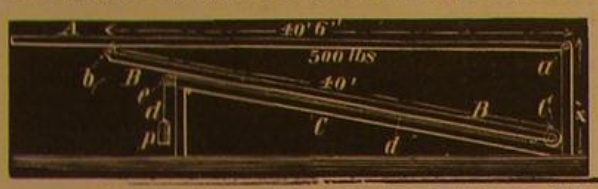
(23) M. E. C. says: We have a private telegraph line, 800 feet long, using No. 16 copper wire for double the entire distance, that is, using no ground wires. We have three offices, the wire in each entering the upper stories of the house and passing, by means of wire insulated with cotton and wax, to the lower floors. Is it perfectly safe to use it without lightning arresters? Our line is completely insulated with regard to the earth, and therefore I should think that it would not attract lightning. A. Lightning arresters are employed principally to prevent the wire, forming the coils of the instruments, from being burnt off. The line does not attract lightning at all. If, however, a discharge occurs in the immediate neighborhood of one end of the line, and the opposite end is very much nearer good ground (gas, water pipes, etc.), part of the discharge will follow the wire on account of the low resistance of such a route. In such a case, the line might be dangerous.

(24) L. G. S. says: Is the greater power of of the lenses produced by the shaping and polishing of the glass only, or is it also the result of a chemical process in manufacturing the glass? A. It is only the form of the lens that gives it its power. A convex lens makes objects appear larger; a concave one makes them look smaller.

(25) A. F. H. asks: Will you suggest a cheap and simple method whereby I may be able to grind lenses suitable for a microscope of high power, also others suitable for use in a telescope? A. There are two kinds of glass used, one very heavy, called flint, the other light, called crown; and with the proper combination of these, the lenses are made achromatic. Any text book of natural philosophy or optics will give you the proportions; and much valuable information may be gleaned from the last four volumes of the SCIENTIFIC AMERICAN.

(26) J. P. says: 1. I herewith send you a piece of a porous cup. Can you tell me of what substances it is made? It is the best porous cup that I have ever used, as it offers but very little resistance to the galvanic current. A. The clay in the sample appears to be that ordinarily used for porous cells. The cup was very thin and not over-baked, which accounts for its low resistance. 2. There is a deep red cement used for coating the inside of glass cylinders for electrical machines. Can you tell me how it is made? A. The best sealing wax is much used for the purpose.

(27) C. N. W. says: A is a ladder weighing 500 lbs., pivoted at *a*, and having a lever or prop, B, hinged to it at *b*. This prop has a wheel, *c*, attached to its lower end, which runs up an inclined plane, C (inclined 1 in 5 or 8 feet in 40 feet). The power is applied at P through a rope, *d*, which runs over a pulley, *e*, and thence down the incline, *c*, and is attached to the lower end of the prop, B. What power will be required to raise the ladder? A. You do not send sufficient data, but we will explain the method by which you can make the solution. It will first be necessary to find the pressure exerted at the point, *b*; next find, by the principle of the lever, the force that, acting in the direction of the prop, will balance this pressure; and finally, by the principles of the inclined plane, determine the relation between this force and the weight on the cord, *d*.



(28) D. R. B. asks: Is there anything that will settle or precipitate dirt in flowing varnish? I am using a varnish that has a good luster, but after it has flowed, it appears to be specked with fine dirt. A. Thin the varnish down and filter through a small plug of cotton wool.

(29) A. H. R. says: I have a small piece of quartz rock, supposed to contain silver. Will you tell me some way to test it? If the rock is pounded up fine and treated with nitric acid, thoroughly stirred up, and salt be added, and then the solution be washed, put on to white paper, and exposed to the sun, would it turn dark if it contained silver? A. Grind the rock into an impalpable powder, and digest for some time with nitric acid. Filter the solution through good, clean, white filter paper, in order to remove the undissolved residue. If the solution contain silver, upon the addition of a solution of chloride of sodium (common salt), a heavy, white, flocky precipitate of chloride of silver will form, which will shortly subside, when the excess of liquid may be decanted and the precipitate washed with clean cold water. On exposure to light, this precipitate will soon change to a dark color.

