SCIENTIFIC AMERICAN

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

Vol. XXXI.—No. 4.
[NEW SERIES.]

NEW YORK, JULY 25, 1874.

$3 per Annum.
IN ADVANCE.

IMPROVED HOISTING MACHINE.

The machine illustrated in the annexed engraving is the result of a series of experiments in adapting the friction clutch pulley, of the same manufacturers, as a means of transmitting the power, in combination with a new improved shipping apparatus and stop motion. All parts of the machine are inclosed in a single iron framework or hanger, so constructed that the bearings are less liable to get displaced or out of line than when bolted in separate parts to the wood framework.

We represent the device in perspective, Fig. 1, and in section, Figs. 2 and 3. The frame of the apparatus consists of the two main standards, A, Fig. 1, connected and held in their position by means of the three studs or bolts, B, the two upper bolts or studs having shoulders inside, against which the standards bear when the outside nuts are screwed up; and the lower bolt being incased by the sheath or pipe, C, so that, when the nut is taken off either end, the bolt may be drawn out. The sheath, C, can be removed in case of necessity, for repairs or renewal of any portion of the machine in case of accident or wear. D is the main shaft, having its bearings in each end of the frame standards, A. Upon the former are the worm gear, E, drum, F, and the small gear, G, which meshes into the gear, H, Fig. 2, which drives the stop motion disk, I. This disk has a V scroll cut from a point near its hub or center to its circumference; and when the drum, F, revolves, also rotates by reason of the gearing described. On the face of the scroll are adjustable stops for the purpose of striking the shoe, J, which traverses the radial slot in the shipper wheel, K. When the shoe is moved by the stops on the scroll wheel, this actuates the shipper rock shaft, L; and its crank, on its inner terminus, moves the sliding shipper bar to unship the clutch which is driving. This stop motion is independent of the stop motion usually provided in the hatchway on the shipper rope, being provided to prevent accident in case the latter should become disarranged or inoperative, as quite frequently happens.

Another important feature of this invention relates to stopping the revolving worm shaft, M, promptly at the same time the clutch is unshipped. This is accomplished by means of a brake, shown bearing against the worm in the oil receptacle, N, attached to one side of which is a bolt, O, adjustable by two check nuts to regulate the pressure of the shoe against the worm and a set screw on the opposite side. The top of the bolt is provided with a cam strap, which encircles the shaft adjoining the crank (which throws the shipper bar). The same movement of the shaft, L, which operates the shipper bar, also operates simultaneously to draw up the brake shoe against the worm to stop the revolution of the shaft, M, and thereby it prevents the platform from traveling by the point where it should stop, at the top or bottom of the hatchway, or at any intermediate point where it is required to stop. These machines are furnished with platforms when desired, the latter being constructed of new patterns, and extra strong in their safety parts.

All further information required, with circulars, may be obtained by addressing the inventor, Mr. Volney W. Mason, post office lock drawer 33, Providence, Rhode Island.

FIG. 1.

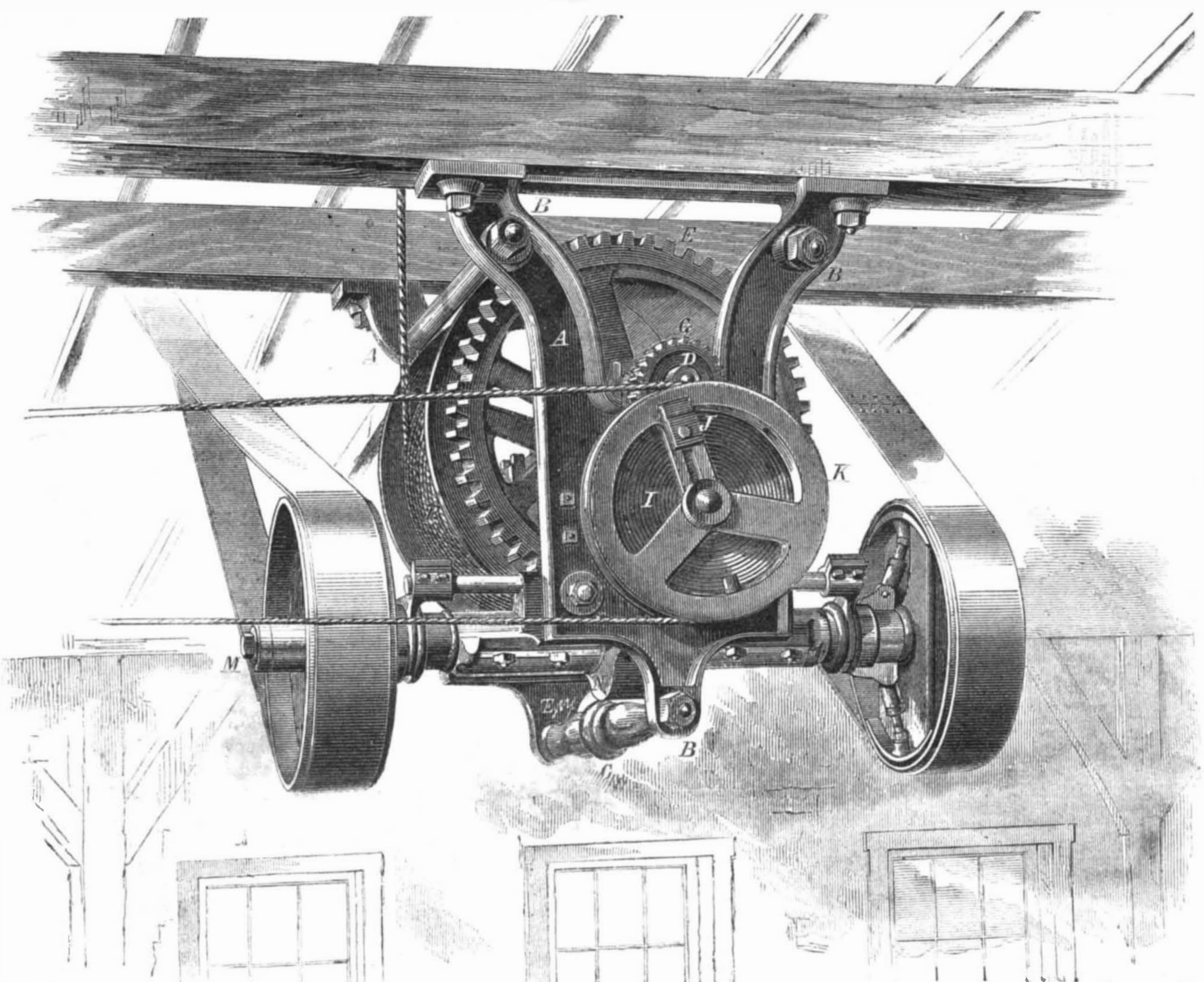


Fig.2

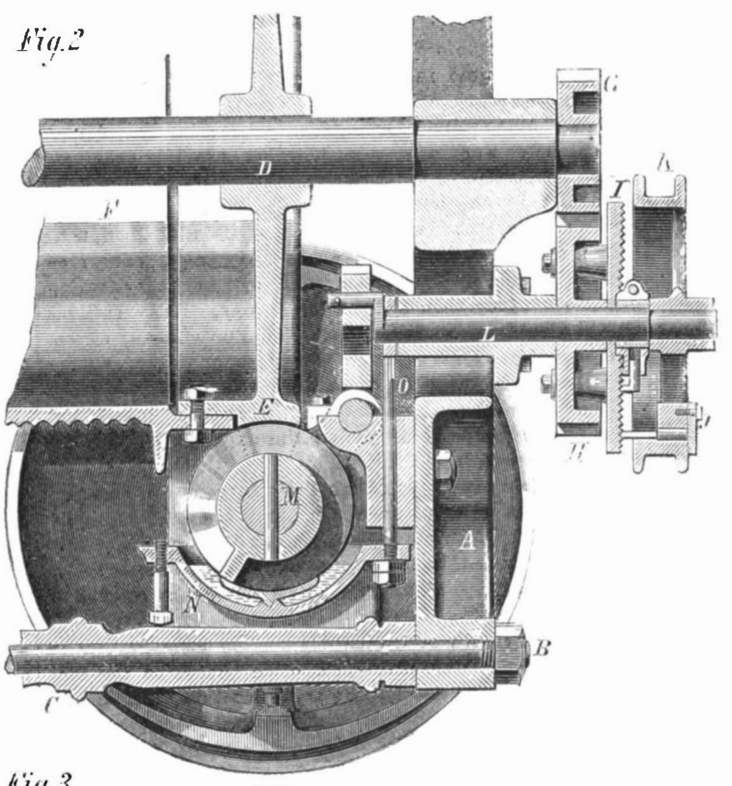
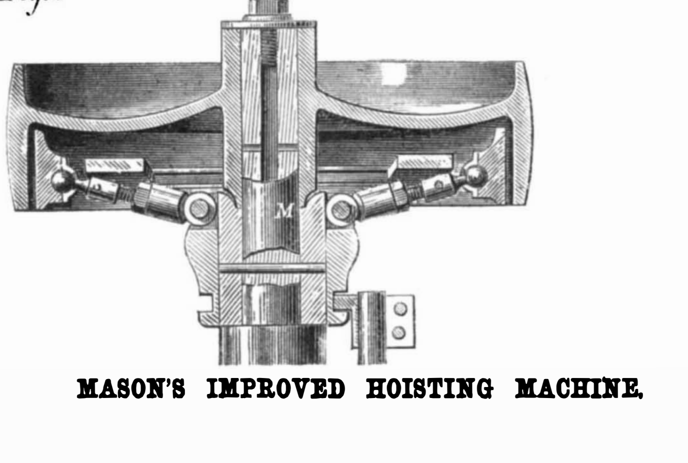


Fig.3



MASON'S IMPROVED HOISTING MACHINE.

The Magnetic Metals.

It is well known that, besides iron, there are a few other metals possessing magnetic properties, namely, nickel and cobalt in a strong degree, manganese and chromium in a feebler one. Mr. W. F. Barrett, in an article in the *Philosophical Magazine*, has pointed out the similarity of these metals to each other in their physical and chemical properties.

Thus, as to specific gravity, that of the thirty-eight known metals ranges from lithium, 0 50, to platinum, 21·5, a difference of nearly 21; whereas those of the three strongly magnetic ones are iron, 7·8, nickel, 8 3, cobalt, 8 5, where the extreme difference is only 0·7. Their specific heat is nearly identical; their atomic one is the same; so also their conductivity for sound, heat, and electricity. Their dilation by caloric, and the amount they lengthen by mechanical strain, are also identical. The enormous cohesive power of iron, nickel, and cobalt, in the solid state, signalizes these substances as the most tenacious of metals, and their melting point is only exceeded by the platinum group of metals. They are not volatile at the temperature of the hottest furnace, but only by the electric spark, when they yield very similar spectra. As to their chemical properties, the combining weight of iron is 56·0, nickel, 58·5, and cobalt the same. Chemists class these three metals in the same group, from the similarity of their chemical behavior, and also the identity of their combining energy or atomicity.

What has been said concerning the likeness of iron, nickel, and cobalt, in many respects holds true of manganese and chromium. The former has latterly been used to replace nickel in the alloy of German silver. The compounds of all these five metals are conspicuous for the brilliancy of their colors. This uniform coincidence suggests the practical inference that nickel and cobalt might be obtained in a malleable and ductile condition when submitted to a process similar to that by which wrought iron is produced.

Gas Pipes Fatal to Trees.

J. Boehm says: Cuttings of willow, the lower ends of which were placed in flasks containing a little water and filled with coal gas, developed only short roots, and the buds on the upper parts died shortly after unfolding in the air. Of ten plants in pots (varieties of fuchsia and salvia), among the roots of which coal gas was conducted through openings in the bottoms of the pots, seven died in four months. To show that the plants were killed, not by the direct action of the gas, but in consequence of the poisoning of the soil, several experiments were made with earth, through which coal gas had passed for two or three hours daily for two and a half years. The rootlets of seeds sown in this soil remained very short, and soon rotted. A plant of dracæna was re-potted in the soil; in ten days the leaves dried up and the roots died. The author thinks these results sufficiently account for the fact that trees planted near gas pipes, in streets, so often die; and recommends the inclosing of gas pipes in wider tubes, having openings to the air, and through which currents could be maintained by artificial means. Such a plan is still more to be recommended on hygienic grounds, since it has been shown, by Pettenkoffer, that infiltration of coal gas, through the soil, takes place even into houses not supplied with gas.

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS.

One copy, one year $3 00
One copy, six months 1 50
CLUB RATES { Ten copies, one year, each $2 50 .... 25 00
{ Over ten copies, same rate, each 2 50

VOLUME XXXI, No. 4. [NEW SERIES.] *Twenty-ninth Year.*

NEW YORK, SATURDAY, JULY 25, 1874.

Contents:

(Illustrated articles are marked with an asterisk.)

MORBID MENTAL CONDITIONS.

There is an old saying that "every man has a bee in his bonnet," which, being translated, means that we are each, on some one topic, slightly insane. Somewhere in the marvelous organism of the brain there is a weak spot; some place in the connection between mind and body is at fault; and in the exercise of certain faculties, as a consequence, our actions are less governed according to the dictates of a sound reason. We are not prepared to vouch for the accuracy of such a theory, or to adduce scientific proof in its support; but in the daily life of every one, instances apparently substantiating the notion may be constantly encountered. Take, for example, the search for perpetual motion, which in some reaches a mania, or, indeed, the efforts made for solving any of the problems which Science demonstrates to be beyond peradventure insoluble. This is not confined to the ignorant, though perhaps such a class are in excess; for there are men, scores of them now living, some we have ourselves encountered, who, while well versed in philosophy, and who will follow the mathematical demonstration that a circle cannot be squared or a perpetual motion constructed, point by point admitting the truth of every step, will yet, after all, nevertheless find it impossible to divest themselves of the idea that, by some hook or crook, the wished-for result may be obtained. Or, conversely, they may see results reached which their reason and knowledge must teach them are impossible, either in principle or from the means employed, without the addition of hidden or extraneous circumstances, and yet they will grasp at the apparent proof, and even hold it out to the world as genuine, simply because it goes to confirm their secret and cherished ideas which their very reason prevents them openly avowing. Such cases, mere ignorance being eliminated from consideration, we may term the mildest form of the "bee in the bonnet," and starting from them, as it appears, may be traced a whole series of mental defects, reaching perhaps up to actual monomania.

We mention the above as a common and harmless instance of the triumph of will or desire over reason and judgment. As the beginning of a special category of human actions, which, did we believe in the doctrine used by some, that spiritual beings unseen govern men's every doing, we should say were directed by a demon of perversity. Passing through all intermediate grades, considered in their ascending order, in proportion to their hurtful effects upon society, the end seems to be found in morbid impulse, in that strange condition which Professor Hammond, in his recent able lecture on the subject, defines as a state "in which the affected individual is impelled consciously to commit an act which is contrary to his natural reason and to his normal inclinations." We would not have confounded the feelings which impel an educated man to seek the perpetual motion, and those, which perhaps all of us have felt, when on the verge of some high eminence, to cast ourselves down; but while they differ in point of time, one extending over years and the other over seconds, there appears, in certain cases, in both a morbid element which, in its result of overcoming reason, lends to them a similarity sufficient to class them as extremes of a like mental action.

At the present time, however, when the plea of insanity is so frequently interposed in courts of law to shield the criminal from the consequences of his guilt, too great care cannot be exercised in approaching or admitting the existence of a mental state which tends to destroy the responsibility of a person for his own actions. How fine a distinction may be drawn, showing the existence or non-existence of morbid impulse, Professor Hammond indicates by pointing out that, in the case of a person committing murder while delirious, who acts in accordance with reason, though it may be perverted at the time, and in that of another who, supposing himself to be imminent to a great danger, commits suicide to avoid it, neither acts from morbid impulse; but if a delirium acts so over the mind as to convince a man that some one is going to murder him, and hence he lies in wait for and kills that individual, that is true morbid impulse. The person suffering is perfectly aware of his wrongdoing, but cannot help performing the action. Dr. Hammond mentions repeated cases of such impulses impelling men to murder, and instances especially that of Jesse Pomeroy, the child who recently killed his playfellow in Boston. The boy, on being questioned, asked to be put where he could not do such things.

In other cases people have been impelled to throw vitriol on handsome dresses, and we are aware of an instance of a lady, for some time known in society, who could not resist the temptation of stealing small articles from shop counters.

What to do with such people is a question which the community sooner or later must solve, and Dr. Hammond's answers, as the result of his experience, may be summarized as follows: A person aware of the influence of the disorder, and knowing that he cannot resist it, is bound to put himself under suitable physical restraint, so as to render it impossible to yield. If he does not, then, when shown to have committed acts thus impelled, it is the duty of society to prevent his being at liberty. Morbidly constituted persons who commit crime because it is pleasant for them should be dealt with according to law. The apparent absence of motive is apparent only. The fact that a murder has been committed in order that the perpetrator might secure his own execution is not a palliating circumstance; the desire to be hanged is the evidence of a morbid mind, not of an insane one. A morbid impulse to crime experienced by a really insane person demands continued sequestration; but the plea "I could not help it," when standing alone in an otherwise sane individual, should be absolutely disregarded.

CHEAP TRANSIT FOR OIL.

We have heretofore described the extensive ramifications of the pipes, used in the oil regions, for conveying the oleaginous products of the neighboring wells to the railway stations. Many miles of such pipes are now in use. A new and extensive work of this kind, which is rapidly progressing, is the oil pipe of the Pittsburgh Pipe Company, now being laid from the heart of the oil regions, at Millerstown, Butler county, Pa., to the Baltimore and Ohio Railroad, near Pittsburgh, Pa., a distance of about forty miles. The pipe has a diameter of three inches, and will have a delivering capacity of four thousand barrels a day. Relay stations will be placed every five miles. The pipe company expect to charge thirty cents a barrel for pipage, the present charge by railway being fifty-five cents. This will, doubtless, prove to be a profitable investment. The first cost of pipes is not great, and, if properly laid down, the expenses of working cannot be heavy.

The ordinary railways undoubtedly furnish the cheapest transportation for most products; but there are some substances, as, for example, water, gas and oil, that to a certain extent may be said to possess the power of self-transportation, whereby they can be moved cheaper than by railway or canal.

The facility with which liquids may be made to flow in pipes, between distant places, has often suggested the idea of using similar means for the transportation of grain and merchandize. Years ago it was proposed to convey grain from Chicago to New York in pipes, by air pressure, and the notion has been lately revived. The idea of transporting merchandize packed in rolling balls, within tubes, the balls to be driven by air pressure, was patented a generation ago in England, and re-patented here recently, as a new discovery. Wonderful things in the way of speed and cheapness of transportation were predicted in favor of these schemes. But the predictions were not based upon the mathematics of the subject. After all, whether the project relates to so ideal a thing as music, or so practical a matter as the carrying of goods, the performances of mankind are inexorably confined to the limits of exact numbers. We think that any intelligent person who will take the trouble to figure out the cost of pipes and air machinery, and the expenses incident to the working thereof, will soon become satisfied of the folly of expecting to compete with the ordinary railway over long distances in the transportation of general merchandize. The pneumatic system is a good motor for short lines in cities. But it stands no chance with the common railway, economically considered, on long lines through the open country.

Oil, water, and gas are exceptional commodities. These, when placed in pipes, will flow of themselves; and if the apparatus is properly arranged, of the right size, almost any extent of distance can be easily overcome. Thus, the city of New York is supplied with water which flows through an underground tube from Croton Lake, Westchester county, a distance of some forty miles, while the street piping, by which the water is locally distributed, has a total length of some two hundred miles. In view of the cheapness and facility with which liquids may be transported in pipes, it would seem as if this method might be employed with great advantage to convey oil, from its fountains in Western Pennsylvania to Philadelphia and New York. The present cost of transporting oil by rail from Venango and Butler counties to New York is $1.20 per barrel. The pipe system would, probably, effect a considerable reduction over this cost, and yield a handsome profit to the projectors.

POWER REQUIRED TO DRIVE COTTON MACHINERY.

The New England Cotton Manufacturers' Association have recently performed a good act in publishing a little "Manual of Power," prepared for them by the well known engineer, Mr. Samuel Webber, of Manchester, N. H. Mr. Webber presents an extended tabular statement of the power absorbed in driving mill machinery in a large number of mills, as determined by the dynamometer. Some of the machinery was new when tested, some very old, some in good and some in very bad condition. Special tests were made to determine the effect of weather changes, of different kinds of oils and various methods of lubrication, of altering the method of banding, etc. The information given is derived from the experience of the author, extending over several years, and is of great value to engineers and manufacturers. We have only space for a general *résumé* of results.

Cotton openers, delivering cotton loose on the floor, with single beaters revolving from 532 to 820 revolutions per minute, and single fans at 700 to 1,600 revolutions, required, including countershaft, from two to over six horse power: with two beaters and two fans, four and a half to six horse power. The cotton delivered ranged from 3,000 to 10,900 lbs. per day.

Cotton pickers, delivering cotton in the lap, at the rate of from 1,000 to 5,000 lbs. per day, required from 3 to 13½ horse power, averaging about 2½ horse power per 1,000 lbs.

Cotton cards absorbed from 2 to 9 horse power, carding from 30 to 76 lbs. per day, averaging about one twentieth horse power per pound for finishers, a third more for breakers, and one fifth for very fine work.

Railway heads required from 1¼ to 2½ horse power, a usual figure being about a horse power for 9 inch rolls at 10 yards per minute, and half a horse power for 1½ inch rolls at 300 revolutions per minute.

Drawing frames indicated a resistance of from ¼ to 1¾ horse power at speeds varying from 200 to 400 revolutions, 3 to 5 rolls, 2 to 4 doublings.

Roving frames ranged from 28 to 276 spindles per horse power, at speeds of from 475 to 1,350 revolutions. A fair performance would seem to give about 150 spindles per horse power, at 1,200 revolutions.

Throstle spinning required a horse power for from 65 to 165 spindles, the latter at 2,685 revolutions of the flier, the former at 5,000. Ring spinning absorbed very nearly similar power.

Mule spinning gave 200 to 280 spindles per horse power, speeds of spindles ranging from 3,000 to 5,000 revolutions.

Cotton looms required usually about one sixth or one eighth horse power, at 120 picks per minute. Looms making 156 picks per minute, on Nos. 15, 16, and 20 warp and weft, ran 5·1 per horse power. Others, at nearly the same speed, on finer goods, ran 9 and 10 per horse power.

Cotton spoolers, at 100 revolutions, required 0 2 to 0·3 of a horse power, twisters about three fourths of a horse power, and warpers 0·11 to 0·17; dressers 2 horse power, and slashers 1¼ horse power.

A circular saw, 18 inches in diameter, sawing 3 inch hard plank, gave 1·27 horse power; and a saw, 9 inches in diameter, cutting 1 inch pine board, 1·6, their speeds being 1,300 and 4,000 respectively.

A small lathe, turning ⅜ inch iron, took 0·09 of a horse power, and a larger lathe, turning 1 inch iron, 0·21. An upright drill, boring a ¾ inch hole, absorbed 0·16. A crank planer, cutting with a two inch stroke, required 0·23, and a planer with a five feet table took, when making 4 feet length of cut, 0 25. Three polishing wheels, of 12 inches diameter and 1½ inches face, absorbed 1·15. A grindstone, 6 feet in diameter and 12 inches face, grinding axes, took 3 horse power, while another, 6½ feet diameter, grinding axes, in wooden boxes, absorbed 11; and a stone, 3 feet 10 inches in diameter and 11 inches face, required 7·8.

Wool cards absorbed 0·9 to 1·27 horse power, at 96 to 130 revolutions; jacks, at 2,457 revolutions, 0·65 to 0·78; and looms, making 65 to 95 picks, took 0·4 to 0 6.

Coefficients of friction on shafting ranged from 0·0336 to 0 759, a good average result being about 0 05.

Reviewing the whole series of results, we deduce the following as fair approximate rules for estimating power:

Cotton openers, one horse power per thousand pounds cotton delivered.

Cotton pickers, three horse power per thousand pounds cotton delivered.

Cotton cards, one twentieth horse power per pound cotton delivered per day.

Cotton cards, best practice, one fortieth horse power per revolution per minute.

Railway heads, breakers, one horse power per each ten yards per minute.

Railway heads, finishers, 0·001 horse power per revolution per minute.

Drawing frames, 0·002 horse power per revolution per minute.

Spindles, 0·008 horse power per spindle per 1,000 revolutions.

The very great irregularity of the results given in the pamphlet indicates how vast are the losses experienced in every mill where machinery, badly made, out of repair, or badly lubricated, is allowed to run. We have little doubt that there are many mills in the United States where a knowledge of these facts may lead to a reduction of running expenses within their walls, which will go far toward compensating the proprietors for their losses incurred in these dull times outside their mills.

A SWITCH ACCIDENT.

A very unfortunate switch accident recently took place on the Shore Line Railway, near New Haven, Conn. The switchman shifted the switch just before the last truck of the last car of the train had passed. This threw the truck from the rail, and the truck bumped along over the sleepers for a short distance to a trestle work bridge, when the rear car fell off the trestle, drawing with it the next car ahead, then the next, and the next, and then the baggage car. The coupling then broke, leaving the tender and the locomotive on the track. The superintendent of the road, Mr. William Wilcox, was in the baggage car and jumped out, but only to be crushed and killed by that car. His was the only life lost, though many passengers were more or less injured. The train was moving quite slowly, or the loss of life might have been serious, as the trestle was some fifteen feet high. The coroner's jury found that the switch was in perfect order, both before and after the accident; and there appears to be no other way to account for the catastrophe than as stated, though the switchman avers that he did not move the switch too soon, as alleged. The switch was of the caboose style, the switchman being obliged to enter a round house and close the door, in order to shift the switch, the switch being connected with the door. The object of this arrangement is to compel the switchman to remain at his post so long as the main track is open. A window is so placed in the house that the range of view of the switchman is confined almost entirely to the switch points, thus compelling him, as it were, to pay attention to his duty, that is, observe the switch.

This device has been in use for several years on the Connecticut railways, and has hitherto been an effective and valuable auxiliary in the prevention of switch accidents. It is, perhaps, as good a contrivance of the kind as can be provided. But what the public require is an easy plan of shifting cars from one track to another, without subjecting passengers to the risk of injury if a switchman is sleepy or careless. One plan of this kind was mentioned last week in the SCIENTIFIC AMERICAN, whereby switches are done away with altogether.

It is pleasing to be able to state that the Shore Line Railway is a comparatively well appointed institution, in respect to the ordinary means of safety. The rails are of steel. To prevent a repetition of the telescoping horror which occurred on this road a few years ago, the cars have been provided with the Miller platform and its strong couplings. Had the cars at the time of this last accident been coupled with the old style of couplings, it is probable that the coupling of the first car that left the track would have snapped, and the other cars would not have been thrown down. The strong safety couplings appear to have been productive of evil in this case But experience shows that, in the ordinary run of accidents, in nine cases out of ten, this device may be relied upon to prevent injury.

Superintendent Wilcox was one of the most careful, experienced, and able railway officials in this country, highly esteemed in every walk of life. His loss is deeply deplored.

THE MANUFACTURE OF GEM STONES.

What boxwood is to the wood engraver—the means without which his finest art would be impossible—that chalcedony is to the engraver of gems. Hard without brittleness, susceptible of a fine and endurable polish, tinted by Nature with beautiful and at times strongly contrasted hues, or capable of taking on such colors at the hand of man, it has been from the earliest period of art not only the favorite medium but the only possible medium of the gem engraver's most striking effects.

In its simplest state, chalcedony is an unattractive white stone, nearly transparent, and chiefly useful for making spear heads and arrow tips, or their more modern representatives, gun flints. Sometimes it has a striped or banded appearance, due to alternations of more or less translucent layers, ranging in color from whey white to the white of skim milk, still not very serviceable for gems or jewelry. When stained by metallic oxides, however, chiefly those of iron, it rises to the dignity of gem stone, as sard, cornelian, chrysoprase, etc., when uniformly tinted brown, yellow, red, or green: as agate, onyx, sardonyx, etc., when the colors lie in bands or strata, or are separated by layers of white. The natural formation of these flowers of the mineral world is recorded in their substance. Though commonly found in lavas and other igneous rocks, or in the *débris* remaining from their disintegration, gem stones are substantially an aqueous product, and require the agency of fire simply to develope their fine colors, a step in their production more the work of Art than of Nature.

