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IMPROVED VARIABLE CUT-OFF VALVE.

The importance of a good cut-off valve for steam engines is fully shown by the numerous patents recently issued for improvements to effect that object. The one we are about to describe was patented on the 23d of August last, through the Scientific American Patent Agency, and lays claim to important features, producing results attained by no other.

A is the steam-chamber into which the steam is admitted direct from the boiler through the opening, W, on one side. B is the valve seat, with the openings, U U, directly under the valves, to admit the steam into the steam chest in which the main slide valve works. C C are the valves, the stems of which, D D, pass upward through the stuffing-boxes, E E, and through holes in the cap, *m*, which form guides for the upper ends. H H are drops attached to the stems by the pivot pins, *d d*, having notches, *n n*, in the lower end to receive the points of the lifters, F F, by which they, with the valves, are raised to admit the steam into the main steam chest. These drops are double, and hang down on each side of the stem, which is square at that part. The ends of the lifters are also forked, so as to reach round on each side of the stem, and catch into both parts of the drops. The crank G, which operates the lifters, is moved by an eccentric on the main shaft, so adjusted as to commence raising one valve as soon as the slide valve has closed the port of the engine. On the top of each stem is a nut with a notch in one side to receive the end of the lever, L, which, by means of the spring, M, throws the valve back to its seat after it is disengaged from the lifters. The spring, M, is caused to act on the lever, L, with any desired force by the screw-bolt, N. The lower ends of the drops are pressed inwards by the springs, Y Y, so as always to catch on the ends of the lifters.

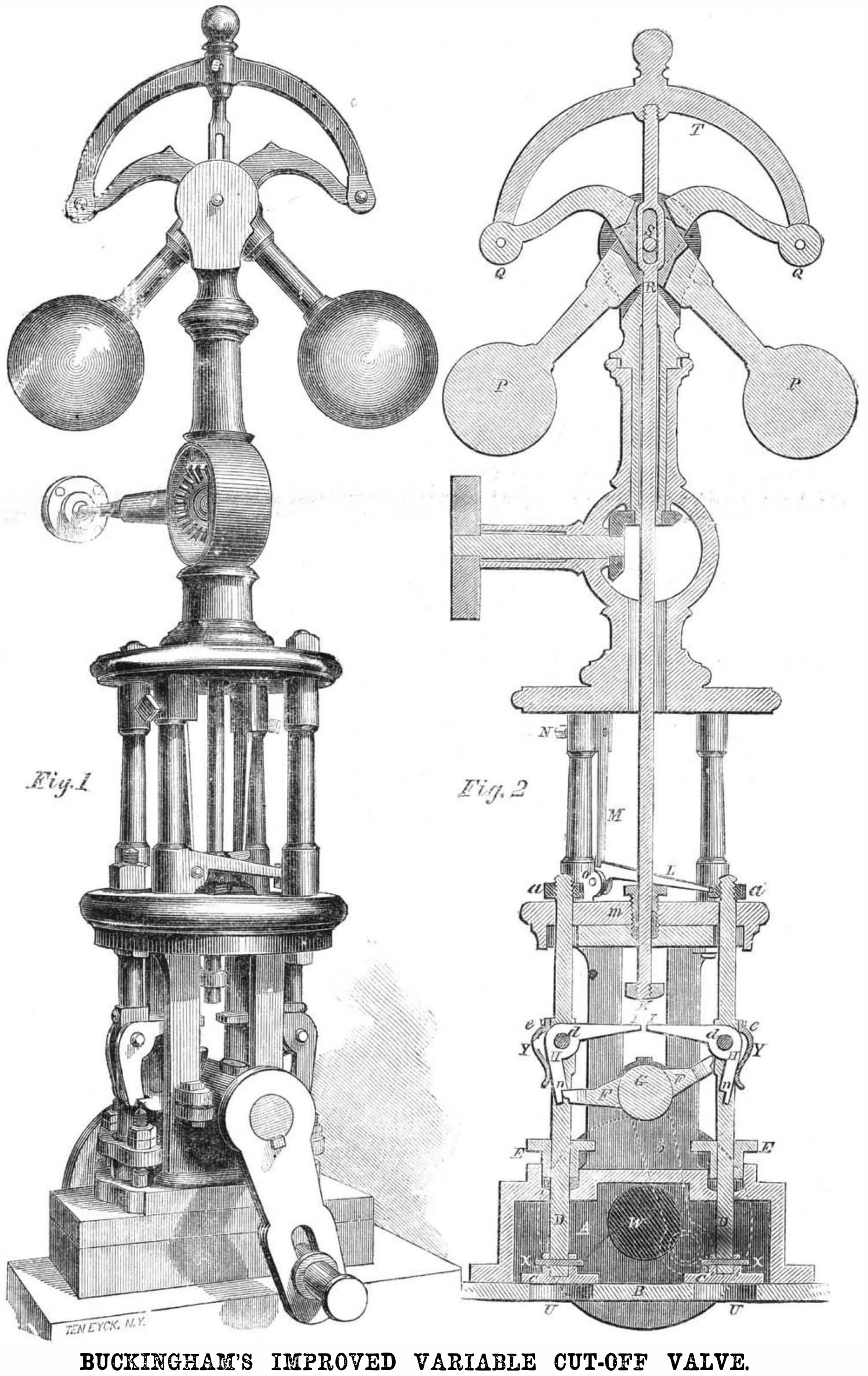
The governor is so arranged that as the balls, P P, rise, the points, Q Q, of the arms descend, and draw down the yoke, T, and with it the rod, R, at the bottom of which is the tripping button, K. It will be noticed that the rod, R, is slotted, for the pin, S, to pass through, and one arm of the governor is slotted for the rod to pass through, while the other arm is slotted for both; so that each arm has two bearings on the pivot pin, one on each side of the rod, and in this way the balls are carried round by the pin alone, the side rubbing on the joint avoided, and the governor made very sensitive and obedient to any slight change of motion.

The operation is as follows:—The crank being at its extreme point of motion, as shown in the engraving, and the point of the lifter having caught into the notch of the drop; as soon as it begins to move to the opposite side, the lifter raises the valve and admits the steam into the steam chest. The valve will continue to rise until the point, I, of the arm of the drop strikes the tripping button, K, at the bottom of the governor rod. This throws the lower end, *n*, of the drop, H, off from the point of the lifter, and the valve instantly drops back into its place, cutting off the admission of steam. When the piston returns, the other valve rises and performs the same duty. It will be seen that the valve, if not tripped, would continue to rise until the steam port was closed, so that the range of action of this cut-off is during the the whole stroke of the piston until the steam is cut off by the main valve.

The tapping of the arms, I, against the tripping button, K, produces a gentle jar or vibration through the governor which keeps the joints free and ready to obey the slightest alteration in the motion of the engine. This vibration can, however, if necessary, be controlled or entirely destroyed, by a small dash-pot attached to the stem of the governor. The valves being relieved from the pressure of the steam, the moment they leave their seats, require a very slight blow to disengage the drops from the lifters.

This valve can just as well be attached to the main slide valve rod, if desired, by making a slight alteration in the shape of the lifters; but in that case, as in all cases where it is thus attached, the range of its action will be considerably less than half the stroke of the piston, depending on the "lap" of the main slide valve.

The advantages claimed for this valve are:—1. Its simplicity and economy. Every part acts in the most direct and advantageous manner, so that it can be made light and yet strong. 2. The lifters take hold directly on the valve stem, and raise it straight up without any side pressure. 3. The lifters do not slide on the drops, but raise them without friction until they are tripped, and that is done instantly, so that any slight variation in the construction of the parts would not sensibly affect the regularity of their action. 4. There is but one tripper, which insures perfect regularity of action. 5. The lower end of the drop, where the lifter acts, wears alike over its entire surface, so that it will never wear uneven, and cause the danger of the lifter slipping off before the proper time.



BUCKINGHAM'S IMPROVED VARIABLE CUT-OFF VALVE.

Further information may be obtained by addressing C. P. Buckingham & Co., Mount Vernon, Ohio.

The explosion of the great meteor in Ohio, on the 1st inst. was at first generally believed to be an earthquake.

NAVAL ARCHITECTURE OF GREAT BRITAIN.

IRON SHIPS.

An "Institution of Naval Architects" having been formed in London recently, a congress, composed of the most eminent shipbuilders and naval architects of Great Britain, was held during the early part of last month. Its deliberations were presided over by Sir J. Pakingham, G.C.B., who deemed it one of the highest honors to occupy that position. Quite a number of papers were read on different subjects relating to shipbuilding; but the most important seemed to be that of Mr. Wm. Fairbairn, C.E., on the construction of iron ships. He stated that he had been engaged for a period of 40 years in various works connected with iron, and its application for shipbuilding purposes. About 30 years ago, in conjunction with the the Messrs. Laird, of Birkenhead, he found by numerous experiments that vessels made of iron would be capable of more resistance, lighter, and better calculated for a large cargo than timber-built vessels. Messrs. Laird and himself then commenced building iron vessels on a large scale, and from 1835 until 1848 upwards of 100 first-class ships were produced. When first constructed, iron vessels had many defects; great improvements had since taken place, but much remained to be done. Of late years this class of vessels had been constructed very long, in order to give them fine lines and increase their carrying power; but hitherto this increase of length had been obtained at an expense of the strength of the ship. In many cases the length of iron vessels was eight or nine times that of the beam, and although he did not say that such had yet obtained their maximum length, yet the mode of construction was capable of much improvement. He assured them that vessels in a rolling sea, or stranded on a lea-shore, were governed by the same laws of transverse strain as hollow iron beams, like the Britannia tubular bridge; hence a ship could not be lengthened with impunity without adding to its depth or the sectional area of the plates in the middle. An iron ship of the ordinary construction—300 feet long, 41½ feet beam and 26½ feet deep—was inadequately designed to resist strains when treated as a simple beam; and a ship was like a simple beam when supported at each end by waves, or when rising on the crest of a wave, it was supported on the center with the stem and stern partially suspended. In these positions an iron ship underwent, alternately, a strain of compression and a strain of tension along the whole section of the deck, corresponding with equal strains along the keel. Such a vessel could make a number of vogages on sea, because it was there sustained in a measure by the water; but when driven upon a rock, with its bow and stern suspended, it would break in two, owing to the insufficient mode of constructing the decks. An iron ship of the foregoing dimensions, as usually constructed and tried by the beam formulæ $W = (a\ d\ c + l)$, would be broken asunder if tried with a weight of 960 tuns suspended from bow and stern. But if the deck beams were covered with iron plates throughout the whole length on each side of the hatchway, so as to render the deck area equal to that of the bottom, we should have nearly twice the strength. He next considered the displacement of such a vessel in tuns, and found the strength far from satisfactory. When loaded to a depth of 18 feet, the displacement was about 177,000 cubic feet—equivalent to 5,000 tuns for the ship and cargo. If we considered this weight uniformly distributed, and compared it with the strength determined, we have a load uniformly distributed of 5,000 tuns to that of the breaking weight of the metal in the vessel, which would leave a deficiency of strength equal to 1,160 tuns; so that, if laid high and dry on a rock at the center, it would break with four-fifths of the load which it carried. These were extreme cases, but ships should be built for them if possible. There had been improvements introduced recently in iron vessels, still they were all too weak in the decks. These, he argued, should be so strengthened as to be equal to the keel, and thus provide a margin of strength for every contingency. He recommended the addition of two longitudinal stringers, running one on each side of the keel; the covering of the cross-bearers of the upper deck with iron stringer plates thickest towards the middle; also two cellular rectangular stringers—one on each side of the hatchways—all running the whole length of the ship. He also argued the importance of using the best quality of metal. No plates should be employed that were incapable of withstanding a tensile strain of 20 tuns per square inch. This paper elicited an animated and lengthy discussion.

Mr. J. Scott Russell pointed out various improvements which he had carried out, especially with relation to water-tight bulkheads. These were a source of great strength to iron vessels, as they were placed inside the ship, and even if a collision took place, and the ship was cut through, they would save it from sinking. Twelve years ago he built a vessel which might be described as all bulkheads, and entirely divested of frames. Believing that the center of the vessel required to be essentially strong, he carried a web of iron completely through it, in some cases passing through the bulwarks, and sometimes avoiding them.

Mr. Ritchie (Surveyor of Lloyd's Register) said he should like to hear something from Mr. Russell on the subject of rivets.

Mr. Russell said that was a most important matter in the construction of iron ships. He had recently inspected a vessel returned from a voyage, and found that the heads of at least 1,000 rivets were off. How they came off was a mystery to him; but he gave a very modest rap with a hammer and one of the rivets dropped out. He had adopted the system of conical riveting, which he found to answer very well, as when the head was gone the rivet was perfectly water-tight.

Mr. Napier (of Glasgow) observed that he did not approve of the tubular system advocated by Mr. Fairbairn; and it must be remembered that a stationary tubular iron bridge had not to contend with the constant strain of the sea. Many and conflicting opinions prevailed as to the best form of the keel; some were for having it flat, others sharp; and perhaps both were right. (Laughter). For his own part he did not build a vessel to go on the rocks, but if she were taken there he could not help it. If they could possibly arrive at the absolute breaking power of the sea which an iron vessel would bear, it would be a great discovery. He agreed with Mr. Scott Russell that it was not in the power of man to build a ship which would be able to bear up against the breaking power which the *Royal Charter* encountered as the sea went over her broadside.

Mr. Fairbairn again addressed the meeting, expressing his opinion that iron shipbuilding was at present in a transition state. They required to have better and stronger plates; and if owners would only give a fair price for their vessels, many catastrophes which resulted from the use of bad iron might be averted.

In our next we shall present the substance of some of the other interesting papers read at the above-named congress.

AMERICAN MANGANESE.

MESSRS. EDITORS:—I wish to say a few words to the readers of the SCIENTIFIC AMERICAN on the subject of manganese. I am aware that it is a mineral of great value to the arts and sciences, but that its use is much limited by its high price and the small quantity in our market. I understand it has been, and perhaps is even now, imported to this country from Germany at high figures. My aim is to impart information as well as to gain it. I wish to tell our chemists and scientific men that Virginia can furnish all the manganese that their wants may require; and a pure, excellent article, at comparatively low prices. It abounds in different parts of the State, and has been developed in large quantities on our great leading lines of railroad and canal. It can be mined and delivered in any of our Atlantic cities much lower than its present market value, and still leave handsome profits to the miner. Some of our manganese has been shipped to Germany—principally the black oxyd, containing from 60 to 80 per cent of manganese. We have both gray and black, but the latter is the most abundant. If any of your readers would like more information on the subject, I shall be ready at any time to impart it, as far as the mineral is concerned—its character, locality, extent, formation, &c., &c. But I wish to know from yourself, or from some of your readers, into *how many uses* this mineral (in its various forms) now enters, *how much* of it is used altogether, *whence* it is obtained in this country, and *at what prices*. Many of your readers are interested in this matter, and would be glad to hear what you have to say on the subject, particularly those of your subscribers who live in Virginia, many of whom possess this mineral without knowing its full value.

I wish, also, to call attention to the general mineral productions of this State, which have been long neglected both at home and abroad. Very few know anything of the vast extent of our coal-fields, or our immense and varied deposits of iron ores, which are not excelled by any other State or any other country of like extent in the world, and which, when properly developed, must become a magnificent source of wealth to the "Old Dominion," independent of our ores of copper, lead, manganese, &c., which also promise an abundant yield. The first great effort towards the development of our iron ores, for practical purposes, has just been inaugurated in the establishment of a magnificent furnace near this city, which furnace—for simplicity, elegance and substantiality of structure, and general arrangement of improvements—will compare favorably with any work of the kind in this or any other country.

S. HERRIES DEBOW.

Richmond, Va., May 15, 1860.

[We have made inquiries, but have not been able to ascertain the amount of manganese imported annually; but we know it must be small, because it is only used in the manufacture of chlorine gas for bleaching purposes, and this is not carried on to a very great extent. It is also very moderately used as an oxydizer to render paints quick-drying. We are aware that Virginia possesses vast natural resourses of the most valuable minerals—gold, copper, iron, lime and coal. All that she needs in order to become, perhaps, the very greatest manufacturing and wealthiest State in the Union, is a great increase of skillful and industrious operatives and manufacturers.—EDS.

INVENTIONS FOR WOMEN—SENSIBLE SUGGESTIONS.

MESSRS. EDITORS:—I was much gratified by reading the two letters of your fair California correspondent—Mrs. M. L. Varney—(published on page 410 of the first volume of the new series of the SCIENTIFIC AMERICAN, and page 279 of the present one), expressing her views on the subject of lightening the household labors of women. I can endorse all she said about the *cooking stove;* but I would remark, in addition, that, in a coal-burning district and in the winter season, a good method whereby the clinkers and non-combustible refuse could be easily removed from the bottom of the stove, without disturbing the fire at the top (and thus gain the ability to keep up a good fire for months, if required), would add still more to the value of that "woman's friend." I prepared a rough sketch of a plan to secure this result, and offered it, gratis, to an eminent stove-manufacturing firm, considering myself well paid if I should be the means of lessening even only one poor, overburdened woman's ceaseless labors. They spoke favorably of my idea, liked my method, and concluded by politely declining to have anything to say to it; thus speaking volumes for the value of my invention!

A *washing machine* is still a *desideratum*—I mean a small one, adapted to an ordinary family. There are large ones, driven by power, that operate satisfactorily; but I have never seen a really good small one among the multitudes daily offered for sale. A radical fault with most of them is, that the washerwoman's arms still furnish the driving power, so that the muscular labor is little (if anything) reduced, and is often much increased by friction. They ought to be so arranged that other power may be available—be it horse, water, steam or (what is more readily obtained) the husband's arms; he, surely, could afford to *spell* for his "better-half," occasionally, at such a laborious, unhealthy business. Then the water always ought to be kept boiling in the clothes receptacle, as the hands should never go in there; here Mrs. Varney's idea of a "wringer" would come into play with good effect. It seems to me that the caloric engine promises much for housewives; it might do well for working the aforesaid washing machine, grinding coffee, chopping meat, and a hundred other jobs that would hardly call for a steam engine. Could not the heat of the caloric engine be also made available for all the purposes of cooking, warming water, &c.? There is a fine opening in this direction for inventors. I, myself, have also "thought out" a washing machine, but, from the "brilliant success" of my cooking stove, I fancy the washer will remain in the workshop it was made in—the brain.

What is the use of invoking the inventive genius of the age to devise a good working-dress for females, when they will not wear a most excellent one that is already not only invented, but, still better, well-tested by ample experience. I mean, of course, the "reform dress," or "Bloomer," as it is generally mis-named. Perfection is not claimed for it, although, compared with the body-crushing costume now in fashion, it almost does seem like perfection. It is not necessary for inventors and artists to exercise their powers on a new dress for working females; but it *is* necessary for the millions of working females to take courage enough to adopt a dress that is already waiting for them, and for the millions of short-sighted men to sustain them in this course. So besotted is the prevailing taste for "Paris fashions" that, if the wisdom of a Newton and the ideality of a Raphael were strained to the utmost to devise a good and beautiful apparel for women, it would be rejected for the last whim of the Empress Eugenie! This matter is particularly appropriate for the columns of the SCIENTIFIC AMERICAN, which is pre-eminently the industrial paper of the country; and what more nearly concerns the industry of about one-half its inhabitants than the question of a good *working-dress for women?* E. M. RICHARDS.

Moore's Ordinary, Va., May 14, 1860.

IMPROVING FARMS WITHOUT MANURE.

We request the attention of our farmers and all others interested in agriculture to the following letter:—

MESSRS. EDITORS:—Although our opinions are so widely different on the principle which governs the vegetable kingdom, yet there is one point on which we perfectly agree, namely, the subject is one of great importance to our people. But when you say that every bushel of wheat or other crop taken from the soil is required to be returned again, in constituents, in some form or other, under penalty of barrenness, our opinions again widely differ. You say that this fact is now universally recognized. This is proof to me that your knowledge of the views of those who cultivate the soil is very limited indeed. A very large majority of the farmers with whom I converse, express reverse opinions. They assert that if the constituents which are taken off the soil had to be returned, they would give up farming in despair, because it would be impossible for them to do so. I read your article on agricultural science to my next neighbor, and asked him how much he returned to the soil annually. He replied, that for thirty years he had taken a large amount of hay, straw, grain and roots, and sold them in the market, for which not a particle had been returned to the soil, and yet his farm had greatly improved during that time. Nine out of ten of the farmers with whom I have conversed and to whom I have put this same question, have testified in the same manner. G. B.

Bethelhem, N. Y., April 28th, 1850.

The constituents of the soil for raising crops mean those manures called "fertilizers." If our correspondent and his neighbors have cultivated their farms for a number of years without manuring them, and have taken several crops from them during those periods, and at the same time have greatly improved their land, then they have discovered the "philosopher's stone," and we recommend their appointment as professors in all our agricultural colleges and schools. We assert without fear of successful contradiction, that every crop taken from the soil requires to be restored again in constituents in some form, under the penalty of future barrenness. We know that on the rich river-bottoms of the West the soil is very deep, and it will take many years to exhaust it, but thousands of farms have become barren in this new country on account of not restoring the constituents of crops regularly to the soil. We know something about farming practically, but have not learned in the same school as our correspondent and his neighbors. If he is right, what a lot of fools must those farmers be who spend money for guano, superphosphates poudrettes and other fertilizers. If one man can improve his farm and take crops from it regularly for thirty years without manuring, so can all farmers—if they know how. We trust our correspondent will communicate the method by which this is done, as it is of great consequence to the whole world.—EDS.

MORIN ON "FRICTION."

The very important subject of friction has been more thoroughly investigated probably by Arthur Morin than it ever was by any one else. His experiments were made at Metz in 1831, '32,'33 and '34, and were published in *Recueil des Savans E'trangers*, tomes IV. and V. The general results are stated in his work on "Mechanics," recently translated by Joseph Bennett, and published by D. Appleton & Co., of this city. As some of our readers may not have met with an account of these most valuable experiments, we present a very brief abstract of the most interesting results.

The three principal laws which Morin established in regard to the friction of plane surfaces rubbing on each other are these:—1st, The friction is proportional to the pressure; 2d, It is independent of the area of the surfaces of contact; 3d, It is independent of the velocity of motion.

A weight was placed upon a plane and drawn along by a cord passing over a pulley with a weight suspended at its end. The power required to bend the cord, the friction of the pulley, and all other modifying elements were measured and taken out of the problem; so that the figures show the number of pounds required to overcome simply the friction of one surface rubbing on another under different degrees of pressure, with different materials, and with several lubricating circumstances. For example, cast iron resting upon cast iron, without any lubricator, and pressed down with a weight of 496.1 lbs.; it required 64½ lbs. hanging perpendicularly to overcome the friction in drawing the upper piece of iron along; and the ration of 64½ to 496.1 is 13-100, or expressed decimally, it is in proportion of 0.13 to 1. In other words, it requires 13-100 of a pound suspended vertically to overcome the friction of one pound of dry cast iron resting upon a plane cast iron bed.