(30) C. D. B. asks: What cheap substance can I add to Venice turpentine to destroy its odor without injuring its healing properties? A. We do not think this could be accomplished without altering the chemical properties of the body to some extent.

(31) C. H. D. asks: 1. In what form is nitrogen generally applied to the soil? A. Generally in the form of compounds containing ammonia and ammoniacal salts, such as urea. 2. Is there any way to ascertain approximately the proportions of nitrogen and phosphoric acid which would be required per acre in a field where cereals are intended to grow? A. Yes. An analysis of a fair sample of the soil would determine what was requisite. 3. What properties does air-slaked lime supply to the soil? A. It decomposes part of the organic constituents of the soil, and renders them suitable for assimilation by the plants.

(32) C. asks: Is there any chemical composition by which the skin may be darkened permanently, without any injurious effect? A. We do not know of any compound that will accomplish this.

(33) E. M. L. asks: Are the following proportions right for a small steam yacht? She is 30 feet long by 8 feet beam. The machinery is composed of an engine with a 5 inch cylinder with 6 inches stroke. She has a 32 inch screw of 4 feet 2 inches pitch. The boiler is 5 feet high by 30 inches in diameter, and has a low crown sheet with 56 two inch tubes, and is supposed to be an 8 horse boiler; but we can hardly keep steam to supply the engine. What is wrong? A. You do not send enough data to enable us to form a very definite conclusion. The proportions are very fair. If you could attach an indicator to the engine, and measure the water evaporated by the boiler, you can soon detect the trouble.

(34) T. J. H. asks: At what time in the year should I cut timber for wagon lumber, etc., so as to prevent the worms from getting into the lumber? A. The proper time for felling trees is that in which the largest quantity of hard and durable wood can be obtained as free from sap as possible. Timber is felled during the cold months, when the natural juices are most inactive, and the tree, in a measure, dormant. To properly season the wood, it is necessary that it should be exposed for about a year to the influence of dry air.

(35) C. S. asks: How can I find the power of a turbine water wheel? A. By experiment only.

Which is the best to use with a windmill 12 feet in diameter, a circular or a straight saw, to saw wood? A. A circular saw.

(36) T. A. L. asks: If I take two locomotive springs of like dimensions, and give one 1 inch more set than the other, what effect will it have in regard to strength? A. The former spring will be stronger.

(37) J. V. asks: Why cannot I weld sleigh shoe steel? I can weld cast steel with good success. A. Probably from inexperience.

(38) J. W. B. asks: 1. Is there any difference in the power of an oscillating and a balance valve engine, if both engines are of the same size? A. It depends on the workmanship. 2. Is there any way to change the motion of an oscillating engine, as simple as the link motion? A. No, none so effective. 3. Are the drive wheels on locomotives keyed to the axles? A. Yes.

Has the mariner's compass the same polarity under water as it has above water? A. Yes.

(39) D. C. B. says: I have an hydraulic ram in operation, working at 8 feet head, by 1¼ inches feed and ¾ inch discharge, throwing water through 300 feet of pipe, 50 feet high. When first put in operation, it worked well, but occasionally the water runs slowly until very little is obtained through the discharge pipe. The ram appears to labor very heavily, making a loud vibrating noise in the dwelling house where the water is delivered, even when it is throwing very little water. When it delivers its proper amount, there is only a sharp click heard from the valve. When working properly, the ram delivers over 1,000 gallons per day of 24 hours: when laboring heavily, with the loud vibrating noise, it only delivers about 100 gallons in the same time. What shall I do to remedy it? A. The trouble probably arises from the valves getting choked at times.

(40) J. A. S. asks: How are gun springs tempered? A. The springs are heated to a blood red, then kept covered with oil and held over a slow fire until the oil on them blazes freely all over the spring.

(41) J. R. says: 1. I assert that steam can be used expansively to advantage where you do not need the full power of the engine. I have an engine of 30 horse power and only require 15 horse power. Cannot I save steam by using it expansively, that is, by cutting off the steam when the piston has travelled one half or two thirds of its stroke? A. Yes. You are right. 2. Is it necessary to have the exhaust port larger than the steam port when you use the exhaust to create draft? A. Yes.