At high temperatures, especially under pressure, silica, the basis of all these stones, is dissolved to a limited extent by water, and thrown down in a more or less crystaline form when the temperature falls or the pressure is lowered. Illustrations of this process may be seen on a grand scale in the hot springs of the Yellowstone country and elsewhere in the Great West, where immense masses of siliceous sand and rock, sometimes chalcedonic, have been brought up from the heated depths by the flowing or spouting water, and deposited around the orifices of the springs. When water similarly impregnated with silica finds passage through rocks containing cavities, bubble holes, and the like, a portion of the mineral is deposited in the cavities, gradually filling them from circumference to center, the variable rate of deposit showing in concentric rings or bands of more or less opacity. Frequently the supply of silica-bearing water appears to have been prematurely cut off, leaving a crystal-lined druse or geode; and occasionally the cavity remains filled with water hermetically enclosed, forced in possibly under pressure and unable to escape when, by some geologic change, the pressure has been removed. In case the siliceous water is also charged with iron, nickel or other metal, the stone may be more or less impregnated with the foreign material according to the degree of its crystalization, the more amorphous layers naturally taking the most and consequently developing the deepest color when subjected by Nature or Art to the action of heat, sunlight, or other agent of chemical change. Or after the deposition of the stone, the enclosing rock may be washed by chalybeate or other mineral waters supplying the coloring matter necessary to convert the unattractive gray chalcedony into the highly prized sard, cornelian, onyx, or other gem stone. It is in these latter processes that Art steps in to complete or improve upon the work of Nature, either by developing the latent color of naturally impregnated stones or, going further back, by supplying the coloring material also. Probably the majority of gem stones, thus owe part if not all their beauty of color to Art, as well as their beauty of engraving and finish.

The simplest process is the development or hightening of dull or latent color by the action of heat. The celebrated cornelians of India, for example, are largely produced from dull brown stones, by a native process of roasting in a matrix of camel's or cow's dung, which prevents the stones from being too highly or too rapidly heated. A temperature sufficient to char wood is enough, the effect being like that observed in the burning of bricks: the brown oxide of iron is changed to red oxide, and the color of the stone is correspondingly improved. At Oberstein, the great manufacturing place of gem stones in Germany, carefully regulated ovens are employed for the same purpose. Similarly treated lumps of unimpregnated chalcedony are converted into white cornelian, the texture of the translucent stone being sufficiently disturbed by the heat to make it opaque. The snow-white bands of onyx, to which we owe the art of the cameo engraver, are almost always artificially produced in this way, the heat which improves the color of the darker layers, serving to develope the white ones at the same time.

But Art, as we have said, goes a step further back, and introduces as well as developes the colors of these stones, sometimes producing effects which Nature is unable to rival. In all cases the staining process involves, first, the introduction of a substance capable of producing color on precipitation, by heat or chemical action, second, the precipitation of the color. As the stone is too finely grained to absorb any colored solution, the coloring liquid must itself be colorless To convert gray chalcedony into cornelian, the stone is soaked in a solution of pernitrate of iron, roughly made by dissolving old nails in dilute nitric acid; then the colorless pernitrate is changed into red peroxide of iron by roasting, the resulting color being faint or dark according to the amount of the solution absorbed. The more translucent the stone, the longer the period of steeping required; and when layers of unequal translucency exist, unequally colored bands result, giving sardonyx or cornelian onyx instead of simple sard or carnelian. Black onyx, that is, black stones crossed by bands of pure white, are always artificial. The coloring matter is carbon introduced in a colorless solution and blackened by fire or sulphuric acid. By the oriental and most ancient method, the stones are first boiled in honey or oil, sometimes for weeks, then heated to a temperature which chars the vegetable matter in the pores of the stone, producing black or brown according to the amount absorbed. This method produces the finest and most permanent black; but as the heating is liable to check or crack the stones and so destroy them, the western practice is to darken the carbon by the action of sulphuric acid. Inasmuch as the oriental black resists the action of nitric acid, while that produced by sulphuric acid is readily "drawn" thereby—that is, reduced to the iron mold tint of natural sardonyx—it has heretofore been regarded as a natural color. Billing has discovered, however, that it is merely a question of time in soaking, a sufficiently protracted bath in nitric acid drawing the oriental as well as the western black color. He has found also that any stone made pale by nitric acid, if properly heated, will recover its color by the charring of the carbon remaining in its pores, and that the color so produced will resist nitric acid as well as the best oriental black, which in fact it is.

The yellowish brown, orange, and lemon tints of sards are artificially producible by methods the same in principle as those already described, the last being developed by the action of hydrochloric acid on nearly transparent stones slightly impregnated by Nature with oxide of iron, the other two by the protracted soaking of the stone in the neutral solution of pernitrate of iron, afterwards exposing them to the action of sunlight.

The pale green of chrysoprase is imparted to translucent chalcedony by a bath in the saturated solution of nitrate of nickel, the best effect being produced with the unpurified metal, which always contains a trace of cobalt. The stone must remain a long time in the bath—three or four weeks or more—as it is nearly crystaline and the process is comparatively slow.

A blue color is more easily produced, but it is not permanent. The dye is Prussian blue, precipitated in the pores of the stone by the action of ferrocyanide of potassium on the peroxide of iron, introduced as for the production of red. A better effect is secured by soaking the stone in the ferrocyanide solution first, then treating it to a bath in the peroxide solution.

SCIENTIFIC AND PRACTICAL INFORMATION.

BLEACHING IVORY AND BONES.

The curators of the Anatomical Museum of the *Jardin des Plantes* in Paris have found that spirits of turpentine is very efficacious in removing the disagreeable odor and fatty emanations of bones or ivory, while it leaves them beautifully bleached. The articles should be exposed in the fluid for three or four days in the sun, or a little longer if in the shade. They should rest upon strips of zinc, so as to be a fraction of an inch above the bottom of the glass vessel employed. The turpentine acts as an oxidizing agent, and the product of the combustion is an acid liquor which sinks to the bottom, and strongly attacks the bones if they be allowed to touch it. The action of the turpentine is not confined to bones and ivory, but extends to wood of various varieties, especially beech, maple, elm, and cork.

SOFTENING VIOLIN NOTES.

M. Laborde states, in *Les Mondes*, that the disagreeable rasping tone peculiar to some violins may be avoided by placing a small strip of wax on the upper portion of the bridge. The notes are immediately rendered sweet and soft, and can be suited to the ear by regulating the size of the piece of wax.

RABIES IN ANTS.

Corrosive sublimate, it is said, has the most remarkable effect upon ants, especially the variety of insect which we lately described as living upon fungi found on leaves of trees. The powder, strewed in dry weather across their path, seems to drive every ant which touches it crazy. The insect runs wildly about and fiercely attacks its fellows. The news soon travels to the rest, and the fighting members of the community, huge fellows some three quarters of an inch in length, make their appearance with a determined air, as if the obstacle would be speedily overcome by their efforts. As soon, however, as they have touched the sublimate, says the narrator in the *Naturalist in Nicaragua*, all the stateliness leaves them; they rush about; their legs are seized hold of by some of the smaller ants already affected by the poison, and they themselves begin to bite, and in a short time become the centers of balls of rabid ants. As these insects are one of the scourges of tropical America, destroying vegetation in immense quantities, it is probable that this extraordinary remedy may be of considerable service to agriculturists.

A REMARKABLE HAILSTORM.

A hailstorm of extraordinary nature recently took place in the northern portion of New Jersey. The hailstones, it is stated, in some instances, measured as much as five inches in circumference, and resembled common rock candy, being of oval form bristling with cubical crystals. The ice was very hard and difficult to break, but when broken presented the appearance of the section of an onion, in its concentric rings. The damage done to buildings and crops was excessive, windows being smashed by scores, roofs torn, and fruit trees completely denuded.

FOSSILS OF THE DEPARTED.

A German inventor, Dr. Von Steinfels, seems to have hit a happy medium for disposing of the dead, which is at least free from the objections urged against burial, while it does no violence to the feelings which naturally shrink from destroying by fire the corpse of a beloved friend. It is proposed to place the body in a sarcophagus made of stone, and to pack around the corpse artificial stone or cement in a plastic state. The latter being allowed to harden, the remains become like a fossil embedded in the solid rock, and, if need be, the deceased finds his grave and his monument in one and the same mass.

COCOA NUT TREPANNING.

There is a well known trick performed by the clowns in pantomimes, to the mystification of the juvenile portion of the audience, which consists in shooting a hole in a man's head, and then artistically plugging up the orifice with a carrot, thus completely curing the apparently assassinated individual. While this is, of course, very ridiculous, it is not more so than a somewhat similar operation practiced by the inhabitants of Uvea, an island in the Loyalty group. These queer people have a notion that when a person gets a headache his skull is cracked, or that the bone is pressing down on the brain. Consequently they proceed to cure the trouble by cutting open the scalp, and scraping a hole in the cranium with a bit of glass, and then stopping the aperture with a piece of cocoanut shell rubbed smooth Sometimes the surgeon scrapes too far and injures the *pia mater*, when the patient is killed; but ordinarily the boring proceeds to the *dura mater*, leaving a hole in the skull. It seems that few adults are without perforated heads, and that the cocoanut patch is common.

Our Iron Rail Products.

In 1873 the United States produced 850,000 tuns of rails and imported 207,986 tuns, making an aggregate consumption of 1,057,986 tuns. Comparing these figures with those of 1872, there is shown a diminution of production of 91,992 tuns, and of importation of 372,864 tuns. From this it appears that the effect of the stoppage of railroad construction, due to the panic, must have resulted far more disastrously to foreign producers of rails than to those at home. The figures of importation for 1873 are less than those of any single year since 1867, while the aggregates of 1872 are larger than at any period during the past twenty years. Our production during the last mentioned space of time steadily increased, rising gradually from 108,016 tuns in 1854 to 941,992 tuns in 1872, while on the other hand importations have widely fluctuated, running as low as 10,185 tuns in 1862.

The coal product for years past shows an enormous development, every year, with one exception (1867), indicating an increase. For 1873 about the usual rate of augmentation was maintained, 45,413,000 tuns being produced, against 42,749,000 tuns in 1872 and 22,500,000 in 1864.

The Chemical Centennial.

We have already alluded to the proposition of Dr. H. Carrington Bolton, of Columbia College, of a reunion of chemists to celebrate the hundredth anniversary of the birth of modern chemistry, that event being fixed as in the year 1774, owing to the discoveries, at that time, of oxygen by Priestley, chlorine by Scheele, and other important investigations by Lavoisier having simultaneously taken place. The day set apart for the meeting, we understand from a circular lately received, is August 1st next, and the place, Northumberland, Pa., where Priestley's remains are buried.

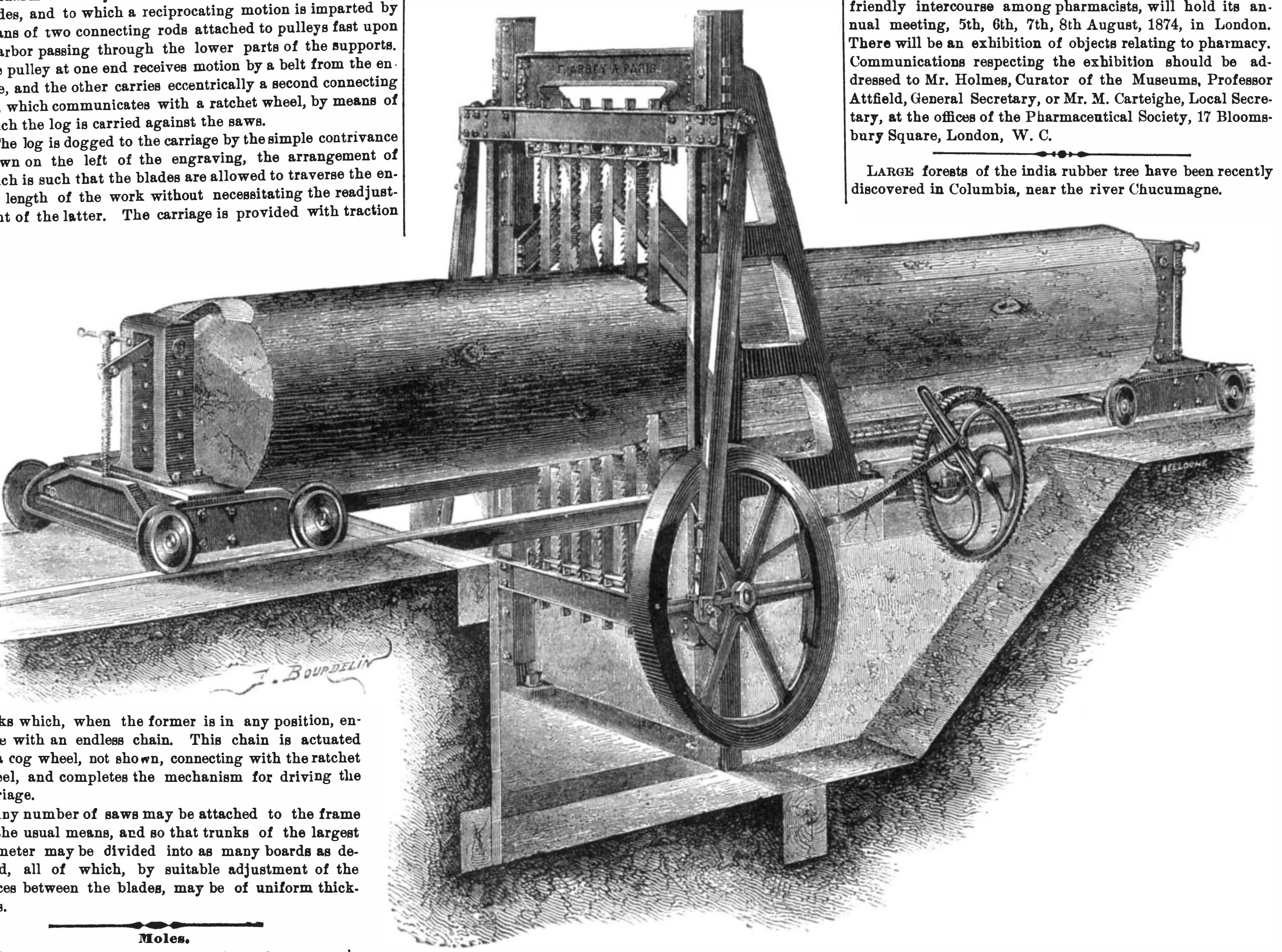
The programme of the celebration will include an address by Professor Joseph Henry; a sketch of the life and labors of Joseph Priestley, by Professor Henry H. Croft, of Canada; a review of the century's progress in theoretical chemistry, by Professor T. Sterry Hunt; a review of the century's progress in industrial chemistry, by Professor J. Lawrence Smith, and an essay on American contributions to chemistry, by Professor Benjamin Silliman. The books, manuscripts, etc., of Dr. Priestley will be exhibited, together with other objects of historical interest.

GANG SAW IMPROVEMENTS.

We extract from the *Moniteur Industriel Belge* the annexed engraving of a new gang saw, manufactured by M. Arbrey, of Paris. The machine, which appears to be of very simple, and doubtless effective, construction, is composed of two heavy standards of cast iron, joined above by a crosspiece and bolted below to a heavy bed of stone. Between the standards vertically travels a frame which carries the saw blades, and to which a reciprocating motion is imparted by means of two connecting rods attached to pulleys fast upon an arbor passing through the lower parts of the supports. The pulley at one end receives motion by a belt from the engine, and the other carries eccentrically a second connecting rod, which communicates with a ratchet wheel, by means of which the log is carried against the saws.

The log is dogged to the carriage by the simple contrivance shown on the left of the engraving, the arrangement of which is such that the blades are allowed to traverse the entire length of the work without necessitating the readjustment of the latter. The carriage is provided with traction hooks which, when the former is in any position, engage with an endless chain. This chain is actuated by a cog wheel, not shown, connecting with the ratchet wheel, and completes the mechanism for driving the carriage.

Any number of saws may be attached to the frame by the usual means, and so that trunks of the largest diameter may be divided into as many boards as desired, all of which, by suitable adjustment of the spaces between the blades, may be of uniform thickness.



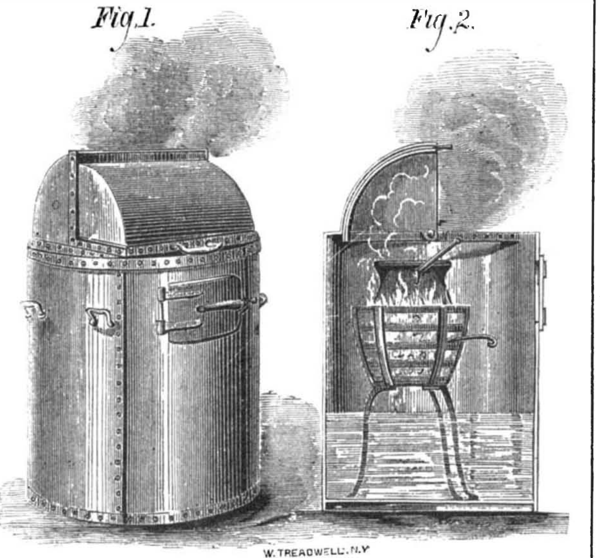
A FRENCH IMPROVEMENT IN GANG SAWS.

Moles.

M. Flourens and other naturalists have experimented with moles to ascertain their habits. It has been found that they will starve to death in presence of abundant vegetable food, refusing to touch it, but that they will greedily devour cutworms, earthworms, mice, and even small birds, when nearly starving in an enclosed jar. Of the birds they only devour the inside; but they devoured, indiscriminately, their own weight each day of snails, insects, larvæ, chrysalides, caterpillars, adders, slow worms, and lizards. M. Carl Vogt relates an instance of a land proprietor in France who destroyed every mole upon his property. The next season his fields were ravaged with cutworms, and his crops totally destroyed. He then purchased moles of his neighbors and preserved them as his best friends.

A SAFETY FURNACE.

We extract from the London *Building News* an illustration of a furnace for the use of plumbers in repairing roofs, an operation attended with considerable danger to the building itself, and (from the distribution of sparks by the wind) to others in the neighborhood. It is the invention of Messrs Shand and Mason, engineers, of London; and its use would probably have saved the roof of Canterbury cathedral from the destruction recently caused by fire.



In Fig. 1 is seen the furnace when closed, the only outlet from which is the slot in the cover, through which the smoke passes. The basket containing the fire is placed some distance below and at one side of this opening, so that immunity from the escape of sparks is secured. The tripod, on which is the fire basket, stands in nine inches of water; and a side opening, at the hight of the fire, allows of the introduction and removal of ladles and soldering irons. The cowl of the furnace can easily be removed when required.

The New York Post Office.

The new Post Office in this city is rapidly approaching completion, and the department will move therein during the latter part of the present year. About 100 workmen are now employed, principally upon the basement, first and second floors. In this part of the building, every improvement which invention can suggest will be utilized. Arrangements are in progress for pneumatic tubes from all the daily newspaper offices to the paper mailing room, by the use of which hardly an instant will be wasted in the dispatching of daily journals. The basement portion of the building has been arranged with special reference to the admission of railway postal cars from the tracks of the Broadway Underground Railway; and when that road is built, the mail cars will run directly down from Forty-second street into the Post Office building. The Underground Railway is to pass directly along the Broadway front of the edifice. One of these days, when the Hudson river is tunneled or bridged, the postal cars of all the railways that center in this vicinity, such as the New Jersey Central, the Pennsylvania Railway, the Erie, the Delaware and Lackawanna, will all be brought down on the Broadway Underground Railway, directly into the basement of the Post Office. This will greatly facilitate the receipt and dispatch of the mails. The new Post Office is a magnificent building, imposing in appearance, and well calculated, by its location and construction, to be the great postal center of the country. The estimated cost of the building is over five millions of dollars.

Results of Improved Weapons.

Improvements in missile weapons have, partly by keeping the combatants wider apart, tended materially to reduce the cost of victories in their most costly element—human life and suffering. The French War Office has worked out the statistics of this question and the following are some of the results: At the battle of Friedland, the French lost fourteen per cent and the Russians thirty per cent of their troops; and at Wagram, the French lost thirteen per cent and the Austrians fourteen per cent. At Moscow, the French lost thirty per cent and the Russians forty-four per cent. Again, at Waterloo, the French lost thirty-six per cent and the Allies thirty per cent of their forces engaged. Forty years later, when the new weapons were employed, the loss of the French at Magenta was seven per cent, that of the Austrians the same. At Solferino, the French and Sardinians suffered a loss of ten per cent, and the Austrians of only eight per cent.

THE British Pharmaceutical Conference, for the encouragement of pharmaceutical research and the promotion of friendly intercourse among pharmacists, will hold its annual meeting, 5th, 6th, 7th, 8th August, 1874, in London. There will be an exhibition of objects relating to pharmacy. Communications respecting the exhibition should be addressed to Mr. Holmes, Curator of the Museums, Professor Attfield, General Secretary, or Mr. M. Carteighe, Local Secretary, at the offices of the Pharmaceutical Society, 17 Bloomsbury Square, London, W. C.

LARGE forests of the india rubber tree have been recently discovered in Columbia, near the river Chucumagne.

APPARATUS FOR TRANSPLANTING TREES.

In order to reconstruct the Bois de Boulogne, the great pleasure ground of Paris, which, during the late war, suffered almost total demolition at the hands of the contending forces, it has been necessary to transplant a large number of trees to replace those cut down. This work being found very costly, as well as difficult to perform with existing means, a less expensive method has been devised for its accomplishment, which consists in the use of wagons especially built for transporting the trees bodily from place to place.

Our illustrations show two forms of the apparatus, Figs. 1 and 2 giving different views of the small one horse vehicle, and Fig. 3 of the largest machine, requiring the power of several horses. The former is constructed of wood and the latter of iron. The mode of operation co sists in first digging an annular trenc around the tree, so as to leave sufficie earth about the roots of the latter. As th excavation progresses downward, the e terior of the clod is enveloped in branch or with barrel staves encircled by iron hoop held by binding screws. The tree is su tained by guys from falling. When a su ficient depth is reached, the earth und the tree is cut away and planks shoved be neath.

Timbers are next laid on the surface t serve as ways for the vehicle, which is ru thereon. The rear crosspiece of its fram is detachable, so that the machine can b placed directly over the hole and surroun ing the trunk. Chains are then carrie down from the two windlasses and led u der the planks beneath the roots. Th windlasses being turned, the tree, root and clod are lifted bodily up between th wheels, and there remain suspended whi the wagon is dragged off to the point which the tree is to be placed. There, hole being dug, and its interior well w tered, the tree is lowered in and the ear packed around, thus completing the operation. The smaller vehicle is used for moderate sized trees; but with the larger one and its more powerful machinery, trees of considerable magnitude, it is stated, may be readily transported.

It may be added that vehicles for transplanting large trees have long been in use in this country. In the Central Park, in this city, and Prospect Park, Brooklyn, many large trees have thus been transplanted with much success.

Fig. 1.

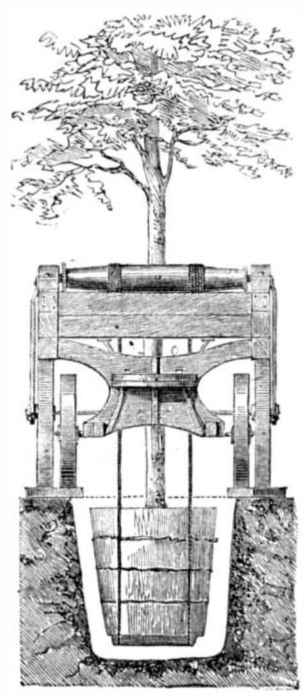
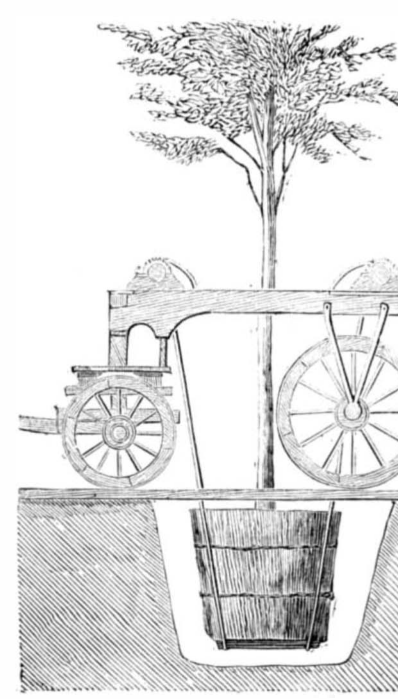


Fig. 2.



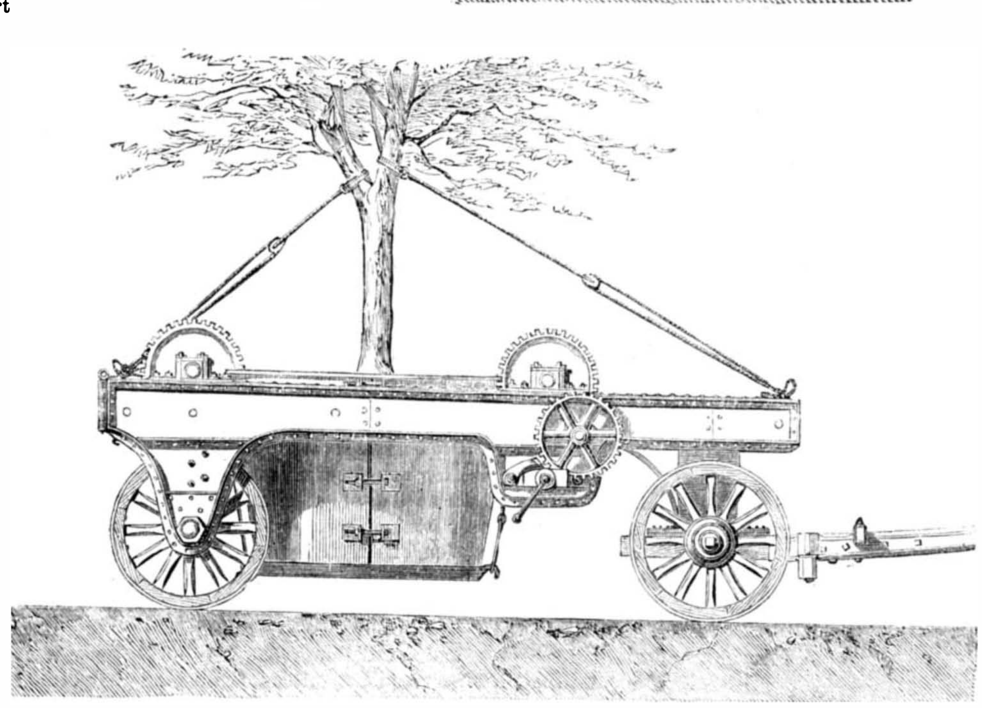


Fig. 3.—APPARATUS FOR TRANSPLANTING TREES.

Sad Fate of a Nevada Inventor.

The coolest and most refreshing item we have read since the commencement of the heated term lately appeared in the Virginia City (Nevada) *Enterprise.* The story runs thus: A gentleman who has just arrived from the borax fields of the desert regions surrounding the town of Columbus, in the eastern part of this State, gives us the following account of the sad fate of Mr. Jonathan Newhouse, a man of considerable inventive genius. Mr. Newhouse had constructed what he called a "solar armor," an apparatus intended to protect the wearer from the fierce heat of the sun in crossing deserts and burning alkali plains. The armor consisted of a long close-fitting jacket made of common sponge, and a cap or hood of the same material, both jacket and hood being about an inch in thickness. Before starting across a desert this armor was to be saturated with water. Under the right arm was suspended an india rubber sack, filled with water, and having a small gutta percha tube leading to the top of the hood. In order to keep the armor moist, all that was necessary to be done by the traveler, as he progressed over the burning sands, was to press the sack occasionally, when a small quantity of water would be forced up and thoroughly saturate the hood and the jacket below it. Thus, by the evaporation of the moisture in the armor, it was calculated might be produced almost any degree of cold. Mr. Newhouse went down to Death Valley, determined to try the experiment of crossing that terrible place in his armor. He started out into the valley one morning from the camp nearest its borders, telling the men at the camp, as they laced his armor on his back, that he would return in two days. The next day an Indian, who could speak but a few words of English, came to the camp in a great state of excitement. He made the men understand that he wanted them to follow him. At the distance of about twenty miles out into the desert, the Indian pointed to a human figure seated against a rock. Approaching they found it to be Newhouse, still in his armor. He was dead and frozen stiff. His beard was covered with frost, and, though the noonday sun poured down its fiercest rays, an icicle over a foot in length hung from his nose. There he had perished miserably, because his armor had worked but too well, and because it was laced up behind where he could not reach the fastenings.

THERE are Pullman palace cars on all lines in Upper Italy.

A Queer Looking Prescription.