Cast Iron upon Cast Iron.

Area of sur- in contact in sq. feet.	Lubricator.	Pressure. lbs.	Friction. lbs.	Ratio of friction to pressure.
0.3874	Nothing	496.1	64.5	0.130
"	"	1091.1	211.1	0.193
"	"	4412.7	681.7	0.154
			Mean	0.154
0.3874	Water	1104.3	312.3	0.282
	"	2202.7	731.3	0.332
			Mean	0.311
0.3874	Lard	1103.4	72.9	0.070
Strong Leather—tanned and placed flatwise upon Cast Iron.				
0.4155	Nothing	471.0	272.7	0.579
"	Oil	1114.1	140.9	0.126
Brass upon Oak—without unguent; the fibers of the wood being parallel to the direction of motion.				
0.141	Nothing	248.3	153.6	0.616
Oak upon Oak—the fibers of the wood being parallel to the direction of motion.				
2.798	Nothing	2291.5	1080.6	0.471
1.062	"	102.1	50.8	0.498
0.33	"	604.0	293.5	0.484
Elm upon Oak—the fibers of the wood being parallel to the direction of motion.				
1.338	Nothing	260.0	117.2	0,45
"	"	1980.1	821.7	0.42

From the above table it will be seen that, when cast iron is rubbing upon cast iron with the bearings dry, the friction is doubled by wetting the bearings with water, while it is reduced more than half by lubricating with lard. The friction of brass rubbing upon oak is about nine times that of lubricated cast iron upon cast iron, being considerably more than the friction of oak upon oak.

The following table exhibits the ratio of the friction to the pressure for various substances rubbing together with the same lubricating material. In these experiments, the substances, after having been smeared with an unguent, were wiped, so that no interposing layer of the unguent prevented their intimate contact. In all cases in which woods were tried, the fibers were parallel to the direction of motion:—

Copper upon oak...........	0.100	Elm upon elm..............	0.140
Brass upon cast iron........	0.107	Cast iron upon wrought.....	0.143
Cast iron upon oak.........	0.107	Cast iron upon cast iron....	0.144
Oak upon oak..............	0.108	Wrought iron upon brass...	0.160
Yellow copper upon cast iron........................	0.115	Wrought iron upon wrought	0.177
Elm upon oak..............	0.119	Leather upon brass, wetted.	0.244
Brass upon brass...........	0.134	Leather upon cast iron, wetted........................	0.229
Elm upon cast iron.........	0.135	Beech upon oak.............	0.330
Wrought iron upon elm....	0.138		

Morin says that the three laws of friction above stated were proved by all the experiments in the whole 179 series which he tried, *without one exception.* In making up the first table we have selected instances of as widely varying pressure as possible, in order to show our readers just how much range there is in the ratio of the friction to the pressure.

We shall publish next week the most important results obtained by Morin in his experiments on the friction of *journals*, with his general conclusions and practical hints. These will be found very valuable to such of our readers as have not chanced to meet with them.

PRODUCTION OF A COPPER GREEN WITHOUT ARSENIC.

BY PROFESSOR H. DUSSANCE.

The green of Scheele and Schwanfurtz (arsenite and arseniate of copper) are much used in the manufacture of paper-hangings, buildings, paintings and many other arts. Their preparation is a dangerous one; and, lately, a great many poisoning cases have occurred from their use in covering the walls of apartments. I think it will be a great benefit to make known some colors having the same optical qualities as the foregoing, without their chemical dangers. I have found a method of making a green equal to the one of arsenic, and not so dangerous; and I believe it will be used. There are several ways of preparing it. I will describe the two that are quickest and cheapest:—

First, Take 19 lbs. of quick lime, slack and mix it with water to make a milk of lime; add to to it a solution made with 100 lbs. chloride of copper; then boil the mixture for some time, and filter through canvas. The portion which remains in the filter (the precipitate) is the coloring matter. Wash it with hot water, and dry it at about 90° Fah. The filtrate is a mixture of chloride of copper mixed with a chloride of calcium. To prepare the chloride of copper, dissolve, separately, in hot water 62 lbs. fused chloride of calcium and 100 lbs. sulphate of copper; mix the two solutions, and shake well. It forms chloride of copper, soluble, and sulphate of lime, insoluble. Filter this through a canvas; the sulphate of lime remains on the filter, and the chloride of copper passes on the filtrate. The precipipate is washed with hot water. The above quantities gives 75 lbs. anhydrous chloride of copper.

Second, The same color could be obtained in boiling for about one hour 47 lbs. of whiting (carbonate of lime) with 100 lbs. sulphate of copper, filtering and washing the precipitate (which is the color) with boiling water, and drying it at about 90° Fah. In substituting the carbonate of magnesia for carbonate of lime, the same product is obtained.

Colors prepared by these processes are solid, durable, and acquire brightness with artificial light, while they do not present the dangerous properties of the arsenical preparations.

I must describe another industrial application of these important re-actions, which could be applied with advantage. If we heat the carbonate of magnesia with sulphate of copper, as above, we obtain three products: first, the green chloride; second, carbonic acid gas, which could be used in the preparation of aerated waters; third, sulphate of magnesia, so important in medicine. If the manufacturer has only for his object the preparation of carbonic acid and sulphate of magnesia, he may substitute sulphate of alumina for sulphate of copper.

These chemical re-actions are important enough to call the attention of manufacturers; and it will be a great benefit for many trades to substitute these preparations for the dangerous colors prepared with arsenic.

LAKE SUPERIOR COPPER.

The Lake Superior *Miner* states that a discrepancy lately found its way into our columns, regarding the amount of copper obtained from the mines of that region during the past year. "Instead of being 696 tuns, as stated, it was about 6,096 tuns, as follows:—

Ontonagon district	2,610	tuns.
Portage lake	" 1,573	"
Eagle river	" 1,301	"
Eagle harbor	" 607	"
Copper harbor	" 3	"

These sums, adding the fractions omitted in the above, give the total shipments last year, 6,095 tuns 1,621 lbs. Perhaps the error in the quotation we make may have occurred by setting down the total product of our mines last year, 6,096 tuns, and the typo left out the cipher, which the proof-reader failed to correct."

If our cotemporary had constantly conned the carefully-revised columns of the SCIENTIFIC AMERICAN, he would have seen that we published the substance of the above "correction" on page 187 of the present volume —*ten* weeks ago!'

We learn from the *Miner* that the copper-mining business is active and apparently prosperous. It says:—"We are not at present working, probably, on any 400-tun mass, as we were two years since, but there is more mass copper showing in several of our best mines than at any previous period in the history of the country. Three mines in Rockland township, twelve miles from this village, are yielding in the aggregate about 270 tuns of copper per month."

IMPROVED GRIST MILL.

The accompanying engravings illustrate one of the latest improvements in grinding mills. Although they have of late years engaged a large share of the attention of inventors, and it would seem as if there was but little room for improvement, yet this one has some features that are really novel and important, especially the method of attaching the spindle to the runner stone, which differs in principle from any hitherto known.

The grinding is done by French burr-stones cemented into broad, shallow cast iron cups, *s* and *t*, leaving two or three inches of the naked stone projecting above the cup to allow for dressing down and wear. The lower or bed stone, *g*, with its cup, is supported on a steel point or cockhead, let into a recess under its center and is perfectly balanced, thus naturally hanging level, though permitted to rock freely on the central point. It is prevented from rotating by pins, *w*, on the sides, which project into vertical slots, *k*, in the frame, and thus allow entire freedom to the rocking motion, which permits it to assume any position necessary to adapt its surface to that of the runner stone.

To prevent it, however, from assuming a vibratory motion while the mill is in operation, a series of elastic bars, *i i*, are made to press on the sides of the cup by means of set screws, producing any required degree of friction, and thereby holding the stone perfectly steady. By this arrangement the stone *trams* itself, as soon as it is brought up against the runner, with unerring certainty, and is held steady by the spring bars.

The cockhead which supports the bed-stone passes down through a sleeve, 5, and stands with its lower end on a bridge-tree, *q*. One end of this bridge-tree rests on

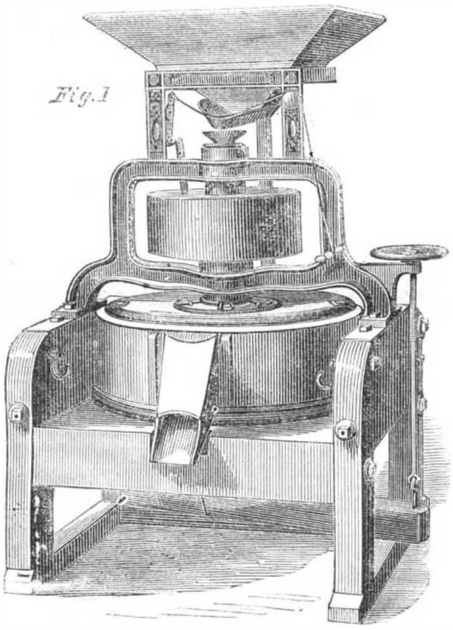


Fig. 1

a pivot and the other end is supported by the rod, *p*, passing through a projection in the upper frame, and having a screw and hand wheel, *l*, at the top. By this means the bed-stone is raised or lowered to regulate the fineness of the grinding.

The upper stone, which is the runner, is strongly cemented into a cup, *s*, which is attached to the spindle by a contrivance hereafter described. This spindle is hollow and runs in an iron frame, *e c*, cast in one piece, which stands upon and is bolted to the upper part, *b*, of the husk. The lower box of the frame projects downwards into a groove around the lower end of the spindle, which forms a pivot for holding oil, and the lower end, D D, of the hub of the pulley rests on the upper side of the same box. On the upper end of the hub are projections, *z z*, which, when rotating, strike the block, *x*, and through the levers, *v v*, act on the shoe, *y*, to give it the proper vibratory motion for feeding the grain into the mill.

There is a projecting ring, R, on the edge of the lower cup, *t*, which supports the curb, *u*, which covers the runner stone and cup, leaving only the central portion exposed to sight.

A stationary tube, *h*, passes down through the hollow spindle, which prevents the grain from touching the revolving surface until it reaches the point of entrance between the stones. In order to get at the stones for the purpose of dressing, the husk, B, is furnished with hinges, which permit the upper part, with the iron frame to which the upper stone is attached, to open out and turn completely over (the hopper and its frame having been removed), which brings the grinding surface of the upper stone uppermost and leaves that of the bed-stone exposed. The latter is dressed in the usual manner; but the runner (should the face ever get untrue, which will

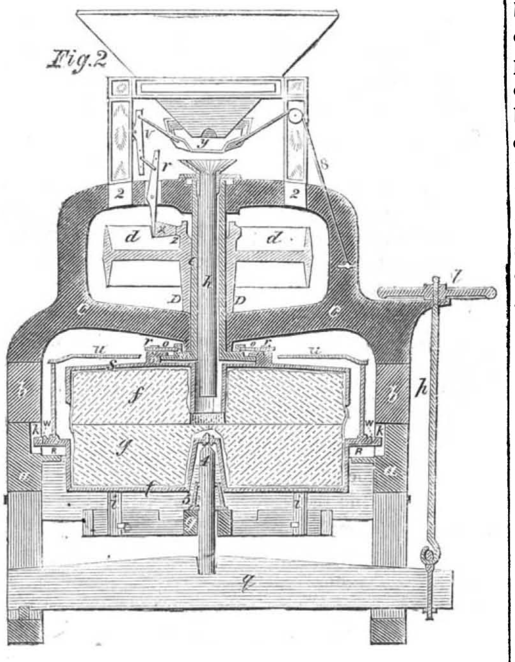


Fig. 2

seldom happen) must be dressed by being turned round on the spindle under a stationary paint stick, which will indicate the high points and bring the face perfectly true with the spindle.

The contrivance by which the spindle is attached to the runner stone is shown more clearly in Figs. 3 and 4. Fig. 4 is a section of that part of the spindle and cup where the attachment is made. Fig. 3 is a horizontal projection of the same, showing its appearance when viewed from above. At the bottom of the spindle, *e e*, is a plate, *m m*, cast in one piece with it. On the upper side of this plate is a ring, *d d*, at a sufficient distance from the spindle to receive the bottom of the lower box into the groove thus formed, which becomes a cup for holding oil. On the outside of this ring is a groove to receive the points of the springs, *o*, The plate extends

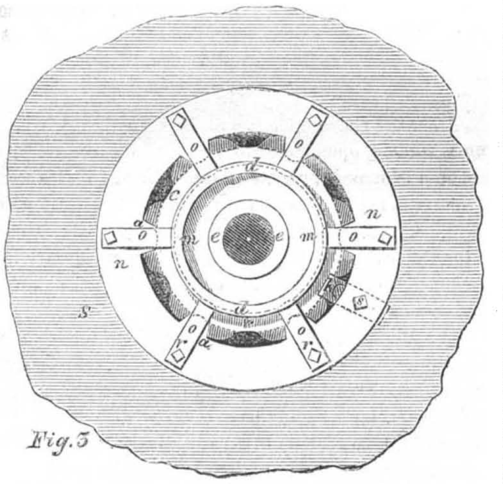


Fig. 3

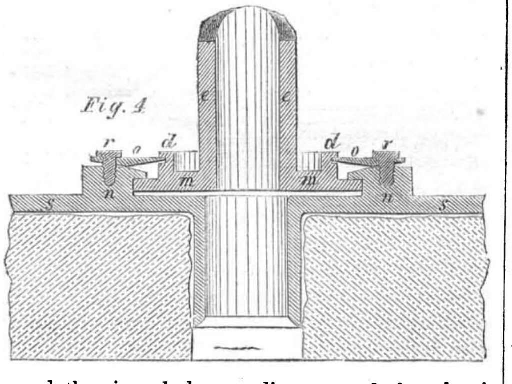


Fig. 4

beyond the ring, *d d*, some distance, and the edge is accurately turned to fit the inside of the ring, *n*, which is cast in one piece with the cup, S. Around the edge of the plate are notches, *c*, which are of proper size to permit the projections, *a*, on the inside the ring, *n*, to pass through them. These projections are near the top of the ring, so that there is room for the thickness of the spindle plate under them and about a quarter of an inch to spare. When, therefore, the notches, *c*, are made to register with the projections, *a*, the plate will drop into the ring, *n*, and on being turned so as to bring the projections between the notches represented in the engraving, it cannot be withdrawn. To retain the two in this relative position, a key, *k*, is passed through the ring, *n*, into one of the notches in the plate and is held there by the screw bolt, *s*. This locks them both together, so that one cannot rotate without the other. The stone and cup thus hang on the spindle plate by means of the projections or hooks, *a*, and are carried round with a true and even motion so long as the weight will keep the hooks down so as to rest on the edge of the plate. To provide for cases in which the weight is not sufficient for this purpose a number of springs, *o*, are placed around the spindle with their points entering the groove on the outside of the ring, *d*, and the outer ends resting on the top of the ring, *n*. These ends are drawn down by the screw bolts, *r*, and the points thrown upward with any degree of force necessary to prevent the hooks, *a*, from rising off the plate, *m*, by pressure occasioned by grinding. But if foreign substances that cannot be ground should pass through the mill, the stone can rise by the yielding of the springs and permit it to pass out, and then quietly return to its natural position without any vibratory motion afterwards, and without straining or injuring its connection with the spindle.

It will be easily seen that this principle of attachment of the spindle to the runner, as well as the method of holding the runner steady, is quite as applicable to an under as to an upper runner mill.

The patent for the above improvement was issued, through the Scientific American Patent Agency, Dec. 6, 1859, and any further information in relation to it may be obtained by addressing C. P. Buckingham & Co., Mount Vernon, Ohio.

A NEW GROUPING OF THE STARS SUGGESTED.

MESSRS. EDITORS:—As I believe the SCIENTIFIC AMERICAN is doing more permanent good than any other paper in the land, I should be glad to see the following points suggested in it by you. Suppose the celestial map was divided by meridians running along the first points of Aries, Taurus, Gemini, &c., and all the stars south of Aries were embodied into one constellation and called *South Aries*, and all the stars north of Aries were embodied into one constellation and called *North Aries*, and the same of all the other constellations of the zodiac; this method would condense the constellations from upwards of one hundred to thirty-six in number, would reduce them all to plain mathematical forms, lessen their perplexity, simplify their names and render this portion of astronomy perfectly intelligible to children. J. W. P.

Newborn, Ga., May 14, 1860.

[The objection to this plan is that the first point of Aries is constantly moving among the stars, owing to the precession of the equinoxes. It is now about 30° west of the constellation, Aries, with which it was associated when the signs of the zodiac were named—300 years before the Christian era. The plan suggested of forming the constellations seems to us an admirable one; but would it not be better to give them names other than the names of the zodiacal signs? Signs and constellations having the same names, and still not corresponding with each other, are a manifest source of confusion.

A HOT-BED STOVE WANTED.

MESSRS. EDITORS:—In these days of gardening and fruit-growing we need, or think we do, a small arrangement for propagating cuttings of plants of various sorts by means of bottom heat—something movable and heated with a lamp, the plan of which some ingenious man could easily conceive; and if the thing be not expensive, I think it would find a ready market in very many houses through the country. The "Waltonian Propagating Case" described in the *Horticulturist* of 1858, (page 403) is something like the thing. The SCIENTIFIC AMERICAN seems the right source to inquire from, whether there is any such thing within reach of country men, or whether some of your readers will not supply one in reasonable time. W. B. W.

Johnsville, N. Y., May 12, 1860.]

ARTIFICIAL TEETH—THEIR HISTORY AND MANUFACTURE.

We were privileged, a week or two ago, to pass through the extensive manufacturing establishment of Messrs. Jones & White, Philadelphia (manufacturers of porcelain teeth), and were obligingly furnished with some items of interest in reference to the history of the art and the progress of the manufacture, which we think will be of interest to our readers.

It is but a few years since human teeth were used in artificial denture, as well as ivory, bone, the teeth of domestic animals, &c.; but the greater durability and cleanliness of porcelain teeth have caused all other substances to be discarded; it being a fact admitting of no contradiction, that no animal growth can long resist the rapid decomposition which all organic substances, devoid of vitality, are liable to, under the combined action of heat and moisture and the secretions of the mouth. To obtain artificial teeth exempt from these objections, it became necessary to seek them from inorganic materials.

The French dentists were the first to introduce mineral teeth; but their progress toward perfection was very tardy. The teeth, being composed almost entirely of clay, were very opaque, too highly colored, and destitute of any natural form. We were shown a treatise on dentistry, published in Boston in 1814, in which occurs the following remark:—"Artificial teeth, of a French invention, have been preferred in Europe, from their being made of mineral substances, and because they do not decay or affect the breath. They are, however, more brittle, less natural and more expensive than the kind in *common use*, viz., those made from the tusk of the hippopotamus." In 1818, or thereabouts, some experiments were made in the manufacture of porcelain teeth in Philadelphia; for the honor of being first in the business there are not less than a dozen claimants. For some years, however, the success attending these efforts was not very flattering, for, as late as 1822, in a treatise on dentistry (published in Boston), the following opinion is expressed:—"Artificial teeth have been formed of various substances; but those which are most perfect are made of the teeth and tusks of the hippopotamus or sea-horse. The mineral or china teeth are very imperfect; they have an opaque, earthy appearance, are brittle, and the sensation they produce when brought in contact with the natural teeth, in mastication, is very disagreeable." It was not until after 1830 that any considerable progress was made; all the teeth made previous to that time being very unsightly in color and shape, and *totally* unlike natural teeth. From that time to the present, the march of improvement has been steady. One after another, the difficulties in the way of imitation of the natural organs, on account of their semi-transparency, their peculiar color and their variety of tints, have been surmounted by perseverance and labor, until it would seem that, in point of strength, beauty of finish and perfect resemblance to nature in form, color and surface, as well as in the almost endless varieties of shape and style, and the ease with which they can be adapted to the great variety of cases which present themselves, and in the ability to resist the hammer in riveting and the blow-pipe in soldering, there is little to be desired.

Having thus glanced at the history and progress of the art, we come now to some details of the materials used in the manufacture and the processes.

The chief materials are:—1. *Feldspar.*—This mineral forms an essential part of most primitive rocks; it is found of various shades of white, blue, brown, red and green, and is composed principally of silica, alumina and potash. That which is white, or nearly so, is the only kind suitable for the manufacture of teeth. 2. *Silex or Flint.*—This substance abounds in almost every part of the globe; it exists, more or less pure, in the form of white sand; the kind best adapted to such purposes being that which is familiarly known as rock quartz or rock crystal. 3. *Kaolin.*—This is disintegrated and decomposed feldspar, and consists of nearly equal proportions of alumina and silica; it is of a slightly yellowish color, unctuous to the touch, and infusible, except with the addition of a flux.

Beside the foregoing, there are fluxes which, though differing from each other in the results produced, may all be described as *glasses;* they are used to determine the point of fusion desired of the different parts of the tooth.

The materials used in coloring are as follows:—1. *Titanium.*—This is a very hard, copper-colored and infusible metal, found in various localities throughout the United States. The crystals are of a reddish-brown color and shining metallic luster. It gives, when ground finely, a beautiful yellow color. 2. *Platina Sponge*—This is formed by dissolving platina in nitro-muriatic acid and precipitating. It gives a gray-blue color. 3. *Oxyd of Cobalt.*—This gives a bright blue color. 4. *Oxyd of Gold.*—This is used to give the red color, in imitation of the gums. These are the principal colors used. Singly, and in different combinations with each other, and with the minor colors, they produce a great variety of shades. About 130 distinct standard shades are made.

Now, as to the process of manufacture:—The feldspar is first submitted, in the crude state, to a red heat, and suddenly thrown into cold water. This is called "calcining," and its effect is to render it more easily broken. All impurities having been carefully removed, it is broken between flint stones, and so rendered fine enough to be put into the mill, which is formed of burr-millstone, with chasers of the same material. It is ground in water, floated off, and allowed to settle. The water is then evaporated, the spar dried and sifted, and is then ready for use. The silex is treated in the same manner. The kaolin is prepared by washing until perfectly free from impurities, and, when dry, is ready for use.