(42) J. G. W. asks: Can a left hand screw thread be cut with a right hand die, by taking one half of the die and a piece of copper, and cutting it? A. No.

(43) M. F. S. says: A friend asserts that, in belting directly on the face of an engine fly wheel, the most power is obtained from the wheel. He says also that the centrifugal force is greater at the face, and of course is transmitted to the belt, and concludes by saying that it is the best known way to belt from the engine. My claim is that, if the belt were driven from a smaller wheel on the same shaft, that the engine would not vary so much when work was thrown on or off, and the engine would not be strained so much, and consequently would run more easily. My theory is that the leverage is much greater in the fly wheel, and the weight is at the end of leverage, and will overcome the shorter leverage of the belt wheel, thereby causing the engine to run with less strain, allowing the fly wheel to check sudden jerks caused by work thrown on. Your decision will be gratefully received. A. Since you both agree to drive from the fly wheel by belting, the engine will be, with the same speed of belt, more powerful with the small fly wheel.

(44) J. N. T. asks: Please give me recipes for bright red and white paints, for painting the outside jacket and heating pipes of a dwelling house furnace. A. Use a paint made of red and white lead.

(45) R. F. G. says: I have a saw mill in which the engine cylinder is 8x16 inches, and the fly wheel 4 feet in diameter. The weight of fly wheel is about 400 lbs. I contend that it would improve the power to get a larger fly wheel, say about 600 lbs. in weight. Am I right? A. No. It would not improve the power.

(46) E. O. asks: What tools are necessary for making a small 2x4 inches engine, the cylinder being already bored? A. A lathe, a vise, and a few hand-turning tools, drills, scrapers, and files.

(47) W. W. K. says: On a recent examination of our steam boilers, we find a substance covering the tubes, braces, and the whole interior of the boilers. It resembles black wax, and comes, we presume, from allowing our exhaust steam to enter the cistern from which we feed our boilers. How can we prevent the destructive effects of this deposit? We notice that the braces are already being corroded by it. A. The deposit must be analyzed before a preventive can be recommended.

(48) H. H. F. asks: How can I bore a long tube in a slightly taper form? A. A very slight amount of taper may be obtained by keeping the tube very cold at the commencement and gradually increasing the temperature up to 200° Fah. as the boring proceeds.

(49) R. A. C. says: It appears to me that the most natural and effectual way to brake a car would be by gravitation, that is, by throwing the weight of the body of car, by means of toggle joints, on each wheel, the lever running diagonally across the bottom of the car to a bar of iron running up center, under bottom of car, from end to end, to the windlass on the platform. It could be so constructed that, when the engine is reversed and the cars are pushed together, the pressure can be utilized and brought to bear upon the wheels, so that a rolling motion can be changed into a sliding one immediately. Some of my friends maintain that a car would not be stopped so quickly with all the wheels instantaneously stopped as it would if their speed were partially impaired. Has such a brake device as I mention ever been tried? A. Your plan is quite old in idea, and not practically useful for railways. The same effect can be produced by any continuous brake that is sufficiently powerful.

(50) F. H. M. asks: 1. Our school building is heated by steam. I put a check valve on the boiler, to prevent the water from backing up when the steam is shut off from part of the rooms. The valve retards the flow of water back to the boiler, and the arrangement does not heat so well. Can I not put a slender spiral spring under the valve to counterbalance its weight, and obviate the difficulty? A. Yes. 2. I have taken the valve out, and since that I have discovered several bad leaks in the steam joints. Why did they not leak before the valve was taken out, when we had greater pressure of steam? A. They were probably then not so much worn.

(51) C. B. C. asks: In turning cast or wrought iron, which can be driven at the highest speed without using oil or water? A. Cast iron.

(52) H. S. M. says: 1. I am building an engine to use steam at 500 lbs. pressure per square inch. Will the temperature of such steam be too high for brass or composition connections and valves? A. No. 2. Would it be safer to use malleable iron? A. No. 3. Which will stand the highest temperature without crumbling, yellow brass or gun metal? A. Gun metal.

(53) J. B. L. says: I am running an 18 feet overshot water wheel and an 8 feet driving wheel. If I increase my driving wheel to the size of water wheel, will it increase my power? A. No.