For all that might be recognized, after careful examination, the scrawl which we give in facsimile herewith might indicate either the vagaries of planchette or the tracks of a spider whose legs had been dipped in ink. It happens, however, to be neither, but, on the contrary, a physician's prescription, printed in the London *Chemist and Druggist*—a formula for a medicine which, if wrongly compounded, might produce death directly, or be indirectly injurious by failing to better the sufferer. We publish it as a specimen of the difficulties and doubts which dispensers of drugs are too often called upon to decide. It is not an uncommon thing for physicians, lacking knowledge of chemistry, to order compounds the ingredients of which exercise their mutual affinities in some unlooked for manner, tending perhaps to neutralize the remedial effect sought in the mixture; but where ignorance may be palliated, carelessness may not be,

and for a doctor to emulate the calligraphy of Rufus Choate or Horace Greeley is a fault which cannot be condoned. Druggists receiving illegible prescriptions, or those in which there is the least ambiguity in the terms, should return them; promptly to the patient with reasons.

The Sanitary Condition of Water.

There is no more prolific source of disease than bad water; but to distinguish whether the fluid is unfit for consumption or not is somewhat difficult. Water from a certain river, spring, or well may be repulsive to the senses, and yet harmless to the stomach, in comparison with other water which has a much more attractive appearance. Perhaps the best mode of determining the question is to examine the condition of the organisms dwelling in the proposed source to be utilized. If, for example, an industrial establishment or a collection of dwellings empties refuse into the stream, and as a result fish disappear or are found dead upon the surface, it is certain that the water is strongly and injuriously affected. The gradual infection may be noted by the fish first rising to the top, apparently ill at ease, and subsequently dying.

In vitiated water also mollusks perish, and their bodies decompose rapidly. In the air they merely seem to dry up and retain life, though torpid for some time, becoming revivified by return to water. Cresses cannot live in corrupt water, and their existence is a sign of purity in the fluid. White algæ deprived of their green color indicate absolute corruption.

M. Gerardin, in referring to this subject, in a recent note to the French Academy, states that the best method of measuring the degree of purity or of infection in water is by determining the amount of oxygen in a given quantity. Water containing a large per centage of the gas is pure and good; but when little of the latter is present, the water is decidedly deleterious to health.

A New Alkaloid from Morphine.

G. Nadler has obtained an alkaloid by the action of ammoniacal solution of oxide of copper on morphine, the chlorine compound of which is dazzlingly white, sparingly soluble in cold but easily soluble in hot water, and insoluble in alcohol and ether. The aqueous solution gives with ammonia a dense, white, amorphous precipitate, which does not alter in the air while moist, but dries up, like aluminum hydrate. Ferric chloride produces in the aqueous solution an amethyst red color, which rapidly darkens. Strong sulphuric acid dissolves the alkaloid on warming, forming a dark green solution, which does not alter when heated sufficiently to volatilize the acid. Blue ammoniacal copper solution assumes a splendid green color. Potash, like ammonia, produces in the aqueous solution a curdy precipitate, which however, dissolves in excess in the cold. In this respect the alkaloid resembles morphine. The potash solution, when heated to boiling, deposits the alkaloid in silvery scales. The alkaloid rapidly reduces silver nitrate, and gives with platinic chloride a pale yellow platinum salt. Dilute sulphuric acid throws down from the solution in hydrochloric acid a white amorphous sulphate. The new alkaloid is distinguished from morphine by being precipitated in the amorphous state by ammonia, by its behavior with ferric chloride, ammoniacal copper solution, potash, and strong sulphuric acid, and by the sparing solubility of its sulphate; and from apomorphine by the fact that in the moist state it does not become colored on exposure to the air, but remains perfectly unaltered.—*Journal of the Chemical Society.*

THE manufacture of cast iron nails and shoe pins is peculiar to the South Staffordshire (Eng.) district, although, curiously enough, the demand for one description, known as lath nails, is almost entirely for Scotland. The smallest nail made is ¼ inch in length, and of these a good workman will mold upwards of 750,000 in a day. The largest measure 2½ inches long, and of these a good day's work is about 52,000. The yearly production of cast nails is about 1,000 tuns.

A new air machine has lately been put in operation in the House of Commons, London. By means of this apparatus a constant supply of air, cooled to any required degree even in the warmest weather, can be supplied at the rate of from 60,000 to 90,000 gallons per minute. The House contains about 900,000 gallons of air, so that, when the apparatus is working at its maximum, it is possible to renew the air without sensible draft every six minutes.

M. TOMMASI, inventor of the hydro-electric cable, a device by means of which signals are transmitted through fine tubes filled with water, has lately succeeded in sending ten signals per second over a distance of two miles and a half. A full description, with illustrations of the invention, is contained in *Science Record* for 1872.

Correspondence.

Aerial Navigation.

To the Editor of the Scientific American:

The accompanying engraving shows a boat which, it is asserted, can be propelled and guided through the air by means of surplus buoyancy (in rising) and weight (in falling) without any machinery, except the two rudders and the weight exhibited.

A is a boat of fixed form, inside of which is placed a gas bag. B B are stationary resisters or wings, projecting on each side, on a plane with the bottom of the boat. D is an ordinary rudder attached to the stern of the boat, to guide it in a horizontal direction; C is a horizontal rudder, connected by a rod with E, which is a weight; these, pushed fore or aft, will elevate or depress the bow of the boat.

The two rudders, the weight, as also the valve for the escape gas, and said bags, if any, are all to be controlled by a man in the pilot house at the bow; and when ready for starting, the center of gravity is through the cabin.

Suppose we have a surplus buoyancy of 500 lbs.: this, I claim, will lift the boat with the same force as if it were so many pounds falling, and the air will press downwards, so the boat will take the course of least resistance—a diagonal—the resultant of the two forces. Besides, after ascending upward and forward some distance, a force will be developed which, on depressing the bow of the boat, will drive it some distance downward, or further on a horizontal. The same action as described in rising will take place in falling, after 1,000 lbs. of buoyant force is thrown off, leaving the weight 500 lbs.

D. L. RHONE.

Wilkesbarre, Pa.

The Mississippi River.

To the Editor of the Scientific American:

The letter of Mr. Sidney Cook, of Presque Isle, Mich., in your issue of June 27, proposing to deepen the channel at the mouth of the Mississippi by means of currents of water forcibly discharged on the bottom, calls to mind my letter to you under date of July 30, 1868, describing a dredging process invented by me, in which I said: "I propose a powerful pump on a vessel (steamboat, ship, or scow). The pump to be propelled by steam or other power, and conduct the water through pipes to near the bottom, there to be ejected downward, vertically, or at such angle as may be found advantageous. The force of the water, shot through a pipe, will rouse up all the mud or earth at the bottom of the river, and the natural current will carry it away." And again in my letter of August 6, 1868: "to be used on steamboats or other vessels to remove bars when aground." This plan of operating was secured by letters patent (No. 95,213) to me, in 1868, you being the agents and attorneys.

In 1869 I had a tin model made of a section of a vessel to operate at the mouth of the Mississippi, and have it yet, which, together with patent 95,213, will show Mr. Cook that he has been anticipated. My patent machine (on paper) is now under consideration by United States engineers, and ought to be put into a substantial form for use. That the mode of operating proposed by me is the most philosophical, the most in harmony with natural laws, and the most economical, I have never doubted; but I have not been in a fret to have it put to use. Everything must bide its time; and inasmuch as water, put in motion rapidly enough, will stir up mud more effectually than any other agency at the same cost, the time will surely come when my mode of removing bars—where there are currents—will be resorted to. Dredging is not, in my opinion, the proper remedy at the mouth of the Mississippi. I would build jetties, and make the river keep its own mouth open. But if people will try to keep a channel deep by dredging, let them do it in the best way.

Kirkwood, Me. R. S. ELLIOT.

The Shadow Sail.

To the Editor of the Scientific American:

In your issue of May 16 is an illustration of a shadow sail, spoken of as being patented. I have used one on my boat for the past two years; but instead of the clumsy arrangement described by *Land and Water*, I use one of the American fashion, namely, a lug sail nearly as large as the mainsail.

I need scarcely say that the shadow is useless except when going dead before the wind and when the jib can be of no service unless boomed out. I bend the fall end of the jib halyards to the yard, which saves the expense, or what is worse, the encumbrance, of a special halyard. The boom can be attached to the mast by a gooseneck; and in the case of boats with standing masts, a small stay from the hounds to the deck amidships could be fitted with a hook traveler to keep the sail in place aloft. A top sail could be as easily set over a lug as a gaffsail. The fore and aft guys or vangs are superfluous, as this sail needs them no more than the mainsail.

I am induced to make these remarks, thinking they may be useful to some person as fond of boating as I am.

Hermitage Bay, Newfoundland. I. LEWIS KNIGHT.

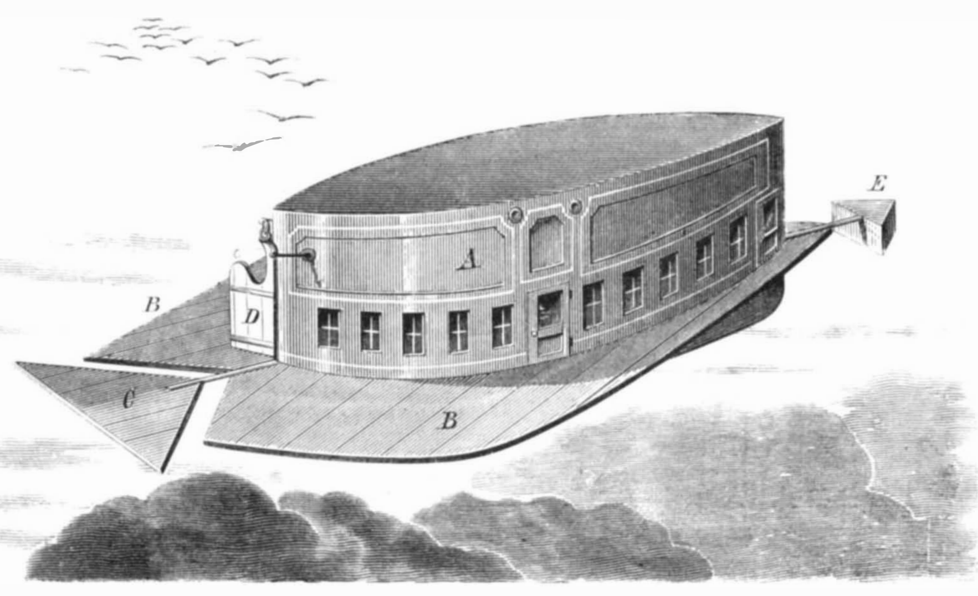
The Colorado Potato Bug.

To the Editor of the Scientific American:

The Colorado bug has appeared in Maryland, doing serious damage to the potato crop. I have tried every remedy suggested in print or by my own observation with the following results: Guinea fowl, recommended in a late issue of your paper, are ineffectual. The birds will eat a few, but soon become surfeited. Hellebore, sulphur, soot, ashes, whale oil soapsuds, carbolic acid, and many other methods give no positive relief.

I succeeded in saving my crop by shaking the larvæ from the vines and then dusting with Paris green. The simplest way to work is to cut a round log with the bark on, about 4 feet long, and 12 to 18 inches diameter. Sharpen one end and drive in a staple, to which harness a mule. Two boys with stout leafless bushes pass down the rows, striking the vines briskly and knocking the bugs into the space between the rows, where they are crushed by the log which follows. The vines should then be immediately dusted with Paris green 1 part and common flour 9 parts, thoroughly mixed and dressed on every point of the vine. A 3 lbs. fruit can, with the bottom punched full of holes, makes a handy and safe tool for this purpose. It is better to have two boys following the mule and applying the poison. In this way a large field can be rapidly worked. If the work is done while the dew is on the vines, the flour will cause the Paris green to adhere. For large fields the above mentioned force will be found more economical than a less number. In garden culture, of course it would not be required.

Baltimore, Md. MARSHALL P. SMITH.



A NOVEL AIR SHIP.

Car Ventilation.

One of the hardest of problems to solve appears to be that in relation to the satisfactory heating and ventilating of railway cars. The public demand for such appliances increases year by year, but has not yet been met. Never was there a better opportunity for the invention of effective devices in this line. A good and simple improvement would have a wide introduction and be likely to prove very remunerative to its author. Nearly all the railway companies are calling for improved means for heating and ventilation. The Master Car Builders' Association have frequently discussed the subject, and have appointed committees to search for information, but they cannot reach a satisfactory result. Different members have different views as to how ventilation should be accomplished. Here is an example of how minds differ on the subject, taken from the report of the proceedings of the Association at their recent session:

Mr. L. Garey, New York Central and Hudson River, said that the subject of the report was one of the greatest importance, especially that part of it which pertained to the ventilation of passenger cars. No public conveyances were so poorly ventilated as passenger cars; and if any improvement upon present devices for remedying the evil could be made, the means for doing it should be ascertained. He was glad to notice that the subject of ventilation was receiving a due share of attention in our common schools, and that the nature and elements of the atmosphere, its effects on physical health, and the importance of a right understanding of its laws, were getting to be better understood. He hoped there would be a full discussion of the subject in its application to railway cars.

Mr. J. D. McIlwain, Lake Shore and Tuscarawas Valley, thought the best method of car ventilation was to admit the air at the bottom of the car and let it out at the top. He did not find that the system of letting the air in and out at the top of the car exclusively worked well, for the reason that it did not create sufficient movement of the volume of air in the lower part of the car, where it was most needed.

Mr. W. W. Wilcox, Chicago, Burlington, and Quincy, said his road had formerly used the Ruttan system, but did not find it to be altogether satisfactory. His road was now using the system of taking in the air at the frieze and exhausting in the upper deck. The supply openings in the frieze, or upper part of the car sides, were protected by perforated plates, which to a very great extent excluded the dust. He had tried the plan of taking in air at the bottom, but it did not prove to be a success.

Mr. Ambrose Ward, Pennsylvania Railroad, had abandoned the frieze plan on account of the dust. He had found that the best point for admitting the air was under the hood at the end of the car, with an automatic arrangement on the roof for exhausting it.

Mr. W. R. Davenport, Erie Car Works, said that it was one of the most perplexing and difficult problems ever presented for solution. One important fact, which is very apt to be overlooked, is that a kind of ventilation which will do for summer will not do for winter, and *vice versa*. To get pure air, it must be taken in high up and not low down. Ventilation from windows in winter was not to be thought of. The air must be warmed in some way before it enters the car. This we have got to do. The top of the car must be closed in winter, and there must be a free outflow from the floor.

Mr. M. P. Ford, Pittsburgh, Cincinnati and St. Louis, said that none of them were satisfied with the methods they were using. He thought that, for summer, Foote's plan was as near perfect as any he had seen tried, which consisted in ridding the inflowing air of dust and other impurities by causing it to pass through a spray of water. This water was carried in a reservoir underneath the car, holding about two barrels, and the impurities contained in the air were shown by the color of the water, which was nearly black as ink after being used for any considerable time. He believed that in winter the air must be exhausted at the bottom. The great obstacle to the working of any effective plan was the movement of the car. This set nearly all theories at defiance.

Mr. John Kirby, Lake Shore and Michigan Southern, said that his road, as long ago as 1854, put the Foote ventilation into 24 new cars. The box reservoir under the car held between two and three barrels of water, and was 16 or 18 feet long. It was found objectionable, however, for several reasons. The apparatus occupied too much room in the center of the coach, the spray injured the seats, and in wet weather the car was too moist for comfort. These ventilators were all taken out at the end of the season, and Westlake's plan was next tried. This consists of a hood on the roof facing each way. It worked very well in the open country; but in the woods, where the smoke and cinders follow in the wake of the cars, it was less satisfactory. The Ruttan system was next tried, and was found to work well for short trips.

Mr. F. D. Adams, Boston and Albany, favored the plan of admitting the air into the end of the car by means of wicket windows over the door, the entrance of dust and cinders being prevented by a projecting hood on the outside. The drop sash in the door was objectionable, as it disfigured the door, was liable to rattle, and was more or less difficult to raise. Admitting air through the frieze was also objectionable, as it exposed passengers to a direct draft. The wicket sash over the end windows could be regulated by the conductors or passengers, and the projecting hood outside obviated the necessity for using wire screens.

Mr. F. D. Adams, Boston and Albany, said: "Mr. Garey has alluded to some experiments that were made on our road; these experiments were tried very thoroughly. The committee have taken a great deal of pains to ascertain all the facts that they could; and yet neither they nor any of the rest of us are fully satisfied yet. Some things, however, have been demonstrated beyond contradiction, and among these things are these exhaust ventilators talked about so much today. To speak in plain words, the whole thing is a humbug. I have got up on the seats and smoked, and in many cases I have found no air that would take the smoke out at any of these ventilators. If there happened to be an eddy, the smoke would go out with the air, and perhaps the next mile the air would come in. It does not create a steady draft out of the car. Practical demonstration shows clearly it does not do so.

I will allude to one other test that we are trying now. The air is conveyed into the car by a blower driven from one of the axles of the truck, at a speed of twenty miles an hour; about a thousand turns a minute, drawing the air into the car through a side window. This side window is covered with gauze wire, which is supposed of course to keep the cinders all out. The air is designed in the winter to pass over a hot stove, and in summer over an ice box. It is then taken immediately up to the top of the car and carried completely around in a tube perhaps six inches in diameter. That tube is at various points, as often as is deemed necessary, perforated with fine holes, allowing the air to pass out into the car, distributing it equally and evenly as far as possible. We found that, at a high rate of speed, this worked very finely. I might say, in addition, that they exhausted the air through the floor by registers. Unfortunately our road is very heavily graded, and we found that, when we came to go up a long grade of 75 to 80 feet to the mile with a heavy express train, we did not make very rapid speed, and consequently got no air. That trouble occurred on hot days, and we felt like knocking the windows out with our elbows. There is no difficulty in devising a plan to ventilate a house, yet the various circumstances under which railroad trains are placed make the difficulties to be overcome almost insurmountable."

Mr. S. Griffith, Indianapolis, Cincinnati, and Lafayette: "I think the time for exhausting the foul air is much less than any person would suppose,and I will state that we have a practical test of it by every train that passes over our road. There is a fertilizer factory established a few miles below the city on the road, which causes the air to be very offensive. The moment the train strikes this stench, the car appears to be entirely filled with it, but I don't think it requires half a minute after the car passes through this stench before it is entirely clear of it, to all appearance. We have nothing except the ordinary exhaust ventilators and perforated plates; and this is the case in winter, when the doors and windows are closed. I think that people generally are mistaken with regard to the time required to change the air.

Mr. J. M. Leech, Pittsburgh and Connellsville, said: "I think that what we require is something that will force the air from the floor up, and not something overhead. The ventilation that we have had heretofore has been either on the end of the car, forcing the draft into our faces, or else over our heads,forcing the air down. I think that what we require is something below. We don't propose to fasten down the windows. We propose to fetch the air in, and every person can regulate it to suit himself. We also propose in the winter season, by forcing the air over the fire box in the engine, to make it warm. In case the train is not in motion, there is a small stationary engine which will work a fan and supply air, either warm or cold, to fill the cars, giving all the air needed. I think something of that kind is what is required by the public."

PRACTICAL EDUCATION.

Professor John Sweet, of Cornell University, is a practical man, if there ever was one. It will be seen from the following address to the students that he considers the practice of the manipulations of the art which the student intends to follow to be of as much value in an educational sense as the study of text books, and thinks the time spent in the shop ought to count, hour for hour, equally with class room periods:

Mr. President and Gentlemen:—Every man's value, aside from his value to himself, that is, his value to his employer, if he be an employee, his value to his family, if he has one, and certainly his value to the world, depends upon what he can do rather than upon what he knows. Unless he can do, what he knows is nowhere. The more we know, the better we ought to be able to do. Education fills its mission only when it aids us in accomplishing our life work better or more readily.

However well a minister may be versed in theology, Scripture, morals, religion, rhetoric, and elocution, unless he has the power to hold an audience, to increase his congregation, to build up his church, to loosen the purse strings of his flock, he is not a success; he is of limited value. The first is to know, the last is to do. Many men possess the former without the latter, and doing is something accomplished without any very great stock of education. A physician, however thoroughly versed in his profession, if all his patients die, is a failure; while a quack who cures is so far a success; and in this matter of doctoring, which is especially one of the learned professions, so much depends upon practice, so much on good judgment, so much on the character of the patient and the influence of the physician in the sick room, that the knowledge which they acquire from books is on the short end of the lever; and the more successful the physician, the nearer the fulcrum gets to the book end. With the surgeon it is as with the physician. One might have the ability to make a manikin with his eyes shut; but if he lacks even the nerve, which is acquired only by practice, to cut off a finger, he would be, as a surgeon, a failure. A lawyer, were he an unabridged edition of Blackstone, bound in calf, if he had not the ability to convince the judge and jury, would be a failure.

Now, if this is true with professions professedly intellectual, is it not equally true of the profession of mechanical engineering? The question is not: Do you know how a carding machine works, but can you make a machine to trim teasel? Less likely are you to be familiar with threshing machines, cotton gins, locomotives, wood-working machinery, portable engines, clocks, gun-making machines, scythe making, gimlets, fish hook machinery, pin machinery, machines for setting carding machine teeth, rolling mills, books and eyes, blast furnace machinery, carpet tacks, machinist tools, nail machines, agricultural implements, and sugar machinery. The question is more likely to be: Have you done either, than have you seen it done, or do you know how it is done? More likely to be, can you do, than have you done? Are you to step from your graduating classes into positions of master mechanics, managing directors, superintendents, professors, or foremen? Is your sheepskin degree to be that which will enable you to get a high salary, a commanding position, a passport to every workshop you may walk up to? I hope none of you are so childish as to suppose it. Your education and the opportunities, if we can make them what I hope we can, will enable you to take leading positions; if you make the best use of your advantages and are judicious in selecting companions, you can lead. According to the natural order of things, not more than five out of every twenty will ever be mechanical engineers, and not more than two or three out of that five will ever acquire distinction. Five, ten, fifteen years, yes, even a lifetime, is to be devoted to work, work to which our two hours a day, in comparison, is but child's play, and not only work but study. Study with a new significance Study to achieve, not to acquire; study to do, not to know. Study to accomplish, and none of this long day, late night, temporary "cramming" to pass. If you have entered on the study of mechanical engineering with a view of becoming mechanical engineers, which it is fair to presume the most of you have, and as the success of a mechanical engineer most assuredly depends upon what he can do, the question of all others which most nearly concerns you is: How can you best fit yourselves for doing? One might spend his entire freshman's year in drawing 60° angles, free hand and by drafting instruments; he might spend the remaining three years of his college life in seeing a journeyman grind diamond-pointed lathe tools; and without practice, to which his four years drafting and observation would add nothing except to shorten the time required to learn, he could no more grind a tool for cutting screw threads than he could copy the statue of the Venus di Medici. No one knows how a piece of steel will "wiggle" on a grindstone until he tries it.

Handling a file even excellently well is an art acquired by years of practice only, and those of you who take to the glory of making a dead true surface with shadows of reluctance find even in that there is something gained by practice; or rather that, simple as it appears in itself, it is an art no more to be learned without practice than the art of writing. And further, when the time comes when you can say: "I can do it no better than I could yesterday; I can do it as well as any man:" then, if you will count up the time it has taken you to scrape a flat surface, you will find that it falls not much short of the time which it took you to learn to write. I expect you to ask why are we to learn to grind and file and scrape at all? Cannot we be mechanical engineers without going through the drudgery of a common workman? Let us see. Did you learn to read and write and cipher before you came to the university? Yes. And what headway would you have made had you not? Do you expect to run a lathe and keep a cheap hand to grind the tools for you? Do you expect to be a judge of a workman and his work without having been a workman yourself?

One cannot take a leading position unless in his own shop, without becoming an employee. Employers do not place their affairs in the hands of men without some evidence of competency, and inexperience in the minor affairs shows itself when one is least conscious of it.

You came to the university to get a higher class of instruction than you could at the common schools. I had hoped and still hope to make the Sibley College machine shop a place where you can get a kind of experience which you cannot get at the ordinary establishments, but you must learn to chip and file and grind before you are fitted for it. Some of you may reasonably inquire, then, why are not those who have learned the trade before coming here compelled to take shop practice and do by their work as they do by their studies? That is exactly what I had hoped to do, not by rules and proclamations, but by force of example. Those who are doing so, I believe, will have less reason to regret it at the end of their college life than those who are not.

The glory of winning the Woodford prize is only equal to the glory won by another the year before, and may be eclipsed by him who comes after; while the glory of making the first measuring machine of America is the glory of a longer time; a glory not to be divided. There may be a good many Woodford prize winners; there can be but one first measuring machine. I regret that, in carrying out my plan to let each and every one do what he wanted to do, so far as possible, there should be even so few who, it would seem, have wanted to take the advantage of it. I regret that I have failed in getting more interest taken in the care of the tools; but I regret, far more than all, that I have failed in getting a greater interest taken in our work, by the larger part of you who are most to benefit by it. While I would not question the value of theoretical knowledge, as you may some time in your life find a use for every item of knowledge you can possibly acquire, that certainly will be of the most use to you which you can use the most frequently, and you most assuredly have got to gain a prominent position before your theoretical knowledge will be of special value. Suppose you were to leave here without any practical experience whatever, your only chance then for a situation would be side by side with the boy of no education. It is now a work of hands, not heads; and the boy, while you have been storing the mind for four years, has been skilling his hand for two; and although you may be two years his senior, he will at this handicraft outstrip you two to one. You will be paid for what you do, and not what you know; and if on Saturday night you go home with your little four dollars and a half in your pocket and not conclude that your college life has been half thrown away, I for one will be mistaken.

It is claimed that we give theoretical and practical instruction in the mechanic arts. The words are equal—how about the fact? It requires no greater knowledge of mathematics than to be able to count your finger ends, to find the ten hours a week spent in the shop is not half your working time; besides, the ten hours is not taken from your working time at all, but just so much out of your hours of recreation. To assume shop practice is recreation, is boy's play indeed. To put the practice on an equal footing with the study: While some of you choose to come here for an education, with the privilege of getting a smattering of the trade, others, if they so choose, should be allowed to come here and learn the trade, with the opportunity of gaining so much of theory as they have time and capacity for.

I, myself, should have liked to have had the shop practice put upon its true basis,that is that what you learn in the shop is and by right ought to be considered just as much education as that which you learn in the lecture room. But we have become so accustomed to dividing the theoretical from the practical—so used to call the one education and the other work—that as yet, it is past our power to change it. But whether we call it work or study, trade or education, I wish to convince you of its importance. I wish to show up the insignificant position it holds compared to what it deserves. Let us see. The spirit of the law, giving Government and State aid to the university, if it means anything, means to encourage practical education. Mr. Cornell with his endowment, if he "would found an institution where any man can receive instruction in any study," did not intend to exclude practice; and knowing the interest he takes in our progress, it is well enough known that he meant to include it, while Mr. Sibley's gift was unquestionably intended to establish the work shop. Now these gifts and endowments, and land grants, were given for what? To pay the superintendent of the machine shop and business managers? No, not at all. They were given wholly and solely for your instruction and the instruction of others like you. The executive committee are but guardians; the faculty, from president to instructor, are but instruments or agents for its execution.

It is but right that the students of one class should stand upon an equality with the students of any other. At present the candidates for the degree of B.M.E. are not so situated. I would have the work and study equally divided, or optional, and credited hour and hour alike. I know this will necessitate the abandonment of some of your studies. What one of you has not at least one study that you would like to abandon? Besides you cannot learn all there is to be learned, nor all that is both advantageous and desirable in four years, and what is to hinder your learning after leaving the university, as well from books as from your practice? You will find many things to learn which are of the greatest value, in fact things indispensable in a leading position, which you are getting neither in your studies nor the shop. You must learn to lead, command, or direct men. That sometimes takes years of experience; to get that experience is easy if you begin right. The key note is this: "Always let your ability be superior to your position," for while you are superior to your associates you can lead them. Attempting a position you are not capable to fill is fatal. You are all supposed to be competent to write a good business letter; if you are not, let me tell you you will want that qualification one hundred times for every time you find use for your French and German. You are also supposed to understand bookkeeping; if you do not, you will find it is something you will want three hundred and sixty-four times to every time you find use for your calculus.

In conclusion, allow me to say that this is the opinion of but one man, in opposition to the opinion of twenty. It is based on firm conviction, after as due deliberation as I have been able to devote to the matter; and while no principles relating to business will hold good in all cases, I trust you will not find more exceptions to the rule than enough to prove it true.

Dangers of Nitro-Glycerin.

Nitro-glycerin is a thick colorless oil, and appears to be as harmless, to look at, as lard oil or petroleum. People are so accustomed to the handling of oils of all kinds that it is almost impossible to make them realize the danger that lurks even in the smallest quantity of nitro-glycerin. It explodes when gently struck, and is ten times more powerful as an explosive, weight for weight, than gunpowder. The other evening, in Jersey City, a gentleman and lady were taking a moonlight stroll on the hights, in the vicinity of one of the shafts of the new Delaware and Lackawanna railway tunnel. The man saw on the ground the glimmer of a small tin tube, picked it up, and slapped it from one hand to the other, when a terrific explosion ensued. His eyes were destroyed, his flesh lacerated, his limbs broken, while his lady companion was dreadfully injured. It was a discarded nitro-glycerin tube, such as are used in blasting, and is supposed to have been thrown away by workmen at the tunnel shaft.