The coloring materials are also ground until reduced to an impalpable powder. These materials are then mixed in proper proportions, and made into a mass resembling putty. This is what is termed "body," and is now ready for the molding room. In this room are employed about 30 men. The molds in which the teeth are formed are made of brass, and are in two pieces—one-half of the tooth being represented on either side. The precise shapes desired are carved out with great care and labor, the holes to receive the platina pins drilled in each tooth, the two halves fitted accurately together, and the mold is ready for use. The mold must be made about a fifth larger than the size desired, to allow for shrinkage. These molds form a very important item in the stock of a manufacturer, numbering in the establishment before-mentioned over 700, making nearly 9,000 different shapes and styles, costing as high for some varieties as $50 per mold. There are from 6 to 24 shapes in each mold. The first operation in the molding room, after greasing the molds, is to place the platina pins (of which there are 10 sizes, differing in length and thickness to suit the different sizes of the teeth) in the molds; this is done very dexterously by means of small tweezers. The consumption of platina in this manner, in the establishment referred to, amounts to 900 ounces per month, which, at $6.50 per ounce, gives an outlay, for this article alone, of more than $70,000 per annum. In the cutting of these little pins, as in almost every other department of the business, great improvements have been made. In their earlier experience, 500 per hour were as many as could be made by an experienced workman. There can now cut to a given size and head 600 per minute! The end that is embedded in the tooth has a head somewhat like the head of a pin, to prevent it drawing out.

To return to the operation of molding. The pins being properly adjusted in the molds, the "point enamel," as it is called (a composition lighter in color than the body of the tooth), is placed in the molds by means of a small steel spatula; the body is placed in them in pieces corresponding to the size of the teeth; the top of the mold is then put on and the mold placed under a press, which compacts the mass. They are then dried by a slow heat. When perfectly dry, the top is removed, and the teeth will now drop out. In this state they are very tender, and require very careful handling. They are now placed on clay slides, and are ready for "biscuiting." This is done by subjecting them to a bright red heat, when they can be handled and cut or filed like chalk. They are now sent to the trimmers' room. In this room more than 20 girls are employed in removing and filling-up imperfections, cutting away the "spare edge" (as it is called) left in molding, and preparing the teeth for the next operation, which is enameling. The main ingredient of the enamel is spar, so tempered as to flow at a less heat than is necessary to vitrify the body; so that, when burned, the body will not have lost its strength by too much vitrifaction, and yet the enamel have the proper gloss. The enamels are put up in jars, colored as desired—blue, yellow, brown, &c.; they are mixed with water about the consistence of cream, and laid on with a brush. After drying, the teeth are examined to remove any enamel which may have run over the edges, smoothed with the finger, and are then ready for the gum room. The gum enamel is substantially the same as the other enamels, colored to imitate the natural gum, and is put on with a brush in the same manner. From this room, the teeth are passed into the gum-trimmers' room, where the edges are dressed with a file, and the arch of the gum made rounding and true with a small, pointed instrument. They are then placed on clay slides, and are ready for the furnaces. These are structures of fire-brick, of which there are 13, holding over a half tun of coal each, with a clay muffler in the center. Beneath and around this the coal is placed, the door-way walled up, and the fire started. They burn three or four such furnaces daily. The early part of the fire is used for biscuiting the teeth, and after the coal is thoroughly ignited and the heat becomes sufficiently intense, the burning is commenced. One slide, holding about 150 teeth, is put into the muffler at a time, and occupies (depending upon the state of the fire) from 10 to 30 minutes in burning. The practiced eye of the burner must detect, from the appearance of the teeth, when they are properly burned. If taken out before they are done, the enamel will craze or crack in cooling; if a little too much done, the surface will be too glossy, and the body will not be strong. When cool, the teeth are removed from the slides, and, if perfect, placed upon wax cards in sets, and are ready for sale.

There are now engaged in Messrs. Jones & White's establishment over 100 persons, nearly one-half of whom are females. They can turn-out, in finished teeth, with their present force, over 200,000 plain teeth per month—of course, not so many gum teeth, as there is much additional labor on these. The amount of wages paid weekly is over $900. Independent of the trade in this country, they are supplying orders for all parts of the world where the advancement of civilization has rendered the *dentist* a necessity.

MAN SCIENTIFICALLY DESCRIBED.

In a recent lecture, delivered before the Royal Society, in London, by Professor Owen, D.C.L., F.R.S., as reported in the *Engineer*, he described man as a specimen of organic nature, as follows:—The fourth and highest type of mammalian brain rises at once, and without transitional rudiments of the hippocampus minor, hinder horn of lateral ventricle, or concomitant lobe of cerebrum protruding backward beyond the cerebellum, to that marvelous structure which is peculiar to our own species. The sole representative of the archencephala is the genus homo. His structural modifications, more especially of the lower limb, by which the erect stature and bipedal gait are maintained, are such as to claim for man ordinal distinction on merely external zoological characteristics. But his psychological powers, in association with his extraordinarily developed brain, entitle the group which he represents to equivalent rank with the other primary divisions of the class mammalia, founded on cerebral characters. In this primary group man forms but one genus—homo—and that genus, one order, called bimana, on account of the opposable thumb being restricted to the upper pair of limbs. The mammæ are pectoral; the placenta is a single, sub-circular, cellulo-vascular, discoid body.

Man has only a partial covering of hair, which is not merely protective of the head, but is ornamental and distinctive of sex. The dentation of the genus homo is reduced to 32 teeth, by the suppression of the outer incisor and the first two premolars of the typical series on each side of both jaws, the dental formula being:—

$$i.\frac{2-2}{2-2},\quad c.\frac{1-1}{1-1},\quad .\frac{2-2}{2-2},\quad m.\frac{3-3}{3-3}=32$$

All the teeth are of equal length and there is no break in the series; they are subservial in man not only to alimentation but to beauty and speech.

The human foot is broad, plantigrade, with the sole not inverted, as in the quadrumana, but applied flat to the ground. The leg bears vertically on the foot; the toes are short, but with the innermost longer and much larger than the others, forming a "hallux" or great toe, which is placed on the same line with, and cannot be opposed to, the other toes; the pelvis is short, broad and wide, keeping the thighs well apart, and the neck of the femur is long and forms an open angle with the shaft, increasing the bases of support for the trunk. The whole vertebral column, with its slight alternate curves, and the well-poised, short, but capacious sub-globular skull are in like harmony with the requirements of erect position.

The widely separated shoulders, with broad scapulæ and complete cavicles, give a favorable position to the upper limbs, now liberated from the services of locomotion, with complex joints for rotatory as well as flexile movements, and terminated by a hand of matchless perfection of structure—the fit instrument for executing the behests of a rational intelligence and a free will. Hereby, though naked, man can clothe himself and rival all natural vestments in warmth and beauty; though defenseless, man can arm himself with every variety of weapon, and become the most terribly destructive of animals. Thus he fulfills his destiny as the supreme master of this earth and lord of lower creation."

JOURNAL OF PATENT LAW.

AN AUTOMATIC OVEN—A PATENTEE'S DODGE.

Sellers vs. Berdan.—This was an application by the defendant to the Court of Common Pleas of the City and County of New York, to compel the plaintiff to disclose a patent alleged to have been obtained by him in France.

It appears the plaintiff commenced a suit against the defendant to recover an amount claimed to be due for the construction of an automatic oven with the application of hydraulic power, alleged to have been ordered by the defendant; and to be used in France. It appeared from the papers in the case that Berdan and Sellers both agreed that a new patent would be necessary to protect the former in his right in consequence of the application of the hydraulic power. Defendant alleged that after the completion of the machinery, the plaintiff, without defendant's knowledge, went to London and Paris, and took out patents in his own name for the application of the hydraulic power; thus depriving the defendant of the use of the machinery which he had employed plaintiff to construct for him. The discovery was therefore asked by the defendant, with leave to inspect the patent in order that he might properly defend the suit.

The counsel for the plaintiff resisted the motion on two grounds: first that the existence of the patent was sworn to only upon information and belief; and second, that the taking-out of the patents did not prevent the defendant's use of the one constructed for him by the plaintiff.

The counsel for the defendant replied that a statement of the existence of a document on information and belief, and its possession by the plaintiff, were sufficient—especially when the opposite party came into court and made no denial; further, that, when the plaintiff had obtained a patent which gave him an exclusive right to use an article, he could not set-up that the defendant could use the patented article *notwithstanding*, because the patent was obtained in fraud of the defendant's rights; and that, perhaps, the defendant could compel the plaintiff to assign the patent to him; at least the plaintiff could not compel the defendant to pay for the construction of the machinery which their subsequent acts had rendered worthless.

The court reserved its decision on the argument; but it afterwards decided to grant the discovery.

RAPID STEAMSHIP PASSAGES.—A New York correspondent has prepared a list of the fastest trips made by transatlantic steamers. "The extraordinary passage of the *Vanderbilt* has hardly been noticed in the excitement about the fight. She made the trip from Southampton to New York in nine days, twelve hours and thirty minutes—the shortest western passage ever made. The following table is worth placing on record:—

1851.	Left Liverpool.		Arr. at New York.		d.	h.	m.
Baltic.......	Aug. 6,	4 P. M.	Aug. 16,	6 A. M.	9	19	9
1853.							
Arabia......	Aug. 13,	2 P. M.	Aug. 23,	7.55 A. M.	9	22	55
1854.							
Baltic.......	June 28,	1 P. M.	July 8,	1.15 A. M.	9	17	15
1857.							
Persia......	June 13,	2.15 P. M.	June 23,	6.56 A. M.	9	16	11
1858.	Left Southampton.						
Vanderbilt..	June 9,	7.30 P. M.	June 19,	10.30 A. M.	9	15	0
1860.							
Vanderbilt.	April 18,	6.30 P. M.	April 28,	8 A. M.	9	12	30

Had it not been for adverse winds during the latter part of the trip, the time would have been reduced at least to nine days. We can expect nothing better than this from any ship afloat, except perhaps the *Adriatic*, on her homeward trip in May, or the *Great Eastern*, which will probably cross the Atlantic in June."

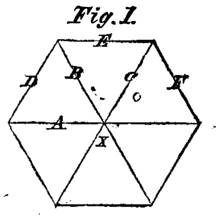
THE HEXAGONAL CELL OF THE HONEY-BEE.

BY W. J. WEEKS.

> "The same keen horns within the dark abode,
> Trace for the sightless throng, a ready road."
>
> "These, with sharp sickle, or with sharper tooth,
> Pare each excresence and each angle smooth,
> Till now in finish'd pride. two radiant rows
> Of snow-white cells one mutual base disclose,
> Six shining panels gird each polish'd round,
> The door's fine rim with waxen fillet bound,
> While walls so thin, with sister walls combined
> Weak in themselves, a sure dependence find."

In common with the equilateral triangle and the square, the regular hexagon can also be united, side by side, to others similar and equal, without leaving intermediate spaces—a property not possessed by any other regular polygon of a greater number of sides; and while it is well-known to mathematicians that the regular hexagon affords greater capacity and strength, in proportion to the quantity of material, than either the triangle or the square, it is obvious to the most superficial obsever, that it is also better adapted to the insect form; but besides these advantages it has another property not common to any other figure, and which may be expressed as follows:—

Fig. 1.



In every regular hexagon, the distance from its center to any one of its angles, is exactly equal to any one of its sides. Thus, in Fig. 1, X being the center, any one of the lines, A B C, &c., is exactly equal to any one of the sides, D E F, &c.; this is the crowning beauty of the regular hexagon, and it is this peculiarity which renders it so admirably adapted to the architectural instinct of the bee and other insects, which construct hexagonal cells.

Fig. 2

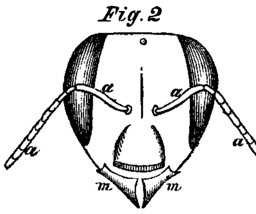
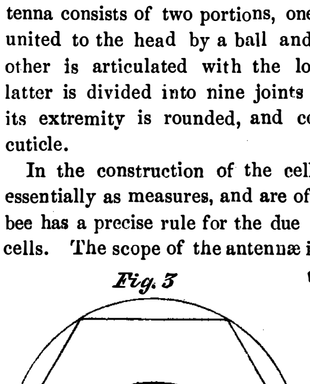


Fig. 2 exhibits the outline of the bee's head, and the anterior portion of it; *a a*, are the antennæ, and *m m*, the mandibles; the latter are hard horny organs, of a peculiar form, and have a lateral motion, they are used as occasion may require, in the various operations of biting, gnawing, compressing, drawing-out, smoothing, &c. They are the mechanical instruments. Each antenna consists of two portions, one end of the shorter is united to the head by a ball and socket joint and the other is articulated with the longer or fore-arm, the latter is divided into nine joints imparting flexibility; its extremity is rounded, and covered by a sensitive cuticle.

In the construction of the cells, the antennæ serve essentially as measures, and are of such a length that the bee has a precise rule for the due and proper size of its cells. The scope of the antennæ is such that, extended,

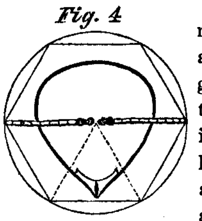
Fig. 3



their extremities can touch any part of a circle in a plain anterior to the head, and again, the articulations being brought together in front, the tips of the fore-arms can in like manner touch any part of a smaller circle; hence, it is obvious that this admits of the reaching of the opposite angle of the greatest regular hexagons which can be inscribed within those circles respectfully, see Figs. 3 and 4.

Practically, the bees construct but two kinds of regular hexagonal cells, the first designed for the embryo worker, has each side equal in length to the forearm of the antenna, and the second, for the embryo drone, has each side equal in length to the whole antenna. Although it might be possible for the bee, by flexing the forearm, to construct a regular hexagon somewhat smaller than the first mentioned, yet such a cell would be useless, as the smallest now constructed is just large enough to admit the body of the adult worker, or the queen in the act of depositing her eggs. The maximum size is also limited; the greatest possible regular hexagon which the bee can construct, is one whose diameter between opposite angles, does not exceed the extent of the antennæ, together with the space of forehead between their sockets; the diameter of the drone cell is less than this by the space just mentioned, as if it were laid out by the sweep of only one of the antennæ, but the greatest diameter of the embryo queen-cell corresponds with the stretch of the two antennæ in opposite directions.

Fig. 4



We may often observe, in the recently perished bee, these organs assuming apparently the very angle of sixty degrees, as shown by the dotted lines in Fig. 4, thus indicating, in the plainest of sign-language, one mode of their capable application. They also serve as delicate and sensitive calipers, both being indispensable, which, during the progress of the work are frequently applied, one upon each side, to the several walls of the cell, until the wax is drawn out to its utmost tenuity compatible with strength.

The intimate relation between the length of the antennæ and the size of the cells was discovered by the author of this article, in the year 1852, he being previously acquainted with the properties of the hexagon. Any one, knowing this relation, may now understand how thousands of cells in a single hive may be all of one form and size, how every individual cell of these thousands may be precisely similar to every cell of the aggregate millions in all other hives, and how, the world over, wherever this species of bee (*apis mellifica*) exists, all its regular hexagonal cells of the two classes—worker and drone—can be exactly equal each to each, for every adult worker in its antennæ is provided with an equal rule and compass. The regular hexagon, with its unique peculiarity, was doubtless a part of the earliest creation of material forms; and in the subsequent production of animal life, Infinite Wisdom supplied the bee with organs adapted to that peculiarity, and endowed it with the instinctive knowledge necessary for their proper application.

CLAY RETORTS.

MESSRS. EDITORS:—Under the head of "Clay Retorts," in your last number (May 12th), Mr. J. P. Kennedy, gas engineer, of Trenton, N. J., states that "many superintendents are under the impression that clay retorts cannot be worked without an exhauster; but this is a mistake—they require the aid of an exhauster no more than those made of iron." Now the question would seem to be, "Are iron retorts not benefited by the use of an exhauster?" In order to demonstrate whether this is or is not so, let such as have experimented give their results. In a small gas-works, where there is generally a superabundance of purifying surface, and where the back pressure is no greater than the pressure of the seal of the dip pipes in the hydraulic main, there is no advantage to be gained by the use of an exhauster. But, where the make or consumption of gas is increasing and the limited purifying apparatus and other causes produce a pressure by several inches greater than exists in the hydraulic main (if only from two to four inches more), the deposit of carbon will soon show itself and accumulate rapidly; in this state of things, the good effects of an exhauster will be quickly apparent.

Having suffered much from the accumulation of carbon by unavoidably great back pressure, I had an exhauster put up, having still the same iron retorts in use. In less than two weeks the whole of the carbon was consumed away, and no more was formed. I worked the same retorts over a year after that, whereas, with the same amount of carbon as they had in them previously, they would not have lasted six months; the change was so great as to be a source of repeated remarks among the workmen. I now use all clay retorts and have had some ovens of threes and fives last nearly three years, with a pressure of from 10 to 12 inches in winter; repeated trials have shown a reduction of yield of gas of from 10 to 12 per cent when the exhauster was stopped, and with the same kind and amount of coal. An exhauster will keep down any back pressure, and the retorts will then bear an increased quantity of coal, from 20 to 25 per cent more to each charge, and burn it off in the same space of time. Nearly all the works of any note in England, Scotland, and other parts of Europe are adopting exhausters.

There are some articles in the late numbers of the London *Journal of Gas-lighting*, in which the report of a superintendent of a small works states the advantages he has derived from the use of an exhauster, and he also recommends it to others. Such is my—

EXPERIENCE.

POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.

[Reported expressly for the Scientific American.]

On Wednesday evening, the 9th inst., the usual weekly meeting of the Polytechnic Association was held at its room in the Cooper Institute, this city; President Mason in the chair.

MISCELLANEOUS BUSINESS.

Improved Kettle.—F. C. Treadwell, of this city, exhibited a kettle for cooking farina, rice, fruits, &c., which are liable to be burned in an ordinary kettle. The vessel in which the food is cooked fits into another containing water.

Major Serrell—How does this contrivance differ from a glue-pot?

Mr. Treadwell—Very little. The outer vessel here has a spout attached near the top, by which water may be poured in without disturbing the inner vessel. The spout also serves to carry off the steam. These kettles are now quite common, and I introduce the subject here only to make a claim for its first invention. They were first made for cooking farina; and my success seemed a mystery to those who were ignorant of the simple apparatus I used. The gallon kettles are sold for $1.50; the two-gallon, for $2. Three quarts of water and one-half pound of farina make three-and-a-half quarts of farina jelly.

The President—What is the philosophy of the burning in the ordinary method of cooking food like farina?

Professor Hendricks—The solid matter becomes separated from the fluid at the bottom, adheres to the kettle, and, being a poor conductor, the heat is accumulated, and the substance burns or is charred.

Working Steam Expansively,—Mr. Rowell read some statistics of experiments recently made at the Metropolitan Mills, in order to test the working of steam expansively. The results seemed unfavorable to the ordinary theory and practice. But some of the members thought that some of the elements were omitted which should be taken into account to render the test satisfactory.

Filters.—Mr. Haskell presented a report favorable to Baxter Brothers' filter.

Dr. Stevens—Filters do not purify water from what is often the most unhealthy contamination, namely, organic matters in solution. Nature's method is to filter and purify by means of earth or by the distilling process of evaporation. Water from a barn-yard may be made sweet by passing a few feet, only, through the proper kind of soil.

The President—Are not the mineral matters in solution also unhealthy?

Dr. Stevens—Some of them. But water containing lime is good medicine for certain diseases of the bladder and for scrofulous constitutions.

Gas-burners.—The Committee on Gas-burners (Messrs. Seeley and Hendricks) presented a lengthy report unfavorable to "Johnson's patent gas regulator and burner combined." The committee are of opinion that all the alleged advantages of the Johnson burner, and of the various stuffed burners, may be more easily attained by simply enlarging the apertures of the ordinary burner, and checking the flow at the stop-cock; and that the economy thus gained might be compensated by the necessity of using spreaders and chimneys to prevent unsteadiness and smoking. Mr. Garvey, a member of the committee, disagreed with the report, believed that it was unscientific, and promised to prepare a minority report. The club decided to take up the reports for discussion on the 24th inst.

The hour for the discussion having arrived, the president announced the regular subject—"Expansion."

DISCUSSION.

Mr. Reed said that, as some doubt had been expressed on the statement made at a late meeting, that rails on the Erie Railroad are being laid so that their ends are in contact, he had taken some pains to verify it. He was satisfied that the statement was correct, and he was assured that, so far, no signs of bending or "buckling" had been observed.

Mr. Dibben—If rails be laid at 10° below zero, and the temperature be raised to 100°, I cannot doubt that the expansion would be noticeable. If the Erie road plan is used, the rails should be laid near the mean of the ordinary temperature.

Mr. Reed—In 18 feet of steam pipe, I have been unable to observe any expansion in its ordinary use, except the tightening of the stop valve.

Mr. Rowell—In the old roads, a distance of one-eighth of an inch between the rails was left as allowance for expansion, and this distance was often closed up. The rails were about three-eighths of an inch thick.

Dr. Stevens—The Erie road has a serpentine route, and any expansion would take effect laterally, and only to alter the curves in an appreciable degree. On the straight roads of the West the expansion is noticed, and is a great annoyance. The ties are sometimes lifted-up, and even the whole track is loosened from the earth, rising like a wave in front of a moving train. In one case, when the track was taken up on account of damage so done, the rails were re-laid with a considerable interval between, which was filled by driving in chips of wood. This device was used in a track 25 or 30 miles in length.

Mr. Cooper suggested that the Cooper Institute was well provided with instruments to determine and measure expansion, and that, should the club desire, they should be brought in at the next meeting. The offer was received with applause.

The President—The space between rails has always been a fact of annoyance to those connected with railroads. Science seems to teach that the spaces are necessary; if they are not, it is a novelty of the greatest interest. Many railroad men will look upon Mr. Reed's statement as incredible.

Major Serrell—I see by the reports that it was stated at the last meeting that iron is weakened by vibrations and concussions; and that, from this, some day, Niagara bridge might fall; a disaster in which I should have a personal interest. I have little fear, however, of such an event; for we have examples of similar structures which have stood sufficiently long for the test. In China, there is a suspension bridge which was erected in the time of Julius Cæsar, and which, at last accounts, was still in good condition. In the Basse Alps is an iron chain, put up by the knights of Rome (600 years ago), and it is still in a good state of preservation. Mr. Brunel told me that he was of opinion that good wrought iron would not be weakened by vibrations, the ordinate of which was less than one-third of what would produce a permanent bend. The amount of expansion of iron has been accurately determined. I have a card which was marked by a pencil attached to the moving end of the Britannia tubular bridge. The card was kept under the pencil for a day, and the mark is about two inches in length.

Mr. Fisher—Iron is somewhat compressible and elastic, so that if rails be well fastened down, it is possible sufficient resistance might be offered to prevent the expansion.

Mr. Seeley—Some of the expansion of rails alluded to here may be due to their being rolled out by the weight of the trains. When the lengthening is permanent, this is a sufficient explanation.