(54) A. asks: How is the fine color on case-hardened iron, such as on gun trimmings, obtained? A. Casehardened iron does not present a fine color.

(55) H. W. S. says: I have an engine lathe of 16 inch swing and 5 feet bed. Is it possible to run it by foot power to turn cast iron cylinders not over 5 inches in diameter? A. No. It is impracticable.

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

G. B.'s and J. M. R.'s minerals have not been received.—H.—Nos. 1, 3, and 4 are siliceous rocks, containing oxide of iron, but not in profitable quantity. No. 2 is carbonate of lime.—J. A. Y.—No. 1 is manganese. No. 2 is coral replaced by silex. No. 3 is encrinite. No. 4 is cyathyphylloid coral. No. 5 is millepore coral. No. 6 is an imperfect fossil replaced by carbonate of lime. No. 8 is stilbite. No. 7. Send a larger fragment.—W. B. H.—It contains 85 per cent metallic lead, and will pay to mine if there is enough of it.

J. A. S. asks: 1. How are laminated steel guns made? 2. How are stub twist guns made? 3. How are Damascus gun barrels made?—A. F. asks: Why will a stick of timber 50 feet long and 1 foot square, sag more, whole, than when sawn into two inch plank?—S. T. S. asks: How are artificial limbs covered with raw hide?—D. H. S. Jr. asks: 1. What is the greatest depth of snow through which the most powerful locomotive can propel the best snow plow, at a uniform speed, on a level straight track? 2. What is the greatest feat which has been accomplished by a snow plow propelled by any number of locomotives?—H. M. T. asks: How do dairymen skim milk in large quantities?—J. K. says: I want to raise a certain weight. I put, on a stationary surface, a wedge 3 inches long by 1¼ wide at the large end, and 1⅛ wide at the small end, the taper all being on one side, and the other side straight. I move the wedge by means of a screw ⅜ inches in diameter, with 10 threads to the inch, with a crank 4 inches long. What weight can I raise by exerting a force of 50 lbs. on the lever?

COMMUNICATIONS RECEIVED.

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

On Crossing the English Channel. By G. W. P.
On the Hydro Pneumatic Puzzle. By R. H. A., and by W. H. P.
On the SCIENTIFIC AMERICAN. By S. S. B.
On the Dioptric Light. By W. C. G.
On the Hoosac Tunnel. By F. W. G.
On Spark Arresters. By C. F. P.
On Pumping Water into Mains. By J. A. R.
On a Problem. By G. D. B.
On Laying Out a Square. By H. B N., by C. E. B., and by J. W. D.

Also inquiries and answers from the following:

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

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 inquiries analogous to the following are sent: "Who sells miniature steam engines? Where can simple galvanic batteries be bought? Whose is the best apparatus for projecting the spectrum on a screen? Where can steam engine indicators be obtained?" 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.]

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November 30, 1875.

AND EACH BEARING THAT DATE.

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DESIGNS PATENTED.

8,811, 8,812.—BUTTONS AND STUDS.—T. G. Brown, Newark, N. J.

8,813 to 8,815.—SHOW CASES.—J. Lehnbeuter *et al.*, St. Louis, Mo.

8,816.—TOBACCO BAGS.—W. J. Cussen, Richmond, Va.

8,817.—CUTLERY.—J. D. Frary, New Britain, Conn.

8,818, 8,819.—SODA WATER APPARATUS.—F. H. Shepherd, Boston, Mass.

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CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA, November 24 to December 1, 1875.

5,404.—G. McConnell, Oconto, Wis., U. S. Sleigh. Nov. 24, 1875.

5,405.—E. E. Mann, Lawrence, Mass., U. S., *et al.* Apparatus for fog signals. Nov. 24, 1875.

5,406.—H. S. Clark, Towanda, Pa., U. S. Spring gear for vehicles. Nov. 24, 1875.

5,407.—G. E. Taylor, Philadelphia, Pa., U. S. Manufacture of tinned plates. Nov. 24, 1875.

5,408.—W. Dickson, Jr., Richmond, P. Q. Fire extinguisher. Nov. 24, 1875.