In Parker City, Pa., recently, a young man was carting six cans of nitro-glycerin over a rough road in a wagon, when, from some cause which will never be explained, it exploded. The man, horse, and cart were literally blown to pieces. The man's head and part of his breast were found three hundred feet distant, having been blown over the tops of the highest trees. Fragments of his limbs were scattered in different directions, and his right hand was found half a mile from the spot. Even the horse's shoes were torn from his feet.

Copyrights.

The new law in respect to copyrights, by which the official fees for copyrights on labels are increased, goes into effect in August. Until that date, however, copyrights can be had at the old rates, and all who desire to avail themselves thereof should have their applications filed at once. Further information can be obtained at this office.

G. L. M. says: To make a nest egg, take an ordinary hen's egg, break a small hole in the small end, about $\frac{3}{8}$ of an inch in diameter, extract the contents, and, after it is thoroughly clear inside, fill it with powdered slacked lime, tamping it in order to make it contain as much as possible. After it is full, seal it up with plaster of Paris, and you have a nest egg which cannot be distinguished by the hen from the other eggs, and one which will not crack (like other eggs) by being frozen.

AN automatic feed arrangement, for supplying boiler and other furnaces with fuel in a pulverized or granulated state, is the invention of Mr. J. Martin Stanley, of Sheffield, Eng. The powdered or granulated fuel, suitably prepared, is injected into the fire space by means of a jet of steam, the quantities being regulated by suitable valves, and the supply of steam and fuel being automatic.

PROFESSOR C. A. YOUNG, of Dartmouth College, is on his way to China to observe the transit of Venus.

NEW ICE MAKING PROCESS.

Cool subjects, during hot weather, have an appropriateness peculiarly their own. Hence the reader will doubtless, during the present heated term, experience a refreshing satisfaction in not only perusing the following account of a new and simple manner of manufacturing ice, but in contemplating the annexed engraving of workmen engaged in that refrigerating occupation.

The process is one which is calculated to render the user independent of the monopolies which now control the ice supply, by affording a simple means whereby every one, having the requisite facilities, may easily manufacture his own ice, or enough to maintain as large a trade in the commodity as may be desired.

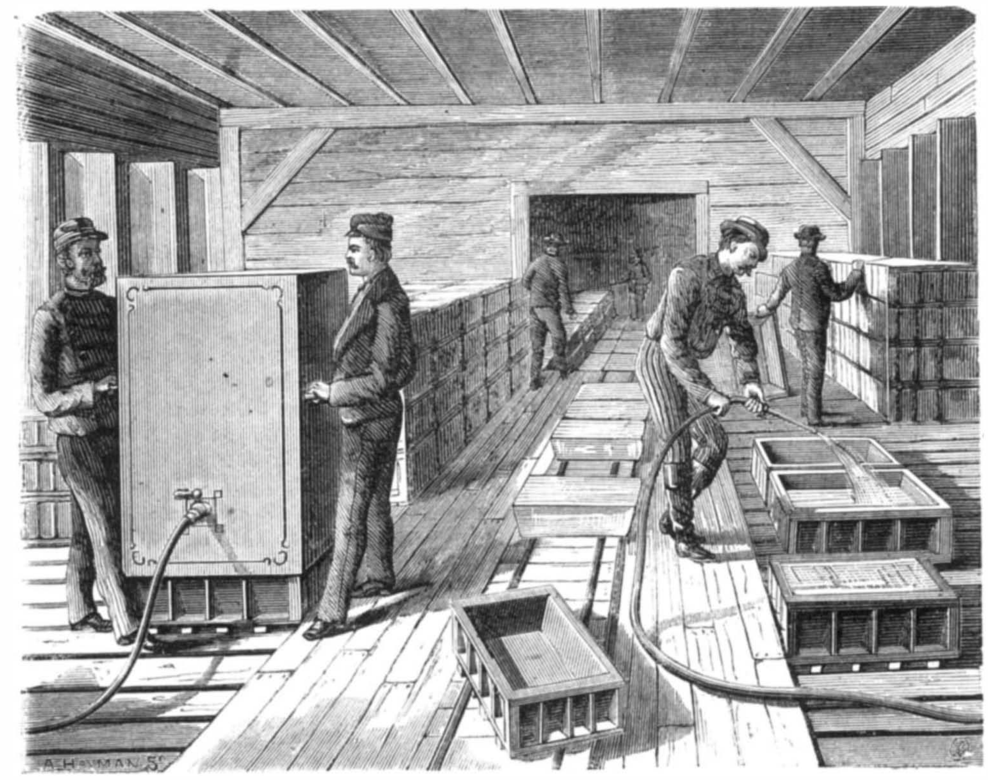
The prominent feature of the plan is that no pond or river is necessary. The requirements, however, are a good supply of water; a rough, strong frame building, open on all sides, for a freezing house, provided with suitable shutters which may be opened to allow the free passage of any light breeze; a well constructed ice house for storing the ice, and some simple appliances, which we proceed to describe.

In the wooden cribs or frames, shown in our engraving, are placed tanks made of strong cotton canvas especially woven for the purpose. These are filled with water, and are placed in piles of four each, as represented on the left, thus exposing a larger surface of water to the action of the atmosphere. They are then left until their contents become thoroughly frozen. In order to detach the blocks of ice, a cover is provided which is inverted over the set of four tanks, and steam admitted into it for a few moments. The cover is then removed, when the ice blocks may be readily turned out of the boxes. The latter are made with sides sloping inward toward the bottom, in order to facilitate the above operation, and are of such a size as to be readily handled, while containing the ice, by two men.

In our engraving the various operations peculiar to the process are clearly depicted. The freezing is done under the shade of a roof, and hence will not be interrupted by the sun, so that it can be continuously carried on in weather when ponds and rivers are usually open. The ice house can be used as a freezing shed when it is necessary to economize space.

We are informed that the average amount of ice produced by this process, from November 1, 1873, to April 1, 1874, was two tuns to each tank, the dimensions of the blocks being 30 inches long, 26 inches wide, by 10 inches thick. By making preparations so as to be ready by November 1 next, it is stated that purchasers of rights under this patent will have the advantage of making and using their own ice through the winter, as the present high prices will probably be maintained until the opening of the rivers next spring.

Patented November 1, 1870. For further particulars address Messrs. Newsham, Haynes, & Henson, 108 Pacific street, Newark, N. J.



NEW ICE MAKING PROCESS.

EARLE'S IMPROVED ICE CREEPER.

Mr. Reginald H. Earle, of St. John's, Newfoundland, has patented through the Scientific American Patent Agency, De-

Fig.1

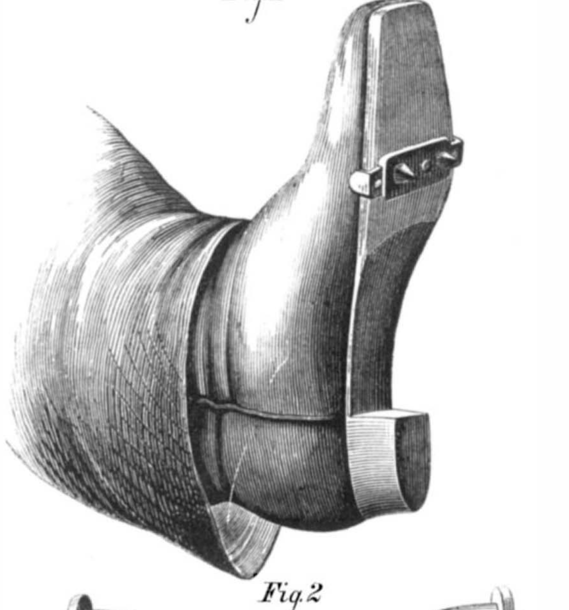
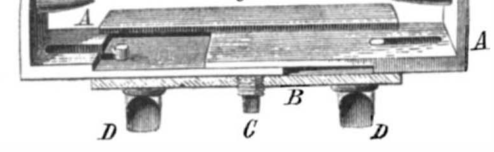


Fig.2



cember 9, 1873, a novel and simple form of ice creeper, an engraving of which is herewith presented. A patent has also been applied for in Canada through the same medium.

The device consists of two sliding plates, A, Fig. 2, the outer extremities of which are turned up at right angles and are provided on the inside with spikes. The inner ends of these plates are suitably formed to overlap, while the side edge of each enters a groove in a main plate, B, the length of which is about equal to the width of the sole of a boot. Plate, B, has projections on its upper side, which enter slots in, and thereby serve as guides for, plates, A. Through the under side of plate, B, passes a set screw, C, and to the same portion are attached short spikes, D, which take hold of the ice and prevent the wearer from slipping.

In using the invention, the set screw is loosened and the plates, A, drawn outward. The creeper is then placed upon the sole of the boot, as shown in Fig. 1 and the plates, A, are pushed inward, forcing the spikes thereon into the edges of the sole. The set screw, C, is lastly tightened, thus completing the adjustment. For further particulars address the inventor, 216 Water street, St. John's, as above.

Preparation of Ether.

The most efficacious process is to heat to 140° a mixture of 9 parts sulphuric acid at 66° B., and 5 of 90 per cent alcohol, alcohol being allowed to run in so that the level remains constant. By direct firing the vessel is apt to be destroyed, and accidents are rendered likely through the inflammability and volatility of the ether; superheated steam is far more safe as a means of heating, though a little more costly. Iron vessels lined with lead appear to be preferable to copper or lead-lined copper vessels. When the operation is properly conducted, 66 per cent of ether (sp. gr. 0·73) is obtained. For 100 lbs. of ether, ½ lb. sulphuric acid is required.

The crude ether is washed with water and rectified. This washing and rectification may, however, be dispensed with by passing the vapors first through a jacketed receiver, the jacket of which contains water at about 35° (alcohol and water condense in this, but not ether), and next through purifiers containing lumps of quick lime and trays of charcoal or coke soaked in caustic soda and well dried, whereby sulphur dioxide is removed. The purification simultaneously with the preparation is, however, open to several practical objections.

The conditions of success and of a good yield consist in keeping the temperature constant, and the flow of alcohol regular.—*O. Süssenguth.*

Strange Stories Confirmed.

Some months ago, Darwin wrote to his disciple Fritz Müller, now in Brazil, directing his attention to the habits of the leaf-cutting ants. The reply contains a confirmation of Mr. Belt's observations to the effect that these ants do not feed on the leaves they gather in such vast quantities, but on the fungus which grows on the leaves in their underground chambers. On examining the stomachs of these ants, Mr. Müller found no trace of vegetable tissue which might have been derived from the leaves, but only a colorless substance, showing under the microscope some minute globules, "probably the spores of the fungus."

Again, as to the protective partnership between certain plants and their ant inhabitants, Mr. Müller says he has cut down hundreds of *cecropiæ* and never missed the ants, and adds: "I wonder that it had never occurred to me that the trees are protected by the ants; but there can be no doubt that this is really the case, for young plants of *cecropiæ*, not yet inhabited by ants, are often attacked by herbivorous insects."

Manufacture of Chloral Hydrate.

Chloral hydrate is now manufactured on an enormous scale, some German makers supplying over 500 lbs. daily. Chlorine is passed into alcohol of at least 96 per cent. For 120—150 lbs. of alcohol the current of chlorine must be maintained for 12—14 days, in which time the temperature rises to 60°—75°, and the liquid acquires the density of 41° B. The crude product thus obtained is purified by heating it with an equal weight of strong sulphuric acid in copper vessels lined with lead. Considerable quantities of hydrochloric acid escape at first, and afterwards chloral distils at 95°—100°. This distillate is redistilled, collected in glass flasks, and mixed with water; and the hydrate then formed is either poured into large porcelain basins, in which it solidifies in cakes in half an hour, or it is poured into vessels one third full of chloroform, to crystalize.

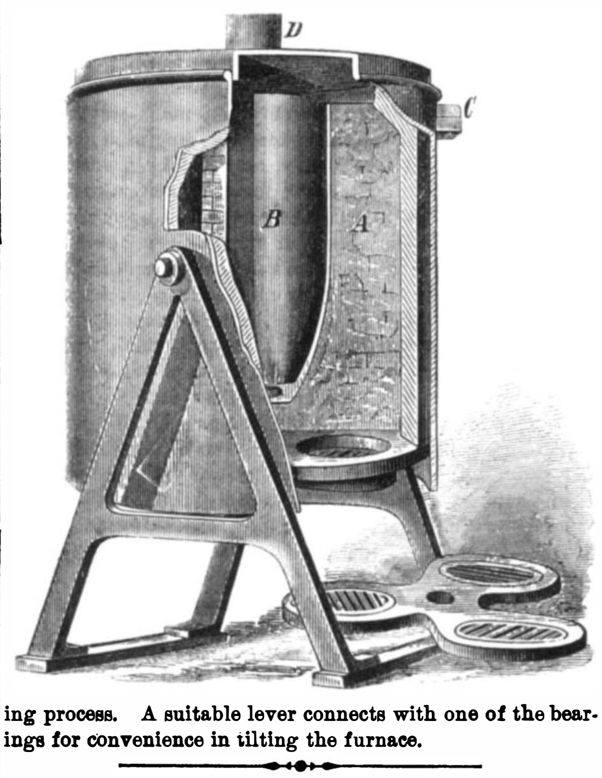
Rain Water Impurities.

In a recently published work on "Sanitary Arrangements for Dwellings," Mr. Eassie points out the precautions to be adopted by householders in cases where rainfall forms the chief or only source of water supply. Generally it will be found convenient to store rain falling on the roof in an underground tank, formed of brick or concrete, puddled outside with clay and covered inside with Portland cement. But care must be taken that the down spouts conducting the rainfall to the tank do not drain either zinc roofs or lead flats. Even on tile or slate covered roofs, the water will have passed over lead flashings, ridges, hips, and valleys, charging it with a small percentage of lead, but not more than one twentieth of a grain to the gallon. With a greater proportion than this, water becomes dangerous to use, being more or less poisonous. Since rain acquires certain impurities, even while passing through the air, it should always be carefully filtered before being used for drinking or cooking purposes.

In the case of a house supplied with an underground receptacle, filtration could be easily managed, by placing an earth filter on the delivery side of the down spout, at its exit from the tank. An eminent authority on sanitary subjects, Dr. Angus Smith, believes rain water can be so completely filtered through earth as to remove all impurities. Whenever rain water is stored for drinking purposes, the eaves of the roof, troughs, and down spouts should be enameled, and the supply ought to be carried to the tank through glazed earthenware pipes. This prevents leading, but other deleterious ingredients will still remain. In manufacturing towns, soot, oil, and sulphuric acid form some constituents of rain water. With these facts in view, most people will agree with Mr. Eassie, in his conclusion that "generally speaking, rain water should be excluded from the kitchen," although extremely useful in laundries and conservatories.

IMPROVED FURNACE FOR MELTING BRASS.

Mr. Ira D. Bush, of Detroit, Mich., has patented, through the Scientific American Agency, a novel form of furnace for melting brass or other metals, an engraving of which we herewith present. The apparatus is mounted on trunnions in a suitable frame, and is divided interiorly into three compartments by partitions, two of which are shown at A A. B is the crucible, supported by the said partitions, and having a spout running along the top of one of the latter, terminating at C. The furnace cover is detachable, and has a chimney at D. To a central pivot on the furnace bottom is confined the grate plate, shown separately in the foreground. By this means each of the apertures in the lower side of the device is provided with a separate grate; and as all are connected, by turning the plate the air ports may be quickly opened to discharge the cinders and refuse formed during the melt-



ing process. A suitable lever connects with one of the bearings for convenience in tilting the furnace.

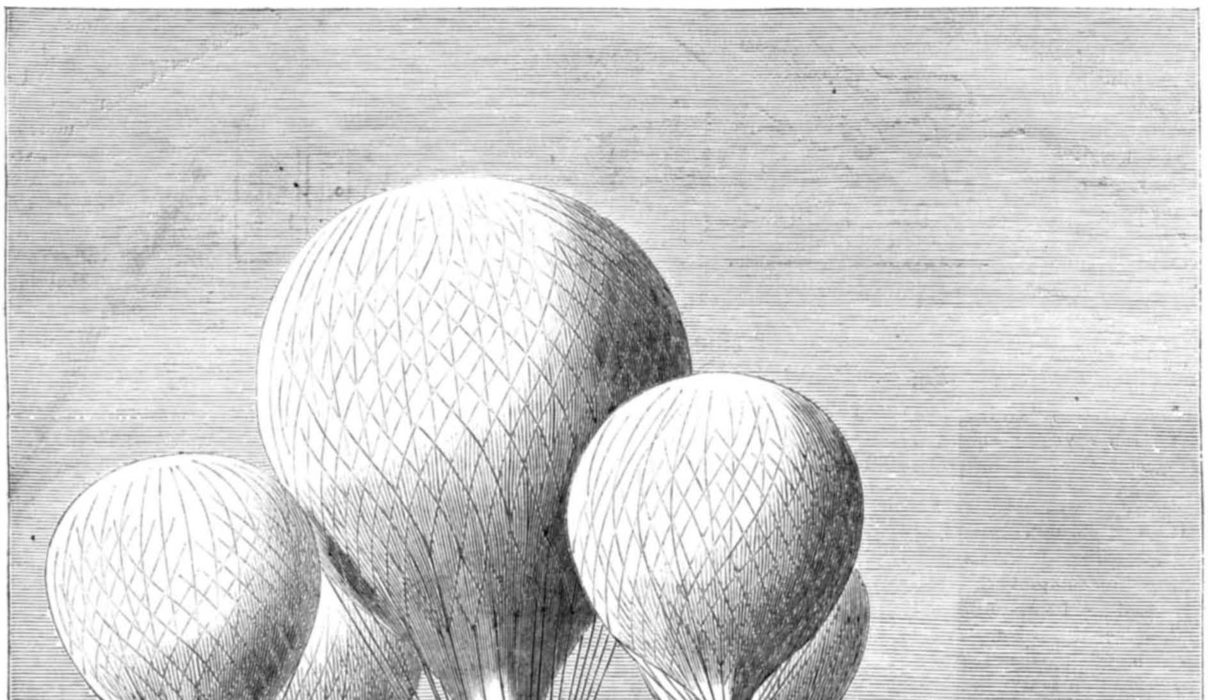
A SHAFT, weighing 50,000 lbs., and some cranks that weigh 31,000 lbs. each, have just been made at Bridgewater, Massachusetts, for the Fitchburg water works.

A NOVEL BALLOON ASCENT.

The French nation has long been foremost in aerial navigation. Pilâtre de Rozier became famous as the first who ventured to ascend in a fire balloon, the invention of the renowned Montgolfier. This was on October 15, 1783, a few animals having previously been sent up, which safely returned to earth. Soon after, Pilâtre again went up, taking with him the Marquis d'Arlandes; and gradually it became so fashionable to take a trip into the higher regions that many persons fell victims to the aerial fever. Pilâtre himself lost his life, being precipitated into the Channel in attempting to cross. It is to him that the idea of using balloons for war purposes is to be ascribed, as on his suggestion the Convention authorized the formation of a company of *Aerostiers*, who were employed in reconnoitering the enemy. Two officers made the observations, and communicated with earth by means of flags, or by messages written on paper and weighted to prevent their being lost. The last experiments of this kind were made in Algiers, in 1830, but with so little success that the company was dissolved.

Aerial navigation, however, assumed great prominence again in the late war, especially, as we have often described in these columns, during the siege of Paris. It was in this excellent school for aeronauts that Theodore Sivel, one of whose remarkable ascents forms the subject of our illustration, was educated. He traveled after the close of the war, with his beautiful balloon *Koloss*, in Sweden and Denmark, and then in Germany. His mother-in-law, Madame Poitevin, a well known aeronaut, was probably his instructress. The ease and elegance of Sivel's balloon in ascending created a general sensation.

In Leipsic (in the fall of 1873) he was descending rapidly, with five other voyagers; and seeing a great danger, he boldly discharged the gas at once (by a suitable mechanism for slitting up the balloon), after the anchor had taken hold, and obtained thereby full control over the empty balloon, without any loss or accident. His most remarkable ascent, however, was made on May 20, 1874, from Leipsic, when he ascended with five balloons, fastened together, which was, as he himself stated, "the grandest experiment ever undertaken in this line." This ascent is the subject of our picture. Around the main balloon, *Europa*, were secured the four smaller ones, named Asia, Africa, America, and Australia. The ascent was made at 5:50 P. M., Sivel and one passenger being in the basket. The strong wind carried the balloons, which turned playfully around on their axes, in a westerly direction; and they were visible at an elevation of 9,000 feet, as their great bulk made them very obvious at that hight. At about 7 o'clock Sivel detached the smaller balloons, and succeeded in drawing them down to the basket and hooking them thereto. He then opened their valves simultaneously, and descended, safely and majestically, to the earth near the railroad station at Dürrenberg. A few days after this ascent a double ascent was undertaken, Sivel rising in the before mentioned *Koloss*, and Madame Poitevin traveling in the balloon *Zenith*, making an almost unique display in aeronautics.



SIVEL'S RECENT BALLOON ASCENT AT LEIPSIC, GERMANY.

Making Hand Organs.

On the front of a dingy brick building at the head of Chatham street, weather-beaten and dim, hangs the sign: "Hand Organs." A reporter of the New York *Sun* saw the sign and went in; and thus he describes his interview with the workmen, and what he saw. Standing at benches, leaning over old organ boxes, seated before little stands, five men were at work. In the middle of the room stood several old hand organs. On the walls hung queer patterns, numbered and diagramed; in the further corner stood a machine seven or eight feet high, looking for all the world like a threshing machine.

"Is the proprietor in?" asked the reporter of the workman nearest the door.

The workman turned, pointed toward the other end of the room, and went on cutting out long strips from a great sheet of pasteboard.

Sitting on a low chair, with a low table before him, was a short, stout, jolly-faced man, evidently a German. On the bench in front of him, mounted on two wooden rests, hung a wooden cylinder, fifteen inches long, perhaps, and five inches in diameter. Behind the cylinder was a small case, a Lilliputian type case, containing thirty-six little boxes, and every box full of little brass pins.

"What do you charge for a common sized organ?" asked the reporter.

"It depends on the kind," answered the proprietor; "I can make you a flute organ, with twenty-four keys, to play nine tunes, with a black walnut case, for a hundred dollars. If you want an organ to play ten tunes, I can make it for you for a hundred and twenty dollars. An organ of this size will weigh about twenty-five pounds. A parlor organ, with from 25 to 46 keys, will cost from a hundred and fifty to two hundred and fifty dollars. A side show organ, to play nine tunes, with 60 keys, 35 brass trumpets, large and small drums, and triangles, I can make you for two thousand dollars."

While he was talking, the jolly little man sat pegging away at the cylinder before him, driving a pin here and a peg there, straightening them with a little pair of pinchers, and flattening them with a little, light hammer.

NEW TUNES IN OLD INSTRUMENTS.

"What are you driving those pegs in there for?" asked the reporter.

"This is an old cylinder. It was made years ago," he answered; "the tunes that were all the go then don't draw out the pennies worth a cent now. I am putting new tunes in it. I take the cylinder out and paste a sheet of clean white paper around it. Then I mark it for the tunes, and drive these little pins in, and the thing is none. Its very easy to do."

It looked very easy. The cylinder was covered with hundreds of little black lines, some half an inch long, others scarcely more than a dot. The reporter asked how he knew where to draw the lines.

The little man took a handful of the little pins out of his apron on his lap, took a few dozens more out of his mouth, got on and began to turn the crank of a dismantled organ that stood near.

HAND ORGANS AND CHURCH ORGANS.

"You see," said he, "a hand organ is made like any common organ. It has a bellows and pipes and keys. When you want to play on a church organ, you push down on the keys; when you want to play on a hand organ, you lift the keys. You use your fingers to play on a church organ; these little brass pins are the fingers on a hand organ. You see these little wires that hang down from the ends of the keys? Well, every time one of those wires strikes one of the brass pins when the cylinder is going round, the key is raised and the note is sounded. If the brass pin is one of those long, half inch ones, the key stays up a good while, and the note is a long one. If the pin is just a little dot, the key falls right back, and the note is short."

"But how do you know where to mark the cylinder for the tunes?"

"That's the secret of the trade," answered the little man; "but I guess I'll show you. You see, the cylinder is covered with clean paper, and all ready; now I hang it in by the iron rod that sticks out at each end. The tune I want to mark it for I play on the keys, only I press the keys down instead of lifting them, for I know what noise they would make just as well as if they did make it. Every time one of those little wires strikes the cylinder, it makes a little dent. If I hold it down for a long note, it makes a long mark; for a short note, it makes just a dot. Then I go over the marks with a pen to make them plain. When one tune is marked, I go on with the next. When the tunes are all marked I put the pins in, as you see."

"How do the organ grinders change from one tune to another while they are playing in the street?" inquired the reporter.

"Every organ," responded the little man, "plays from seven to ten tunes. This one I am working at plays eight. Do you see these little grooves?" and he pointed to one end of the cylinder, where a piece of wood had been left, about two inches long and an inch and a half in diameter. There were eight little grooves around the projection. "When the organ grinder wants to change the tune, he lifts that little spring, shoves the cylinder in or out one groove, and the tune is changed."

"How long do the organs generally last?" asked the reporter.

"Oh, bless your soul," said the little man, "five years is no time at all for a hand organ. Why, there's many an organ travelling the streets that's been used every day, week in and week out, for the last thirty years. That's just what kills the business. They last too long."

"How many organs do you make in a year?" asked the reporter.

"Well, from seventy five to a hundred. When times are hard, more men have to go to grinding organs, and the business is better. I shall make a hundred this year."

"That ought to make a profitable business."

"No it don't. Materials are so high that there's not very much profit on organs. I have to do some work in other branches to make it pay. I make a great many automatic figures for travelling shows, and repair 'most all kinds of musical instruments."

"Then there are a hundred new organs turned loose to prey on the public every year."

"More than that," said the little man. "This is the only hand organ manufactory in the country, but there is a firm that imports them from France. They sell about as many every year as I do, and sell them for the same prices."

"Then there is no competition?"

"No, no competition."

"Can any of your workmen mark the cylinders for new tunes?"

"No; there are only two men on this side of the Atlantic who can put the tunes on a cylinder—the man who imports organs from France, and myself."

"Are there many Germans grinding organs?"

"No," responded the organ maker, "the grinders are nearly all Italians and old American soldiers."

Four Messages at once with One Wire---A New Telegraphic Improvement.

A new invention in telegraphy by George B. Prescott and Thomas A. Edison has lately been successfully tested at the main office of the Western Union Company in this city. The new invention is a process of multiple transmission by which two messages can be sent simultaneously in the same direction over the same wire, and either message can be dropped at any way station on the circuit. The old duplex system can be applied to the new invention, and by the combination four messages can be sent simultaneously over the same wire in opposite directions between any two terminal points. The old Morse key is used, with no duplication except as to parts of machinery. It is alleged that the invention will quadruple the usefulness of the 175,000 miles of wire now owned by the company.

Mr. Prescott is well known as the electrician of the Western Union Company. Mr. Edison has probably made more inventions pertaining to practical telegraphy than any one man now living. We hope that these expectations will be fully realized. The advances thus far made in the practical uses of electricity are many and various. But it may be truly affirmed that we have at present only reached the threshold of this great department of human industry. Except chemistry, we know no field more promising for the inventor and discoverer than that of practical electricity. Young men should study the subject.

The Bessemer Saloon Steamer.

This vessel, intended to obviate sea sickness in the passage across the Channel, is rapidly approaching completion. The vessel has been completely plated, and the fitting of her engines and boilers in place will soon be accomplished. This work will be done while the ship is on the stocks, so that, when she is launched, she may, by the same tide, be sent upon her trial trip. The vessel, so novel in her construction, is an object of great interest, and scarcely a day passes without several visitors from a distance inspecting her. The ship is 350 feet long at the water line, and for 48 feet at each end the deck is only about 4 feet above the line of flotation, so that in rough weather the sea will wash over these low ends. The decks on this portion of the vessel have a considerable curve, and the sides of the ship are rounded off so that the water may escape as speedily as possible. This form of end has been selected with a view to obviate any tendency to pitching. Above these low decks a breastwork is erected about 8 feet high. The whole of this breastwork deck is to be devoted for the use of the passengers, and that portion fore and aft of the paddle boxes will be protected with stanchions. The vessel will be propelled by four paddle wheels, and 90 feet of the space between the paddles will be occupied by the swinging saloon. Beyond this and at each end the space is occupied, nearest the saloon by the engines and next by the boilers. At one end of the breastwork there will be accommodation for the crew of the ship, and beneath their quarters stowage room for passengers' luggage, etc. At the opposite end of the breastwork the space is fitted with cabins for the special use of ladies, and below these cabins there is a saloon 52 feet long, and fitted with sofa seats all round. Along the sides of the breastwork deck, between the paddle boxes, there are other cabins for passengers, besides smoke rooms and refreshment rooms. The Bessemer swinging saloon is making good progress, and already a good idea of the principle may be obtained by an inspection of the work. The saloon proper is about 70 feet long, 26 feet wide, and very lofty. The weight of the saloon is borne by four large bearings, one at each end and two near the center. The end bearings are fixed on iron transverse bulkheads, which are well stiffened by four and aft ways to prevent them buckling. The saloon will be one of the most superbly fitted apartments afloat. The top of it will form a promenade deck, and it will be fitted all round with seats. The saloon will be entirely under control of the machinery invented by Mr. Bessemer, and it is declared that it will be kept perfectly free from rolling during the passage across the Channel, and passengers, it is expected, will not feel any more unpleasant sensation than they would in going up or down the Thames. The ship will be supplied with two very large life rafts on the plan patented by Mr. Christie, and she will be steered and her capstans, etc., worked by hydraulic machinery. She was designed by Mr. E. J. Reed, C. B., M. P., and Earle's Shipbuilding and Engineering Company at Hull are both the builders and the engineers.