The same subject was ordered for the next meeting, after which the association adjourned.

Patents.—Many of our subscribers are interested in procuring patents for improvements connected with the manufacture of leather and of boots and shoes; and, from time to time, we receive inquiries relative to these matters. Where any professional assistance is required, we invariably refer the parties to Messrs. Munn & Co., of New York and Washington, the publishers of the Scientific American, who have now the most extensive and best organized patent agency in the world. One-third, or more, of the entire business of the United States Patent Office passes through their hands. Their facilities have been recently still further extended by the accession to their regular force of Judge Mason, well-known as the late Commissioner of Patents. The Scientific American has entered upon its fifteenth year. During the past year it has been enlarged and otherwise improved. Its typographical execution, as well as its editorial management, has always been excellent. The subscription price is $2 per annum.

We copy the above very excellent notice from the *Shoe and Leather Reporter*, a valuable journal published in this city.

In the "pleistocene (geological) period" a huge elephant, clothed with wool and coarse hair, roamed through the northern portions of this continent and obtained his food from hardy trees, such as now grow in the 65th degree of north latitude. Abundant remains of this animal have been found in the temperate and high northern latitudes of Europe, Asia and America. The musk buffalo was its cotemporary in Europe, where it is now unknown, but it still lingers in the northernmost regions of America.

A COLUMN OF VARIETIES.

The first locomotive west of the Missouri river commenced to run on the 26th of last month (April), on the St. Joseph and Marysville Railroad; this is intended to be a section of the Central Railroad to the Pacific.

A commercial institute in Louisville was chartered by the last Legislature of Kentucky; and it is now proposed to erect an observatory in connection with it. Measures have been taken to procure a proper site for a suitable building.

Native iron has been found in very few localities. In Canaan, Connecticut, there exists a seam of it, two inches in thickness, from which good horse-shoe nails have been forged. This seam is so small, however, that it will not pay expenses to work it.

Some experiments were recently made at Liverpool (England) by Mr. A. Lindsay, for sending electric messages through the river Mersey without wire or cable. Large metal plates were sunk at each side in the water, and connected with the batteries. A current was sent through the river so as to move the needle of a galvanometer, but it was more curious than useful in its operations. Improvements, however, may yet render this system practical for telegraphing.

The Sydney (Australia) *Herald* is printed on one of Hoe's six-cylinder lightning presses. Its whole cost, after it was put up, amounted to $30,000. The Australians have no native aristocracy; they are growing up to republican self-government, which will be effected at some future day without a revolution. No less than twenty drinking fountains have also been put up in the streets of Sydney. Our South Sea cousins are going ahead.

Stevens' floating battery was again before Congress last week. This "institution" was intended to be a floating shell and ball-proof battery, moved by a propeller, for defending New York harbor. It was commenced several years ago (under a government appropriation) by the late R. L. Stevens. It has cost several hundred thousands dollars, and is still a marine skeleton, confined within an inclosure at Hoboken and is generally considered a government *fossil*.

The steamship *Great Eastern* is being rapidly prepared for her trial trip across the Atlantic, and it is expected she will be completed in the beginning of next month, so as to accompany the Prince of Wales in his visit to our continent, in July. Her proprietors having sent word to this city that she would come here if it were possible to get her into the harbor, the Board of pilots have returned an answer that they will navigate her right straight up to "Gotham," if she does not draw more than 26 feet of water. It is believed that the "Knickerbockers" will yet see the "Leviathan."

In one of Lord Brougham's recently-published mathematical and physical tracts, it is stated that one of the papers on light and color had been published in the Philosophical Transactions for 1796, with omissions of parts that were in the copy sent to the Royal Society. These omissions contained remarks on the effects of exposing a plate of ivory, moistened with nitrate of silver, to the rays of the sun passing through a narrow aperture into a dark room. The secretary—Sir C. Blagden—did not consider these pure science, and withheld their publication. Had they appeared they would have led to the discovery of photography fifty years before Daguerre and Talbot.

According to the experiments of Professor W. R. Grove, F.R.S. (inventor of the celebrated intensity battery), electricity cannot be transmitted through a perfect vacuum. Ordinary matter is required for its transmission; if space could exist void of matter, then there would be no electricity. Mr. Grove says "electricity is an affection or mode of motion of ordinary matter."

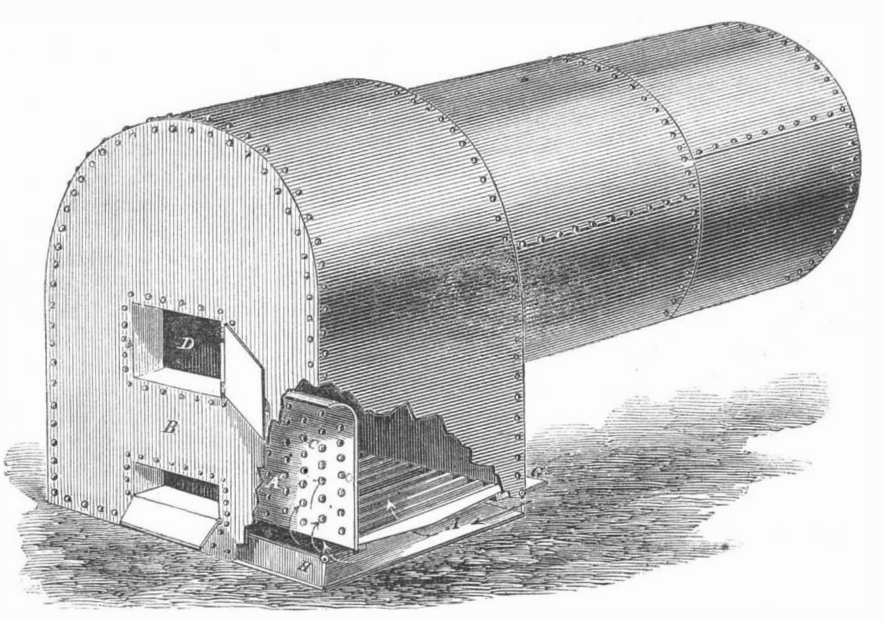
Dew has peculiar properties. It differs from fine rain and common moisture because it is never deposited on any surface except it is colder than the surrounding atmosphere. Most dew is deposited in clear nights when the greatest amount of radiation goes on. It never falls copiously in places screened from the clear sky; a thin piece of muslin, suspended over a delicate flower, will prevent the dew being deposited upon it.

A total eclipse of the sun will take place next July, visible in some parts of this continent, extending, in a belt, from Labrador to the Pacific, through the British possessions. Lieutenant Gillis, U.S.N., has been appointed to take observations in Labrador, and Captain Reynolds, U.S.A., in the interior.

IMPROVEMENT IN FURNACES.

It is well known that when bituminous coal is burned in ordinary furnaces a considerable portion of the combustible matter passes off without being ignited, in consequence either of an insufficient supply of air or of that which is supplied being too cool to effect the combustion. The plan of furnace here illustrated is designed to remedy this waste of fuel by an ample supply of hot air.

The front of the furnace is made of a plate, A′, perforated with a number of holes and placed a short distance within the outer casing, B, leaving a narrow air space which is kept hot by the fire. As the air enters into the space, A, under the grate, a portion of it passes at once into the fire in the usual manner, while another portion moves along into the air-space in front of the furnace where it becomes heated, so that, when it passes through the perforations, C, in the plate, A′, and mixes with the vapors rising from the fire, its oxygen is in a proper state to enter into combination with the combustible matters which these vapors contain. The opening from the outer air is closed by the damper, G, and the opening into the hot air space is closed by the damper, H; both dampers being under the control of the engineer, who is thus able to regulate the fire with great precision.



DUHME'S IMPROVEMENT IN FURNACES.

It is calculated that coal contains from 5,000,000 to 10,000,000 foot-pounds of power to the pound, varying with the quality, and as no steam engine has yet yielded a horse-power for every pound of coal consumed in an hour, which would be equivalent to 1,980,000 foot-pounds, it would follow that at least three-fifths of the coal used with steam engines are wasted. This shows the wide room for improvement in this most important field.

As the furnace here described may be almost wholly enclosed with water, and as it has in addition an air jacket on two sides, it seems to us that, while it is admirably calculated to insure perfect combustion of the fuel, this object is effected without any counterbalancing loss of heat.

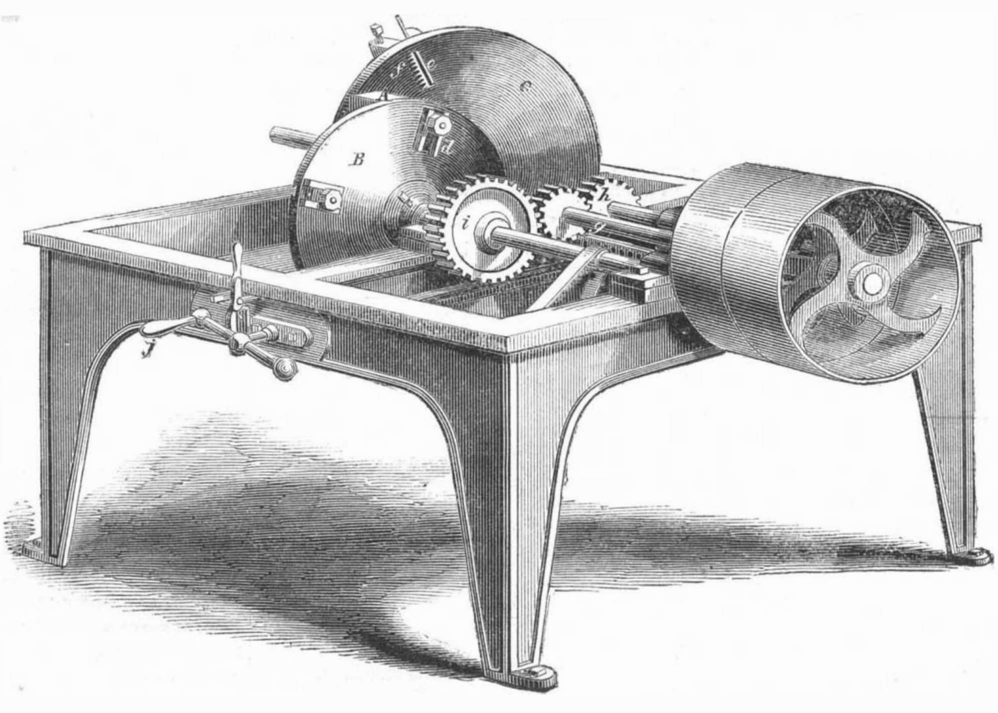
The patent for this invention was granted June 28, 1859, and further information in relation to it may be obtained by addressing the inventor, John H. Duhme, at No. 432 Main-street, Cincinnati, Ohio.

American Washing Machines in England.—The Board of Guardians of the parish of Hampstead have recently made a series of experiments for testing the qualities of various washing machines, in order that they might adopt the best one among the number for doing the washing of the workhouse. The one which they have chosen is an American invention; and the London *Mechanics' Magazine* states that it was introduced into England only about a month prior to the trial. The editor had visited the workhouse to see the experiments, and he states that the powers of the American machine were "somewhat extraordinary, as compared with others." It has been used every week since the fifth of March last, and has operated with entire satisfaction; no hand-rubbing, whatever, being necessary. The medical officer of the establishment states that it is calculated to promote cleanliness and health. Upwards of 1,000 articles have been washed by it, weekly, in 24 hours, and the cost of fuel and soap has not exceeded 5s. sterling (about $1.25), while every article washed has been improved in whiteness. Our cotemporary says:—"It is certainly somewhat curious that the two most successful washing machines, of late years, have come from America." It can wash blankets and coarse articles; also, muslins and delicate cambrics with equal facility, and without injury. All persons of a scientific turn of mind in London have been invited to witness this machine in operation; its ingenuity and superior method of acting upon the clothes are highly applauded. The name of the inventor is not given, but our country receives the honor of enabling Uncle John to keep his linen clean.

IMPROVED SHAVING-MAKING MACHINE.

"The soft side of a plank" has not generally been regarded as a very luxurious bed, but when an inventive Yankee finds even this substance the cheapest for the purpose, he will fashion from it a mattress which, in cleanliness, healthfulness and comfort, will sustain a creditable comparison with curled hair, goose feathers, or eider down. Instead of wasting his time in vain repinings at his hard lot, he appeals to his own cunning brain and skilled right hand to give him a more comfortable couch. Combining a knowledge of the properties of matter and of mechanical motions with the most recondite relations of curves to lines which have been discovered in geometry, he constructs a machine which will swiftly whittle his plank into curled shavings, and form a soft, elastic, and really comfortable bed.

The machine illustrated in the annexed cut will prove more than usually interesting, from the practical mechanical application in it of a very curious mode of producing a straight line from a combined revolution of two circles. For cutting wood into shavings, for stuffing furniture, carriages, &c., a machine has been in use, by which the block was carried under a plane by a reciprocating motion, the shaving being split into narrow ribbons before it is cut off by means of a toothed cutter placed in front of the plane iron, and inclined at an equal angle in the opposite direction. The object of the invention here illustrated is to accomplish the same result by means of a rotary instead of a reciprocating motion.



SKINNER'S IMPROVED SHAVING-MAKING MACHINE.

The block, A, which is to be cut, is secured upon the face of the wheel, B, by means of two dogs, one only of which, *d*, is seen in the engraving. The wheel, B, is upon the end of its shaft, and the block, A, is fastened with its middle running directly through the diameter of the wheel. The plane iron, *e*, with the cutting teeth, *f*, in front of it, projects slightly through the face of the wheel, C, which wheel runs in a plane parallel to the plane of the wheel, B, and at a distance from it corresponding with the thickness of the block. Now, if the sizes of these wheels are properly proportioned, and if C is made to perform two revolutions while B is performing one, then will the end of the cutter, *e*, be carried along the middle of the block, A, from one end to the other, exactly in a straight line. To effect this motion the driving shaft, *g*, is placed between the shafts of the two wheels, and the spur, *h*, has just half as many teeth as the spur, *i*. The cutter, *e*, is made, practically, three inches in length, and cuts a shaving from one-half the face of the block at each revolution; the half revolution of the wheel, B, presenting the opposite end of the block to the cutter at its succeeding revolution, which then takes a shaving from the other half of the face. The shaft of the wheel, C, has a sliding motion in its bearings, by which the knife is fed to its work as the block is cut away, and when the knife is brought sufficiently near the dogs which hold the block, this feed motion is automatically thrown out of gear. For securing the succeeding block, the wheel, C, is carried back by turning the feed motion backward, by means of the crank, *j*, and after the block is placed, the wheel is brought up to commence cutting, when the feed motion is again thrown into gear and the machine started.

The shavings are cut from 1-8th to 1-32d of an inch in width, and from 1-120th to 1-150th of an inch in thickness. They are sold at about 3 cents per pound, and many tuns of them are used annually by carriage and furniture manufacturers, and by makers of mattresses. The inventor says:—"The machine can be run up to a speed of some 600 to 700 revolutions per minute, and with good seasoned wood will cut 800 pounds per day, which is double the quantity any other machine invented for this purpose will do. The advantages possessed by this machine over the machine made on the reciprocating plan, are the high speed, less power for a given amount of work, compactness (it being only 4 feet square), and the arrangement whereby a block of wood *double* the *width* of the cutters can be worked, the cutters being only 3 inches wide and the block 6 inches."

The patent for this invention was issued Jan. 10, 1860, and persons desiring further information in relation to it will please address the inventor, Franklin Skinner, at New Haven, Conn.

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VOL. II., No. 22......[NEW SERIES.]....*Fifteenth Year.*

NEW YORK, SATURDAY, MAY 26, 1860.

COLBURN ON BOILER EXPLOSIONS.

BOILERS and bottles have a much closer relationship than most persons would imagine. Of this fact, we have been powerfully convinced by a pamphlet (recently published in London), by Mr. Zerah Colburn, formerly of New York, but now of the London *Engineer*. It seems to have produced something like a bomb-shell explosion among the mechanical periodicals of the British metropolis, on account of a new theory advanced therein. This consists in attributing an explosion to the reduction, at first, of the pressure of ordinary steam in a boiler through a rupture, by means of which some extra escape of steam is effected. This lowering of the pressure, it is held, produces the disastrous result by, a secondary effect, namely, the instantaneous flashing of a large quantity of the water into steam, thereby causing it to strike "a violent blow" against the shell. We have stated this theory in as few words as possible. Mr. D. K. Clark, the well-known writer on railroad subjects, has also advanced a theory on this question, which is given in the pamphlet in the form of a letter. It consists in attributing explosions to the sudden projection of water against the bounding surfaces of the boiler, and that the combined momenta of the water and steam act like shot to shatter the metal; simple over-pressure of steam not being sufficient to account for an explosion.

The London *Mechanics' Magazine* has criticized the pamphlet with considerable severity, and Mr. Colburn has replied in two letters, in one of which he takes the familiar example of a bottle of soda-water discharging its gas and fluid contents into the air to illustrate Clark's theory; and he maintains his own with decided ability. We shall give our reasons to show that it is not *altogether* proved, however; and, as for Mr. Clark, he simply mistakes an effect for a cause. All explosions of boilers or bottles are due entirely to the over-pressure of expansive gas or vapor, not the percussion of the fluid.

Mr. Colburn's theory assumes that, when the pressure of steam is suddenly lowered, a *greater quantity* of water in the boiler than that due to supply the reduced pressure caused by the escaped steam, is instantly converted into steam; thus causing a vast and sudden over-pressure, which shatters the metal to fragments. If equal effects are produced from equal causes, we do not see how this can be possible. If steam of 60 lbs. pressure in a boiler is suddenly reduced to 50 lbs. pressure—from a temperature of 294.1° to 281.3°—by escaping through a rupture, the quantity of water converted into steam will neither be more nor less than the amount required to raise the pressure to 60 lbs.; and so on for all other pressures, and the excess will be immediately carried off through the rupture. Safety-valves are applied to steam boilers because this principle is held to be correct; but if Mr. Colburn's theory is true, safety-valves are the most dangerous appliances that have ever been attached to boilers, and the whole engineering profession, from the days of Papin to the present moment, have been wofully blind to their true nature. If, as this theory assumes, an explosion is caused by the sudden escape of steam, a safety-valve is to a boiler what a percussion cap is to a loaded cannon. At the same time, however, this theory affords a very plausible explanation of some apparently mysterious explosions which have taken place. Thus, a boiler exploded, a few years ago, in Philadelphia, at the instant the engineer lifted the safety-valve, by which event he lost his life. A great number of explosions have also occurred just when the engine or pump had been set in motion, whereby the pressure had been first reduced in the boiler.

By this new theory, the incipient cause of every explosion is held to be a rupture in some weak part by over-pressure; and if, as a whole, it cannot be sustained, it can do no harm, but rather good, because it affords a most powerful support to those who attribute all explosions to over-pressure of steam—either gradually or suddenly accumulated. We quote the following extract from this pamphlet, and fully endorse its appropriate soundness:—"All our knowledge of boiler explosions goes to show that, however possible it may be to accumulate an excessive pressure within a boiler, the actual explosion results in the majority of cases from some defect, either visible on concealed, in the materials, workmanship or construction of the boiler. Probably not more than one per cent of all the steam boilers made ever explode at all; but the results of systematic inspection show that a far higher per centage of boilers are constantly in a condition inviting explosion, and from causes which a general examination would not only disclose, but of which it would also insure the removal." This is a strong argument for voluntary Boiler Inspection Associations, which we have recently recommended, and which we hope may soon be formed throughout the various sections of our country.

ALUMINUM.

The ore of this valuable metal is scattered in millions of tuns through all sections of the country, being more abundant and more accessible than any other metal. All granite rocks and all beds of clay are partly composed of it. Pure clay, or alumina, is simply the sesqui-oxyd of aluminum ($Al^2 O^3$), containing 24 lbs. of oxygen to 27 lbs. of the metal, and all that is necessary to give us unlimited supplies of this precious substance is a cheap mode of separating it from the oxygen. So rapid have been the improvements in the method of effecting this separation, that within about four years, the price of aluminum has been reduced from $250 to less than $9 per pound. If the price should be reduced sufficiently, this metal is destined to play a great part in the industrial arts, for by its lightness, strength, and incorruptibility in the air, it is admirably adapted to many uses. Even at the present price, it will no doubt replace silver to a considerable extent.

The *Revue Universelle*, from which we translate, describes two processes for the reduction of the sulphuret of aluminum, which have recently been patented in England by J. Johnson. The sulphuret is first obtained from the sesqui-oxyd by one of the known modes; for instance, by passing sulphureted carbon over alumina heated red-hot in a suitable apparatus. This sulphuret is placed in a furnace with such a proportion of the sulphate of alumina that the oxygen which is disengaged by the heat will produce sulphurous acid by combining with the sulphur of the substances employed. The furnace is sealed air-tight and raised to a high temperature, when the whole of the sulphur combines with the oxygen, forming sulphurous acid, and the aluminum is left in the metallic state. In the place of the sulphate of alumina, anhydrous alumina may be employed if care is taken to proportion the alumina to the sulphuret, so that the oxygen of the former may combine with the sulphur of the second, and carry it off in the form of sulphurous acid. It is well to aid the reaction by frequent stirring of the mixture. When the aluminum has been obtained, it may be treated in a manner similar to that in use for puddled iron, and is capable of being either hammered or rolled.

In Mr. Johnson's second process, the sulphuret of aluminum is placed in a melting pot, and sheltered from contact with the air. It is then heated red-hot, and submitted to the action of a current of dry hydrogen, which carries off the sulphur of the sulphuret in the form of sulphureted hydrogen. By adding the sulphuret of another metal, an alloy of the two metals is obtained. The hydrogen employed in this process may be economically obtained by passing the vapor of water over red-hot coke or charcoal.

Some of the alloys of aluminum have very remarkable properties, especially the aluminum bronze, composed of 90 lbs. of copper to 10 of aluminum. This alloy is stronger than the best wrought iron; it may be cast, hammered, or rolled, and it resists the corroding action of the atmosphere, nearly if not quite as well as gold. Besides these properties, it is of a beautiful yellow color, and is susceptible of a very fine polish.

Alloys of aluminum may be obtained by the decomposition of alumina by carbon, in contact with certain metals electro-positive in relation to aluminum—for instance, copper and iron. E. L. Benzon obtains an alloy of aluminum and copper by the following method. Alnmina, animal charcoal and copper (either the simple metal or the protoxyd or peroxyd), all finely pulverized, are thoroughly mixed together in proportion to their atomic weights, and placed in a melting pot similar to the pots in use for cast steel. The mixture, covered with charcoal, is exposed to a strong red heat, nearly sufficient to melt the copper, uutil the aluminum is reduced to the metallic state. The heat is then augmented for half an hour or an hour, until the metals are thoroughly melted together and a perfect alloy obtained.