5,409.—H. H. Bultzly, Assumption, Ill., U. S., *et al.* Hand truck. Nov. 24, 1875.

5,410.—H. H. Furbish, Yarmouth, Me., U. S. Making paper pulp from wood. Nov. 24, 1875.

5,411.—J. C. Schoonmaker, Geddis, N. Y., U. S. Lightning conductors. Nov. 24, 1875.

5,412.—A. Page, Boston, Mass., U. S. Wringer. Nov. 24, 1875.

5,413.—A. Willson, Bell Ewart, Ont., *et al.* Device to protect brakesmen on freight cars. Nov. 24, 1875.

5,414.—P. W. Hart, Camden, N. Y., U. S. Saw collars for grooving lathe. Nov. 24, 1875.

5,415.—A. Corbett, Hicksville, N. Y., U. S. Sleigh lance. Nov. 24, 1875.

5,416.—W. Lyman, Middlefield, Conn., U. S. Rowing gear. Nov. 24, 1875.

5,417.—J. Angus, St. Stephen, N. B. Process of tanning hides, etc., with the hair left on. Nov. 24, 1875.

5,418.—G. McPherson, Chicago, Ill., U. S. Regulating percolator. Nov. 24, 1875.

5,419.—J. Mallinson, Welwyn, Eng. Steam cocks and valves. Nov. 24, 1875.

5,420.—W. Watt, New York city, U. S. Distilling apparatus. Nov. 24, 1875.

5,421.—R. Dick, Buffalo, N. Y., U. S. Machine for labeling newspapers, etc. Nov. 24, 1875.

5,422.—J. C. Ramsden, Lightcliffe, Eng. Securing the combustion of fuel, etc. Nov. 26, 1875.

5,423.—L. Theobald, Plainwell, Mich., U. S. Fanning mill. Nov. 26, 1875.

5,424.—J. Ellis, Lynn, Mass., U. S. Gas burner and regulator. Nov. 26, 1875.

5,425.—H. Collinson, Boston, Mass., U. S. Closing gas retorts, etc., hermetically. Nov. 26, 1875.

5,426.—J. R. Foster, Springvale, Me., U. S. Bale tie. Nov. 26, 1875.

5,427.—H. M. Smith, Chicago, Ill., U. S. Furnace for the combustion of coal. Nov. 26, 1875.

5,428.—R. Garand, Montreal, P. Q. Stench trap. Nov. 26, 1875.

5,429.—A. Stone, Ticonderoga, N. Y., U. S. Boot and shoe pegging stand. Nov. 26, 1875.

5,430.—J. R. Foster, Springvale, Me., U. S. Clamps for assembling barrel staves, etc. Nov. 26, 1875.

5,431.—A. Kenney *et al.*, Hamilton, Ont. Crucible for melting glass. Nov. 30, 1875.

5,432.—E. Patterson *et al.*, Cornwall, Ont. Reservoir on street lanterns. Nov. 30, 1875.

5,433.—E. Rawlings, Montreal, P. Q. Advertising medium. Nov. 30, 1875.

5,434.—R. Heneage *et al.*, New York city, U. S. Ozone machine. Nov. 30, 1875.

5,435.—R. A. Griffin, Montreal, P. Q. Extension of No. 751. Peat fuel machinery. Nov. 30, 1875.

5,436.—S. Wallace, Seaforth, Ont. Machine for cutting veneers. Dec. 1, 1875.

5,437.—A. Kline, Bondhead, Ont. Machine for washing linen. Dec. 1, 1875.

5,438.—J. W. Glover, Mount Savage, Ky., U. S. Horse detaching apparatus. Dec. 1, 1875.

5,439.—J. Cumming, Buffalo, N. Y., U. S. Railway frog. Dec. 1, 1875.

5,440.—W. S. Potwin, Chicago, Ill., U. S. Tea kettle handle. Dec. 1, 1875.

5,441.—C. E. Steller, Milwaukee, Mich., U. S. Sash holder. Dec. 1, 1875.

5,442.—A. H. Potter, Chicago, Ill., U. S. Watch or time keeper. Dec. 1, 1875.

5,443.—H. McKenzie, Rawdon, N. S. Apparatus for transferring wool, etc. Dec. 1, 1875.

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