A NEW THAMES TUNNEL AT LONDON.—This is intended to provide a road and railway communication from East Greenwich, across the marshes, to Blackwall Point, then straight across the river by a tunnel to Poplar, thus forming a direct communication from the East India Dock Road on the north side of the river to the Woolwich and Greenwich Road on the south side. The general gradient would be one in forty, and the length of the tunnel 600 yards. The estimated cost is $2,500,000. The distance is greater by 200 feet than the width of the East river between the towers of the New York and Brooklyn Suspension Bridge.

THE NEW STEAMER BRITANNIC—A NEW PROPELLER IMPROVEMENT.

The Britannic, a new steamer belonging to the White Star Line, recently arrived in this port, and has attracted no small degree of public attention on account of numerous modifications and improvements entering into her construction and fittings. The vessel is of exceptionally fine build, 472 feet long, 45 feet beam, and a total carrying capacity of 5,000 tuns. She has compound engines of 760 nominal, but working to nearly 6,000 actual, horse power, and eight boilers, and developed great speed, making the passage over in 7 days, 19 hours, and 35 minutes, which is within half an hour of the fastest time recorded. The interior fittings of the ship are remarkable for elegance and completeness, no improvement adding to the personal comfort of passengers being omitted. There is a blowing engine to force fresh air through the cabins, swinging berths for the sea sick, and running water and basins in every state room.

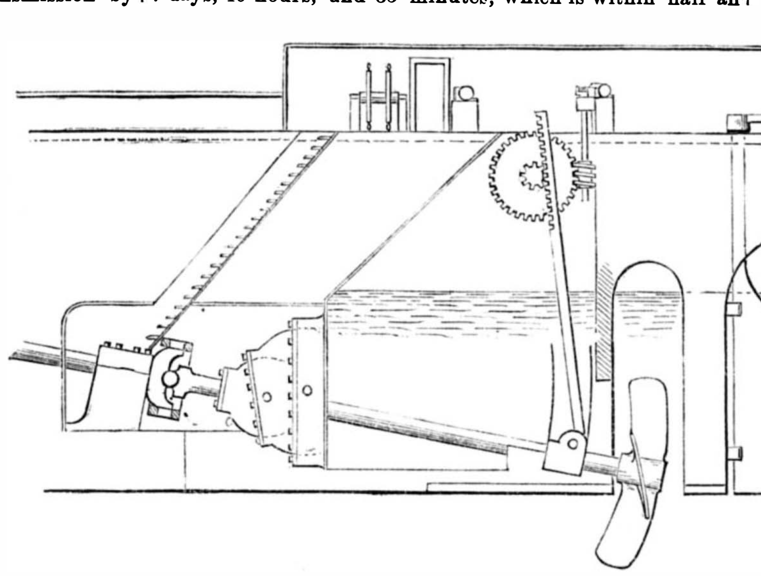
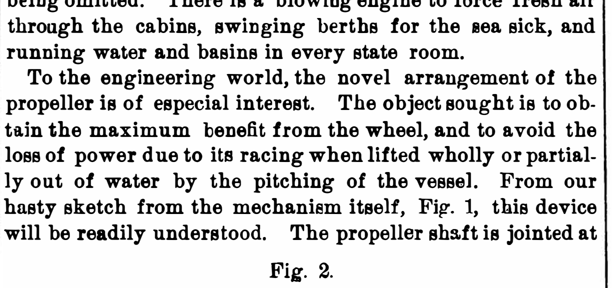


Fig. 1.—PROPELLER OF THE STEAMSHIP BRITANNIC.

To the engineering world, the novel arrangement of the propeller is of especial interest. The object sought is to obtain the maximum benefit from the wheel, and to avoid the loss of power due to its racing when lifted wholly or partially out of water by the pitching of the vessel. From our hasty sketch from the mechanism itself, Fig. 1, this device will be readily understood. The propeller shaft is jointed at

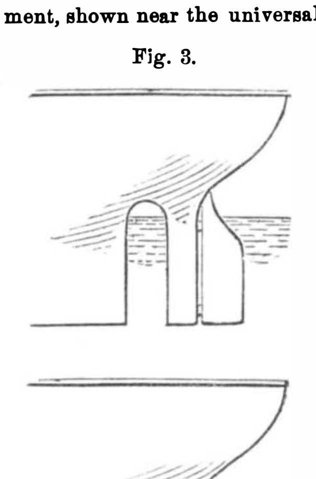
Fig. 2.



a suitable distance from the screw by a universal joint, so that the rear portion of the shaft may be raised or lowered as desired, and still always be in a position to receive motion. We may state here that the invention is somewhat similar in principle to that patented here August 3, 1872, by James M. Dodge, of Newark, N. J., of which we present a diagram, Fig. 2. How far the claims of the British and the American inventors will interfere, or which has priority of date, is uncertain.

The Britannic's apparatus has a very ingenious arrangement, shown near the universal joint, in Fig. 1, for the exclusion of water at whatever angle the shaft may be. A disk, through which passes the shaft, is pivoted within a second disk, and the latter is, in turn, pivoted within a casing forming part of the shaft well, the joints being provided with suitable packing. When the screw is raised by means of the simple gearing shown attached, the first disk is elevated bodily, carrying its point upward, and there rotating the second disk within its casing, and around the first disk, the universal joint being, of course, the center of motion.

Fig. 3.



Not only can the screw be thus lowered at sea, but it may be raised in passing over shoals, or in port, or when a blade is broken, for repairs. The difference in the stern of the vessel, necessitated by this device, is shown in Fig. 3, in which the upper diagram exhibits the construction of the Britannic, while the lower diagram shows the ordinary aperture made for the propeller. It will be noticed that, in the new invention, the strip between the keel and rudder post is necessarily cut away, though replaced, when the screw is sufficiently elevated, by a kind of bolt which slips across. As to how the rudder post, thus left entirely unsupported below, will stand the strain of the rudder and the shock of cross seas is a question which further actual experiment must decide. At first glance, we are inclined to think that this portion must eventually prove an element of weakness.

The Britannic is constructed with the eight watertight bulkheads so arranged that the water entering any compartment will close the door and isolate it from the rest. There is also ingenious steam steering gear and a telegraphic apparatus for the transmission of signals to the helm.

New Method of Detecting Mercury.

Mayençon and Bergeret give a method consisting in placing an iron nail, to which a platinum wire is attached, in the urine, etc., acidulated with so much sulphuric acid as to cause a slow evolution of hydrogen. The mercury is deposited in the metallic form upon the platinum, which is taken out after the lapse of half an hour, washed, and exposed to a current of chlorine, to convert the mercury into corrosive sublimate. The wire is then gently drawn over blotting paper slightly moistened with a 1 per cent solution of potassium iodide. If mercury is present, red streaks of mercuric iodide, soluble in potassium iodide, are formed. The method is very delicate and rapid. The authors could always detect mercury in the urine (but not in the saliva, notwithstanding that salivation had taken place) after the internal administration of corrosive sublimate, or inunction with mercurial ointment. They also found mercury in abundance in the milk of a woman 48 hours after inunction.

DECISIONS OF THE COURTS.

United States Circuit Court.---District of Massachusetts.

PATENT SAFETY VALVE.—EDWARD H. ASHCROFT *vs.* THE BOSTON AND LOWELL RAILROAD COMPANY.

[In equity.—Before Shepley, Judge.—Decided May 8, 1874.]

Shepley, Judge:

The bill in this case charges the defendants with infringement of letters patent of the United States, reissued November 9, 1869, to the complainant, as assignee of William Naylor, of the county of Middlesex, England, for an improvement in steam safety valves.

The invention relates to spring safety valves for use on locomotive, stationary, and marine engine boilers. As the spring on common safety valves was compressed by the lifting of the valve, the force of the spring became stronger by tension, while inversely, from other causes, the tendency of the valve to rise became weaker. The spring safety valve, therefore, failed to relieve the boiler, for, as the spring was compressed by the lifting of the valve, its power to resist was largely increased; and if steam was rapidly generated, the pressure in the boiler continued to increase while steam was escaping at the valve.

Various attempts have been made, as shown by the various patents in evidence, to obviate this defect in the operation of the common spring safety valve.

William Naylor, in his specification filed in the Great Seal Patent Office of Great Britain, on the 21st day of January, 1864, described two methods of obviating this difficulty: one of these methods claimed by him as his invention, he says, "consists, when using a spring for resisting the valve from opening, in the employment of a lever of the first order, one end resting by a suitable pin upon the safety valve, and the other end of the lever resting upon the spring, being bent downward to an angle of about forty-five degrees from the fulcrum, so that when the valve is raised by the steam the other end of the lever depressed upon the spring downward, and at the same time is moved inward toward the fulcrum, thus virtually shortening that end of the lever, and thereby counteracting the additional load upon the valve as it is raised from its seat by the greater amount of compression put upon the spring." This method he claimed as his invention in the specifications of his English patent. These specifications also described another method of obviating the difficulty. This consisted of the following contrivance: A lateral branch or escape passage was provided for a portion of the steam after it passed the valve, the valve was made to project over the edges of the exit passage for the steam, and the projecting edges of the valve were curved slightly downward, so that the steam, on issuing between the valve and its seat, would impinge against the curved projecting portion of the valve, and a portion of it would be directed downward into the annular chamber which surrounded the central passage for the steam, which chamber communicated with the exit pipe, while the other portion of the steam ascended past the edges of the valve. "By this means," he states, "I am enabled to avail myself of the recoil action of the steam against the valve, for the purpose of facilitating the further lifting of such valve when once opened; *but I wish it to be understood that I lay no claim to such recoil action, nor to the extension of the valve laterally beyond its seat.*" And in the claims, at the close of his specifications, he made no claim for any such extension of the valve, or any device for effecting any recoil action of the steam. In fact Charles Beyer, in his English patent, dated October 21st, 1863, before the date of Naylor's patent, had fully described "a valve made to project over the edges of the exit passage for the steam, and the projecting edges of the valve were curved slightly downward, so that the steam, on issuing between the valve and its seat, would impinge against the curved projecting portion of the valve."

Without adverting to the patents of Henry Waterman and other devices older than Naylor's, we have seen that Naylor could not, with propriety, claim to have been the inventor of the combination, in a spring safety valve, of every form of projecting, overhanging, downwardly curved lip or periphery with an annular recess surrounding the valve seat into which a portion of the steam is directed as it issues between the valve and its seat.

Neither of the attempts to overcome the objections to the spring safety valve in common use appears to have been so far successful as to have introduced either of the inventions into common or general use.

Letters patent of the United States issued September 25th, 1866, to George W. Richardson, of Troy, N. Y., for an improvement in safety valves. The purpose of a safety valve being to open and relieve the boiler, and then to close again at a pressure as near as possible to that at which the valve opened, Richardson accomplished it so far as to invent a valve which would open at the given pressure to which the valve was adjusted and relieve the boiler, and then close again when the pressure in the generator was one hundred pounds to the inch. This practically answered to the required conditions for a useful spring safety valve. It went very soon into general use. The complainant, who is a manufacturer in this country of safety valves, then, as appears from the evidence in the record, endeavored to find something to anticipate the invention of Richardson. Finding in the Patent Office a model of the Naylor valve, with an overhanging lip and an annular chamber surrounding the valve seat, he goes to England and purchases the right to the Naylor invention, and although Naylor himself had disclaimed the recoil action of the steam consequent on the passage of a portion of the steam downward into the annular chamber surrounding the central chamber, while the other portion of the steam ascends past the edges of the valve, and had also disclaimed the extension of the valve laterally beyond its seat, the complainant caused the patent to be reissued to him, as assignee of Naylor, with the following claims which were not in the original patent:

2. The safety valve C, with its overhanging, downward curved lip or periphery and annular recess D, substantially as herein shown and described and for the purpose set forth.

3. The annular recess D, surrounding the valve seat, substantially as herein set forth.

4. The combination of the valve C, and the annular recess D, as herein set forth and for the purpose described.

From a history of the art as previously given, and from a comparison of the original with the reissued Naylor patent, as well as from the language of the claims in the reissued patent, it is manifest that if these claims can be sustained, it can only be for the combination of the described valve with its overhanging, downward-curved lip, with precisely such an annular recess surrounding the central chamber as he describes. Naylor did not invent the overhanging, downward-curved lip or periphery, nor was he the first to use an annular chamber surrounding the valve seat into which a portion of the steam is deflected as it issues between the valve and its seat. His claims must therefore be limited to the combination of the other elements, with precisely such an annular recess as he has described, and operating in the described manner, so far as such recess, separately or in combination, differed in construction and operation (if it did materially differ in those respects) from those which had preceded it. The claims cannot be made to cover a safety valve like the Richardson valve, which, in its construction and mode of operation, is substantially different from the valve described in the Naylor patent. The Richardson valve is the one used by the defendants.

There is a substantial difference between the Richardson valve and the valve in the specifications and drawings of the Naylor patent, not merely in degree, but its increased practical utility results from a substantial difference in construction and mode of operation.

Bill dismissed.

[*James R. Robb*, for complainant.

J. G. Abbott and *Benjamin Dean*, for respondents.]

Recent American and Foreign Patents.

Improved End Gate for Vehicles.

John C. Hawker, Pana, Ill.—This is a convenient fastening for the end boards of wagons. Plates are riveted to the side boards, which hook under and support the bottom board. Hook recesses in the plates receive the ends of fastening bars, which are screwed to the end board. The parts which enter the recesses project and have each a flat bolt head, which prevent the side of the wagon body from spreading. From the two upper heads button pins project, to which are attached the ends of the chains which hook to the side boards. In unloading the wagon, in order to deliver the contents back from the wagon body, the end board is adjusted on a level with the bottom, and supported by the chains and by the two lower fastening bars, which are dropped into the hook recesses. When the end board is closed, its top is brought to a level with the top of the side boards.

Apparatus for Removing Oils fr Animal and Vegetable Substanc

George N. Phelps, Brooklyn, N. Y., assi to himself and Conrad Braker, Jr., New York city.—This is an impro apparatus for removing oils, fats, resins, etc., from solid material, by treating it with bisulphide of carbon or other suitable solvent. Shelves are arranged in connection with semi-cylindrical plates inside of a high case, so as to form a continuous zigzag passage, through which, over pulleys placed at the ends of the shelves, travel endless chains. To the latter are attached buckets made of perforated sheet metal, so as to allow the liquid to pass through them, while they retain the solid material. The oil is extracted from the solid material by bisulphide of carbon, which is introduced through an inlet pipe and withdrawn through the outlet in the lowest compartment of the zigzag passage. The inflow of the solvent is regulated to fill the lower part of the case nearly to the inlet. The solid material is carried by the buckets down through the solvent, and up from one shelf to another through the zigzag passage, and is discharged through a discharge spout. By this construction the inflowing stream of the solvent meets the solid material as it rises above the water line of the solvent, and thus removes any oil that may remain in it after passing through the solvent. The solvent and the solid material pass through the lower part of the machine in opposite directions, and the solvent flows out as it meets the solid material, as said solid material reaches the lower end of the vertical part of the passage, so that the solvent may be as near saturation as possible wh :n it flows from the machine. The solvent and oil, as they escape from the machine, are conducted to a still, where they are separated, and the solvent may be again used.

Improved Car Coupling.

Morris E. Bromeling, Leroy, Min n.—The drawhead has two cavities for coupling links, separated by a vertical slide piece. One cavity is larger than the other and is arranged with tapering mouth for the entering of the free end of the coupling link, the smaller cavity taking up the head of a second coupling link. The separating slide piece runs in grooves of the drawhead, being attached to the same by a pin. A recess of the slide allows the insertion of the common coupling link, so that, on fastening the slide by its pin, cars with the common pin-and-link coupling may be attached. The links are constructed with a heavy tapering head, which is introduced into the smaller cavity and fixed there by a pin. The larger cavity serves to take up the round end of the second link, producing a twofold coupling of the cars. The automatic coupling of the links is produced by pivoted pins of the larger cavity, which are pushed back by the entering links till the pins slide over the links, and, dropping, couple the same.

Improved Hay Tedder.

James Taylor, De Kalb Junction, N. Y.—A rod passes through a coil formed in wire teeth near their forward ends, and serves as a fulcrum to said teeth. The teeth are kept in proper relative position upon said rod by tubular washers. The forward ends of the teeth project nearly to the axle, so as to be struck by cams attached to the said axle, and raised to drop the hay caught by them. The cams are so arranged that the teeth will not be operated in consecutive order, and that but one or two of them will be operated at the same time.

Improved Stamping Mill and Furnace for Roasting Ores.

Pentecost J. Mitchell, Salt Lake City, Utah Ter., assignor to himself and Joseph E. Gay, New York city.—This stamp is made in any of the known forms used in stamp mills. In the shaft are toothed racks, between which is an adjustable clutch, which receives a cam secured upon a revolving shaft, by means of which the power and motion are communicated. The form of the cam and contrivance of the clutch are such that, no matter how much or little the stem may fall, the fall of the clutch will always be the same, so that, if at one blow the stamp is checked by a large piece of ore, it will be raised, at the next operation, the hight of a full stroke. The object is to secure uniform blows from the stamp upon the material to be crushed. The same inventor has also devised and similarly assigned a furnace for roasting ores. It is an oven of rectangular structure, of fireproof material, on the side walls of which are arranged hoppers of iron, with a movable side, to be opened or closed by means of a shaft and chain. The materials for calcination are placed within the hoppers, where they remain a few hours, when they are dropped through the action of the sliding doors upon the calcining floor, which is constructed of cast iron plates supported upon brick flues, through which the heat is conducted from the furnaces and returned over the working floor through a flue, receiving an additional supply of heat. The gases are carried on by the draft of the chimney through the flues and condensers, the latter consisting of a showering apparatus, through which water is let fall, by which a portion of the escaping sulphur, arsenic, etc., are deposited in the pans and removed at pleasure.

Improved Pump.

Samuel H. Warner, Darbyville, O.—This invention consists of a double acting pump with two cylinders and alternating plungers, of which each plunger slides in a narrower tube or telescope, while its piston forms, with the tube and outer cylinder, a varying space, in which a constant body of water acts, by a communicating pipe of the pump cylinders, on the plungers, and accelerates the raising and lowering of the same. The action of the plungers and valves is claimed to be expedited, and an increased lifting capacity of the pump produced.

Improved Plow.

John W. Thomas, Silver Springs, Tenn.—This invention relates to the combination of pivoted blocks or rollers and cross bars or plates for connecting the plow beams and standards, whereby the plows are allowed movement in any direction, one relative to the other. By suitable construction, and by reversing the plows, two shovel plows may be connected with the turn plows for plowing out the row. This construction also enables two right hand plows to be used for throwing the first two furrows. The same construction enables the plows to be arranged for breaking out the middle of the row. By detaching the connecting device and attaching another handle, each plow may be used as a single plow.

Improved Mainspring Attachment.

James C. Edwards, Binghamton, N. Y.—This is an eccentric notch in the face of the arbor of the barrel to which the mainspring of a watch is connected, the notch being as deep as the thickness of the spring, and terminating with the end of the spring by a radial wall, extending to the true circumference of the arbor. The object is to so shape the arbor that the spring end will not form an abrupt projection for the first coil of the spring to wind over, which produces an extra strain and bend at that point, and weakens it so that it breaks, moreover causing an irregular action of the watch, which it is desirable to avoid.

Improved Foot Mat.

Theodore W. Ells, Macon, Ga.—This invention consists in a number of parallel bars, either of wood or metal, confined by iron bolts or rope, and securing the necessary filling for a mat. The filling, when worn out, may be replaced.

Improved Cotton Bale Tie.

William C. Banks, Como Depot, Miss.—This invention consists in the combination of a band and buckle, the former crimped near one end and the latter having a tongue bent below the plane of side pieces to form an improved tie.

Improved Stove.

M. C. C. Church, Parkersburgh, W. Va.—This invention relates to and consists in means whereby a heating stove may be made to economize fuel and supply heat by radiation, reflection, and convection in a more thorough and effectual manner than has been heretofore used.

Improved Copying Press.

Philander S. Abbott, Bowling Green, O.—This invention relates to copying presses, and contemplates the manufacture of an article that will be less expensive and may be brought within the reach of persons in the smallest business and of ordinary private individuals. It consists in a copying press composed essentially of base and slotted standards, together with a spring retracted and driving wedge.

Improved Waterproofing Compound.

A. C. McKnight, Philadelphia, Pa.—The basic or primary compound consists of iodine, wheat starch, alum, oil, and soda. This is combined with a preparation known as acetate of alumina. Leather treated with this compound is rendered perfectly waterproof without discoloration or stiffening or other injury of fiber.

Improved Medical Compound.

J. P. Dyer, Lynchburgh, Va.—This compound is a salve for application to sores, ulcers, cancers, tumors, etc., composed of red oak bark, sarsaparilla, belladonna, hyoscyamus, honey, spirits turpentine, camphor, beeswax, and beef or mutton suet.

Improved Type Distributing Machine.

John A. Reynolds, Danville, Pa.—This invention relates to that class of machines which are used for distributing into appropriate cases the type that has been printed from, and is a new and improved arrangement for doing the same, by which the operator is enabled to effect said distribution by simply reading his matter and operating appropriate keys. It consists in an arrangement of keys which operate upon arms attached to a shaft, which is provided with a loose sleeve, pinion, and ratchet wheel. Upon the pinion moves a rack which is connected with a bar, which in turn is attached to a secure bar that presses against the line of type in the galley, and, each time a key is touched, forces a type over a passage, where it is held in suspension by a spring-seated tongue until a vertical ejector plunges down and relieves it. The type then falls of its own weight through a curved chute which brings it to a horizontal position upon the table. To a hinged sectional metallic belt, revolving around pulleys and running in grooves with its upper surface level with the table, is attached an arm which, as the belt revolves, passes over the surface of the table to the finger of the key which brought it out; said finger, having been drawn by the action of a cam groove in the hinged belt across the table, grasps the type, and, by the action of the same cam groove, draws it back over the open end of its case, into which it falls. When a line has thus been distributed, the bar which pushes the line of type out is run back, and the column of type in the galley advanced by the automatic operation of levers, cams, and pulleys. The operation of this machine is thus reduced to five mechanical sections: 1st. Forcing the type into suspension above a chute. 2d. Driving it down the same. 3d. Carrying it along the table. 4th. Depositing it in its case. 5th. Advancing the column of type in the galley when a line has been distributed.

Improved Can for Oil, etc.

Francis E. Josel, Freeport, Ill.—This invention consists of a spout, turning in a socket of the body of the can, both being provided with corresponding apertures, through which the oil is discharged when both are brought into connection with the interior of the can, closing the same when separated. The end or nozzle of the spout is placed under an angle, corresponding to the body of the can, to its lower part, turning in the socket and provided with a projection which catches into a groove of the can top, so as to be retained firmly thereon, and there closed by a small cap hinged to the can top.

Improved Slate Frame.

Joseph W. Cremin, New York city.—The common method of holding the slate by one corner of the frame, and pressing the opposite diagonal corner against the breast or stomach, the inventor has found, by thirty years' experience in the school room, to be very injurious to young children. Hence, he makes a curved notch in the frame, by which the slate can be held resting on the arm. He also uses metal caps for fastening the corners of the frame, and rivets, having projecting heads, for receiving said caps, said rivets having projecting heads to receive the shock and protect the slate from breaking when it falls.

Improved Combined Work and Spool Holder.

William W. Tunis, Easton, Md.—This invention relates to that class of devices which are intended to facilitate the holding of ladies' work, so that it may be gradually and intermittently moved in an easy and convenient manner.

Improved Ruffler for Sewing Machines.

John Irvine, Ickesburgh, Pa.—This invention is an improvement on the class of rufflers in which motion is derived from the needle post, and the feed may be changed or adjusted while the machine is in operation without interrupting the work. It relates to pivoted and parallel spring bars, combined or operating with a notched vertical plate for changing the feed of the ruffler.

Improved Ice Plow and Ram Attachment for Vessels.

D. Conrad Grant, Houghton, Mich.—The ram is constructed with a pointed, inclined, or rounded front prow, and is bifurcated to fit exactly the shape of the stem of the vessel, extending backward along the same. The whole attachment is easily adjusted from the deck of the boat. A recess in front contains a torpedo, which may be used for breaking heavy masses of ice which are not penetrable by the plow and the power of the vessel, and also, in times of war, for the purpose of destroying the vessels of the enemy.

Improved Machine for Nailing Shoe Soles.

Elton F. Richardson, Reading, Mass.—This invention has for its object to furnish an improved machine for nailing shoe soles and heels, and for various other similar purposes, with a continuous wire driven into the article to be nailed before being cut off. The invention consists of an extensible guide for the wire, which is composed of a series of bars adapted to close together, and thus support the wire in its descent into the leather.

Improved Wagon Jack.

James S. Rowland, Senecaville, Ohio.—This implement consists of a base, an upright bar and an inclined bar connecting the two. To the last and above the standard is pivoted a lever; to the same and below the standard is pivoted another bar. The ends of the lever and the bar last mentioned are pivoted to a notched bar. In using the jack, the free end of the lever is raised, and the jack is moved forward until the axle rests in one of the notches. The lever is then lowered until the load has been raised to the desired hight. The hook on the lever is then swung forward until it catches upon one of the teeth of a ratchet bar which holds the load suspended. To lower the load, the load is lowered slightly, which allows the hook to drop away from the ratchet, when the load can be easily lowered.

Improved Lamp Pendant.

William M. Underhill, Oconto, Wis.—This invention consists of a piece of wire bent in triangular form, with the base bent up in the form of two sides of a triangle toward the apex, at which point there is a little notch to hold the pendant when suspended for use. The contrivance is to be used for lowering a lamp to clean it, and for other purposes, by shifting the pendant out of the notch in the base wire of the triangle, and letting it drop down in one of the angles between the base and one of the side pieces, by which the lamp will be lowered considerably from its normal position.

Improved Sewing Machine.

Johannes Bühr, Hamburg, Germany.—The object of this invention is to provide for family and other purposes a sewing machine which allows the direct use of the common spools without requiring the spooling of the thread on the bobbin, performing the work with equal exactness and dispatch. The invention consists of the arrangement of a pivoted lever arm at the needle bar, which takes up or feeds, in connection with suitable tension devices, a sufficient quantity of thread to the thread catcher pivoted below the throat plate, so that the larger shuttle containing a common spool of thread may freely pass through the loop of the needle, and form, with the shuttle thread, the stitch.

Improved Wheel for Vehicles.

Oliver Lundin, Richland, Iowa.—By suitable construction, by screwing up a band nut, disks will be pressed against the ends of the spokes, securely clamping them in place. This construction allows any of the spokes to be removed and replaced by new ones without taking off the tyre.

Improved Horse-Detaching Device.

William Rosenbaum, Cheyenne, Wyoming Ter.—This is a device for detaching horses at any moment from carriages, buggies, wagons, reapers mowers, or other vehicles, so that not only the individuals, but also the vehicles, are protected against injury from runaway or vicious animals. The invention consists of a lever attachment to the pole or tongue of the vehicle, which may be operated from the seat so as to detach a clevis with wedge-shaped end, to which the double tree is applied. In case of any accident or danger, the horses may be instantly detached by pulling the hand lever back, which forces the sliding bar beyond its guide recess and gives sufficient play to the wedge clevis to slide out. The horses carry then the double tree along with them, leaving the vehicle behind.

Improved Liquid Vent.

Hiram W. Love and James Talley, Jr., Kansas City, Mo.—This invention relates to means by which air may be readily introduced into a barrel, keg, or vessel of liquid, in order to counterbalance the air pressure at the outlet, and thus admit a free flow of liquid from the vessel. It produces a very neat, simple, and effective device for the purpose.