THE AGE OF STEAM.

The eras of gold and silver and bronze no longer exist; with the lapse of centuries, and the progress of time, they and their barbarism have passed away, and a new age and period holds sway. *Steam*—the agent and servant of man—represents it; and to its influence and through its might the desert becomes populous, the wilderness smiles and is busy with the hum of a new generation, with new thoughts and strong purposes, who carve its very stones into habitations and shelters, and wrest from the bowels of the earth an abundant and a generous support.

If we take a stand in a mental point of view, and look backward upon the years which are irrecoverably gone; if we reflect through what convulsions and changes the political and social world has passed, from a state of ignorance and commercial stagnation to one of the most prosperous and peaceful, we must see among the most prominent and efficient causes of this reformation—steam. Without it, at this present day, if it were abolished and utterly unknown, on the face of the earth, darkness would reign again as it formerly did. The development of the arts and sciences in their highest perfection tend inevitably to moral and social advantage, if it be only in the insignificant cause of lessening the severity of labor through the use of a powerful motor; leaving more leisure for the workman and the operative to search out the causes which produce certain effects, and which lead him, as stated before, insensibly to the cultivation of a thoughtful mind; and the improvement and stimulation of the brain, within proper bounds, is the very base and foundation of a national and commercial greatness.

The rudest minds and the most unreflecting persons who are, by chance or necessarily, brought up to its use, cannot fail to wonder and feel awe-stricken, at times, in the presence of this awful force. Escaping from its bonds, and rending all before it, as it does sometimes through carelessness or mismanagement, it exemplifies in a literal sense, and demonstrates in a most practical manner, the strength of its sinews and the illimitable range of them. Who can form any accurate estimation of what power is exerted against the pistons and cranks of a steamer moving so majestically and surely in the teeth and front of the hurricane and tides, until, some parts having given out, it lays bent and twisted into a hundred fantastic shapes? Rods and links, six or eight inches in diameter, of the best wrought iron, bent at right angles as a boy would bend a wire; and iron castings, ribbed and strengthened with braces and radii, snapped into fragments as if they were but the frailest glass. When he sees all this, then may he form some conception of that noble servant who, at this moment as we write, is driving a thousand busy wheels and whirling heavy masses in mid-air, to the increase of wealth and the general prosperity. There is not a mechanical force in operation at the present day, nor a machine turning out work by the 100 per cent better and faster than by manual labor, but what owes its origin, in some form or other, to the power of steam. If we take the pick of the miner (who plies his calling in subterranean darkness, and who burrows like a mole), even so small a tool as that is the son and offspring of steam, either in smelting the ore from which it was made or in forging it. Upon the banks of busy streams, and in the solitudes of the primeval forests, the song and chirp of this agent, steam, is loudly heard. Even the water wheel, which disputes a little part in the list of motors, owes its increased efficiency and its greater power to the better facilities for manufacturing through the employment of steam.

There is no corner or quarter of the globe, known to man, where it has not penetrated. The icebergs of the Pole have overlooked its toil, and cast their shadows athwart its funnel, whitened by the salt air and furnace heat; the waters of the northern seas have lent their drops and globules to be evaporated and aid man in penetrating into unknown solitudes; and the fierce heat of the tropics has heated the bearings and dried out the oil from the steam engine until they have screamed again. Everywhere—in all lands and habitable places—its wreaths are seen twining and coiling in the air, and finally disappearing entirely; and lately, in Japan, through the exertions of Commodore Perry, a little locomotive carried upon a circular railroad a throng of wondering and pleased Japanese. It is an assertion that cannot be disputed, to say that it is the very emblem and symbol of peace and prosperity. When the steam engines are the most rapid in their revolutions, and when their number and sum increase in quick succession, then do the papers teem with joyous accounts of prosperous harvests, groaning warehouses, and full freights; then are all men busy, and the voice of complaint and the piteous cry of want are unknown in the land. In all its various operations, whether in swinging the ponderous beam of the steamer slowly and steadily to-and-fro, whether heaving the piston regularly up-and-down through all the wrath and tumult of the elements, urging the vessel on, and trampling even the might of the seas beneath its resolute beat and stroke, it is still the object of unflagging and never-ceasing interest. In careful and experienced hands—careful, beyond every other consideration—there is no limit nor bound to its range, and man need not enumerate the catalogue of its operations to praise it; the *results* are enough. The fires of sacrifice that burned of old on altars and hill tops no longer gleam and startle the terrified people with the victims' shrieks and cries; but, through all the night, and through the summer's heat and winter's cold, the genial furnace-fires flame and burn, and render good return to man.

DEFALCATION OF THE POSTMASTER OF NEW YORK.

On Saturday, May 12th, it was discovered that Isaac V. Fowler, Postmaster of New York, was in arrears in his payments to the department to a large amount, variously stated at from $155,000 to $176,000. This is particularly startling as being the first considerable defalcation (except one or two in California during the confusion of its early settlement) which has occurred among the officers of the United States government since the passage of the Sub-treasury Bill. Previously to the adoption of that measure it was customary for these officers to use the government moneys in their hands temporarily for their own benefit, paying them over punctually at the stated periods of settlement. But numerous defalcations having occured in consequence of the government funds having been invested in enterprises which proved unprofitable, a provision was embraced in the sub-treasury law making it felony for any custodian of the public money to use it for any period, however short, for his own benefit. The wisdom of that enactment, so manifest in itself, has been abundantly proved by its operation in practice, having almost wholly prevented the occurrence of defalcations. It seems even that Mr. Fowler's would not have taken place, had he not been allowed to violate this provision of the law. It is said that most of the large sums which he has used and is unable to repay have been lost in unprofitable speculations. The *Tribune* says—"The following appear to be some of the speculations in which he has failed: real estate operations; shares in Pennsylvania coal companies; shares in the Empire City Bank, by which he lost $20,000. The only profitable investment seems to have been in a patent right for manufacturing wire sofa and other springs."

LITERARY AND SCIENTIFIC NOTICES.

NEW AMERICAN CYCLOPÆDIA, VOL. IX.

It has been well said that the possession of a good cyclopædia has more influence in elevating the social position of a man and his family than the investment of an equal amount in any other form of property. And it may be added that there is no other portion of a man's possessions from which he can derive so large a measure of the noblest and most durable enjoyment and satisfaction. Next to our schools and newspapers, we believe that the old "Encyclopædia Americana" has been the most valuable boon that has yet been bestowed upon the mind of this country. But in the swift progress of science, arts and events, that publication has nearly lost its value, and the Messrs. Appleton judged rightly that there was a demand in the community for another work of a similar character. We rejoice that the enterprise of supplying this demand has been undertaken by such competent hands, and we congratulate the editors on the ability, the learning and the capacity for the kind of writing required, which they have been able to marshal for the composition of this great work.

The new cyclopædia is to consist of 15 or 16 volumes, each containing 700 or 800 pages, and costing three dollars. It will thus be a very cheap work in proportion to the amount of matter which it contains, and will constitute a complete library in itself, with the several subjects arranged in alphabetical order, so as to be readily found as attention is called to them by either reading, conversation or reflection. The ninth volume contains more than 1,300 articles, and the following list will give an idea of the immense variety of the subjects:—Heart, Heat, Herod, Hessian Fly, Henbane, Hippopotamus, Holy Alliance, Holy Water, Holy Week, Homer, Homestead, Honey, Robin Hood, Hop, Horse-breaking, Horse-power, Hot-bed, Hour Circles, Henry Hudson, Howitzer, Alexander Humboldt, David Hume, Husband and Wife, Hustings, Hydraulic Ram, Hydrogen, Hydrophobia, Hymen, Immaculate Conception, Inquisition, Language of Ireland, Itch, Andrew Jackson, Japan, Language of Japan, Japanning, Jaundice, Jersey City, Jelly and Sir Jamsetjee Jejeebhoy.

All of these articles are written by persons familiar with the subjects of which they treat, and some single articles are really worth the cost of the whole volume. For instance, the plain treatise on the legal relations of husband and wife, by the learned Professor Parsons, not only gives the common law principles which govern these relations, but adds a summary of the modifications of the common law on the subject which have been made by the statutes of the several States; showing, in the briefest space, the rights of women in regard to person and property in the several parts of the country. We have examined several of the articles in this volume on subjects with which we are familiar, and find them, like those in previous volumes, admirably written. The "New American Cyclopædia" is exactly adapted to the perpetually recurring intellectual needs of the great mass of educated families throughout the country.

THE EDINBURGH REVIEW. Re-published by Leonard Scott & Co., this city.

The number of this periodical for the present quarter contains several very able essays, among which the best is, perhaps, one on "Education in England," and the other a scientific criticism of Professor Darwin's work on "The Origin of Species." This periodical is the oldest of its class in Great Britain; but although many of its old contributors are dead, they are well represented by the vigor, ability and independence of their succesors.

THE MATHEMATICAL MONTHLY. Published by Ivison, Phinney & Co., this city.

The May number of this magazine continues the discussion of the problem of probabilities. There is occasionally something in this purely intellectual periodical which is applicable to real life; for instance, the note on co-factors, by Pliny Earle Chase, of Philadelphia, in this number, might be sometimes used for reckoning dollars and cents.

THE WESTMINSTER REVIEW. Re-published by Leonard Scott & Co., this city.

The April number of the Westminster has a timely article on Japan, which moves through the subject in the methodical, clear, thorough and able manner characteristic of the great English reviews.

DINSMORE'S RAILROAD AND STEAM NAVIGATION GUIDE. Published by Dinsmore & Co., No. 9 Spruce-street, this city.

This old, useful and reliable publication is out in a new dress, and is the neatest and cheapest work of the kind published. It contains tables of the distances between the stations of all our railroads, the time of starting the trains, fares, &c.; also the time of sailing and routes of steamboats. It is a necessary hand-book to every traveler.

REVUE UNIVERSELLE. E. Noblet, editeur, Paris et Liege.

We have received the first number of the fourth volume of this work. It is devoted to mines, metallurgy, public works, sciences and arts applied to industry, and appears to be very ably edited. We shall transfer to our columns such of its articles as we think will interest our readers.

THE QUARTERLY JOURNAL OF AGRICULTURE. Published by the United States Agricultural Society, at Washington, D. C.; edited by Benj. Perley Poore, secretary of the society.

The first number of the eighth volume of this standard work is almost entirely filled with lectures and articles by men eminent in agricultural science.

AMERICAN INVENTIONS IN EUROPE.

The following useful inventions made by our countrymen have recently been introduced in England and patented through the foreign office connected with the Scientific American Patent Agency:—

American Steam-heating Apparatus.—The *Rhadamanthus* steam frigate has been ordered by the British Admiralty to be fitted with the Wethered steam arrangement for her engines. This consists in using combined saturated and superheated steam. The system in this case is an experimental one; £900 being appropriated for the purpose. Before receiving the apparatus, she is to be fairly tested as to speed and consumption of fuel by her present arrangements, so as to judge fairly of the gain which may be secured under the use of the improvement. An increase of speed, with a saving of 40 per cent of fuel, is promised.

Sewing Machine.—Invented by H. W. Hayden, of Waterbury, Conn. It relates to the formation of the lock stitch, an improved device for taking up the slack of the thread, and a new contrivance for feeding the cloth.

Weighing Machine.—Patented by John Howe, Jr. and Frank E. Howe, both of this city. The invention relates to improvements in the supports, joists and levers of platform balances. This is a very excellent scale and it is having an extensive sale in this country.

Fire-arm.—Patented by Charles T. Pierson, of this city. This invention consists in encompassing the cone or nipple of the fire-arm with a cup, and attaching a collar packed with india-rubber to the hammer, to protect the percussion powder from moisture and prevent accidental discharge of the gun.

Apparatus for Blowing-off Water from Steam Boilers.—Patented by James H. Washington, of Baltimore, Md. The blow-off pipe has a hinged joint and float so as to keep the opening in the same position in relation to the surface.

Tailors' and other Shears.—Patented by James H. Roome, of this city. This invention consists in combining one limb of a pair of shears with a handle forming part of a separate lever, and of combining the said limb and handle with the other limb of the shears, whereby the leverage exerted by the thumb or hand, in cutting, is gradually increased as the shears close, and a drawing cut is produced.

Variable Cut-off Gear for Producing Expansion in Steam and other Motive Engines.—Patented by Foster, Sutton and Stephens, of Harlem, N. Y. A compound cam, composed of two parts yoked together, is applied to the main shaft and controlled either by a governor or by the engineer.

Machinery for Cutting Corks.—Patented by Edward Conroy, of Boston, Mass. This machine was described and illustrated on page 345, Vol. I. (new series) of the SCIENTIFIC AMERICAN, and was alluded-to, favorably, in an extract from a British cotemporary, published on page 250 of the present volume.

Revolvers and Bullets for the same.—Patented by John Walch, of this city. Two charges are placed in each chamber, one forward of the other; both being fired before the breech revolves.

Salinometer Case for Steam Boilers.—Patented by Joseph Grice, of this city. A vessel is interposed between the boiler and the salinometer case, for the passage of the steam, to prevent ebullition in the salinometer case.

FOREIGN NEWS AND MARKETS.

Steam Frigates.—Steam was introduced into the Royal Navy of England in 1822, and now two-thirds of all the war ships are steamers. The screw was introduced as the propelling agent in place of paddle wheels, in 1842; now there are 345 screw sloops and frigates, and 48 line-of-battle ships, having a power capable of moving them in a calm at the rate of from 10 to 15 knots an hour. The activity lately displayed in the British dockyards has led to such an increase of war steamers that the fleet is now equal to the fleets of France and Russia combined.

Miscellaneous Matters.—The wages of the operatives in the cotton factories of Bolton have been advanced 5 per cent, which brings them up to the Manchester standard. The steamship *Great Britain* (once wrecked in Dundrum Bay) made a recent voyage from Liverpool to Melbourne in 55 days and 16 hours—the quickest time on record between the two places; the total length of the voyage being 13,405 miles; the average speed was 275 miles per day. The demand for crinoline wire in Sheffield has greatly fallen off, but the best quality of steel wire for ropes is in good request. The metal market is quiet, and almost without change in prices.

WEEKLY SUMMARY OF INVENTIONS.

The following inventions are among the most useful improvements patented this week. For the claims to these inventions the reader is referred to the official list on another page:—

HYDRAULIC MOTOR.

This motor consists of a cylindrical chamber with two gates, a central hollow shaft and a snail-shaped piston. The shaft is divided by a horizontal partition; so is the snail-shaped piston. The shaft has a supply opening above the partition, and a discharge or exhaust opening below the partition. The piston has an opening at front above its partition and one at back below the partition. The water under pressure passes down the hollow shaft through the piston, and, by its direct pressure, moves the piston round. As soon as the force of the water is spent, one of the gates opens and the dead water exhausts through the back of the piston and passes off through the lower part of the hollow shaft. We have seen this motor in operation, and we think it a most excellent contrivance; it being portable and capable of being attached to the hydrant pipes of buildings, and operated by the water flowing through the same. As a small power for single lathes and like machines it will be found very convenient, and as a power for pressing tobacco its advantage will be very great. Wm. Kennish, of London, England, is the patentee.

KNITTING MACHINE.

This invention consists in so applying and operating the frame needles, rib needles and sinkers of a ribbed knitting machine, that after the sinkers have given the loops to the frame needles, the rib-needles take the loops directly from the sinkers at the back of the frame needles. It also consists in the construction of the sinkers of a ribbed knitting machine with recesses in which the needles are arranged to operate, and across which the loops are extended in such a manner that the needles have their operation greatly facilitated. It also consists in the novel construction of, and mode of applying, pressers in combination with bearded needles, whereby they are caused to operate upon the needles in a proper manner by the movements of the needles themselves. It also consists in a novel mode of applying and operating two fingers in combination with the selvedge needles of straight knitting machine to aid them in forming the selvedge. And it further consists in an improved mode of driving the yarn guide of a straight knitting machine. The credit of this contrivance is due to John Chantrell, of Bristol, Conn.

KNITTING MACHINE.

The knitting of hosiery with properly-shaped heels and toes by the continuous operation of a machine without stopping to adjust the work, is something which has often been attempted by many ingenious mechanics, but we believe no machine has ever been made to do it successfully, up to the time of the invention of the improvements of W. H. McNary, which form the subject of the claims which appear in this week's list. These improvements, which are of comparatively simple character, effect this desirable result in a very perfect manner. The claims explain the nature of the invention as well as can be done without an illustrated description. The patent is assigned to the McNary Knitting Machine Company, whose office is No. 5, University Building, this city.

This invention has been also patented in several European countries, through the Scientific American Patent Agency.

FLOCK-CUTTING MACHINE.

The object of this invention is obtain a machine that will operate rapidly in cutting flock, perform the work perfectly, and at the same time be capable of being so adjusted as to admit of the ready discharge of foreign substances without injuring the cutting device. The tock from which flock is prepared, being most generally, the refuse from cloth and woolen manufactures, is liable to contain foreign substances such as nails, bits of metal and the like, which are a great detriment to the cutters of a flock-cutting machine, and hitherto the keeping of the cutters of such machines in perfect order, has been attended with considerable expense which is obviated by this invention. The inventors of this improvement are J. Tilton and E. Ritson, of Sanbornton, N. H.

MOLDING MACHINE.

The object of this invention is to obtain a machine by which green-sand molds for casting pipes may be expeditiously formed, and the pipes cast in a vertical position, the difficulty hitherto attending the shrinking and bending of the cross-bar avoided, and the mold enabled to be formed at its ends with male and female screws, so that the pipes may be cast with the same. The invention is applicable to the forming of molds for cylindrical, polygonal, elliptical or other shaped pipes. This improvement was designed by William Doyle, of Albany, N. Y.

GRAIN-WEIGHER.

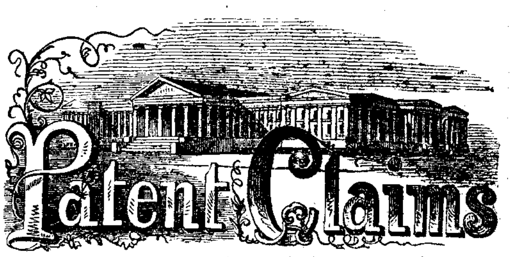
This invention consists first, in hanging the scale or receiver which is to contain the grain while it is being weighed, on one end of the scale beam in such a manner that it will tilt and discharge its contents at a given time, and then return to its former position for receiving another supply; and it consists in suspending said receiver or weighing box to the scale by a weighted lever having its fulcrum or center of motion in the end of this beam; and in adjusting the weight on the lever so as to give a slight preponderance to this end of the lever, and thereby insure the return of the receiver after discharging its contents, to a proper position for receiving and holding the grain flowing from the hopper, until the desired weight is attained, when it will be instantly discharged by the preponderance of the opposite end of the weighted arm. It consists, second, in combining with a weighing box suspended on the end of a weighted arm, having its fulcrum in the end of a scale beam, a novel device for operating and regulating the flow of grain from a hopper to the weighing box, whereby the discharge and cut-off may be automatically effected, and with an upward movement of the gates or valves which are operated, so as to close alternately in supplying the grain from the hopper to the receiver, and opened simultaneously by the return of the receiver after the discharge of the measured quantity. It consists, third, in combining in a novel manner with the two-throated hoppers and the manner of affecting the cut-off of the grain from the hopper to the receiver, a secondary weight which is brought into action after the first discharge is cut off, so as to allow the second discharge to charge and tilt the receiver, thus obtaining a nicety and accuracy in the filling and discharging of the receiver at the instant the required weight is attained. The device has been patented to Lovett Eames, of Kalamazoo, Mich.

PAINT-MIXER.

The nature of this invention consists in a novel arrangement of fixed knives or blades in the bottom of a tub with revolving knives, or knife-edged arms, fixed to a rotary arm, driven by suitable machinery, whereby the paint will be thrown towards the circumference of the tub and receive a thorough mixing action from the arms, and at the same time the movable and fixed arms will be arranged in such relation to each other that they will pass each other in pairs at equal distances from the center of the shaft, and diametrically opposite each other, and not pass between any two pairs in the tub at the same time, and under the same circumstances. The object of this invention is to give to the semi-liquid contents of the tub a thorough mixing by the action of the fixed and revolving arms, at the same time to equalize the operation of the revolving arms by preventing more than two of these from passing each other at the same moment. The patentees of this invention are C. W. Brown and G. W. Banker, of Boston, Mass.

MOLDING SHOT AND SHELL.

This invention consists in the employment for adjusting the pattern of a mold-board with a central aperture to receive a circular projection on the under side of the pattern, and with a circular flange on one, and a rim on the other side, to fit on one side over a rim turned to the end of one of the semi-flasks, and on the other into a flange projecting from the end of the other semi-flask, said rim and flange in the semi-flasks being at the same time so arranged that they serve as guides for the flasks when the same are connected; and this invention consists also in combining with the flanged end of the lower semi-flasks a cross-shaped gage with a half circular recess for the purpose of adjusting the core. The credit of this invention is due to David Huestis, of Cold Spring N. Y.



ISSUED FROM THE UNITED STATES PATENT OFFICE
FOR THE WEEK ENDING MAY 15, 1860.

[Reported Officially for the SCIENTIFIC AMERICAN.]

*** Pamphlets giving full particulars of the mode of applying for patents, size of model required, and much other information useful to inventors, may be had gratis by addressing MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, New York.

28,245.—Wm. Clare Anderson, of St. Louis, Mo., for an Improvement in Lifting Jacks:

I claim the rack-bar, B, and the lever, C, the latter being provided with an oblong slot, e, through which and the upper part of the bar, B, the fulcrum pin, D, passes, the rack-bar being fitted in a stand, A, or equivalent device, to operate as and for the purpose set forth.

I further claim, in connection with the lever, C, and rack-bar, B, arranged as shown, the lugs or projections, g, attached to the lever, and at such a distance from the bar, B, to operate as specified.

[This invention consists in the use of a hollow stand or upright, provided with a base and a pawl at its upper end, and having a rack bar fitted within it, to the upper part of which a slotted lever is attached in such a manner as to raise the article to which it is applied, and to remain permanent after raising the article by the weight of the article alone; no other adjustment of the lever being required.]

28,246.—Luther Atwood, of New York City, for an Improvement in Construction of Apparatus for the Re-distillation of Coal Oils:

I claim a separating chamber, constructed substantially as described, when arranged and combined with a volatile oil still and condenser, in such manner as to gradually separate and condense the heavier parts of the oleaginous vapors formed, and continuously return them to the still, for a further action of the heat, and at the same time preserve the lighter vapors, and pass them over to the condenser, substantially as described, and substantially for the purposes set forth.