Improved Derrick.

Charles Roberts, Mattoon, Ill.—This invention consists of an inclined sweep mounted on a frame pivoted on the top of the post, and also pivoted to said post at or about its middle, and braced in a simple and efficient way, so that the weight may be raised higher than the post, and the sweep may revolve entirely around the latter. The apparatus is adapted for loading and stacking hay, handling coal and the like, and may be made portable, by having the post mounted on a platform instead of on the ground.

Improved Sink Trap.

George Miller, Johnston, R. I., assignor to himself, Henry Miller, and Alfred B. Irons, same place.—This invention consists of revolving scrapers in the trap for stirring up the sediment to be carried away by the water. The scrapers are turned by a thumb bit above the strainer, and are fixed on the lower edge of the inverted cup of the trap. The cup is arranged to revolve either with or without the strainers. This contrivance saves the labor of unscrewing the strainer and screwing it down again every time the trap needs cleaning out.

Improved Drawers.

Emil Weil, New York city.—The object of this invention is to furnish for general underwear drawers which fit not only more c mpletely to the body, but keep also the stomach warmer by taking the place of the abdominal band. This end is effected by extension flaps, which form, when applied, a double layer over the stomach.

Improved Compound for Cotton Yarn.

Henry Wegmann, New York city to H. Wegman & Co., same place.—This is an improved com r sizing cotton yarn, consisting of tallow, soft soap, rosin, vitriol ion, and onions. This compound is designed to be added to twenty-five or seventy five pounds of starch, or fifty to one hundred pounds of flour, the rosin, vitriol, onions, and tallow being boiled till rendered sufficiently liquid to mix freely with the other matters; then the soap is melted in a tank separately, by hot water and steam, and the above mixture added. The ingredients are thoroughly mixed with steam, and then added to the starch or flour in another tank, together with the proportion of water requisite for making the sizing more or less stiff, according to the size of the yarn for which it is intended, the starch or flour being also varied to suit the case in hand.

Improved Harvester.

John Werner, Jr., Prairie du Sac, Wis.—This invention consists of a binder's platform and tables, attached to a tongue frame, which is pivoted on the wheel frame at or near the axis of the main wheel. There is also an adjusting lever, connecting the wheel frame and the tongue frame, for adjusting the wheel frame to tilt the cutters up or down, for cutting high or low, without tilting the platform and tables out of their proper level.

Improved Composition for Artificial Stone.

Luke W. Osborn, Youngstown, Ohio.—This is an improved artificial stone, cast in slabs or blocks of any required size and shape for laying side walks, for the foundation of iron fences, for well covers, door steps drain tile, sewer pipe, and other purposes: which will not crumble or wear through, as imperfect blocks cannot be transported and laid: which shall have a light gray color upon its surface to prevent it from absorbing the sun's rays and being softened; and which may be made of different colors or may have patterns or figures of different colors upon its surface. The upper parts of the slabs for any desired depth are made of a light gray color by the application of gum turpentine, pine resin, and aqua ammonia, in suitable proportions to the cement forming said upper portions.

Improved Chimney Top.

William Hervey Connor, Muscatine, Iowa.—This invention is a conical current-guiding chimney cap, on which is placed the vane, provided with an arc strap, perforated at several points to allow the obliquity of said cap to be changed, according to the draft required.

Improved Glass Bottle.

Thomas P. Spencer, New York city.—This invention consists of a glass bottle for perfumery, made in the form of the bust of the human figure, with certain modifications of the shoulders in form and dimensions of the same and other parts, as compared with a true bust, to adapt it to a shape that is practicable to produce in glass by blowing it in molds.

Improved Plow.

Julius Hartmann, Jefferson County, Ky.—This plow may be used to open a trench or furrow, or for cultivating certain kinds of crops. By turning the share either to the right or the left, it will cause a change in the position of the wings, so that one of them will lie parallel with the beam, and the other stand at a large angle to it, corresponding respectively to the position of the land side and mold board in the ordinary plow. The greater the angle or inclination of the share to the beam, the more land taken or the wider the furrow made.

Improved Oil Can Faucet.

Frank Spinning, Steilacoom, Wash. Ter.—This invention consists of a detachable faucet for oil cans, to be used for drawing oil from the commercial cans now commonly used for packing the oil for market. The object is to enable the faucet to be shifted readily from an empty can to a full one and save a special faucet for each can. There is a flange on the end of the faucet of such a shape as readily to be slipped into a narrow hole in the can. By means of washers and a binding nut, it is then tightly secured in place.

Extracting Silver, Gold, and other Metals from their Ores.

James Douglas, Jr., Quebec, Canada, Thomas S. Hunt, Boston, Mass., and James O. Stuart, Georgetown, Col. Ter.—Copper pyrites is mixed with iron pyrites, in such quantities as will result in the most thorough extraction of silver. The ground ore is then calcined with common salt in a suitable furnace, as is usual in the chlorination of silver ores. The charge, when withdrawn, is to be treated by agitation or lixiviation in any suitable vessel with a bath consisting of a solution of protochloride of iron and common salt, as in the Hunt and Douglas patent copper process. The bath dissolves the copper, besides the zinc and the greater part of the silver which has been chloridized in the furnace, while the copper in the solution chloridizes the silver which escapes chloridization in the furnace. After digestion for four or eight hours at 120° to 200° Fah., the solution is drawn off and the silver precipitated by allowing it to remain for some time in contact with sheet copper, or by filtration through cement copper.

Improved Middlings Purifier.

William H. Todd and Ephraim C. Keyser, Utica Mills, Md.—This invention relates to the purification of middlings in a more convenient, thorough and perfect manner than has been usual heretofore or possible by the machinery employed for that purpose.

Business and Personal.

Charge for insertion under this head is $1 a Line.

Answers to Correspondents

W. H. F. will find engravings of electromotors in back numbers of the SCIENTIFIC AMERICAN —W. S. M. will find directions for soldering files on p. 90, vol. 30.—J. F. will find details of tanning sheep skins with the wool on on p, 147, vol. 30.—A. W. C. should send us a description of his plan for preventing fires in buildings.—S. J. H. will find directions for transferring engravings to wood on p. 138, vol. 30.—H. R. will find directions for waterproofing cloth on p. 90, vol. 30 , and for preventing mildew on p. 138, vol. 30.—J. A. C. must send his name.—G. M. H. will find full information in regard to concrete walls in the answer to J. L. C., p. 138, vol. 30. As to potato bugs, see p. 52 of this issue.—J.S. N. will find full directions for tempering springs on p. 261, vol. 29; for tempering mill picks, on p. 170, vol. 25.—C. W. R. is informed that we published a good recipe for wood filling on p. 155, vol. 30.

J. B. asks: 1. On what class of sea-going steamers are high pressure engines used? A. They are not used. 2. On what class of sea-going steamers is the condensing engine used, and what is the pressure of steam most commonly employed in such engines? What are the extremes of the pressures employed in such engines, measured above a perfect vacuum? A. On all. Steam pressure varies from 30 to 80 pounds. 3. Is steam generally worked expansively in sea-going engines, and what is the lowest terminal pressure in both the high pressure and condensing engines for sea-going purposes, measured above a perfect vacuum? A. Yes. Terminal pressure as low as 5 pounds in some cases. 4. Is the Woolf engine used to any considerable extent in sea-going engines as a high pressure engine? A. No. 5. What is the most common form or type of sea-going condensing engines? A. Vertical two-cylinder engines 6. If, at an additional expense of $100 in the first cost of an engine of one hundred horse power and perhaps $200 in a one thousand horse power, the effective working power could be increased from 10 to 25 per cent, depending on the pressure ranging from 60 lbs. to 150 lbs. above a perfect vacuum, would it be worth the trouble? A. We do not get a clear idea of what you mean.

S. asks: Which is the strongest and will bear the most weight, a hollow pillar or a solid one, of iron, of any size? A. The solid one. The same weight of iron, however, made into a hollow (and of course larger) pillar, will be stronger than if made into a solid one.

J. S. S. says: 1. I have been running my cotton gin by steam power, using a 10 horse power engine. I have recently erected a steam saw mill near my gin house; engines are about 180 feet apart. I want to run my gin from my saw mill engine, if it is practicable. Will it be cheaper to run the gin by wire rope, or convey the steam from saw mill boiler to my small engine, 180 feet, thereby doing away with one boiler? A. We would recommend the latter plan. 2. What sized pipe should be used to convey the steam from boiler to engine? A. About 2 inches in diameter. 3. Would it be better to convey the pipe under or above ground? I need about six horse power to run the gin. A. Whichever is most convenient. 4. Will under runner rocks answer as well for grinding corn as upper runner? A. We think that they will; but there is considerable difference of opinion among millers in regard to this matter.

L. A. G. says: I have made a field camera by the directions given in *Science Record* for 1874, but find no image on the paper unless the object is held within two feet of the lens, or the paper held within three inches of the mirror. Mylens is 2½ inches in width with 7 inches focus, and made to slide in and out; the box is supported about 20 inches above the table, and a dark chamber is made by covering the wire with thick dark cloth. What is the matter? A. If the object or foreground is ten feet off, then the shorter conjugate focus of your lens will be 7·35 inches. The paper or ground glass must be placed at this distance from the lens, or a lens of focal length equal to the distance from table to mirror, *plus* the distance from mirror to lens, may be substituted; or you may reverse the box so that the lens is between mirror and table.

H. R. J. says: I work at architectural drafting and wish to be a thorough architect. I have a very good English education, but cannot afford to go to college. Can you tell me what course I should pursue to attain what I wish? Is a thorough knowledge of constructive carpentry necessary? What is the best and simplest work on it? A. You could succeed best by going into the office of an architect in good practice, and thus get access to his library, where you would find, most likely, the best works on every branch of the subject. In the mean time, you will find Tredgold's "Carpentry" an excellent book to begin with.

F. C. R. asks: How are hollow plaster of Paris toys made? A. They are made in two or more parts, and then joined together.

J. E. S. asks: How can the residuum in the still after the distillation of petroleum be best purified to produce a nice paraffin oil? A. American oils contain but a small proportion of paraffin. The crude oil is first put into a still, into which steam can be admitted; the still is also heated externally by fire. 25 per cent of a fluid is obtained which, on being submitted to fractional distillation, yields hydrocarbon of specific gravity 0·62 to 0·86, while the boiling point varies from 26·7° to 200°. The lightest and most volatile of these hydrocarbons is used as an anæsthetic (known as Sherwood oil), while the heavier oils are burnt in paraffin lamps. The residue of this first distillation (about 75 per cent of the original quantity) is again distilled with steam at 150° to 200°, and the products, of variable volatility are separately collected. The last portions of the distillate contain chiefly paraffin, which is in a crude state separated from the liquid by artificial cold. The heavy oil is used for lubricating, and the paraffin is purified. This is the treatment of the Rangoon oil, from Burmah.

S. H. D. asks: Will hot water put out fire on a building that is ignited by lightning? Some people maintain that it will not. A. Most certainly, if applied properly and in sufficient quantity.

E. K., Penza, Russia, and others write for practical details of a process for burning bricks with mineral oil, mentioned on p. 53, vol 30. A. The writer of the paragraph declines to give further information.

O. L. asks: Is there any simple and cheap method for rendering paper damp proof, so that, in giving it a form by embossing, it will not get out of shape? A process involving the passing the paper though a liquid would be advantageous for the purpose. A. Yes; by saturating it with oil. If you will state more fully what you desire to know, perhaps we shall be better able to answer you.

E. P. says: I have in use a 32 horse power boiler with 62 three inch flues. The brick work strikes the boiler about 4 inches below the water line. The said arch needs repairing. Would it be advisable to construct the cover 4 inches from the shell? Would not a boiler arched over in such a manner supply drier steam than when covered in the ordinary way? Would there be more danger of explosion? A. Such an arrangement as you propose is very common. 2. Would coal tar and plaster of Paris make a good cement for roofs? Would it render it as fireproof as if the tar were boiled? A. It will probably answer quite as well as if the tar were boiled, provided you can make the mixture as thoroughly.

E. L. E. says: A friend says that the lightning seen at a distance in summer evenings is heat lightning. I say there is never any lightning unless there is thunder; but it being at a great distance, we cannot hear the thunder. He also says that the thunder comes before the lightning; but as it takes so long for the sound to reach us, we see the lightning first. I contend that the lightning comes first, and that the thunder is caused by the rushing together of the air after being rent by the electricity. He says that there is never any thunder accompanying flash lightning, that it only comes with what is called chain lightning, and I say that the thunder accompanies both kinds of lightning. Which of us is right? A. As the lightning causes the thunder, you are right in the main. Wherever there is lightning there is always thunder, although it may be so far distant as not to reach the ear; this heat lightning, so-called, is merely the reflection of very distant flashes below the horizon.

M. A. says: The peach crop in this section of our State is becoming a matter of some importance, and the great difficulty is in packing for shipment is the heat. Can a packing room, 20x20 feet, be so constructed that a low temperature can be maintained without the use of ice, and is there any agent other and cheaper than ice by which the temperature of a room can be kept at 45° or 50° Fah.? A. All methods for producing a low degree of temperature (excepting that of ice) are costly and troublesome. Such a room as you speak of could certainly be constructed. There is one simple plan, however, which seems to have worked well, and that is as follows: A small room, such as you speak of, is built entirely of wood and as nearly airtight as possible, having only one small door. The room should be built with double walls, about six inches apart, and between these walls should be filled with sawdust; the room is then covered both inside and out with a double coating of very thick felting. Into a netting hung in one of the top corners of the room is placed about 100 lbs. of ice; the room can now be filled with fruit and the door or opening made tight. It is said that fruit so stored will keep for months unaltered. After once closing the door or opening, it must not be again opened until it is desired to remove the fruit.

M. A. B.—We have never seen any noiseless gunpowder.

R. O. P. asks: Which of the fillings used in fireproof safes have stood the best in large fires? Is cement and water or plaster of Paris and water considered the best? A. There has never yet been a safe constructed that was absolutely fireproof. That in which a filling of alum is used is claimed to be the nearest approach to fireproof. But plaster of Paris and hydraulic cement also are used.

A. L. B. says: I am building a small oscillating engine, the cylinder having 1 inch stroke and ½ inch bore. I would like to make a double acting engine of it, for a small screw steamer. Could you give me a simple way of making this? A. Arrange the valve so that it will admit steam at each end of the cylinder alternately, opening the opposite end of the cylinder to the exhaust at the same time.

F. S. J. asks: A few days ago I placed in a small phial a solution of water and sulphate of copper. I then added about 20 drops of sulphuric acid, which made the solution quite warm; and having some ammonia near at hand, I added it also to the mixture, by way of experiment. Immediately one half (the upper) of the solution turned dark blue, with a hard white or cream-colored substance moving at the bottom of it. I shook the bottle a moment or so when the dark blue and white substance entirely disappeared. The bottle being now full, I emptied about half of it out, and in its stead placed ammonia and spirits of turpentine, which had the same effect at first as the ammonia in the former mixture; but after shaking for some time, the mixture turned a bright green, but was not clear. A. The beat developed on the addition of the sulphuric acid was due to its entering into chemical union with the water. You added the ammonia. It is lighter than the liquid, and only mingles with the upper surface. There the ammonia is in excess. The azure liquid is the solution of the basic sulphate of copper in excess of ammonia. The solid part below the azure is the basic sulphate, where the ammonia is present not in excess. At the bottom the liquid is acid from excess of sulphuric acid. On shaking the bottle, the above-formed bodies redissolve in the sulphuric acid to form sulphate of copper and sulphate of ammonia. The turpentine had no effect; it was the ammonia. The green turbidity was due to the basic sulphate; if you had added less ammonia, it would have been a dense precipitate. If you had added more, it would have dissolved to an azure liquid. Do not waste time in making such mixtures; go through a systematic course of qualitative chemical analysis.

J. W. says: 1. I have a new cistern for rain water. The paint on the roof is dry. Is the first filling of the cistern fit for use, or should it be pumped out and filled a second time before using? Should it be ventilated, and how? A. The first filling of the cistern might be fit for some uses and not for others; if you mean for drinking, we should say not. If the leaden pipe that supplies the water from the roof is of good size and is not trapped by having its lower end in the water, this itself will give you ventilation; but if you have an overflow pipe leading to a drain, it should be trapped. 2. The tank in the roof of my house is lined with lead, and the pipe (leading some 35 feet) is lead is water from the lead tank, through lead pipe, good for cooking purposes? A. We should say that water standing in a lead-lined tank, and supplied through a lead pipe, was not good for cooking purposes. 3. How long should I wait before moving into a new house after the plastering and painting is finished? A. If the weather is good and the house kept open to let the air be frequently changed, it ought to be in a proper condition to be occupied in three weeks after the last coat of paint is put on.

S. asks: What is the best method for testing the percentage of chlorine in bleaching powder? Can you give me the name of some work where I can find specific instructions relative thereto? A. The most recent is the iodometrical method, and is based upon the fact that a solution of chloride of lime separates the iodine from a weak and slightly acidified iodide of potassium solution, the iodine being quantitatively estimated by means of hyposulphite of soda. The test is thus executed: 100 cubic centimeters (=1 gramme) of bleaching powder solution, obtained by dissolving 10 grammes of chloride of lime in 1 liter of water, are mixed with 25 cubic centimeters of solution of iodide of potassium acidified with dilute hydrochloric acid. The ensuing clear, deep brown colored solution is treated with hyposulphite of soda solution until quite colorless. The hyposulphite of soda solution is composed of 24·8 grammes of that salt to 1 liter of water; 1 cubic centimeter of this solution neutralizes 0·0127 grammes of iodine and 0·00355 grammes of chlorine.

W. J. N. W. asks: 1. I hear some men say that they can tell where a stream of water is, underground, and within a foot or two of its depth, by a forked switch which they hold in their hands. Is this true? A. No. 2. I see that the locust deposits its eggs in the twigs of trees. Why is it that they come up out of the earth and from what depth do they come? Do they eat anything while they stay in the ground? A. The eggs of the locust (*cicada septemdecim*) are deposited in pairs in the terminal twigs of different species of deciduous trees, especially the oak. The larvæ hatch out in about six weeks after they are laid, and drop to the ground, in which they live, feeding on roots of trees, for exactly seventeen years, the pupa state lasting but a few days. When about to transform into the winged state they ascend to the surface, making cylindrical burrows, firmly cemented and varnished so as to be waterproof. In low and wet localities the pupæ often extend these galleries from four to six inches above ground, leaving an orifice of egress even with the surface. In the upper end of the chambers the pupæ can be found awaiting their approaching time of change, They will then back down to below the level of the earth, and, issuing forth from the orifice, will attach themselves to the first object at hand, and undergo their transformations in the usual manner. They issue from their burrows in countless millions, in forests or where forests were seventeen years before. The singular noise sounding like "Pharoah" produced by the males in these camp meetings is absolutely deafening. After depositing their eggs in the twigs of trees, they soon perish, no food of any kind being taken by them in their brief above-ground existence, nor do they fly far from their burrows. They have different periods in different localities; in this vicinity they appeared in 1843 and in 1860, and will appear again in 1877.

G. F. P. says: 1. We are informed that hollow copper lightning rods are used in preference to solid ones, on account of conducting the electricity better, also that the hollow rod conducts better, as the atmosphere is damp within the rod, which is a better conductor than metal. Is this so? If so, and the rod were smashed together in bending and turning the eaves, would it not render it dangerous? Does not the current require the same amount of space to pass all the length of the rod as at the beginning? I have noticed some rods that were smashed nearly together where they were bent in turning the eaves and cornices, does this make any difference? A. A good material for constructing lightning rods is three quarter inch iron, terminating at the top in a gilt copper arrow head, very sharp, and in the earth with a large extent of conducting material. The metals are by far the best conductors; damp or moist air is very inferior in comparison. 2. Do rods running only three or four feet into the ground offer much protection to the building? A. The house would probably be safer without the rod.

M. W. J. asks: Why is it that growing clover causes cows to swell? I never hear any complaint of it swelling horses or hogs. I am told that it will swell sheep. Farmers say that it is the gas that causes the cow to burst. If so, what kind of gas is it and what generates it? Why is it that the second growth of clover, that is, the growth after the cutting of the first crop, "slobbers" horses? The first growth will not, or at most very little. A. In consequence of the complicated digestive apparatus in cattle, if their stomachs are excessively distended with green clover or other succulent or saccharine food, fermentation takes place, the carbonic acid gas thus formed (sometimes in excessive quantity) distending and often rupturing the stomach and thus causing death. This result is often avoided by puncturing the distended paunch with a fine trocar with a canula or aspirator needle, thus allowing the gas to escape. Dry food, such as Indian meal, sometimes causes death in cattle if used in excessively large quantities: in their greediness, it is swallowed dry, and, when wet in the stomach, swells and becomes a hard mass which is very difficult to remedy.

N. L. T. asks: 1. Can you inform me of some cheap and efficient solution for the preservation of shingles on roofs? A. A solution of chloride of zinc. 2. Can I construct a reliable lightning rod of iron, and what should be the size of iron for such a rod? A. Yes. About ¾ of an inch in diameter. 3. Is the conducting power of a lightning rod injured by painting, and will ordinary paint prevent iron underground from rusting? A. No; red lead might be used. 4. Is it sufficient to extend the rod vertically into the ground to a depth level with a creek, about ten rods distant from the house? A. No. It would be better to extend your rod underground out into the water of the creek. 5. In my vicinity, the lightning rods generally used are made of copper and hollow, the metal being about ⅛ of an inch in thickness, and the rods about ¾ of an inch in diameter, extending into the ground six feet. Are these reliable in your opinion? A. No. They are unsafe because there is not a sufficient amount of rod conducting surface in contact with the ground. No rod is really a safe conductor unless it has an extensive amount of conducting material for its base, or terminal in contact with the earth.

J. W. S. asks: 1. Will galvanized iron undergo any change if exposed constantly to soapsuds? A. Yes, but very slowly. 2. How can I make a varnish with shellac which will not chip off after being applied sometime, as it does when dissolved in alcohol alone? A. Some recommend the adding to the varnish about 1 tablespoonful of boiled linseed oil to each pint of varnish; of course the oil remains only in mechanical mixture. 3. Can I collect ozone in small quantities, say 4 or 5 ounces, by displacement of water (as oxygen is made)? If not, how can I obtain it? A. No; it cannot be obtained separate from the oxygen or air from which it is formed. If a stick of phosphorus moistened with a few drops of water be placed carefully in a bottle of air, the slow oxidation of the phosphorus is attended with the production of ozone. In about one hour this has reached its maximum, when the phosphorus should be removed, otherwise the ozone odor will disappear This is one of the best methods of obtaining it in small quantities, although very dilute.

P. T. R. says: In your article on chameleons (April 11) you are certainly in error when you say that these curious little lizards are never seen on this continent. I have often seen, in several of the Southern States, small lizards that answer your description of the chameleon in every respect. The people residing in these localities have no other name for them but chameleon, and I believe that they are right in so calling them. A. Sir Richard Owen, F.R.S., says: "This family, which includes only the single genus *chameleo*, contains about 18 known species, all inhabitants of the old world," etc. And again: "It occurs in all the northern parts of Africa and also in India; it has become naturalized in some parts of Europe." There are innumerable varieties of lizard closely allied to the chameleon indigenous to this country; especially iguanas and geckos, which have doubtless led to your impression.

G. C. T. asks: Are you acquainted with any paint, pigment, substance, or solution which can be applied to the weatherboarding of a frame building with the effect of rendering it wholly or partially incombustible, or at least capable of resisting the heat and flames of a burning building 25 feet distant from it without igniting? A. We do not think it is possible to render a wooden house perfectly fireproof. In regard to your other questions, it must be evident to you that it would be improper for us to recommend particular manufacturers in these columns.

C. C. asks: What is the best way to take the scale out of tubular or locomotive boilers? There are several about here that have been running in limestone or some other mineral water; they are thickly scaled inside, and therefore will not make steam well. A. There are numerous compounds in the market, which are said to be efficacious in such cases. By inserting a notice in our Business and Personal columns, you can doubtless open communication with the manufacturers.

E. M. B. says: I have a horizontal tubular boiler in which fire goes under the shell and then through the tubes. Would it save coal to put a brick floor within 9 inches of the shell's front end, and 6 inches from back end to keep the heat in the shell of boiler. A. We would not recommend the change if the boiler works well at present.

J. K. asks: How are artesian wells made, and what is the best way of fixing them, in order to water stock? A. The mere fact of inserting a pipe will not cause the water to flow. It is necessary to bore until water is reached that comes from a source higher than the place where the well is made.

H. J. I. asks: What is the rule to calculate the pressure on a hydraulic ram? A. The pressure on the ram is equal to the pressure per square inch produced by the pump, multiplied by the number of square inches in the cross section of the ram.

J. A. A. says: 1. We have a fire engine that will throw about 140 feet. The machine has no vacuum chamber. Will it help her to put one on? Will it be any advantage, and how much? The pumps are 6 inches bore by 7 inches stroke; suction is 3½ inches by 18 feet long. A. We would not recommend it, if the pump works satisfactorily at present. 2. What is the pressure to the square foot of gas that will raise water 5½ inches in a bent tube ¼ inch in diameter? A. About 28 pounds.

O. J. P. says: We generally use here lift and force piston pumps for tanks in houses, bathing purposes, etc., but instead I would like to use two plunger pumps of 2½ inches bore and 24 inches stroke, with air vessels, and connected together, with the same action. In this case, the pump will be about 200 feet from the river and 18 or 20 feet above the level of the water, the tank being 30 feet above the pumps. I fear that two plunger pumps could not be used as advantageously as a piston pump for lifting the water, but I understand that the plunger pumps would force up the water more advantageously than a piston one. Am I right? A. We think that the piston pumps will give better satisfaction in this case. Your other question is a professional one and should be referred to an engineer.

J. H. W. asks: 1. Is it possible to transmit a moderate degree of pressure through a half inch gas pipe, 15,000 to 20,000 feet long, by forcing compressed air into one end? Could the loss of power and the time required for transmission be calculated? A. Yes. You will find some facts in regard to the matter in reports of operations in the Mont Cenis Tunnel, published in *Engineering* a few years ago. 2. Is the process of lighting street lamps by electricity attended with such a degree of expense (in first cost and subsequent operation) as to preclude its employment on the score of economy? A. We think so. 3 What would be the probable approximate cost of erecting the apparatus necessary to light the 5,000 lamps of Boston, Mass., and what would probably be the annual working expense? A. We believe the attempt was made some time ago; and probably by writing to the authorities, you can obtain the information you desire.

W. P. S. asks: Can you give me the dimensions, focal distances, etc., of the lenses for a wonder camera, as described in your paper of June 6? A. The larger your objectives, the clearer will be your picture. The convexity of the glasses depends much upon the size of picture desired. 2. What light is best where gas cannot be obtained? A. A coal oil lamp has been used to advantage. 3. Would an extra lens between the light and the photograph be an advantage, and what should be its dimensions? A. Yes, a condenser, the larger the better. 4. What is the next step in the education of a mechanical engineer after a college course, and on what terms are learners taken into machine shops and other engineering establishments? A. The next step is to lay aside the idea that college education will give anything but a theoretical knowledge, and to learn to do any menial labor that a mechanic has to do with all the strength and ability he possesses. On these terms, if he is fortunate, he will be admitted into a machine shop.

J. C. K. asks: Is it injurious to the water in leadservice pipes, or to the pipes, to lie in the same trench as gas pipes, the gas pipe and water pipe lying within three or four inches of each other, and passing through the same opening in a stone wall? If so, what is the effect? A. No; there is no reason why it should be injurious.

C. F. B. asks: What are the velocities of light and electricity? A. Wheatstone gives electricity (of high tension, such as atmospheric) a velocity of about 288,000 miles per second. Light has a speed of about 190,000 miles per second.

J. K. asks: Does the sun, by shining on one side of a saw every day for a length of time, injure it? A. Ordinarily, we should suppose not. We do not, however, know the circumstances of the case to which you refer.

S. M. L. asks: 1. Can I keep the air out of a tube 20 feet long, 8 feet wide, and 1½ deep? Can I do it with an air pump? What sized valve would be necessary, and what power would be required to run it? A. Yes. The size of the valve is not the matter to be considered. A large air pump would answer. 2. If the air were taken from an airtight cylinder in which was placed a flywheel running at moderate speed, would the motion of the wheel create air again in the cylinder? A. No. 3. If a tube, open at one end, were placed with the open end in a cistern of water, could the air be taken out of it so as to create a perfect vacuum? Would air enter by the water at the lower end? A. Vapor of water and air transpiring through the water would prevent obtaining a perfect vacuum. 4. Please name some good work on air pumps. A. Consult a work on natural philosophy, Ganot's "Physics," for example.