28,247.—I. A. Benedict, of West Springfield, Pa., and G. W. Cummings, of Conneaut, Ohio, for an Improvement in Ditching Machines:

We claim, first, The arrangement of the sleeve, G, sliding shaft, F, in combination with adjusting arms and segment gear and pinions, in the manner and for the purpose described.

Second, We claim the adjusting guides, O O′, and guides, P P′, in combination with the movable buckets, M, when arranged and operating conjointly, in the manner and for the purpose set forth.

Third, We claim the springs and levers, in combination with the revolving hinged buckets, M, in the manner and for the purpose specified.

28,248.—Dana Bickford, of Westerly, R. I., for an Improved Compressed Air Engine:

I claim one or more reservoirs for compressed air, with movable air-tight head, to be operated with either weight, screw, lever, spring or any similar power, for the purpose of keeping up a uniform pressure upon the contained air, combined with an engine, of any form, for the purpose of propelling vehicles or machinery, the whole constructed, arranged and operating substantially as set forth.

28,249.—J. S. Black, of Bloomfield, Ky., for an Improvement in Bee-hives:

I claim the combination and arrangement of the bee palace, constructed as described with the moth trap constructed as described for the purpose set forth.

[This invention consists in constructing the bee palace with two central or main chambers, two side gums or chambers, two top chambers and a moth trap. The top and side chambors serve for the bees to commence their work in, and the main chambers serve for them to extend their operations. The moth trap serves to catch all the moth or enemies of the bees, which a e caused to fall down from the main work chambers by the attack of the bees. This appears to be a good palace for the queen and her co-workers.]

28,250.—Wm. N. Brown, of Camden, N. J., for an Improvement in Vapor Burners:

I claim the combination of a heat conductor, with a non-conductor, in hydro-carbon vapor burners, for the purpose of securing to the heat conductor the greatest possible heat-conducting power, by employing a metallic heat conductor, encased in a non-conducting or partially non-conducting material, as described, and for the purpose set forth in the above given description of my invention, and in the drawings hereunto annexed, or any other mode substantially the same, and which will produce the intended effect.

28,251.—Andrew Buchanan, of Jersey City, N. J., for an Improved Arrangement for Balancing Slide Valves of Steam Engines:

I claim, first, The combination with a slide valve, to which the steam is admitted from the under side of a valve, A, arranged with a stem, D, and enclosed into steam-tight chamber, C, substantially as and for the purpose specified.

Second, The arrangement of the cap, F, with legs, e, and fitting on a seat, c, around the hollow stem, D, in combination with the valve, A, constructed and operating substantially as and for the purpose described.

Third, The arrangement and combination of the valve, A, movable seat, B, cap, F, and regulating pins, f, constructed and operating substantially as and for the purpose set forth.

Fourth, The arrangement of the pipe, G, communicating with the steam chest through the chamber, C, substantially in the manner and for the purpose described.

[The object of this invention is to regulate the pressure of the steam on the upper and on the underside of a slide valve, according to the difference between that portion of the under surface of said slide valve which is exposed to the pressure of the steam and the entire upper surface of the valve; and this device is more particularly applicable to that class of slide valves in which the steam from the boiler acts on the underside, thereby producing a tendency to lift up the valve and cause a leakage of the steam.]

28,252.—A. L. Currier, of Washington, D. C., for an Improved Saw-set:

I claim, first, The construction and arrangement of a series of rotating punches and their corresponding matrices working together, to set the t eth of saws alternately to the right and left at the same time, thereby completing the operation, by passing it once through the operation.

Second, I claim the upright guides, the adjustable slide, B, to regulate the degree of set in saws, in combination with the rotating punches, as described, for the purposes specified.

28,253.—H. L. Castile, of Memphis, Tenn., for an Improvement in Axle Boxes:

I claim the employment of the cone-sided block, G, having the base resting upon the journal, B, in combination with the inclined sided sided seat, A, as shown and described, so that a space, J, will be left between the upper part of the block G, and the seat, A, and the fibers of the block will be laterally compressed, all as set forth.

[This invention consists in preparing suitable blocks of any wood, by boiling them in oil until the sap or juices of the wood are all driven out and the pores are filled with oil; and, in this condition, the blocks are cut pyramidal or wedge-shaped, or what might be termed the frustrum of a quadrangular pyramid, with their bases curved out, so as to conform to the periphery of the journal and with the fibers of the wood, all perpendicular to the axis of the axle.]

28,254.—A. W. Chase, of Ann Harbor, Mich., for an Improvement in Invalid Bedsteads:

I claim the peculiar shape or construction of the bed posts adapting them to the open or false mortises, with the head and footboards constructed to correspond thereto, in combination with the spring bolts to keep them in position, or allow any desired change, substantially as and for the purposes set forth.

28,255.—John Chantrell, of Bristol, Conn., for an Improvement in Knitting Machines:

I claim, first, So applying and operating the frame needles, the rib needles and the sinkers of a ribbed knitting machine, in combination with each other, so that after the sinkers have given the loops to the frame needles, the rib needles take their loops directly from the sinkers at the back of the frame needles, substantially as specified.

Second, Constructing the sinkers with recesses, in which the ribbed needles are arranged to operate, and across which the loops are extended, in the manner and for the purpose specified.

Third, The pressers, J J, applied, operated and operating, substantially as set forth.

Fourth, I claim applying the selvedge fingers, and operating them by means of an arm attached to a slider which operates the needles, substantially in the manner specified.

Fifth, I claim combining the bar which carries the yarn guide with a slider which operates the needles by means of grooved blocks, Q Q', and spring catches, R R', acted upon by stationary wedges, y y', substantially as described.

28,256.—J. E. Cheney, of Lowell, Mass., for an Improvement in Machinery for Winding Laps:

I claim the method of winding a lap lightly upon a small wood roller, disconnected from any weight or motion, otherwise than that given to it by the rollers between which it revolves, by the combination of the three rollers, or their equivalent, arranged substantially as and for the purpose described.

28,257.—Orville Choate, of Morrisville, Vt., for an Improved Mop Wringer:

I claim the arrangement of the togglo levers, a a b b, within the uprights or frame, B B', in combination with the pressing rollers, C C', and treadle arms, D, as and for the purpose shown and described.

[This invention consists in applying to any ordinary portable pail or bucket for holding water, two rollers suitably arranged over the same, and hung and arranged so as to be opened or closed, or so as to recede or approach each other by operating a foot treadle connected with them; the object being to squeeze or press the water out of mops—such as are used for washing windows, floors, &c.—at the same time, the bucket will serve to receive the water pressed out, and to contain the water to be used for washing purposes.]

28,258.—T. G. Clayton, of Washington, D. C., for an Improvement in Vapor Lamps:

I claim the converting of the fluid into gas or vapor below the illuminating flame by means of the combined generator and burner, B, and the jets of burning vapor below said burner and generator, the whole operating as described and for the purposes set forth.

Second, The burner and generator, B, having the gas-chamber, C, below it, constructed and operating substantially as set forth.

Third, The use of jets of gas from chamber, C, or burner, B, for making an oxyhydrogen flame, for heating below the combined generator and burner, as set forth.

28,259.—J. B. Cornell and Wm. W. Cornell, of New York City, for an Improvement in Metallic Rolling Shutters:

We claim preventing the longitudinal slitting of the individual slats of a rolling metallic shutter, by combining a series of bosses with the face of said shutter, substantially as set forth.

We also claim giving the metallic bosses upon the face of our improved rolling shutter, such a shape that they will prevent the edges of the slats of said shutter from being forcibly separated from each other, substantially as set forth.

28,260.—John Dougherty, of Cold Spring, N. Y., for an Improvement in Molding:

I claim the temple block, M, combined with a hollow shaft, B, and screw shaft, G, and operated substantially in the manner and for the purposes set forth.

[This invention is an improvement in arranging the templets that are used in loam-molding for casting large work—such, for instance, as steam cylinders, large pipes, fly-wheels, and such molds as cannot be conveniently and accurately made in the ordinary method of molding. The method of molding such work in loam is at present attended with many difficulties familiar to those skilled in the art; and it is the special object of this invention to remedy this. The invention consists in a novel arrangement of gearing, combined with the central spindle carrying the templet, for giving to said templet or templets, of any description, according to the kind of work to be performed, a vertical reciprocating motion, or a vertical motion combined with a circular motion.]

28,261.—Wm. Doyle, of Albany, N. Y., for an Improvement in Molding Iron Pipes:

I claim, first, The core bar, K, made in sections or with joints, S, in combination with a sand mold, when the sections of said bar are constructed with flanches, t t, for supporting the sand, substantially as described.

Second, The arrangement of the bars, p p, of the flask with rings, q q, and the points, L M P, substantially as shown, to admit of the ready adjustment of the same, as set forth.

Third, The employment or use of the stationary screw, N, and cylinder, O, the latter being provided with an internal screw thread, and fitted on the former, to operate as and for the purpose set forth.

Fourth, The employment or use, for the purpose specified, of the hollow screw, S, formed of two longitudinal parts, in connection with the bar, Q, provided with the annular plate, R, having an interval screw thread to receive the screw, S.

Fifth, The cutter, H, attached to a cylinder, G, or other shaped tube corresponding as well as the cutter, H, to the shape of the pipes to be cast, and used in connection with the screw and gearing, or other proper mechanism, for the purpose of forcing the cutter down through the flask concentrically with the core bar, K.

Sixth, The guide rod, I, fitted within the screw, D, and cylinder or tube, G, and provided with a socket, n, substantially as shown, for the purpose set forth.

28,262.—Lovett Eames, of Kalamazoo, Mich., for an Improvement in Automatic Grain-weighing Machines:

I claim the combination of the weighted pendulum lever, E, with the scale beam, F, and weighing box, D, in the manner and for the purpose substantially as shown and described.

I also claim the combination, in the manner shown and described, of the gate, C C', with the double-discharging bottomed hopper, B, and oscillating weighing box, D, for the purpose set forth.

28,263.—Louis Engler and E. F. Krauss, of Paris, France, for an Improved Insulator for Electrodes:

We claim the insulater consisting of an enameled iron ring, having a lining of glass permanently cemented within it, and a V-shaped opening, a, the sides, c c, of whose throat project inwardly beyond the interior of the lining, substantially as described.

28,264.—J. W. Evans, of Forsyth, Ga., for an Improved Combination of Shovel and Tongs:

I claim the combination and arrangement of the shank of the shovel, c, with the axis of the leg, a, the latch, g, and spring, h, and the groove, f, substantially as set forth.

28,265.—E. N. Foote, of Saratoga Springs, N. Y., for an Improved Filling for the Soles of Boots and Shoes:

I claim the filling of boots and shoes, made and inserted substantially as I have described, and for the purposes set forth.

28,266.—J. Fraser, of Rochester, N. Y., for an Improved Clothes-frame:

I claim the combination and arrangement of the arms, D, with the standard, A, by means of the crank pivot, g, or its equivalent, substantially in the manner and for the purposes shown and described.

28,267.—Thomas Fry, of Brooklyn, N. Y., for an Improvement in Hanging Window Sashes:

I claim, first, Arranging that character of window sashes which can be swung into a horizontal or oblique position, in such a manner that the sash, while it turns, is tightened laterally so as to remain in a horizontal or oblique position, substantially as set forth.

Second, Providing the sash frame, in the manner described, with a spring strip, which has a recess for the reception of the sash when in an oblique position, said strip answering the double purpose of stop and weather strip, substantially as set forth.

[This invention allows of a window sash being turned down to and held firmly in a horizontal or inclined position, so that they may be washed on both sides with great convenience from the inside of the room. The sashes are hung on right and left screw pivots, which bind the sash laterally as they are turned down and release them as they are turned up. The pivots are attached to sliding strips, which rise and fall with the sash. These strips and the sash are locked in a vertical position by means of sliding pieces which spring out from the frame when the sashes are turned up, and close the weather spaces. This is a most excellent contrivance. A patent for it has been applied for in England.]

28,268.—F. H. Furniss, of Cleveland, Ohio, for an Improvement in Railroad Jacks:

I claim the arrangement of the sleeve, F, with the arm, E, and screw, B, and standard, A, in combination with the sliding jack frame, when operating conjointly in the manner and for the purpose specified.

28,269.—Emerson Gaylord, of Chicopee, Mass., for an Improvement in the Manufacture of Bayonet Scabbards:

I claim a bayonet scabbard shaped and finished by the application of moisture, heat, saturation and pressure, as stated, for the purpose of giving it form, rigidity and a highly polished surface, and making it impervious to water, as set forth.

28,270.—James Greenhalgh, Sr., of Pascoag, R. I., for an Improvement in Harness Frames for Looms:

I claim the combination of the hollow heddle bars, A A', and the rods, d d, inserted within the said bars to secure the loops at the ends of the heddles, substantially as described.

[This invention consists in a certain construction of the frames for the reception of wire headles, whereby the headles of one frame are prevented catching against the next frames, or their headles, and the headles are kept stretched better than by the usual mode of securing them.]

27,271.—J. H. Haskell, of Baltimore, Md., for an Improved Machine for Stretching Leather:

I claim, first, Making each of the griping devices of two or more separate cams, l, substantially as and for the purposes set forth.

Second, Arranging the cams, l, upon an adjustable bar, m, in such a manner that not only the whole griping surface can be adjusted for pieces of leather of various thicknesses, but that each cam, l, can also adjust itself to the varying thickness of one piece of leather, substantially as set forth.

Third, Combining a griping cam constructed of separate cams, l, and of an adjustable bar, m, with a lever, a, pivoted to the main frame of the machine at d, substantially as and for the purposes set forth.

Fourth, The combination of a flanged pawl, v, and a sliding cam, x, substantially as and for the purpose set forth.

28,271.—C. F. Hitchings, of New York City, for an Improved Boiler for Heating Buildings:

I claim, first, The water-jacketed chamber, B, in combination with a vertical, cylindrical or conical boiler, inclosing the flue, D, between the inner shell, f f, of the chamber, B, and the outer shell, d d, of the boiler, A, for the purpose and in the manner substantially as set forth.

Second, The diaphragm, C C, formed by an indentation in the inner shell, f f, of the chamber, B, or its equivalent, for the purpose set forth.

28,273.—I. H. Hobbs, of Philadelphia, Pa., for an Improvement in Machines for Hoisting Persons, &c., from one story in a building to another:

I claim the application to a building of any suitable kind, of either a single reciprocating frame, A or A', or of a pair of such frames arranged together substantially as described; the same being actuated by any suitable machinery and motive power, so that the respective platforms, p p, of the said frame or frames may operate in combination with the several respective floors or landings of a building, substantially as described, and for the purpose of conveying persons from any one floor to its next, or successively to any other floors of the said building, substantially in the manner set forth and described.

28,274.—A. G. Holcomb, of New York City, for an Improvement in Telegraphic Instruments:

I claim, first, Producing an additional movement of the armature lever by reversing the electric l current in the coils of the magnet, substantially as set forth.

Second, The arrangement of the steel cores, i', and iron bush cores, l, in combination with the coils of the electro-magnet.

28,275.—James Holland, of Conshohocken, Pa., for an Improved Post Butt:

I claim an earthenware post butt, made substantially as described, so as to receive the bottom of the post entirely within it, as also to a luting of pitch, or its equivalent, between them, and having also a bottom support and protection, as described and represented, and for the purpose specified.

28,276.—Richard Hubbard, of Milton, Ind., for an Improved Bedstead Fastening:

I claim the described combination of the dovetail mortise, a, dovetail tenon, b, metallic lining, C, and metallic casing, D, formed with cylindrical ends, d; the whole being constructed and arranged and operating in the manner and for the purposes explained.

28,277.—David Huestis, of Cold Spring, N. Y., for an Improvement in Molding Shot and Shells:

I claim, first, The employment for adjusting the pattern of a mold-board, C, with a central aperture, c, flange, d, and rim, d', in combination with the semi-flasks, A A', constructed and operating substantially in the manner and for the purpose described.

Second, The combination with the flanged end of the semi-flask, A', of a cross-shaped gage, H, with notches, h, constructed and operating substantially in the manner and for the purpose specified.

28,278.—C. S. Irwin, of Madison, Ind., for an Improvement in the Construction of Machinery for Cleaning Starch:

I claim the rotating disk brush, C, placed on the box or receiver, A, in connection with the bed or platform, D, also placed on the box or receiver, all being arranged as and for the purpose set forth.

[The object of this invention is to supersede the manual process of cleaning starch preparatory to the papering and final drying of the same for domestic use. In the manufacture of starch a slimy crust forms on the sides of the lamps in the preliminary drying process, and this crust has heretofore been removed by scraping with a knife, an operation which consumes considerable time and is attended with much waste.]

28,279.—Z. L. Jacobs, of Hebron, Conn., for an Improvement in Screw Plates:

I claim, as an improved article of manufacture, a screw plate, provided with changeable pivoted dies, E, screws, A, stock, C, pins, N, and plate, Q, substantially as shown and described.

28,280.—Pomeroy Johnson, of Whitney's Point, N. Y., for an Improvement in Felling Trees:

I claim the combination of the pole or scantling, B, provided with a steel or proper metal point, a, the fixed pulley block or shieve, D, and rope, C, with animal or other power attached; all being arranged and applied substantially as and for the purpose set forth.

[The object of this invention is to facilitate the felling of trees by dispensing with much of the cutting or chopping operation, and at the same time to place the falling of the tree under the complete control of the operator. The invention consists in the employment and use of a pole or scantling provided with a metal point or end, and having a rope attached, which passes through a fixed pulley block, whereby, with the aid of a team or other power, the desired end is attained.]

28,281.—M. M. Jones, of Morrisville, N. Y., for an Improvement in Cotton Presses:

I claim the particular arrangement and combination of mechanism described, the same consisting of rods, H, rotating nuts, C, follower, B, bed piece, E, lever, M, pawl, N, springs, o o, pivot, P, stationary roller, i, the several parts being constructed and arranged relatively as described and for the purposes set forth.

28,282.—Wm. Kennish, of London, England, for an Improved Hydraulic Motor:

I claim a diaphragmed snail or other suitably shaped piston, C, which has an opening in its face and another one in its back, in combination with a diaphragmed hollow shaft, D, which has corresponding openings with those of the piston, substantially as and for the purposes set forth.

28,283.—Richard Ketchum, of South Dansville, N. Y., for an Improvement in Mowing and Reaping Machines:

I claim the combination of the cross-bar, K, having supporting rollers, m m, and vibrating bar or beam, C, furnished with rollers, d d, for operation by the corrugated driving wheel, B, all arranged upon the axle, A, for actuating the cutter, substantially in the manner and for the purposes set forth.

28,284.—W. A. Kirby, of Buffalo, N. Y., for an Improvement in Harvesters:

I claim, in combination with the rod and lifting wheel, the lever and rod, x, with their attachments, substantially as described, for the purpose of raising, lowering and holding the cutters at different hights, as set forth.

28,285.—F. L. Langley, of Troy, N. Y., for an Improved Shoemaker's Float:

I claim constructing and arr nging the several parts of the machine substantially as described, whereby the rasp may remain movable upon upon its axis, or rigidly fixed there n, as may be required, for the purposes set forth.

28,286.—J. P. Ledy and Wm. Boyers, of Mount Carroll, Ill., for an Improved Apparatus for Breachy Cattle:

We claim the metallic sheath, A, in combination with the pad, C, and clasp, D, constructed in the manner and for the purpose specified.

28,287.—George Little, of New York City, for an Improvement in Sewing Machines:

I claim the adaptation of a cylinder, piston, rod and valves to, and constituting a part of, a sewing machine, the whole combined, constructed, arranged and operating substantially as set forth.

28,288.—T. J. Mayall, of Roxbury, Mass., for an Improvement in Machines for making Rubber Hose:

I claim, first, An organized machine for the formation of spiral, rubber or gutta percha hose or tubing, the same consisting essentially of a traveling carriage carrying the fabric of which the hose or tubing is to be formed, and a reversible guide, to which such automatic motions are given, as to wind the said fabric in spiral layers upon a suitable mandrel, substantially as set forth.

Second, I claim the combinaton of the traveling carriage carrying the fabric of which the hose is to be formed, and made to receive a reciprocating rectilinear motion, in any proper manner, with the reversible guide, the two so operating together that the said guide shall be reversed in position as soon as the fabric is wound spirally in one direction upon the mandrel, whereby the fabric is fed along and guided in two opposite directions upon the mandrel so as to form spiral layers crossing each other, as set forth.

Third, I claim the combination of the traveling carriage carrying the supplying reel and the mandrel upon which the hose is to be wound, as set forth.

28,289.—John McKellar, of Thomaston, Maine, for an Improvement in Beer Powders:

I claim the said composition or beer powder, made substantially as described.

28,290.—W. H. McNary, of Brooklyn, N, Y., for an Improvement in Knitting Machines:

I claim, first, The threaded wheel, D, with its movable switch, D', H, applied substantially as described, in combination with the needle ring, or other equivalent device carrying the needles, to produce the rotary or traverse movement of the needles in either direction, as may be necessary.

Second, The revolving and longitudinally moving studded cylinder, applied and combined with the movable switch wheel, by means of a forked lever, G, and revolving buttons, h h', or their equivalents, and operating substantially as described, for the purpose of shifting the switch as often as is desired to reverse the rotary or traverse movement of the needles.

Third, I claim the reg lating wheel with its adjustable arms, M M', applied and operating substantially as described, in combination with the needle ring and with suitable apparatus for throwing the studded cylinder into gear with the main shaft, for the purpose of regulating the length of the complete circular portions of the work.

Fourth, I claim combining the studded cylinder, H, with the disengaging apparatus, by which it is made to throw itself out of gear with the main shaft when knitting all round the whole series of the needles is required to be resumed after knitting round a portion of the series only.

Fifth, I claim combining the stitch hook bar, S2, with the main shaft, or other rotary shaft, of the knitting ma hine, by means of one or more cranks, Z Z, and controlling the movement produced by such crank or cranks by means of a slotted arm, S', working on a fixed guide-pin, 24, substantially as described, to produce the movement of the stitch hooks to take off the loops from the needles.

Sixth, I claim giving the stitch hook bar the necessary lateral movement to complete the throwing-off of the loops from the needles and to enable them to pass the needles as they descend to take another loop by means of the cams, Z' Z', at the sides of the wrists of its driving cranks, substantially as described.

Seventh, I claim combining the rockshaft which carries the thread guides with the switch wheel, D, by means of a fork, U4, or its equivalent, substantially as and for the purpose described.