T. J. K. asks: What is the best material to put on a carpet when sweeping it? A. Try spent tea leaves.

H. W. asks: 1. Will scrap zinc do to use in a Hill or blue vitriol battery? A. If melted and cast, yes. 2. What sized cylinder do I want to make a 1-6 horse power engine at 30 lbs. pressure? A. A cylinder 2 inches diameter by 6 inches stroke, making 60 revolutions per minute, will give just over 1-6 of a nominal horse power.

C. L. F. asks: How can I determine the azimuth angle, or the variation of the magnetic from the true meridian? A. By the declination compass.

E. B. W. asks: What is the rule for finding the hight to which a stream of water will be thrown through a nozzle 3 inches diameter at varying pressures in the water main? A. We must refer you to some good treatise on hydraulics for an answer to your question, as its consideration would occupy too much space for these columns. We have discussed some of the points in our article on "Friction of Water on Pipes," p. 48, vol. 29.

H. L. W. asks: What is the best equilibrium slide valve? A. We do not recommend special articles of manufacture in these columns.

M. C. S. asks: What are the chief objections to an iron or steel rail whose under side is wrought into a series of arches or curves, designed to span the spaces between the ties? The top or tread of the rail is to be horizontal as now, but the underside curved, except where it rests upon the ties. A. We scarcely think that the change is very desirable.

C. R. asks: Will a spring made of the best spring steel be affected if placed in the steam chest of an engine? If so, is there any metal or alloy that will resist the most intense heat of steam and retain its original form? A. Springs exposed to high pressures and temperatures are apt to become weakened. We do not know of any better material than steel.

G. M. R. asks. Who compose the American Society of Civil Engineers, what is the object of the society, and what formalities are necessary to become a member of this society? What are the time and place of their meetings and are the meetings public or not? A. It numbers the principal engineers of the country among its members. By addressing the secretary (Mr. G. Leverich, 63 William street, New York city), you can obtain full information in regard to your other questions.

F. W. B. asks: 1. Would there be a demand for a double engine, having oscillating cylinders, and provided with a reversing attachment? A. There are such engines in the market. 2. Is an oscillating engine, with a given head of steam, inferior to an engine whose cylinders do not oscillate? A. Not necessarily.

A. asks: 1. How can gutta percha be fastened to ordinary sole leather? A. By using gutta percha dissolved in naphtha as a cement. 2. Will it wear as long as sole leather? A. No. 3. Will it melt with ordinary sun heat on the sidewalk? A. It will soften in summer weather.

P. P. W. asks: If the pressure is greatest on the bottom of a boiler, how does an injector work? A. We do not see the connection between the two. As to your other question: According to general usage, a corner building is on the street on which the main entrance opens.

G. W. M.—Your questions are too comprehensive to be answered in these columns. You will find the flight of birds fully explained in Pettigrew's "Animal Locomotion."

E. B. K. says: I have a small telescope constructed on the principle of the compound microscope, with achromatic object glass 1⅜ inches in diameter and 13 inches focus. Eye-piece consists of 4 lenses. Can I obtain a higher power by using an achromatic object glass of 30 inches focus and 2⅜ inches diameter? A. Yes.

J. S. asks: How can I cut moss agates and cornelians? A. By means of a blade of soft iron and diamond dust. Copper is sometimes used in place of the iron.

S. D. L. asks: 1. Is there any difference between a stereopticon and a magic lantern? A. No. 2. Can colored photographs be used in them? A. Yes. 3. Can photographic negatives be used? If so, how can they be colored? A. Read directions for coloring published on p. 397, vol 26.

D. G. asks: 1. What is the process of polishing paint, as it is done on carriage work, where no brush marks are to be seen? A. Carriage painting and varnishing are processes much too complicated to be described in these columns. See M. Arlot's work, frequently advertised in our pages. 2. What causes paint to crack? Is it the use of too much or too little oil? A. Too little.

S. says: If spiritualism is a humbug, how can you account for such men as Crookes, Wallace and Edmonds believing in it? A. Spiritualism is no more a humbug than is hydrophobia. Both phenomena have certain points of resemblance. Both appear to be affections of the nervous system, resulting from some sort of action upon the nerve centers. How this action is induced is not positively known; but there is evidence to show that a mental impression, a whim, or the imagination of the individual, may be a sufficient exciting cause. These diseases, and their multitudinous allies, nervous disorders of all kinds, are not respecters of persons. They attack all classes, the learned and the ignorant; but the earliest and easiest victims are generally found among individuals of weak or bad physical conditions.

T. A. C. says: Tell D. S. H., whom you answer at head of first column, p. 27, to cover the face of his pulley with leather to keep his belt from slipping. He can put it on with tacks or very small nails. Flesh sides together I think, work best.

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

R. R. R.—No. 1 is finely laminated micaceous schist, containing, as far as can be determined from such small pieces, nodules of impure steatite. No. 2, heavy spar or barite. The specific gravity of the specimen enclosed is 4·4. No. 3, limonite, containing on an average from 80 to 85 per cent oxide of iron. No. 4, magnetite.—R. L. W.—No. 1, on analysis, was found to contain a little silica and insoluble matter, the remainder being carbonate of lime. It is not a hydraulic limestone. Properly burned it would be converted into quicklime. No. 2 is fibrous gypsum.—J. W. T.—We compared the powder, for polishing purposes, with rouge, the finest French emery paper, and Bath brick. It is a medium between rouge and French emery paper, being inferior to rouge, and much superior to the emery. It is just equal to Bath brick, which it closely resembles in color. An eminent optician observes that it might be used by nickel platers.—A. M. B.—No. 1 is iron pyrites. No. 2 is hepatic pyrites, in which the sulphuret has been converted into oxide of iron.

F. E. T. says: Piles driven in salt water on the southern coast are very soon destroyed by worms. They might be protected by metal sheathing, but that is too expensive. Is there any method known, both cheap and effective, of securing wood against the attacks of these worms?—J. C. G. asks: How can I burnish brass?—J. S. N. asks: How can I straighten a rifle barrel?—E. H. B. asks: How is raw wool prepared for dyeing with indigo blue?—T. H. R. asks: How can I wash a chamois shirt without shrinking or injuring it?—H. L. K. asks: How are white rubber hand stamps made? What kind of molds are used, and what kind of rubber? How is the rubber melted?—E. K. M. asks: How are the rubber bands of different sizes sold by stationers joined together? The joint or seam is quite level, and as strong as any other part.—H. B. S. asks: What materials are used in the manufacture of firebricks, and what is the usual method of their manufacture?—H. E. K. asks: What is the best way to make putty of the colors of different woods (walnut, ash, etc.)?—L. H. asks: What will prevent pastel colors from being rubbed?—G. H. M. asks: What part of a horse power is an eight day clock spring? What is the weight of a four horse power engine?—W. C. L. says: The front wheels of a wagon are 3 feet 10 inches high, and the hind wheels 4 feet 4 inches high, or the front wheels are 4 feet and the hind wheels 4 feet 6 inches. What is the rule for setting the axle, and should the hind axle be any longer than the fore?—W. F. W. asks: 1. What is the rule for computing the horse power of an overshot water wheel, of 18 feet diameter, width of buckets 4 feet, depth 18 inches by average of 3½ inches, with a 10 inch run, making 64 buckets to the wheel? 2. What is the meaning of the word "rages," used by machinists? 3. Will crawfish work in soft slate? Do they go any deeper than to the gravel? 4. Will it injure bolting cloth to wash it?

We shall be glad to receive replies to the above for publication.

COMMUNICATIONS RECEIVED.

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

On Feathered Arrow Heads. By S. C. G., by T. L. W., and by A. H. I.

On a Balloon Device. By L. A.

On the Dress of Women. By F. M. S.

On Bursting and Explosion of Boilers. By J. M.

On the Boiler Explosion at Geddes, N. Y. By D. T.

On the International Rifle Match. By E. H. P.

On the Chances of War. By W. W. H.

On the Interior Angles of a Polygon. By C. E.

On a Small Steamer. By J. F. K.

Also enquiries and answers from the following:

J. A. C.—C. M. C.—W. C.—H. L. M.—C. E. J.—J. E. Jr.—D. B. S.—T. M. C.

HINTS TO CORRESPONDENTS.

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

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

Hundreds of enquiries analogous to the following are sent: "Please to inform me where I can buy sheet lead, and the price? Where can I purchase a good brick machine? Whose steam engine and boiler would you recommend? Which churn is considered the best? Who makes the best mucilage? Where can I buy the best style of windmills?" All such personal enquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

Index of Inventions

FOR WHICH

Letters Patent of the United States

WERE GRANTED IN THE WEEK ENDING

June 23, 1874,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Acid, making carbonic, H. Beins	152,269
Air and steam brake coupling, S. Rhinehart	152,413
Alarm, burglar, J. H. Whitelegge	152,310
Anvil, reversible, B. A. Ellison	152,351
Awl handle, S. Henry	152,228
Bag tie, A. Lodde	152,336
Bale tie, cotton, A. A. Goldsmith	152,362
Bale tie, cotton, G. W. Scott	152,424
Bassinet, folding, S. M. Hogan	152,287
Bayonet fastening, R. P. Beals	152,320
Bedstead, J. B. French	152,357
Bedstead, J. L. Haven	152,370
Bee hive, J. G. Gwaltney	152,366
Belting, leather, C. Munson	152,402
Boat, aerial, D. L. Rhone	152,414
Boiler, steam, C. A. Clark	152,275
Boot soles, trimming, R. C. Lambart	152,388
Bottles, covering heads of, Boeklen *et al.*	152,325
Box, butter-preserving, etc., Gillett & Hartshorn	152,223
Brewers, mashing machine for, A. Neuboeker	152,403
Bricks, enameling, D. W. Clark	152,213
Buckle for clothing, E. B. Schnabel	152,423
Building, fireproof, E. F. Cook	152,340
Burner, gas, J. W. Graham	152,225
Burner, vapor, F. A. Sawyer	152,420
Burner, electric lighting, A. T. Smith	152,427
Can for cooling milk, G. W. Fluke	152,284
Canister, tea, R. R. Lawrence	152,293
Car standard, A. Pennebacker	152,408
Car axle box, S. R. Hughes	152,377
Car braces, bending, S. Rigby, 3d	152,416
Car brake, railway, G. A. Beach	152,319
Car, freight, D. F. Van Liew	152,439
Car spring, A. Middleton, Jr.	152,398
Car, stock, H. Purdy	152,409
Cars, door for grain, H. Purdy	152,410
Carpets, screw for stair, M. Krickl	152,387
Carriage, child's, J. A. Crandall	152,278
Carriage, child's, G. Martienssen	152,298
Cartridge box, P. J. Quinsac	152,411
Cartridge, fire arm, W. S. Smoot	152,428
Cartridge-loading machine, C. H. Webb	152,263
Carts, end gate for dumping, J. Sweeney	152,433
Celluloids, etc., molding, I. S. & J. W. Hyatt	152,232
Chair seat needle, D. C. Mosher	152,407
Checks, etc., die for, R. B. Carsley	152,329
Churn, George & Stutzman	152,361
Cigar bunch machine, C. Windrath	152,416
Cigar case, J. H. Thwing	152,258
Clock lockwork, F. Kroeber	152,29
Cloth-measuring machine, W. M. Keyes	152,234
Clothes dryer, A. F. Stowe	152,431
Clothes wringer, W. A. Sharpe	152,425
Coffee, extracting, R. B. Underhill	152,309
Coffee for transportation, T. H. Berry (r)	5,933
Cooking apparatus, M. A. Scott	152,306
Copy holder, D. T. Hall	152,226
Cork cutting machines, E. O. Schartau	152,421, 152,422
Corset, J. C. Cook	152,341
Cultivator, L. J. Davis	152,343
Cultivator and stalk cutter, R. P. Rogers	152,417
Cultivator, cotton, P. D. Robbins	152,304
Curry comb, T. J. Hutchins	152,290
Curtain fixture, L. Bradbury	152,271
Cutter, meat, S. Gable	152,358
Cutter, straw, J. A. Cornish	152,342
Dams, device for building, E. Bell	152,322
Derrick, portable, H. Donnelly	152,319
Desk, school, W. P. Goolman	152,224
Drawing board, C. Poor	152,303
Dray, C. M. Murch	152,244
Drill, seed, J. H. Arney	152,315
Drill teeth, Linnell & Parker	152,294
Dyeing with indigo, Oldroyd *et al.*	152,404
Egg carrier, W. O. Strong	152,432
Egg hatching apparatus, J. Stone	152,430
Elevator, hog, W. E. Kelly	152,382
Engine and pump valve, A. J. Loretz	152,237
Eye and lung protector, G. A. Crofutt	152,215
Faucet, F. Messmer	152,397
Feather renovator, W. H. Elliot	152,221
Fence, barbed wire, J. Haish	152,368
Fertilizer, H. A. P. Lissagary	152,389
Fiber-separating machine, W. M. Hughes	152,289
Fire arm, breech loading, L. Guineuf	152,365
Fire arms, cartridge for, W. S. Smoot	152,428
Fuel from coal slack, I. McCormack	152,395
Furnace, hot air, E. H. Camp	152,274
Furniture fastening, Haven & Knight	152,371
Gage cock, H. A. Clinton	152,337
Game apparatus, H. L. Crist	152,279
Gas manufacture, I. Kendrick	152,383
Gas retort, portable, C. J. Eames	152,220
Gate, farm, G. Hoskins	152,288
Gear cutting machine, N. T. Mirapeix	152,400
Glove, gauntlet, E. V. Whitaker	152,265
Gloves, die for cutting, J. Haag	152,367
Grain binder, J. Garrard	152,359
Graining roller, J. Carr	152,212
Grate bar, gang, J. C. Kilgore	152,386
Grinding and polishing wheel, Walters *et al.*	152,442
Grinding carpenters' squares, C. S. Bement	152,323
Hame, Smith & Burr (r)	5,929
Hammer, atmospheric, W. Manson	152,391
Hammer, atmospheric power, W. Manson	152,390
Harvester, E. L. Hutchinson	152,379
Harvester dropper, D. B. & J. J. Browning	152,211
Hatch, self-closing, G. C. Howard	152,376
Heater, feed water, R. Garstang	152,360
Heating apparatus, G. Stevens	152,429
Hinge, spring, A. Acker (r)	5,932
Hog ringing and marking, P. Listeman	152,395
Hogs, watering tank for, G. A. Carter	152,330
Hoist, hydraulic, M. L. Bassett	152,209
Horse blinder, J. W. Kennedy	152,384
Horse hay fork, W. R. Reed	152,412
Horse power, L. R. Faught	152,222
Horses, releasing, R. Bragg	152,272
Horseshoeing harness, J. Clarridge	152,276
Horseshoes, making, J. Russell	152,252
Hose, hydraulic, E. A. Street (r)	5,930
Ice machine, B. F. Teal	152,435
Indicator, station, J. F. Kettell	152,385
Iron and steel, making, W. Bushnell	152,326
Ironing board, Loper & Dyss	152,296
Joist seat, W. H. Drake	152,283
Journal bearing, D. C. Clough	152,277

Key hole guard, G. W. Baer 152,316
Key hole guard, G. W. Baer 152,317
Key hole guard, H. Essex 152,352
Lamp extinguisher, W. Wagner 152,441
Lard, etc., cooling, R. B. Bancroft 152,208
Lard, etc., rendering, A. Broadnax (r) 5,925
Last fastener, M. E. Briggs 152,210
Latch, reversible, Hamill & Cluett 152,369
Laundries, bluing package for, A. M. Van Lier 152,438
Lightning rod, J. M. Mott 152,242
Lock, seal, J. S. Lorimer 152,297
Locomotive link block, W. A. Alexander 152,268
Locomotive smoke stack, Ross & McIntosh 152,418
Loom shuttle, C. K. Sawyer 152,419
Loom shuttle, Q. A. Washburn 152,443
Loom temple, J. Hirst 152,229
Loom temple, V. Jaggi 152,381
Lounge, extension, C. Streit (r) 5,931
Mashing machine, A. Neuboeker 152,408
Measuring machine, cloth, W. McK. Keyes 152,234
Medical compound, J. Carnrick 152,327
Metal from ore, extracting, D. Mindeleff 152,399
Meter, water, J. Lewis 152,295
Motor, compressed air, J. Griscom 152,285
Motor, water, Coates and Kennedy 152,338
Nut lock, D. W. De Forest 152,344
Nut lock, C. W. Penfield 152,249
Observatory, submarine, T. Shaw 152,253
Oiler, D. H. Chamberlain 152,332
Oils, distillation of, S. Van Syckel 152,440
Ore washer, A. Heatherington 152,227
Oven, hot blast, H. Essex 152,353
Packing, piston, S. E. and I. Y. Chubbuck 152,335
Paper machine, C. W. Crook 152,216
Paper, calendering, O. D. Murray 152,245
Pavement, wood, P. H. McCauley 152,299
Photographic bath, R. Newell 152,246
Planer, hand, J. P. Grosvenor 152,364
Planter, corn, J. W. Simpson 152,307
Planter, corn, R. S. Tallman 152,434
Planter, corn and cotton, C. Domschke 152,282
Plow, E. Ward 152,445
Plow, ditching, W. B. Tichnor 152,436
Plow irons, construction of, G. Moore 152,240
Press, screw, N. and C. Dubrul 152,350
Propeller, steering, W. H. Mallory 152,238
Pulley block, self-binding, J. Bird 152,270
Pump barrels, lining for, L. B. Brown 152,273
Pump for windmills, I. H. Palmer 152,407
Pumps, drop valve box for, J. Tingley 152,259
Purifiers, bolt for middlings, J. W. Wilson 152,312
Pyroxylin, molding, J. W. and I. S. Hyatt (r) 5,928
Radiator, steam, J. McCarthy 152,394
Railway crossings, gate for, E. Ridge 152,415
Railway switch, G. W. Paine 152,405
Rake, horse hay, J. Hollingsworth 152,230
Ribbon roller, J. Beck 152,321
Roofing tile, illuminating, T. Hyatt 152,380
Sand papering machine, McBride & Brenizer 152,393
Saw, J. T. Tunis 152,437
Saw, diamond, J. D. Husbands, Jr. 152,378
Saw gummer, J. W. Mixter 152,302
Saw, hand, H. Disston 152,347
Sawing apparatus, pile, T. Shaw 152,426
Sawing machine, D. Mater, Jr. 152,392
Separator, grain, D. D. Dickerson 153,315
Separator, grain, C. Johnson 152,291
Sewer and stench trap, H. H. Young 152,449
Sewer trap, H. H. Young 152,450
Sewing machine, D. W. G. and E. Humphrey 152,231
Sewing machine, M. G. Turner 152,260
Sewing machine attachment, F. Henry 152,374
Sewing machine caster, G. B. Morton 152,541
Sewing machine embroiderer, C. H. Palmer 152,248
Sewing machine needle groove, G. H. Dimond 152,346
Sewing machine ruffler, Sievers & Hildebrand 152,251
Sewing table, Fling & Land 152,355
Shafts, preventing backing, M. W. Obenchain *et al.* 152,247
Shingling bracket, F. Henriot 152,373
Sifter, ash, B. F. Towner 152,308
Sifter, flour, H. A. Mears 152,239
Silver, separating, C. Wiegand (r) 5,934
Siphon, W. W. Grant 152,363
Skewer, W. E. Cass 152,331
Sleigh, L. F. Fischer 152,354
Spark arrester, R. Hill 152,375
Spice box, Mefford & Curran 152,396
Spinning bobbin, G. Draper 152,219
Spoons, manufacture of, W. D. Whiting 152,266
Stamp, hand, E. D. Chamberlain 152,333
Stove, cooking, Williamson & Williams 152,311
Stoves, base burning, Carter & Dwyer (r) 5,926, 5,927
Stove center plate, J. Ziegler 152,267
Stove grate, J. H. Wentworth 152,264
Sugar, refining, A. H. W. Schrader 152,305
Table, extension, Thayer & Britton 152,257
Telegraph key, Foote & Randall 152,356
Telegraph relay, P. B. Delany 152,281
Thill coupling, A. Woeber 152,447
Tile machine, I. P. Merwin 152,301
Tile machine, drain, F. Dickenson, Jr. 152,218
Toy, C. H. Powers 152,250
Toy, automatic, W. H. Painter 152,406
Toy pistol, C. L. Wall 152,262
Transplanter, T. Carroll 152,328
Transplanter, C. Stone 152,255
Uterine supporter, J. T. Wright 152,448
Valve, balanced slide, J. T. Hill 152,286
Valve, magnetic safety, C. S. Westland 152,444
Vegetable slicer, J. Ballard 152,318
Vehicle running gear, H. S. Clark 152,336
Vehicle spring brace, A. J. McRay 152,300
Vehicle wheel and axle, S. H. Dailey 152,280
Velocipede, A. Cooke 152,214
Vermin, exterminating, F. Heidelmann 152,372
Vessel, culinary, J. Repetti 152,251
Vessels, attaching rudders to, C. H. Crossman 152,217
Vessels, table for, E. P. S. Andrews 152,314
Washing machine, Vant & Cheney 152,261
Washing machine boiler, R. Wood 152,313
Weather strip, Bishop & French 152,324
Wheelwright machine, O. J. Doerty 152,348
Window reflector, Christensen & Olsen 152,334
Window shade hanger, A. F. Stowe 152,256
Wooden ware, W. H. Kelly 152,233
Worms, implement for destroying, J. W. Colburn 152,339
Wringer roller, C. F. Mowll 152,243

APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

30,153.—ATTACHING SAW HANDLE.—I. Pelham. Sept. 9.
30,157.—BLOWER.—P. H. Roots. Sept. 9.
30,175.—POST HOLE BORER.—A. S. Ballard. Sept. 9.
30,185.—CORN SHELLER, ETC.—J. C. Richards. Sept. 9.
30,215.—HARVESTER.—T. N. Foster. Sept. 16.
30,868.—CASTING TOOLS.—S. W. Collins. Nov. 4.
30,691.—STEE PLOW PLATE.—F. F. Smith. Nov. 4.

EXTENSIONS GRANTED.

28,837.—FOG ALARM.—C. L. Daboll.
28,874.—POST HOLE DIGGER.—J. Lee.
28,923.—NAIL CUTTING MACHINE.—W. Wickersham.
28,941.—SKELETON SKIRT.—S. S. Sherwood.

DISCLAIMER.

28,837.—FOG ALARM.—C. L. Daboll.

DESIGNS PATENTED.

7,498.—CARPET.—J. Fisher, Philadelphia, Pa.
7,499.—HONEYCOMB COVERLET.—P. J. Otto, Lancaster, Pa.
7,500.—MEDAL.—T. R. Hartell *et al.*, Philadelphia, Pa.
7,501.—TOY BLOWPIPE.—F. H. Lane, Boston, Mass.
7,502.—CARRIAGE CLIP.—G. F. Smith, Plantsville, Conn.
7,503.—BRACKET.—J. B. Sargent, New Haven, Conn.

TRADE MARKS REGISTERED.

1,840.—EYE CUPS.—Dr. J. Ball & Co., New York city.
1,841.—WHISKY.—G. Clark, New York city.
1,842.—TALLOW COMPOUNDS.—J. Hobbs, Boston, Mass.
1,843.—VOLTAIC SOLES, ETC.—E. J. Seibert, N. Y. city.
1,844.—WHITE LEAD IN OIL.—St. Louis Lead and Oil Co., St. Louis, Mo.
1,845.—STOVE POLISH.—Strow & Co., Philadelphia, Pa.
1,846.—TOBACCO.—H. K. Thurber & Co., New York city.
1,847.—DENTAL RUBBER.—S. S. White, Philadelphia, Pa.
1,848.—FLOUR.—Bain & Pegram, St. Louis, Mo.
1,849.—MIDDLINGS PURIFIERS.—Brennan *et al.*, Paris, Ill.
1,850.—MACHINE NEEDLE.—H. B. Goodrich, Chicago, Ill.
1,851.—INJECTORS.—Rue Manufacturing Co., Phila., Pa.

SCHEDULE OF PATENT FEES.

On each Caveat $10
On each Trade Mark $25
On filing each application for a Patent (17 years). $15
On issuing each original Patent $20
On appeal to Examiners-in-Chief $10
On appeal to Commissioner of Patents $20
On application for Reissue $30
On application for Extension of Patent $50
On granting the Extension $50
On filing a Disclaimer $10
On an application for Design (3½ years) $10
On application for Design (7 years) $15
On application for Design (14 years) $30

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA

JUNE 15 to 26, 1874.

3,561.—H. L. Lowman, Birmingham, New Haven connty Conn., U. S. Improvements on the manufacture of scythes, called "Lowman's Scythe." June 15, 1874.

3,562.—T. Steers, Jr., Ottawa, Carleton county, Ont. Improvements on currycombs, called "Steer's Currycomb." June 15, 1874.

3,563.—J. Woodhams, Dorr, Allegan county, Mich., U. S., assignee of C. B. Turner, Grand Rapids, Kent county, Mich., U. S. Improvements on steam valves, called "Turner's Improved Steam Valve." June 15, 1874.

3,564.—R. M. Wanzer, Hamilton, Ont., assignee of J. F. Chamberlain, same place. Improvements in portable furnaces, called "Chamberlain's Improved Portable Furnace." June 15, 1874.

3,565.—T. Miller, New York city, U. S. Improvement on what are termed oil cabinets, called "Miller's Oil Cabinet." June 15, 1874.

3,566.—W. J. Clokey, Belleville, Ont. Improvement on a machine for thrashing grain, called "Clokey's Thrashing Machine Safety Gear." June 15, 1874.

3,567.—D. P. Sharp, Ithaca, Tompkins county, N. C., U.S. Improvement on horse rakes, called "Sharp's Improved Horse Rake." June 15, 1874.

3,568.—W. R. Macauley, Hamilton, Wentworth county, Ont. Useful invention for bending painters' brushes to be used in the ordinary pursuance of house and carriage painting, etc., called "The Painter's Friend." June 15, 1874.

3,569.—J. M. Allen, Marion, Plymouth county, Mass., U.S. Improvement on the art or process of making paper pulp and paper, called "Allen's Process of Making Paper Pulp and Paper." June 15, 1874.

3,570.—J. McNab, Widder Station, Lambton county, Ont. Improvements on car couplings, called "McNab's Improved Automatic Car Coupling." June 15, 1874.

3,571.—H. H. Warren, Bridgewater, Ont. Improvements on a machine for trapping animals, called "Warren's Steel and Animal Trap." June 15, 1874.

3,572.—A. R. Nichols, Williamtport, Lycoming county, Pa., U. S. Improvements on machines for edging lumber, called "Nichols' Improved Edging Machine." June 15, 1874.

3,573.—W. S. Wisner, Brantford, Brant county, Ont., assignee of C. P. Brown, Manchester, Ontario county, N. R., U. S. Improvement on seed sowing machine, called "Brown's Improved Grain Drill Distributer and Tube Shifter." June 15, 1874.

3,574.—H. Carter and D. Stewart, Aylmer, Elgin county, Ont. Improvements on odometer, called "Carter & Stewart's Odometer." June 15, 1874.

3,575.—J. Orth and W. Honsberger, Clinton, Lincoln county, Ont. Improvement on threshing machines, called "Orth & Honsberger's Chaffer." June 15, 1874.

3,576.—R. Kline and R. M. Jack, borough of Pottstown, Pa., U. S. Improvement in running gears for carriages, called "Kline & Jack's Improved Running Gears for Carriages." June 15, 1874.

3,577.—I. P. Magoon and H. Fairbanks, St. Johnsbury, Caledonia county, Vt., U. S. Improvement on feed water heaters for locomotives, called "Magoon's Locomotive Feed Water Heater." June 15, 1874.

3,578.—H. Watkeys, Syracuse, N. Y., U. S. Improvement upon throttle valves for locomotive and other steam engines, called "Watkey's Throttle Valve." June 18, 1874.

3,579.—C. Mitchell, De Kalb township, St. Lawrence county, N. Y., U. S. Improvements on animal pokes, called "Mitchell's Animal Poke." June 18, 1874.

3,580. C. V. Hase, Belleville, Ont. Improvement on a machine for propelling vessels, called "Hase's Rim Propeller Wheel." June 18, 1874.

3,581.—B. C. Richardson, Syracuse, Onondaga county, N. Y., U. S. Improvemets on a spool case, called "Richardson's Spool Case and Cushions." June 18, 1874.

3,582.—F. Bramer, Little Falls, Herkimer county, N. Y., U. S. Reissue of No. 2,600, called "The Warrier Mowing Machine." June 18, 1874.

3,583.—J. Lydiatt and E. R. Kent, Hamilton, Ont. Improvements in glass molds, called "Lydiatt's Improved Glass Mold." June 18, 1874.

3,584.—E. Voisin, Bourges, France. Improvements in cupola furnaces, called "Voisin's Improvements in Cupola Furnaces." June 18, 1874.

3,585.—T. Worswick, Guelph, Ont. Improvements on force pumps, called "Worswick's Adjustable Force Pump." June 18, 1874.