28,291.—George Millard, of Waterbury, Conn., for an Improved Chimney Cowl:

I claim the arrangement of the friction rollers, J, to run upon the edge of flanch, B, in combination with the cowl, C C', as and for the purposes shown and described.

[This invention consists in arranging an ordinary curved chimney cowl or cap on the chimney top, so that it will be free to revolve by the action of the wind on a vane, and so that it will be securely attached to the chimney so as not to be blown off; at the same time the rain will be prevented from beating down the chimney flue]

28,292.—Harris Morse, of Columbia, Cal., for an Improvement in the Treatment of Snow or Ice, to Convert it into Large Blocks:

I claim the said process of treating snow or small pieces of ice, in order to convert the same into large blocks or masses fit for preservation and use, as described.

28,292.—S. D. Nelson, of Pittsburgh, Pa., for an Improvement in the Manufacture of Shovels:

I claim the shovel, as a new article of manufacture, having the back strap imbedded in the back of the shovel blade, arranged and constructed as described, and for the purpose set forth.

28,294.—David Niven, of Rochester, N. Y., for an Improvement in Potato-diggers:

I claim suspending the grate, share and clearing wheel together upon the axle by the supporting wheels, by means of the bails, h h, yoke, k, and axis of said clearing wheel, as described, or their equivalents, in combination with a lever, E, so that the said grate, share and clearing wheel may be continually graduated by the attendant to any depth, and adjusted to the undulations of the ground or raised therefrom, independently of the movements of the other parts of the machine, as specified.

I also claim forming the upper surface of the circular concentric grate bars, l, with serrated edges, m m, in combination with the intervening teeth, n n, of the clearing wheel, for the more effectual separation of the tubers from the earth, substantially as set forth.

28,295.—R. F. O'Brien, of Boonville, Mo., for an Improvement in the Construction of Flues:

I claim the metal base, B, formed of the bottom plate, a, sides, b b, and flanches, c c, applied to the timbers, A A, as shown, and perforated at its bottom or corrugated to receive and hold the plaster or mortar, substantially as and for the purpose set forth.

[This invention has for its object the building of brick flues or chimneys on the flooring timbers of buildings, without the danger or liability of the adjoining woodwork taking fire. The invention is more especially designed for building flues or chimneys on the upper flooring timbers of buildings, to receive a stove pipe from below.]

28,296.—Alanson Ordway, of Stratham, N. H., for an Improved Tweer:

I claim the combination of the rotating circular grate, C, with the horizontal sliding grate, E, and levers, D F, as and for the purpose described.

[The object of this invention is to obtain a simple and economical tweer by which the blast from the bellows is placed under perfect control and its action upon the fire regulated ~~as occasion may re~~quire; the tweer also serving the purpose of a grate, to effect the discharge of ashes and cinders from the fire.]

28,297.—S. W. Palmer and J. F. Palmer, of Auburn, N. Y., for an Improvement in Silk or Thread Reels:

We claim securing the slotted arms of a silk reel to the spindle on which they turn in such a manner that they can be extended and contracted at pleasure and folded up parallel to each other, and so that they can be rigidly secured to each other and to the spindle in any desired position, by means of a thumb-screw, without preventing the spindle from freely turning in its bearings, substantially in the manner and for the purpose described.

28,298.—J. G. Perry, of South Kingston, R. I., for an Improved in Sausage Machine:

I claim the combination of the sliding knives, D, with the cylinder, C, substantially as herein described and for the purpose set forth.

28,299.—I. W. Pettibone, of Norfolk, Conn., for an Improvement in Vapor Lamps:

I claim the combination of the vapor valve at the mixing chamber with a supplementary valve—the two being constructed and operating substantially as set forth.

I also claim the combination of the mixing chamber with an air tube or tubes, to deaden the whistling noise which generally accompanies such burners.

I also claim arranging the air tube in such a manner with reference to the mixing chamber of the vapor burner, that it can be removed therefrom, to permit cleaning, substantially as herein set forth.

28,300.—G. B. Phillips, of Newark, N. J., for an Improved Wrench:

I claim a curved bar provided with a rack of teeth, in combination with a scroll nut for traversing and holding the sliding jaw, as described for the purpose specified.

28,301.—W. C. Pitts, of Austin, Texas, for an Improvement in Seed Planters:

I claim the arrangement of the double hoppers, e f, double tubes or ducts, B C, and single seed slide, d, operating together in the manner and for the purpose set forth and described.

28,302.—J. S. Pond, of Cleveland, Ohio, for an Improved Washing Machine:

I claim, first, The construction and arrangement of a compound rubbing board, having a series of alternate ridges and rollers, to compress and rub at the same time, as described for the purposes specified.

Second, The compound rubbing board in combination with a fluted roller or its equivalent, as set forth.

28,303.—J. T. Price, of Rockville, Ind., for an Improved Sediment Collector for Steam Boilers:

I claim the system of pipes, F G I, applied to a boiler in connection with a heater, D—the whole arranged substantially as described, for the purpose set forth.

[This invention consists in a novel system of pipes applied to a boiler in connection with a water-heater arranged as a bridge in the rear of the fire-grate, for the purpose of collecting the mineral or other sedimentary matter from the water and preventing its deposit in the boiler.]

28,304.—T. J. Price, of Industry, Ill., for an Improvement in the Construction of Evaporating Apparatuses:

I claim constructing evaporating pans with a series of dampers, D D D, inserted between the cross partitions, B B B B, and operated with a series of levers, i i i, substantially as shown for the purpose specified.

28,305.—A. F. Reeder, of Bloomington, Ill., for an Improvement in Rotary Engines:

I claim the engine constructed with a cylinder of the form described, with a partition, I, with the induction ports in its abutments and with a cavity, a, and series of projecting surfaces, t u v v', in and upon its rotating piston head, D, substantially as herein described.

[This is a very ingenious and simple improvement in rotary engines.]

28,306.—J. H. Rollins, of Wapello, Iowa, for an Improved Vapor Lamp:

I claim the combination, with the vaporizing chamber, E, of the removable, flanched, screw bottom, a, and globe, I, so that the globe will be supported or hung from said bottom—all as and for the purpose shown and described.

[This invention relates to an improvement in that class of lamps which are designed for burning volatile hydro-carbons, and which vaporize the fluid in a chamber distinct from, but connected with, the fount, by the heat from the illuminating flame. The object of this invention is to facilitate the cleaning of the lamp and also to prevent a shade being cast by it, while permitting the use of a glass globe.]

28,307.—W. J. Sanderson and Sidney Stanton, of Syracuse, N. Y., for an Improvement in Steam Boiler Feeders:

We claim the arrangement of a discharging valve constructed in the manner stated and connected with the water pump of steam boilers, A, solid float, B, within the boiler, balanced by a weight without, and the steam whistle, G, connected with the balancing beam, E, as described, when the valve, J, operates as set forth, to regulate the amount of water in the boiler—and the whole constructed, arranged and operated in combination, substantially as described.

28,309.—J. M. Scribner, of Middleburgh, N. Y., for an Improvement in Lathes:

I claim the arrangement of devices as described, for traversing the leg or article cut to and from the cutter, and rotating it at the same time by the mechanism described, or its equivalent, so as to cut or form curves on the article so turned and traversed, substantially as described.

28,309.—Philander Shaw, of Boston, Mass., for an Improvement in the Method of Preparing and Molding Wood into Different Forms:

I claim the method or process of treating wood, consisting in compressing it within molds and afterwards heating it while thus confined under pressure.

Also the process of treating wood by impregnating it with steam and resinous, oily or other water-proof matter and mineral or metallic salts and preservative chemicals and dyes, or any of these or their substantial equivalents, prior to, and in combination with, the process above-claimed.

28,310.—Marvin Smith, of New Haven, Conn., for an Improved Peach-parer:

I claim the combination, with the stationary hollow concave rail, B, standard, a, and fork, D, of the sliding, hollow, concave rail, E, standard, d, fork, F, and spring, o, as and for the purpose shown and described.

28,311.—S. J. Smith, of New York City, for an Improved Nutcracker:

I claim the combination of the fixed ~~and curved portion, a,~~ lever, ~~B, constructed as set forth, with its~~ spring, D, and the eccentric hand lever, C—all relatively arranged and combined, as and for the purposes described and represented.

[This invention consists in the employment of a cam lever that is acted upon by a coiled spring arranged in such a relation to a curved fixed jaw and operated by a lever having an eccentric motion, that two jaws will be obtained, one a curved and the other a straight one, between which nuts of any ordinary size or kind may be placed and cracked with greater facility and with little power.]

28,312.—Lydia W. Stiles, of Brooklyn, Ohio, for an Improved Butter-worker:

I claim the special arrangement of the workers, B B', hinged to the adjustable post, E, in combination with the revolving bowl, when operating conjointly in the manner and for the purpose set forth.

28,313.—Abraham Stoler and S. A. Sisson, of Bristol, Pa., for an Improvement in Harvesters:

We claim the arrangement of the caster wheel, H, with its frame, G, connected to the main axle, in combination with the levers, K and L, fulcrum, I, rod, M, and shoe, S, applied in the manner and for the purpose substantially as described.

We also claim the combination and arrangement of the rod, M, and levers interposed between the caster wheel frame and pivoted shoe, S, for adjusting the cutting apparatus, substantially as described.

28,314.—A. M. Swain, of Lowell, Mass., for an Improvement in Water Wheels:

I claim, first, The annular chamber, I, arranged substantially as shown, and provided with slots to receive the guides, e, when the latter are attached to the cylinder, J, for the purpose set forth.

Second, The arrangement of the guides, e, and cylinder, J, attached to curb, B, and chamber, I, forming the gate, when said parts are arranged in relation to the wheel, G, substantially as and for the purposes specified.

Third, The adjusting of the block, E, by means of the bar, b, and set screws, c, for the purpose of adjusting the wheel to compensate for the wear of the step.

[The object of this invention is to obtain a simple and efficient horizontal water wheel—one that will have all its parts accessible for repairs and which will give the maximum power of varying heads with an economical use of the water.]

28,315.—R. A. Tilghman, of Philadelphia, Pa., for an Improvement in the Method of Decomposing Fats into Fatty Acids and Glycerine:

I claim the process of decomposing fats into fatty acids and glycerine by means of water at a high temperature and pressure, either with or without the presence of an alkali—

1. Applying the water in several successive portions and removing those portions when partly saturated with glycerine.

2. Arranging the fat and water in shallow layers so as to give an increased surface of permanent contact between them.

3. Causing the fat and water, arranged in shallow layers, to flow in opposite directions so as to bring fresh water in contact with the partly-decomposed fat.

28,316.—Jeremiah Tilton, of Northfield, N. H., and Edwin Riston, of Sanbornton, N. H., for an Improvement in Machinery for Cutting Flock:

We claim the employment or use, in a flock-cutting machine, of two cutters, H J, arranged substantially as shown, so that one cutter, H, will have a rotary motion and a vertical adjusting movement, and the other cutter, J, an universal self-adjusting movement, for the purposes set forth.

28,317.—Maurice Vergnes, of New York City, for an Improvement in the Construction of Voltaic Gas Batteries:

I claim the use, in gas batteries or combined acid and gas batteries, of porous platinized coke, substantially as and for the purposes set forth.

I also claim the general arrangement of the whole battery or apparatus, substantially as described.

28,318.—J. H. Wait, of Portsmouth, Ohio, for an Improvement in Mechanical Movements:

I claim constructing a crank with an elongated wrist pin set obliquely to its axis of rotation, so that a pitman connected thereto can be made to give any desired length of stroke or throw within the capacity of the crank, without retarding the motion thereof, in the manner substantially as described.

28,319.—C. P. S. Wardwell, of Lake Village, N. H., for an Improved Swift. Ante-dated April 25, 1860:

I claim the spring, D, in combination with the jaw formed by lips, B B, substantially as set forth and represented.

28,320.—C. O. West, J. R. Smith, John Carey, George Janney, R. Hunt, Amos Hatchett, D. West, Eliel West and G. Garner, of Martinsville, Ohio, for an Improvement in Ditching Machines:

We claim, first, The employment of the fin, M, in combination with the inclined bottom, L, as and for the purpose shown and described.

Second, The combination of the rib, e', with the inclined bottom, B, as and for the purpose set forth.

Third, The employment of a hinged triangular beam, A, and adjustable sled, F, in combination with the plow as and for the purpose shown and described.

Fourth, The combination with the plow, the beam, A, and sled, F, of the adjustable pivoted brace-rod, K, standard, I, and front brace-rod, J, as and for the purposes shown and described.

[This invention consists in an improved machine for forming ditches or trenches of any desirable width or depth, or having either perpendicular or inclined sides. The machine consists in a shovel plow peculiarly constructed, by which the earth, in the operation of digging, is thrown up and out from the ditch and away from its edges a sufficient distance to prevent its falling back again. The above claims will give an idea of the machine.]

28,321.—I. W. Wetmore, of Erie, Pa., for an Improvement in Railroad Chairs:

I claim, first, The lip chair, E, formed for a longitudinal wedge under the rails and fitting them exactly, because of the trimming of the web, u u, the upper surface of the base of the chair being beveled at each end, w v w v.

Second, The wedge, G, passing between all the spikes except one, and held in place under the joint by notches, h, catching the spike, R.

28,322.—J. M. Whitney, of Astoria, N. Y., for an Improved Sash-fastener:

I claim, as an improved article of manufacture, a window sash-fastener composed of a plate, a, hinged noose strut, C, and a hinged dog, E, arranged as shown.

[This invention consists in arranging, in combination with a strut or band that is fastened to the meeting bar of the inner sash, a hinged dog, which catches under a suitable noose in such a manner that the same most effectually prevents persons from opening the window from the outside.]

28,323.—Dudley Wood and Albert Byrington, of Byron, Ill., for an Improvement in Plows:

We claim the arrangement of the tubular beam, A, tubular standard, B, secondary joint, b, and inside coupling bolts, a a, substantially as described.

28,324.—C. W. Brown and G. W. Banker, of Boston, Mass., assignors to G. W. Banker and G. O. Carpenter, of South Reading, Mass., ~~for an Improvement in Machines for Mixing Paint~~:

~~We claim~~ the method of constructing and arranging the mixing apparatus in such a way that the fixed arms in the tub shall be set so as to describe scrolls from the central tube, or center of the tub, and arranged in such a relation to the parallel revolving arms that they will pass each other only in pairs, at nearly equal distances from the axis of the spindle, in the manner described and represented, for the purpose set forth.

28,325.—Patrick Mihan, of Boston, Mass., assignor to himself and M. A. Lane, of Charlestown, Mass., for an Improvement in the Construction of Condensors of Stills:

I claim the combination of a conical mouth-piece, F, of the supply pipe, E, with the conical bottom, b, of the reservoir, C, substantially as and for the purpose specified.

[This invention consists in combining an annular steam chamber, around a vessel that contains cold water, and the elevated conical bottom of said vessel with a conical receiving chamber, in such a manner that if said vessel is placed on a kettle containing boiling water, the steam arising from the latter, by coming in contact with the conical bottom and with the cold walls of the steam chamber, condenses and collects in the conical receiving chamber, from which it is drawn by a suitable faucet; and it also consists in the arrangement of a conical mouth-piece at the end of the supply pipe, in combination with the conical elevated bottom of the reservoir, for the purpose of spreading the cold water over all parts of said bottom, and to enable it to act with the best possible effect in condensing the steam that may come in contact with it.]

28,326.—Purches Miles, of New Haven, Conn., assignor to A. P. Plant, of Plantsville, Conn., for an Improved Bedstead Fastening:

I claim the arrangement of the shaft, c, provided with eccentric, a', spiral flanches, b', the dovetail mortise, a, tenon, b, and female screw thread, d', with the bracket bearing, C, substantially as and for the purpose set forth.

[The object of this invention is to obtain a lock joint or fastening by which the rails and posts of bedsteads, or other two similar parts to be connected, may be drawn firmly together in close contact and locked by a dovetail; the locking of the dovetail and the drawing of the parts together being simultaneously performed by a simple movement of a lever or the turning of a shaft.]

28,327.—J. H. Parker (assignor to E. H. Ashcroft), of Boston, Mass., for an Improved Hand Drill:

I claim the arrangement of the spring clutch with the drill-carrier and its lever, and within, so as to be protected by the sleeve or cap, L, substantially as specified.

28,328.—J. H. Parker (assignor to E. H. Ashcroft), of Boston, Mass., for an Improved Hand Drill:

I claim my improved hand drill, as constructed, not only with the application of a male screw, G, and a concentric oil-holder or tubular cap, L, directly to, and so as to project from, the drill-carrier, A, but with the tubular shank of the female screw extended directly from the pivot, F, or a handle, K, intervening between the two, as described.

I also claim connecting the chambers, M N, by one or more passages, b, separate from the female screw, that the oil may pass from one chamber into the other, under circumstances and for the purpose set forth.

28,329.—Wm. C. Pitts (assignor to Wm. A. Pitts), of Austin, Texas, for an Improvement in Plows:

I claim the construction of the plow with double points with the hole in the center, so that either end may be turned to the ground and fastened to the stock or "helve" of the same, by the bolt through the hole in the center, so that when one point wears out or breaks off, the other can be turned down; also, the separate bar, so constructed as to fit and sustain the plow, as specified.

And I hereby disclaim the invention of the stock of said plow and claim only the invention of the share and bar, as specified.

28,330.—Ephraim Russell, of Coatsville, Pa., assignor to himself and J. S. Wiley, of Sadsbury, Pa., for an Improvement in Seed Planters:

I claim the arrangement of the slides, D′ D″, the equivalent lever, the armed cylinder, F, screw stems, m m′, slotted plates or loops, n n, and the double dovetail keys, G G G′ G′ G″, operating in the manner described and for the purpose specified.

28,331.—Edward Savage, of Cromwell, Conn., and H. S. North, of Middletown, Conn. (assignors to the Savage Revolving Fire-arms Company, of Middletown aforesaid), for an Improvement in Revolving Fire-arms:

We claim placing the coiled spring which forces back the rotating cylinder away fram the muzzles of the charge chamber, and covering it with the shoulder, b, of the cylinder axis pin, so that its action cannot be clogged by the accumulation of smoke, burned powder or dust from the muzzles when fired; and also increasing the facility with which the rammer can be put in and taken out, all as shown and described.

Second, The employment, in combination with the regulating screw, G, of a thimble or bushing, E, applied to the recoil shield, to serve, at the same time, as a bearing for the rear end of the cylinder axis pin, D, and a bearing for a set screw, f, by which to secure the regulating screw, substantially as described.

Third, The set screw, f, applied in combination with the thimble or bushing, E, of the recoil shield, and with the regulating screw, G, substantially as and for the purpose described.

Fourth, The combination with the plunger, I, fitted to a guide in the head of the cylinder axis pin, D, as described, of the lever, J, fitted to the slots, i and j, of the said head, and to a slot, m, in the plunger, and connected with the said head by a fulcrum pin, k, and with the plunger by a cam-like slot, b, and pin, p, substantially as specified.

[This invention consists in certain improvements in the revolver which constitutes the subject of the patent granted to H. S. North, on June 7, 1856.]

28,332.—Wm. Shields (assignor to Joseph Lockett and Robert Leake), of Manchester, England, for an Improvement in Machines for Engraving Rollers, &c. Patented in England, Oct. 30, 1857:

I claim the combination and arrangement of the mechanism described, by which the movements of a tracer can be modified in extent and changed in direction and transmitted to etching instruments, and the roller or cylinder to be operated upon; and I particularly claim for these purposes the use of the levers or bars, e6 and h4, and the bars or carriages, e e9 f and g1.

28,333.—Emil Trittin (assignor to himself and J. A. Cummings), of Philadelphia, Pa., for an Improvement in Burners for Vapor Lamps:

I claim, first, The tube, A, with its chamber, C, and slotted top, a, in combination with the stem, D, and the attachment, E, or its equivalent; the whole being arranged substantially as and for the purpose set forth.

Second, The cap, d, with its openings, having inclined sides, y, in combination with the slotted top, a, of the burner; the whole being arranged and operating substantially as specified.

28,334.—Jedediah Weiss (assignor to himself and Chas. Brodhead), of Bethlehem, Pa., for an Improvement in Telegraphic Machines:

I claim the application of clock-work to the drawing-out and letting-back of the spiral spring, circular spring or elastic substance (commonly used for adjusting the telegraphic circuit), by combining with the clock-work the eccentric, C C C, the lever, A A, and roller, L, the movable axis to the wheel, S, the sliding wedge-shaped knob, K, and the lever, O O, in the manner and with the effect set forth particularly in the foregoing specification and the annexed drawings.

28,335.—D. H. Williams, of Alleghany, Pa., assignor to himself and R. B. Fitts, of Philadelphia, Pa., for an Improved Apparatus for the Combustion of Smoke in Steam Boiler Furnaces:

I claim the use of steam under pressure, for the purpose of forcing air (through suitably arranged, conically-shaped tubes or other openings, by means of the steam pipe apparatus, operating substantially as described) into steam boiler furnaces, their hot-air chambers, or the flues or tubes of the boiler; the steam jets, H, with their openings, K, or their equivalents, being in combination whether with or without the deflecting or heat-receiving wall, E.

28,336.—T. T. Woodward, of South Reading, Mass., assignor to himself and Whiton, Browne & Wheelright, of Boston Mass., for an Improved Signal Apparatus:

I claim, first, A portable revolving signal apparatus, containing a series of pyrotechnic charges, such as blue-lights or rockets, &c., and operated so as to receive an intermittent rotary motion, and to successfully ignite the several charges by any suitable arrangement of mechanical devices.

Second, The arrangement of devices for rotating the apparatus and igniting the charges at the same time; the same consisting of the spring hammer and cam-grooved cylinder, c, both actuated, as described, by the rod.

RE-ISSUES.

W. E. Kidd, of New York City, for an Improvement in Bonnet Frames. Patented April 13, 1858:

I claim making the tip of bonnet frames of two separate thicknesses of the fabric known as "cape net," by subjecting the same, while in a moist state, to heat and pressure in metallic molds of the required form to impart the required shape, and effect the union of the two thicknesses at one and the same operation, substantially as described.

I also claim making the crown of bonnet frames of two separate thicknesses of the fabric known as cape net, by subjecting the same, while in a moist state, to heat and pressure in metallic molds of the required form to impart the required shape, and effect the union of the two thicknesses at one and the same operation, substantially as described.

And I also claim making the entire bonnet frame of two separate thicknesses of the fabric known as cape net, by subjecting the same, while in a moist state, to heat and pressure in metallic molds of the required form to impart the required shape, and effect the union of the two thicknesses at one and the same operation, substantially as described.