3,586.—J. Brokenshire, Kingston, Ont. Improvement on capstans for the use of vessels, called "Brokenshire's Elevated Geared Purchase Capstan." June 18, 1874.

3,587.—J. Hock, Vienna, Austria. Improvements in motor engines worked by the combustion of petroleum or other liquid hydrocarbons, called "Hock's Petroleum Motor Engine." June 18, 1874.

3,588.—William Gowan, Wausau, Marathon county, Wis., U. S. Improvements on head blocks and set works for saw mills, called "Gowen's Improved Saw Mill Set Works." June 18, 1874.

3,589.—T. D. James, Syracuse, N. Y., U. S. Improvement in wash boards, called "James' Perforated Wash Board." June 26, 1874.

VALUE OF PATENTS,
And How to Obtain Them.
Practical Hints to Inventors.

PROBABLY no investment of a small sum of money brings a greater return than the expense incurred in obtaining a patent, even when the invention is but a small one. Large inventions are found to pay correspondingly well. The names of Blanchard, Morse, Bigelow, Colt, Ericsson, Howe, McCormick, Hoe, and others, who have amassed immense fortunes from their inventions, are well known. And there are thousands of others who have realized large sums from their patents.

More than FIFTY THOUSAND inventors have availed themselves of the services of MUNN & Co. during the TWENTY-SIX years they have acted as solicitors and Publishers of the SCIENTIFIC AMERICAN. They stand at the head in this class of business; and their large corps of assistants, mostly selected from the ranks of the Patent Office: men capable of rendering the best service to the inventor, from the experience practically obtained while examiners in the Patent Office: enables MUNN & Co. to do everything appertaining to patents BETTER and CHEAPER than any other reliable agency.

HOW TO OBTAIN PATENTS This is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them; they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money, is by a draft or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible and send by mail. An answer as to the prospect of a patent will be received, usually, by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these, with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

Foreign Patents.

The population of Great Britain is 31,000,000; of France, 37,000,000; Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000, and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, when business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & Co., 37 Park Row, New York. Circulars with full information on foreign patents, furnished free.

Trademarks.

Any person or firm domiciled in the United States, or any firm or corporation residing in any foreign country where similar privileges are extended to citizens of the United States, may register their designs and obtain protection. This is very important to manufacturers in this country, and equally so to foreigners. For full particulars address MUNN & Co., 37 Park Row, New York.

Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than for the first full term which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing MUNN & Co. 37 Park Row, New York.

Copies of Patents.

Persons desiring any patent issued from 1836 to November 26, 1867, can be supplied with official copies at a reasonable cost, the price depending upon the extent of drawings and length of specification.

Any patent issued since November 27, 1867, at which time the Patent Office commenced printing the drawings and specifications, may be had by remitting to this office $1.

A copy of the claims of any patent issued since 1836 will be furnished for $1.

When ordering copies, please to remit for the same as above, and state name of patentee, title of invention, and date of patent. Address MUNN & Co., Patent Solicitors, 37 Park Row, New York.

MUNN & Co. will be happy to see inventors in person at their office, or to advise them by letter. In all cases they may expect an *honest opinion*. For such consultations, opinions, and advice, *no charge is made*. Write plain; do not use pencil or pale ink; be brief.

All business committed to our care, and all consultations, are kept *secret and strictly confidential*.

In all matters pertaining to patents, such as conducting interferences, procuring extensions, drawing assignments, examinations into the validity of patents, etc. special care and attention is given. For information and for pamphlets of instruction and advice,

Address

MUNN & CO.,

PUBLISHERS SCIENTIFIC AMERICAN,

37 Park Row, New York.

OFFICE IN WASHINGTON—**Corner F and 7th Streets**, opposite Patent Office.

New and Important Work on Paints.

JUST READY:

A Practical Treatise on the Manufacture of Colors for Painting:

Comprising the Origin, Definition, and Classification of Colors; the Treatment of the Raw Material; the best Formulæ and the newest Processes for the Preparation of every description of Pigment, and the necessary Apparatus and Directions for its Use; Dryers; the Testing, Application, and Qualities of Paints, etc., etc. By M. M. Riffault, Vergnaud, and Toussaint. Revised and Edited by M. F. Malepeyre. Translated from the French by A. A. Fesquet, Chemist and Engineer. Illustrated by 80 Engravings. 8vo..........$7.50

Also Published:

Painter, Gilder, and Varnisher's Companion:

Containing Rules and Regulations in everything relating to the Arts of Painting, Gilding, Varnishing, Glass Staining, Graining, Marbling, Sign Writing, Gilding on Glass, and Coach Painting and Varnishing; Tests for the Detection of Adulterations in Oils, Colors, etc.; and a Statement of the Diseases to which Painters are particularly liable, with the Simplest and Best Remedies. Sixteenth Edition. Revised, with an Appendix Containing Colors and Coloring—Theoretical and practical. Comprising descriptions of a great variety of Additional Pigments, their Qualities and Uses, to which are added, Dryers, and Modes and Operations of Painting, etc. Together with Chevreul's Principles of Harmony and Contrast of Colors. 12mo. 356 pages..........$1.50

Sign Writing and Glass Embossing:

A Complete Practical Illustrated Manual of the Art. By JAMES CALLINGHAM. In one volume, 12mo. $1.50

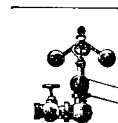
A Complete Guide for Coach Painters:

Translated from the French of M. ARLOT, Coach Painter, for eleven years Foreman of Painting to M. Eherler, Coach Maker, Paris. By A. A. Fesquet, Chemist and Engineer. To which is added an Appendix, containing Information respecting the Materials and the Practice of Coach and Car Painting and Varnishing in the United States and Great Britain. 12mo..........$1.25

☞ The above, or any of my Books, sent by mail, free of postage, at the publication prices.

My new and enlarged CATALOGUE OF PRACTICAL AND SCIENTIFIC BOOKS—96 pages, 8vo.—sent, free of of postage, to any one who will furnish his address.

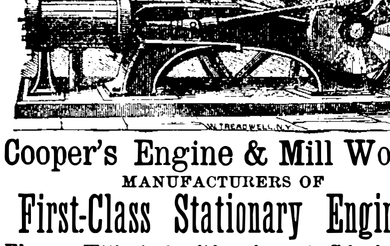
HENRY CAREY BAIRD,
INDUSTRIAL PUBLISHER,
406 WALNUT STREET, Philadelphia.



BLAKE'S PATENT

Stone and Ore Breaker

Crushes all hard and brittle substances to **any required size.** Also, any kind of STONE for ROADS and for CONCRETE, &c. Address BLAKE CRUSHER CO., New Haven, Conn.



Cooper's Engine & Mill Works,

MANUFACTURERS OF

First-Class Stationary Engines,

First — With single slide valve cut-off by lap at ⅜ stroke.
Second—With indexed cut-off valves arranged to close at any part of stroke.
Third — Steam jack ted cylinders, fitted with patent automatic cut-off valve gear and governor, guaranteed to run on 3 lbs. of coal per indicated horse power, or to make 80 barrels from 1 ton coal.

PORTABLE ENGINES, of 8, 10, 20, and 25 Horse Power.

IMPROVED HANGERS, COUPLINGS, FOUNTAIN BOXES AND SHAFTING.
FRENCH BURR SPRING GRIST MILLS AND BOLTING APPARATUS.
CIRCULAR SAW MILLS AND FIXTURES, BOILERS, MILL MACHINERY, CASTINGS, ETC.

☞ State what is wanted and Circulars free. Address in full,
THE JOHN COOPER ENGINE M'F'G CO., Mount Vernon, O.

Last Chance

FOR

AN EASY FORTUNE!

Fifth and Last Gift Concert

IN AID OF THE

Public Library of Kentucky.

JULY 31st, 1874.

LIST OF GIFTS.

One Grand Cash Gift		$250,000
One Grand Cash Gift		100,000
One Grand Cash Gift		75,000
One Grand Cash Gift		50,000
One Grand Cash Gift		25,000
5 Cash Gifts,	$20,000 each	100,000
10 Cash Gifts,	14,000 each	140,000
15 Cash Gifts,	10,000 each	150,000
20 Cash Gifts,	5,000 each	100,000
25 Cash Gifts,	4,000 each	100,000
30 Cash Gifts,	3,000 each	90,000
50 Cash Gifts,	2,000 each	100,000
100 Cash Gifts,	1,000 each	100,000
240 Cash Gifts,	500 each	120,000
500 Cash Gifts,	100 each	50,000
19,000 Cash Gifts,	50 each	950,000

Grand Total, 20,000 Gifts, all cash, 2,500,000

PRICE OF TICKETS.

Whole Tickets	$50 00
Halves	25 00
Tenths, or each Coupon	5 00
11 Whole Tickets for	500 00
22 1-2 Tickets for	1,000 00

For Tickets or information, Address

THO. E. BRAMLETTE,
Agent and Manager,
Public Library Building, Louisville, Ky.
or THOMAS H. HAYS & CO., EASTERN AGENTS, 609 Broadway, N. Y.

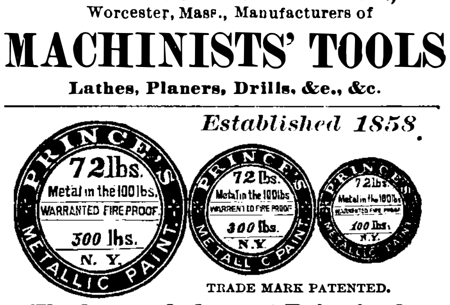
WOODWORTH SURFACE PLANERS, $125. Planers and Matchers, $350. S. C. HILLS 51 Courtlandt street New York.

LATHE & MORSE TOOL CO.,
Worcester, Mass., Manufacturers of

MACHINISTS' TOOLS

Lathes, Planers, Drills, &c., &c.

Established 1858.



TRADE MARK PATENTED.

The best and cheapest Paint in the world for Iron, Tin or Wood. For sale by the Trade everywhere. PRINCE'S METALLIC PAINT CO., Manufacturers, 96 Cedar St., New York.

CAUTION.—Purchasers and consumers are cautioned against imitations of our METALLIC PAINT. All genuine *PRINCE'S METALLIC PAINT* will bear our name and trade mark on each and every package. Send for a circular.

AGENTS—Fast Selling Novelties, new articles. Lowest Prices. Send for circular. Samples 25c. NATIONAL NOVELTY CO., 301 Broadway, N.Y.

PAGE'S Water Flame Coal Lime Kiln, with coal or wood. No 1 Soft White Lime or Cement with use of water. C.D.PAGE, Patentee, Rochester, N.Y.

OVER 7,000 IN USE,

BLAKE'S STEAM PUMP

Send for illustrated catalogue, 79 & 81 Liberty st., N.Y.

$72 EACH WEEK. Agents wanted; particulars free. J. WORTH & Co., St. Louis Mo.

ADVERTISERS! Send twenty-five cents to GEO. P. ROWELL & CO., 41 Park Row, New York, for their *Pamphlet of one hundred pages*, containing lists of 3,000 newspapers, and estimates showing cost of advertising.

GUN WORK.

WANTED—CONTRACTORS AND JOBBERS ON GUN WORK, from Forgings to Stocking. Apply to WINCHESTER REPEATING ARMS CO., New Haven, Conn.

MAGNETS—Permanent Steel Magnets of any form or size, made to order by F. C. BEACH & CO., 263 Broadway, New York. Makers of the celebrated Tom Thumb and Miniature Telegraph Instruments.

E. M. MAYO'S PAT. BOLT CUTTER.
☞ Send for Illustrated Circular, Cincinnati, Ohio.

WHETHER YOU WISH TO BUY OR SELL *STEAM ENGINES, MACHINERY or PATENTS,* Write to E. E. ROBERTS, 119 Liberty St., N.Y.

RISDON'S IMPROVED TURBINE.

Has the tightest gate and most durable Has yielded the highest percentage of any wheel tested at Holyoke or else where. 1873, Dec. 10—36 in. wheel full gate 90 per cent, seven eighths ·89, three quarters ·82. 1874, Apr. 28—43 in. wheel full gate 91 per cent, seven eighths ·89, three quarters ·83, five eighths ·76. Additional information sent upon application to T. H. RISDON, TYLER & CO., Mount Holly, N. J.

PATENT COLD ROLLED SHAFTING.

The fact that this shafting has [illegible] per cent greater strength, a finer finish, and is truer to gage, than any other in use, renders it undoubtedly the most economical. We are also the sole manufacturers of the CELEBRATED COLLINS PAT. COUPLING, and furnish Pulleys, Hangers, etc., of the most approved styles. Price lists mailed on application to JONES & LAUGHLINS, Try street, 2d and 3d avenues, Pittsburgh, Pa. 190 S. Canal st., Chicago.

☞ Stocks of this Shafting in store and for sale by FULLER, DANA & FITZ, Boston, Mass. GEO. PLACE & CO., 121 Chambers street, N. Y. PIERCE & WHALING, Milwaukee, Wis.

OTIS' SAFETY HOISTING Machinery.

OTIS, BROS. & CO., NO. 348 BROADWAY NEW YORK.

THE CHAMPION SILVER-STEEL SPRING MATTRESS, now greatly improved, has been before the public for several years, and continues to occupy its unrivalled position in the trade, as the BEST BED ever produced. It presents the rich and elegant appearance of silver, and is the softest, easiest, cheapest, and most durable Spring Bed in market. Wholly composed of tenacious tempered steel springs, so united that the pressure is equally distributed. Easily litted, turned, or rolled up. Both sides alike. No frame, no wooden slats, no tow stuffing, no straps. May be used on floor without bedstead. No under bed required. Needs only half the thickness of hair mattress. More springs for your money in this bed than in any other. Unequalled for hotels. Any sizes made to order. Send for pictorial circular. Retail price of double bed, $13. Shipped, by single bed or quantity, to all parts of the world. Liberal discount to the trade. Sold by leading dealers in all parts of the country. Refer to Phelps, Doremus & Corbett, J. T. Allen & Co., New York, Gould & Co., Philadelphia, Pa., Gilbert & Sons, Norwich, Conn, Bowditch & Co., New Haven, Conn., and many others. CHAMPION SPRING MATTRESS CO., Makers, 246 Canal St., near Broadway, New York.

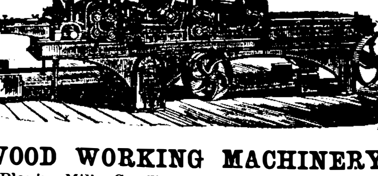
PIPE FELTING.

CHEAPEST, most DURABLE and effective covering known. Encased in Galvanized Iron, ready for immediate application. No skilled labor required. Can be removed and used again. Send for Circular. VEGETABLE FELTING COMPANY, 73 Beekman St., New York

---

IMPORTANT FOR ALL LARGE CORPORATIONS AND MANUFACTURING CONCERNS.—**Buerk's Watchman's Time Detector,** capable of controlling, with the utmost accuracy, the motion of a watchman or patrolman, as the same reaches different stations of his beat. Send for a Circular. J. E. BUERK, P. O. Box 1,057, Boston, Mass. N. B.—This detector is covered by two U. S. Patents. Parties using or selling these instruments without authority from me will be dealt with according to law.

R. BALL & CO.,



WOOD WORKING MACHINERY.

For Planing Mills, Car Shops, Sash, Blind and Door Makers, &c., &c. Send for Illustrated Catalogue and price list. Factory, at Worcester, Mass. Salesroom, at 121 Chambers & 10[illegible] eSts., New York.

SHINGLE AND BARREL MACHINERY.— Improved Law's Patent Shingle and Heading Machine, simplest and best in use. Also, Shingle Heading and Stave Jointers, Stave Equalizers, Heading Planers, Turners, &c. Address TREVOR & Co., Lockport, N. Y.

PORTABLE STEAM ENGINES, COMBINing the maximum of efficiency, durability and economy, with the minimum of weight and price. They are widely and favorably known, more than 1,000 being in use. All warranted satisfactory or no sale. Descriptive circulars sent on application. Address THE J. C. HOADLEY CO. Lawrence, Mass.

IRON BRIDGES—CLARKE, REEVES & Co., PHŒNIXVILLE BRIDGE WORKS. Office, 410 Walnut Street, Philadelphia, Pa. Specialties—Accurate Workmanship—Phœnix columns —Use of double refined iron. No welds. All work done on the premises, from ore to finished bridges. Illustrated Album mailed on receipt of 75 cents.

Machinery,

Wood and Iron Working of every kind. Leather and Rubber Belting, Emery Wheels, Babbitt Metal, &c.

Sturtevant Blowers.

Of every size and descript on, constantly on hand.

Cold Rolled Shafting.

Best and most perfect Shafting ever made, constantly on hand in large quantities, furnished in any lengths up to 24 ft. Also, Pat. Coupling and Self-oiling adjustable Hangers, pulleys, etc. GEORGE PLACE & CO., 121 Chambers Street, & 103 Reade Street, New York.

Niagara Steam Pump.

CHAS. B. HARDICK, 23 Adams st., Brooklyn, N. Y.

THE JOHN HARDICK

Niagara Steam Pump.

HUBBARD & ALLER, Brooklyn, N.Y.

PUNCHING AND DROP PRESSES. For the Best and Cheapest Address THE STILES & PARKER PRESS CO. MIDDLETOWN. CONN.

WOOD-WORKING MACHINERY GENerally. Specialties, Woodworth Planers and Richardson's Patent Improved Tenon Machines. Central, corner Union st., Worcester, Mass. WITHERBY RUGG & RICHARDSON.

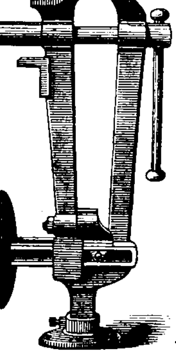
STENCIL DIES For cutting business Stencils, all sizes. Also complete OUTFITS for Clothing Stencils and Key Checks, with which young men are making from $5 to $20 a day. Send for catalogue and samples to S.M.SPENCER, 117 Hanover St., Boston Mass.

$5 TO $20 per day at home. Terms Free. Address GEO. STINSON & Co., Portland, Maine.

WROUGHT IRON BEAMS & GIRDERS

THE Union Iron Mills, Pittsburgh, Pa. The attention of Engineers and Architects is called to our improved Wrought-iron Beams and Girders (patented), in which the compound welds between the stem and flanges, which have proved so objectionable in the old mode of manufacturing, are entirely avoided, we are prepared to furnish all sizes at terms as favorable as can be obtained elsewhere. For descriptive lithograph address Carnegie, Kloman & Co, Union Iron Mills, Pittsburgh, Pa.

Small Tools of all kinds; also GEAR WHEELS, parts of MODELS, and materials of all kinds. Castings of Small Lathes, Engines, Slide Rests, &c. Catalogues free. GOODNOW & WIGHTMAN, 23 Cornhill, Boston, Mass.



PATENT PARALLEL Machinist's Vise,

MANUFACTURED BY

HARRISBURG FOUNDRY AND MACHINE COMPANY.
Harrisburg, Pa.

☞ *Send for Circular and Price List.*

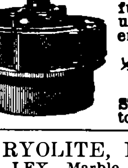
FOR LEGAL ADVICE CONCERNING Infringements and Patents, consult R. B. McMASTER, Counsellor at Law, 9 & 11 Nassau st., Room 26, New York. Counsellor and Advocate in Patent Cases.

BANKRUPT'S SALE OF HORIZONTAL and Vertical Steam Engines. Also, new and second hand Machinist's Tools. Send for circulars at THE YALE IRON WORKS, New Haven, Conn.

Todd & Rafferty Machine Co.

MANUFACTURERS OF

The celebrated Greene Variable Cut-Off Engine; Lowe's Patent Tubular and Flue Boilers; Plain Slide Valve Stationary, Hoisting, and Portable Engines. Boilers of all kinds. Steam Pumps, Mill Gearing, Shafting, &c.; Silk, Tow, Oakum, Bagging, Rope, Flax, and Hemp Machinery. Agents for the New Haven Manufacturing Co.'s Machinists' Tools; for Judson's Governors and Stop-Valves; Sturtevant Blowers; and Differential Pulley-Blocks. WAREROOMS, 10 BARCLAY ST., NEW YORK. WORKS, PATERSON, NEW JERSEY.



The American Turbine Water Wheel,

Recently improved and submitted to thorough scientific tests by James Emerson, showing the following useful effect of the power of the water utilized, being the highest results ever known.

Percentage of Part Gate: ½, 50.08; ⅝, 69.64; ¾, 78.73; ⅞, 82.53; ⅞, 82.90.
Per cent. of Whole Gate: 83.14.

A full report may be obtained of STOUT, MILLS & TEMPLE, Dayton, Ohio.

KRYOLITE, FLUORSPAR, FLINT, SILEX, Marble finely ground, Bloodstone, Loadstone, Sodium, Potassium, Aluminium, Bismuth, Nickel, Antimony and Tin Metals—Manganese, Cobalt, Copper, Chrome, Uranium Oxides, Asbestos all grades, Carbonates Strontia and Baryta, Nickel Salts and Anodes, pure Sulphate Alumina, Black Lead, Zaffre, Borax, Saltpetre—all rare Chemicals, crude materials for manufacturer's use. L. & J. W. FEUCHTWANGER, Importing and Manufacturing Chemists, P. O. Box 3616, 180 Fulton Street, New York.

1832. SCHENCK'S PATENT. 1871

WOODWORTH PLANERS

And Re-Sawing Machines, Wood and Iron Working Machinery, Engines, Boilers, etc. JOHN B. SCHENCK'S SONS, Matteawan, N. Y. and 118 Liberty St., New York.

P. BLAISDELL & CO.,

Worcester, Mass.,

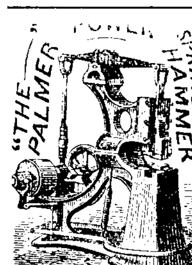
Manufacturers of the Blaisdell Patent Upright Drills and other first-class Machinists' Tools.

NEW & IMPROVED PATTERNS.—MACHINISTS' TOOLS—all sizes—at low prices. E. GOULD, 97 to 113 N. J. R. R. Ave., Newark, N. J

Andrew's Patents.

Noiseless, Friction Grooved, or Geared Hoisters, suited to every want.
Safety Store Elevators. Prevent Accident, Rope, Belt, and Engine break.
Smoke-Burning Safety Boilers.
Oscillating Engines, Double and Single, 1-2 100-Horse power.
Centrifugal Pumps, 100 to 100,000 Gallons per Minute, Best Pumps in the World, pass Mud, Sand, Gravel, Coal, Grain, etc., without injury.
All Light, Simple, Durable, and Economical.
Send for Circulars.

WM. D. ANDREWS & BRO., 414 Water Street, New York.



Superior to any modification of the trip hammer. Simple, Efficient, and Cheap.

☞ Send for Circulars and price.

Address

W. L. Chase & Co.,

95 & 97 Liberty St., New York

MACHINERY, NEW and 2d-HAND.— Send for Circular. CHAS. PLACE & CO. 60 Vesey st., New York.

GLASS MOULDS for Fruit Jars, Lamps, Bottles, Ink Stands, etc., made by H. BROOKE, 15 years COR. WHITE AND CENTER STS., N.Y. For any thing new in glass you will require a mould (or die). ☞ PARTICULAR ATTENTION paid to MOULDS for INVENTORS. Send model or drawing; inclose stamp.

RICHARDSON, MERIAM & CO. Manufacturers of the latest improved Patent Daniels' and Woodworth Planing Machines, Matching, Sash and molding, Tenoning, Mortising, Boring, Shaping, Vertical, and Circular Re-sawing Machines, Saw Mills, Saw Arbors, Scroll Saws, Railway, Cut-off, and Rip-saw Machines, Spoke and Wood Turning Lathes, and various other kinds of Wood-working Machinery. Catalogues and price lists sent on application. Manufactory, Worcester, Mass. Warehouse 107 Liberty st, New York. 17

SAMPLES OF MACHINES, TOOLS, and IMPLEMENTS, received, exhibited, and orders taken. A. M. PAXTON & CO., Vicksburg, Miss.

$2400 Yearly to Agents. 54 new articles and the best Family Paper in America, with two $5 Chromos. Family Journal, 300 Br'way, N. Y.

$70 A WEEK TO AGENTS—Sure. Four new Patents. J. D. NESBITT, Foxboro', Mass.

The Toll-Gate! Prize Picture sent free! An ingenious gem! 50 objects to find! Address, with stamp, E. C. ABBEY Buffalo N.Y.

PATENT

Planing and Matching

and Molding Machines, Gray & Wood's Planers, Self-oiling Saw Arbors, and other wood working machinery.
S. A. WOODS MACHINE CO., { 91 Liberty st., N. Y.; 67 Sudbury st. Boston
Send for Circulars, etc.

CONSTANT EMPLOYMENT—At home, Male or Female, $30 a week warranted. No capital required. Particulars and valuable sample sent free. Address, with 6c. return stamp, C. ROSS, Williamsburgh, N.Y.

NEXT JULY, A WELL KNOWN FIRM of Engineers and Machinery Agents, with large connections at home and abroad, will open a groundfloor Warehouse, having windows fronting Queen Victoria Street and Cannon Street, City, London, England. The firm is prepared to accept the agency for special machinery, tools, etc., and to exhibit a choice selection of these and of working models. Advertizers' travelers canvass Great Britain and the whole of Europe. For terms, apply to W. P., Box 773, New York City.

SHINGLE & BARREL MACHINERY.

EVART'S IMP. HEADING AND SHINGLE SAW, STAVE CUTTERS, JOINTERS, EQUALIZERS, AND HEADING TURNERS.

BAILEY GAUGE LATHE—For turning all kinds handles and Cabinet work. Simplest and best in use. We manufacture a full line of Wood and Iron Working Machinery, Steam Engines, &c. Address T. R. BAILEY & VAIL, Lockport, N. Y.

$10 A DAY. Employment for all. Patent Novelties. GEO. L. FELTON, 119 Nassau St., N. Y.

An deutsche Erfinder.

Diese große und thätige Classe unsrer Bevölkerung machen wir besonders darauf aufmerksam, daß unsre Firma durch ihre Verbindung mit Washington und den europäischen Hauptstädten, besondere Vortheile zur Erlangung von in- und ausländischen Patenten bietet.

Jeder Erfinder, gleichviel welcher Nationalität angehörig, ist durch die liberalen Patentgesetze der Vereinigten Staaten zum Patentschutz für Erfindungen berechtigt. Unsre Firma ist bereit, gestützt auf 26jährige Erfahrung, deutsche Erfinder jeder Zeit zu berathen und zu mäßigen Preisen rasch und pünktlich Patente zu erlangen.

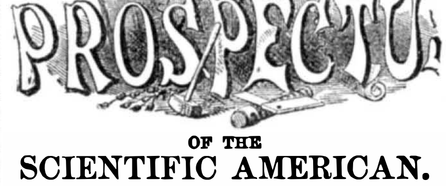
Die Deutsche Section ist in den Händen fähiger deutscher Ingenieure, welche in der Office persönlich mit Erfindern verkehren werden.

Der „Scientific American" wird in seinen Spalten die bedeutenderen Erfindungen besprechen.

Correspondenz erbeten und prompt beantwortet. Pamphlete in deutscher Sprache werden auf Verlangen franco zugesandt.

Adresse:

Munn & Co.,
„*Scientific American*" *Patent Agentur,*
37 Park Row,
New York City.



OF THE

SCIENTIFIC AMERICAN.

THE BEST MECHANICAL PAPER IN THE WORLD.

TWENTY-NINTH YEAR.

VOLUME XXXI.—NEW SERIES.

The publishers of the SCIENTIFIC AMERICAN beg to announce that on the fourth day of July, 1874, a new volume commences. It will continue to be the aim of the publishers to render the contents of the new volume more attractive and useful than any of its predecessors.

The SCIENTIFIC AMERICAN is devoted to the interests of Popular Science, the Mechanic Arts, Manufactures, Inventions, Agriculture, Commerce, and the industrial pursuits generally; and it is valuable and instructive not only in the Workshop and Manufactory, but also in the Household, the Library, and the Reading Room.

To the Mechanic and Manufacturer!

No person engaged in any of the mechanical pursuits should think of doing without the SCIENTIFIC AMERICAN. Every number contains from six to ten engravings of new machines and inventions which cannot be found in any other publication.

TERMS.

One copy, one year	$3.00
One copy, six months	1.50
One copy, four months	1.00
One copy of Scientific American for one year, and one copy of engraving, "Men of Progress"	10.00
One copy of Scientific American for one year, and one copy of "Science Record" for 1874	5.00

Remit by postal order, draft or express.

The postage on the Scientific American is five cents per quarter, payable at the office where received. Canada subscribers must remit, with subscription, 25 cents extra to pay postage.

Address all letters and make all Post Office orders and drafts payable to

MUNN & CO.,
37 PARK ROW NEW YORK.