H. F. Knoderer and L. F. Knoderer, of Chillicothe, Ohio, for a Composition for Preventing Incrustation of Steam Boilers. Patented Jan. 3, 1860:

We claim the application of a compound of alum, glue, wood-ashes and wheat-bran, prepared and applied as specified, to prevent incrustation on the interior of steam boilers and pipes, of whatever kind, pertaining thereto, as specified and substantially set forth.

Samuel La Forge, of Cleveland, Ohio, for an Improvement in Waterproof Leather Goods. Patented Feb. 28, 1860:

I claim the article of manufacture named, prepared from the undressed skin exposed to heat, coated with the charged rubber solution or compound, and then subjected to the vulcanizing process, as set forth.

D. M. Mefford, of Jeffersonville, Ind., for an Improvement in Corn Huskers. Patented Dec. 22, 1857:

I claim the combination of husking rollers and pressure flap, operating substantially as and for the purpose set forth.

Clark Tompkins and John Johnson, of Troy, N. Y., for an Improvement in Knitting Machines. Patented Sept. 18, 1855:

We claim the apparatus for revolving the take-up machinery, in unison with the needle cylinder, as specified, substantially in the manner and for the purpose set forth.

We also claim revolving the shaping plates, S and C, by a positive motion with, and at the same velocity as, the take-up motion, substantially as described and for the purposes specified.

ADDITIONAL IMPROVEMENTS.

Mahlon Gregg, of Philadelphia, Pa., for an Improved Machine for Cutting Tenons on Spokes. Patented Feb. 9, 1858:

I claim operating the carrier, B, and bearer, C, upon the faceplate, A, by means of the eccentrics, f and g; the same being constructed and arranged together substantially in the manner and for the purpose specified.

I also claim adjustably securing the cutter pieces, D D, by means of the nutted T-bolt, E, when the same are arranged and applied together in relation to each other and the carrier, B, in the manner described and set forth.

Josiah Lyman, of Lenox, Mass., for an Improved Protractor. Patented May 25, 1858:

I claim, first, The arrangement of the several verniers, limbs, scales and rule in one instrument, in the manner described, for the purposes set forth.

Second, I claim the peculiar arrangement of the sliding vernier scale plate, by which it can be applied with equal readiness and facility to either side of the rule, so as to read the given angle and its complement in connection with the given distance, or be used separately, as the case may require.

Third, I claim, as an improvement, the arrangement set forth for adjusting the several verniers of the scale plate to their corresponding scales.

DESIGNS.

M. Gibney, of New York City, for a Design for Spoon and Fork Handles.

Jas. Greer and R. I. King, of Dayton, Ohio, for a Design for a Stove.

H. S. Hubbell and T. H. Wood, of Buffalo, N. Y., for a Design for Stove Plates.

Jacob Resor, of Cincinnati, Ohio, for a Design for Stoves.

John Siddons and J. G. Hart, of Rochester, N. Y., for a Design for a Stove Plate.

Wm. W. Stevens (assignor to N. P. Richardson & Co.), of Portland, Maine, for a Design for Parlor Stoves.

NOTE.—In counting the above list of claims, we observe there were ninety-six patents issued for the week ending May 15th. Of this number, we recognize THIRTY-SIX patentees who had their applications conducted through this office.

Notes & Queries.

A. F. W., of C. W.—It will require no more fuel to run a steam engine at 150 revolutions per minute than 70 during ten hours, provided the entire work is equal. It requires about the same amount of fuel to run an engine at 60 lbs. pressure as at 50 lbs., provided the expansion is properly conducted and there will be a greater amount of work done. In the first case, with the higher speed, it is understood that less steam is employed at each revolution, but that the total quantity is the same for both speeds.

G. S., of Ala.—We do not advise you to use lead pipes for conveying water for domestic purposes, as some of the metal may be taken up in solution by the water, and thus poison the life-sustaining fluid. Use either cast iron or wooden pipes. You state that your yard and garden are 90 feet above your spring, and you wish to convey the water from the latter 500 feet to the former, and ask "what proportion of the water can you get from the power of the water itself—can you get a fall of from one to 12 feet?" We do not understand your questions, because you have not stated whether your spring has any fall or not. If it has a 12 foot fall, you will be able to raise about one-twelfth of its water 90 feet through a three-inch tube, 500 feet long. If it has no fall it cannot elevate any of its water.

C. L., of C. W.—We have not seen the machine to which you refer, and cannot therefore give you the desired information respecting its qualities or operation.

W. H. B., of Conn.—We believe the British steamer "Persia" has made the quickest eastward passage, and that the time was about 9 days 2 hours. The last passage of the American steamer "Vanderbilt" to New York, made in 9 days, 12 hours and 30 minutes, is claimed as the quickest westward passage. It must be borne in mind, however, that the average time of passage eastward is much less than that westward, and we think that the "Vanderbilt's" westward passage is, at least, as remarkable as the "Persia's" eastward. The passage between Liverpool and St. Johns, Newfoundland, has been made, we believe, within six days. See, also, an article on this subject in our present issue.

W. P. H., of Conn.—We have no means of ascertaining the amount machine-made hosiery manufactured in this country. There are many machines patented in this country, and on sale, which make men's hosiery (socks) with a properly shaped heel, without a seam up the leg; but two machines have always been required to make a complete sock, the work being transferred from one to the other. Such machines are made and for sale by J. B. Aiken, of this city. A company—called the McNary Knitting Machine Company—has just started, and has applied for patents on a machine which makes the sock from beginning to end, with a proper heel. James J. Wilson, of this city, is president or manager of this company. There are many machines, both European and American, which will knit a sock like a bag or one end of a sausage without stopping. Such socks are afterwards shaped on a block for sale, but when they have been washed they resume the original bag form. There never has been a machine to knit ladies' hosiery with a properly shaped leg, without a seam up the leg; and we believe that if such a machine could be invented, it would be one of the most remunerative things ever got up. The English hosiery manufacturers have long desired such a machine.

H. P., of Maine.—The velocity of water in a sluice or tunnel is in proportion to the perpendicular hight of the fall, not the length of incline. The velocity of water in a sluice with a two-foot fall is 11.28 feet per second.

S. R., of N. Y.—Thirty-three thousand pounds of water falling one foot per minute exerts a force of one horse-power. Consequently, to calculate the horse-power which a water wheel would have if there were no waste, you multiply the number of pounds of water which pass through the wheel in a minute by the number of feet which the water falls in passing through and divide the product by 33,000. The power exerted by undershot breast-wheels ranges from, say 35 to about 60 per cent of the whole power of the water, the remainder being lost in friction leakage, &c. On pages 116 and 200 of the present volume of the SCIENTIFIC AMERICAN, you will find full directions for bleaching wax.

G. M. H., of Maine.—There is no perfect fire-proof wash for shingles known to us, but the silicate of soda is an excellent partial one. As it will be difficult, however, for you to procure this solution, we advise you to use a wash composed of common lime, sulphate of zinc, salt and skim milk. Use a pound of salt and the same weight of the sulphate of zinc to each bushel of lime, and to every gallon of the wash add a quart of the skimmed milk. Dimpfell's blower is a very good one for your purpose; it is manufactured at the Novelty Works, this city. It is constructed so as to prevent the air getting behind the blades.

G. J. L., of N. H.—Electro-magnetism has been frequently suggested as a suitable agent for car-brakes, for the purpose of polarizing the wheels; it is not, therefore, patentable as a new application. You may, however, be able to secure a patent if you provide a suitable and improved mechanism for accomplishing this object. The machine to which you refer in the museum of this city, is not a perpetual motion. If you consider a wedge to be a lever, then its fulcra will be the lips of the split into which it is inserted; but it is so different in its nature and application from the common lever, that it is justly held to be a separate "mechanical power," and the two should never be compared together.

J. Q., of N. Y.—It is impossible to keep copper tanks bright in which water—either cold or hot—is kept. The metal combines with a minute quantity of the oxygen in the water, and forms a thin film of the oxyd of copper on the surface; this is sometimes called "tarnish." The outside of copper kettles, exposed to a coal fire, soon gets coated with the coal dust, and there is no method known to us for keeping it bright.

W. R. McF., of Tenn.—Hot-air engines are unsuited for fire-engines, because they are too bulky in proportion to their power. Compact high-pressure steam engines are necessary for running through the streets and exerting great force in ejecting the water.

J. G. L., of N. C.—By coating your cast iron pump with hot asphalt, and then allowing it to dry thoroughly, it will not be liable to rust afterwards. The water pipes in our city are of cast iron, and yet they do not communicate a peculiar iron taste to the water. Pipes made of tin will not be affected by the water in your well, but they are too dear to use for such common purposes.

N. P., of Del.—Your method of plating with alloys of gold may be patentable, but the patent must be for the process. You will find a chapter on the reduction of alloys by the galvanic battery in "Smee's Electro-metallurgy." This author states that he had not been able to reduce a perfect reguline alloy; but he lays down the principles by which such deposits may be made.

F. R. R., of N. Y.—The dark-brown substance which you have sent us appears to be a mixture of the oxyd of iron and the oxyd of alumina, and would make a cheap paint. The other powder is apparently a mixture of "green marl sand."

MONEY RECEIVED

At the Scientific American Office on account of Patent

Office business, for the week ending Saturday, May 19, 1860:—

J. Y. H., of Pa., $10; C. C. H., of N. Y., $32; W. L., of Mass., $30; J. H. B., of Iowa, $10; S. F. B., of Mass., $25; M. & B., of Mass., $25; S. P. G., of Wis., $30; J. G. R., of Cal., $30; J. H., of Pa., $25; W. A. S., of N. Y., $10; D. G. G., of L. I., $25; W. A. C., of Ill., $100; C. E. L. H., of Conn., $25; G. W. C., of N. Y., $100; J. K., of N. Y., $10; S. Y., of Ala., $30; D. & H. W., of Pa., $30; J. J., of Pa., $25; J. S., of Wis., $25; C. G. E., of Wis., $30; G. W. B., of Mich., $25; G. G., of Wis., $35; J. T. S., of Va., $30; J. G., Jr., of N. Y., $30; W. H. A., of Iowa, $55; G. C., of Pa., $250; H. H. A., of Iowa, $25; D. D. A., of Mass., $35; J. F., of N. Y., $25; C. M. Y., of N. Y., $30; W. S. H., of Miss., $30; D. & O., of Ohio, $20; G. M., of Ohio, $25; G. K. H., of N. Y., $30; H. H. H., of Ga., $25; H. L., of Ind., $30; S. J., of Ohio, $20; McN. K. Co., of N. Y., $300; C. A. B., of N. Y., $30; H. A. R., of Ohio, $40; J. C. C., of Conn., $30; F. L. L., of Mich., $25; B. N. H., of Ill., $10; S. K., of Ohio, $25; C. A. H., of Mich., $35; J. F. W., of La., $30; J. M., of Mass., $15; O. F. F., of Ind., $25; F. D. L., of N. Y., $57; E. B., of Ind., $20; P. & B., of Ohio, $35; W. M., of Mass., $30; H. N., of Pa., $25; F. McM., of Fla., $35; E. H., of Cal., $30; T. & C., of Ky., $55; A. S., of N. Y., $30; T. H., of Cal., $25; G. W. G., of Mass., $30; B. C. C., of Ga., $30; C. B. M., of Wis., $10; H. A. H., of N. Y., $30; J. J. McD., of Ill., $60; J. C. R., of Pa., $30; G. S. A., of N. Y., $250; T. D., of Conn., $25; L. J., of N. Y., $30; F. S., of Ill., $60; D. F. E., of Mass., $30; L. & M., of N. Y., $30; J. H. S., of N. Y., $10; G. S., of Ga., $25; H. C. G., of Ill., $25; J. K., of Ohio, $30; W. T., of Conn., $30; H. J. H., of Ill., $25; C. M., of N. J., $100; J. H., of Ill., $25; S. A. G., of N. Y., $25; C. W., of Va., $30; M. K., of N. Y., $30; G. W. W., of N. Y., $25; J. B., of Pa., $25; L. E. H., of Ill., $25; T. A. G., of Ill., $30; L. D. L., of Ill., $30, J. J. H., of Ill., $25; J. E. A. G., of Va., $35; G. H. C., of Maine, $25; S. B. L., of Pa., $30.

Specifications, drawings and models belonging to parties with the following initials have been forwarded to the Patent Office during the week ending Saturday, May 19, 1860:—

G. H. C., of Maine; C. E. L. H., of Conn.; H. H. H., of Ga.; G. M., of N. Y.; J. F., of N. Y.; T. D., of Ohio; W. H. L., of N. Y.; P. & B., of Ohio; S. F. B., of Mass.; D. G. G., of L. I.; W. F., of Mass.; F. S., of Ill. (2 cases); J. M., of Mass.; S. K., of Ohio; J. B., of Va.; M. & B., of Mass.; R. S., of R. I.; H. N., of Pa.; J. J., of Pa.; J. S., of Wis.; J. J. McD., of Ill. (2 cases); H. H. A., of Iowa.; E. P. W., of N. Y.; J. H., of Pa.; C. C. H., of L. I.; F. L. L., of Mich.; R. A. W., of Pa.; S. A. G., of N. Y.; H. C. G., of Ill.; O. F. F., of Ind.; L. E. H., of Ill.; J. B., of Pa.; G. W. B., of Mich.; G. S., of Ga.; J. H., of Ill.; J. J. H., of N. Y.; J. E. A. G., of Va.

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A MESSIEURS LES INVENTEURS—AVIS IMportant.—Les inventeurs non familiers avec la langue Anglaise, et qui prefereraient nous communiquer leurs inventions en Francais, peuvent nous addresser dans leur langue natale. Envoyez nous un dessin et une description concise pour notre examen. Toutes communications seront recues en confidence.

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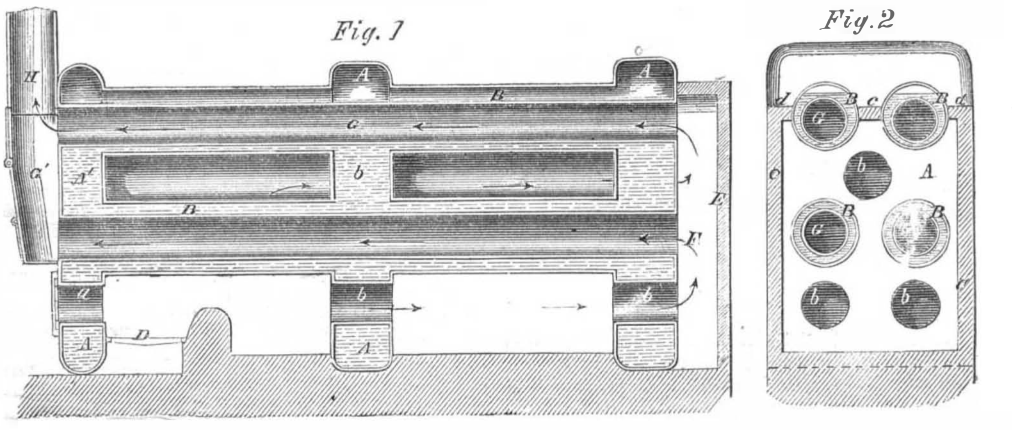
IMPROVED STEAM BOILER.

Notwithstanding all the improvements that have been made in steam engines, it is probable that those in use consume, on the average, at least 6 pounds of coal per hour per horse-power of the engine, while it has been demonstrated, by a number of engines in actual use, that a horse-power may be produced by the consumption of about $1\frac{1}{2}$ pounds of coal per hour. When we consider the immense extent of the use of the steam engine, and the tremendous force of self-interest in prompting men to adopt the most economical processes in their operations, this enormous waste of fuel is one of the most surprising facts which have come to our knowledge. There are two modes by which this waste of fuel is to be avoided; one consists in extracting all the power from the steam after it has been produced, and the other in applying all the heat to the production of steam. The first embraces the cylinder, valves, pipes, &c., of the engine, and the latter the form, construction and setting of the boiler. Both of these departments have occupied the attention of numerous and able intellects, and yet the study is very far from having been exhausted.



ARMSTRONG'S IMPROVED STEAM BOILER.

The annexed engravings illustrate a newly-invented boiler which embraces some decidedly novel features in the combinations of the water-vessels with the flues and furnace, and in its general arrangements. Fig. 1 is a vertical, longitudinal section, and Fig. 2 a transverse section, from which the boiler will be readily understood. The water is contained in three or more rectangular vessels, A A A, one at each end of the boiler and one or more between, and in the cylinders, B B, which unite the vessels, A A A. The steam occupies the upper portions of the vessels, A A A, and of the upper tier of the cylinders, B B. The fire is made on the grate, D, and the smoke passes around the water cylinders, B B, through the short tubes, *b b*, to the chamber, F, and then returns through the long flues, G G, which are enclosed in the water cylinders, B B, passing out through the chimney, H. The walls, C, which enclose the boiler are carried in at the top, as shown at *d d*, against the cylinders, B, and the space between the cylinders is filled with masonry, as shown at *c*. The lower parts of the shafts, A A A, being below the level of the fire-grate, D, the water in them remains comparatively cool, to receive the sediment, and these may be provided with mud valves for blowing off the deposite as it accumulates. The door of the fire-box is framed in the end of the boiler, as shown at *a*, Fig. 1. The object of these arrangements is the construction of a convenient boiler which will produce steam economically with the consumption of the fuel.

The patent for this invention was granted, through the Scientific American Patent Agency, March 6, 1860, and persons desiring further information in relation to it will please address the inventor, John Armstrong, at New Orleans, La.

PECULIARITIES OF THE MOON.

The moon has generally been considered by men-of-science as an entirely mineral sphere, without water, an atmosphere, or any living organism. When viewed through a telescope, it has an appearance of utter desolation. Its surface is apparently dotted with huge craters, and scarred with seams of lava. If it has no atmosphere, of course no living creature possessing a material frame like those on the earth can live upon it, but it has been recently asserted that a limited atmosphere has been discovered. M. de la Rive and Father Secchi, of France, and Mr. Schwabe, a German astronomer, have lately asserted that the moon has an atmosphere; and the latter states that it has also some vegetation on its surface. He says, in the *Astronomische Nachrichten*, that the surface of the moon presents to the view numerous narrow streaks similar in appearance to furrows, which, at times, appear laid over in straight, at other times in circular lines. According to his theory the streaks which extend from the summit of the Tycho, one of the most elevated of the mountains of the moon, have, at certain periods, a greenish tint, which they lose at the end of a few months. Hence he infers that there exists in the moon vegetables, which shoot forth at a season corresponding with our Spring, and die at a season corresponding with our Fall, like all the plants of our globe. But what now becomes of the assertion, commonly admitted, that there exists no water on the surface of the moon? If the vegetation, which Mr. Schwabe has remarked on our satellite, reflected a blue, red or yellow ray, we could admit that its nature was different from that which exists on our earth; but as it is green, must we not conclude by analogy that it is the result of the same chemical combinations? Water should then become a necessity.

As a photograph of the Lord's prayer, taken on a piece of paper the size of a pin's head, can be read distinctly with a microscope, it was supposed with some degree of reason, that a large photograph of the moon would reveal very minute objects on its surface by the microscope. Quite a number of such pictures have been taken but not a single grain of golden sand has been added to the treasury of our knowledge thereby. We have examined stereoscopic pictures of the moon, taken by the Rutherfurd telescope in this city, and the luminary appeared like a huge ball of sandstone; there were neither signs of water nor life upon it. In several pictures which were taken at different times, all of them exhibited a great depression near the upper side, as if there had been a vast basin scooped out of the solid rock and worn smooth by water and abrasion. This appearance may have been caused by the instrument in which the pictures were taken; we merely mention the fact in order to direct the attention of astronomers to it.

CARDING AND COMBING MACHINES.

Messrs. Editors:—I noticed an article on page 305 of the present volume of the Scientific American, in regard to the above subject, in which it is stated that you were "unable to ascertain whether any of these machines have yet been introduced into this country." Perhaps I can throw a little light on this subject. The English combing machine has been in use in this country in the Pacific Mills, at Lawrence, Mass., for at least five or six years, for combing the wool for the fine qualities of delaines, but whether it was the invention of Heilman or not I do not know. The Manchester Delaine Mills, of this city, have in use a comber, the invention of Cullen Whipple, of Providence, R. I. (the well-known inventor of the screw machinery of the New England Screw Company's works, of that city). There are twenty of his machines in operation; and, though not wishing to detract anything from the merits of the Heilman machines, I must say the former are pronounced to be superior to the English machines, both in quality and quantity of work done and economy of first cost and expense of keeping them in repair, &c. Mr. Whipple has been "over the pond" during the past winter, and (I understand) has sold his English patent for a handsome sum; he is now about returning, if not already returned home. So you see we *have* the machinery, if manufacturers only have the spirit to adopt it. L. L. R.

Manchester, N. H., May 15, 1860.

Method of Cleaning and Restoring Oil Paintings.—Good paintings have often been coated with varnish with a view of preserving them; but the varnish being of a bad quality has after a few years done more harm than good by its becoming discolored. To restore such paintings it is necessary to remove the discolored varnish. This may be done either with strong spirit, or with soft soap and water; both means, of course, requiring great care. We prefer the use of spirit because the varnish is dissolved by it, but the oil colors are not; but when the artist's touches are on the glaze, spirit must not be used. One ounce of soft soap melted in a quarter of a pint of water brushed over the painting will so dissolve the varnish in the course of half-an-hour or so, that it may be removed with a sponge and warm water, and thus leave the picture clear; still, the age of the varnish and its nature may be such that this operation has to be repeated several times. It must be remembered, however, that when the varnish is thus removed the oil colors will also be attacked by the soft soap; hence careful manipulation becomes necessary. Very strong spirit laid on the varnish will also dissolve it, and it must be removed with a sponge or camel's hair brush as soon as it becomes tacky. This process is more expensive for cleaning pictures, but there is no fear of the spirit disolving the oil colors unless they are the touches often added by the artist on the glaze. When the painting is free from its artificial coat the colors may be brightened by brushing them over with Thenard's peroxyd of hydrogen. This, however, being both expensive and difficult to procure, M. Schoebein, of Basle (the inventor of gun-cotton) has suggested the use of oxydized oil of turpentine for the same purpose. The turpentine is placed in a shallow vessel, and fully exposed to the sun, and being at the same time frequently agitated for two months, it becomes oxygenated in a high degree. This liquid being brushed over lead colors that are discolored by the sulphur in the air, they rapidly assume their pristine beauty. In cleaning pictures with spirit, the painting must be rubbed over with a little sweet oil after the spirit is removed; this prevents further action of the spirit on the color. It is a good plan to apply the spirit with a sponge covered with a linen rag in the manner and with the rotary motion of French-polishing.—*Septimus Piesse.*