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Cigar Machine.

A very large item in the cost of manufacturing cigars is the labor. To make by hand a first-class cigar requires much skill, only to be acquired by long practice, and such skill always commands a high price. Eighteen dollars per thousand, is perhaps a fair average of the prices now paid in this country for the manufacture of prime Havana cigars. This, with the duty on imported tobacco and the large internal revenue tax, has raised the price of cigars to an unprecedented figure. Anything which could lessen the labor required to make cigars, would immediately increase the consumption in a much larger ratio than the labor would be diminished, so that a machine which, as is claimed for the one we herewith illustrate, would diminish the cost of labor to less than one fourth that required now to produce a given number of cigars, would probably increase the number of cigar makers required to meet the increased demand four fold.

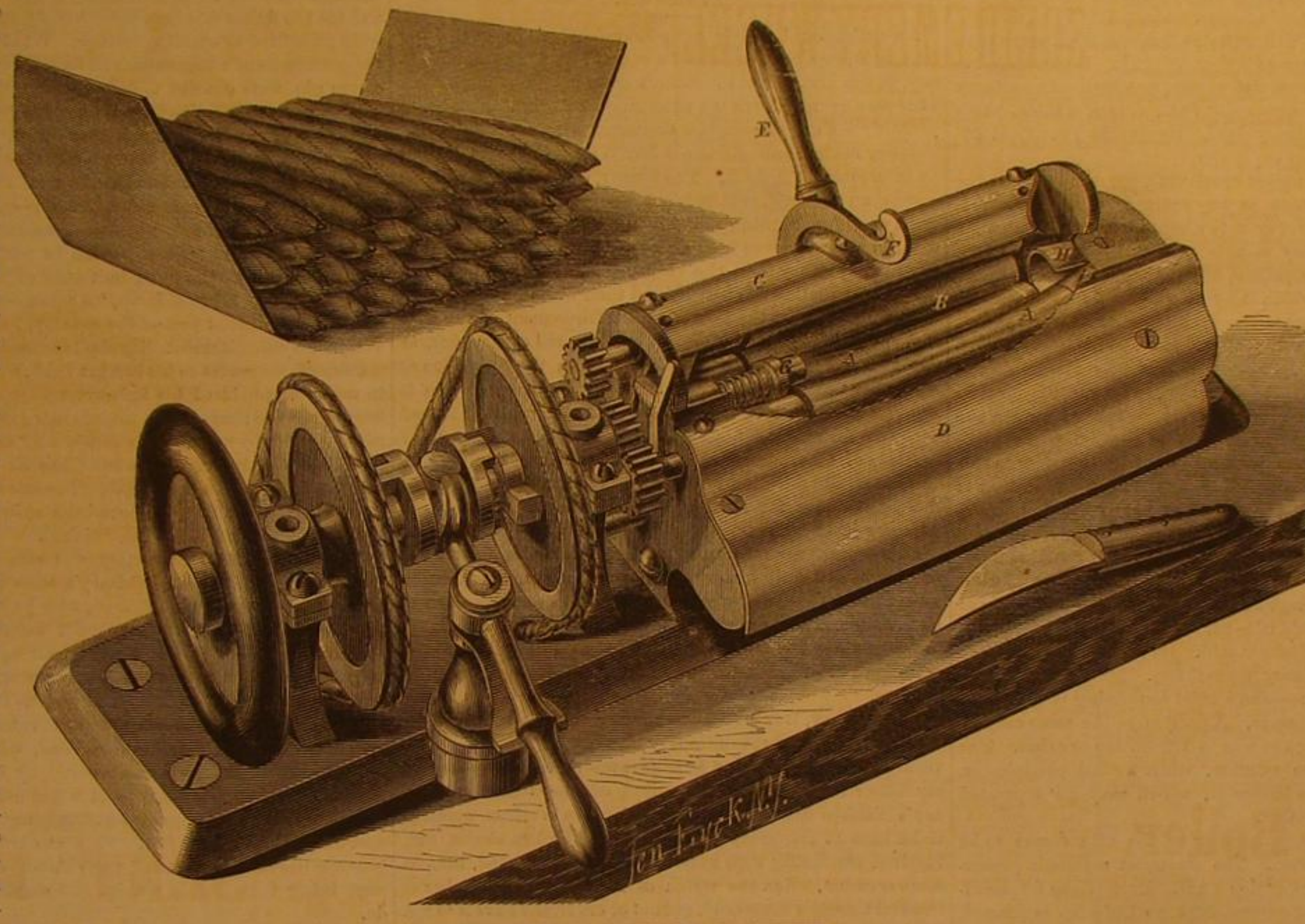
This is the legitimate result of all labor saving machines. Labor-saving considered with reference to a single article produced, they, by the immense increase in the aggregate number of cheapened articles demanded, caused by their employment, are also, in the aggregate, *labor-creating* machines. The history of all labor-saving inventions which have superseded hand labor in their respective departments will bear us out in this assertion. When Arkwright invented cotton-spinning machines, the cotton spinners forcibly resisted their introduction; but the inventions of Arkwright, Whitney, and others, have increased the number, not only of cotton spinners, but all others engaged in the manufacture of cotton goods more than *ten thousand* fold.

The machine we are about to describe, though a radical innovation upon the present mode of making cigars, and therefore destined to revolutionize the business, will cause a great increase in the number of cigar makers, as by cheapening cigars it will inevitably increase their consumption.

A pair of rollers, A, are revolved through a system of gearing, either by hand, foot, or other power. The rollers are turned concave longitudinally, the curve of the concavity corresponding to the required outline of the form of cigar desired. Another pair of rollers, B, of precisely the same shape as A, are journaled in the upper part of the machine. This upper half of the case, C, is pivoted or hinged to the lower half of the case, D; both C and D being of sheet brass and of a graceful form. A handle, E, is used to close the upper half, C, upon the lower half of the case, when the machine is in use, and a latch, F, then holds it firmly closed until it is again released.

When the machine is closed as described, the ends of the upper pair of rollers, B, shut down upon the small friction roller, G, and are also run into gear with the pinions of the lower pair, which communicate the motion of the lower pair of rollers to the upper pair. Each of the lower pair of rollers is geared to revolve in an opposite direction to the other, and consequently, when the upper pair are set in motion, they revolve also in opposite directions. A roll of tobacco, therefore, placed between these rollers, would be equally compressed toward the center, while it would be rolled around at the same speed of the rollers, but without causing any strain upon the leaf, which is liable to tear it. A "header," H, shapes the head or mouth end of the cigar, and the roll of tobacco is made to enter this "header," by the action of a small coiled spring behind the friction roller, G, which thrusts the roll of tobacco toward and into the "header." These are the essential parts of this simple machine.

The operation of making a cigar is as follows: The filling is portioned out in the hand as in making cigars by hand, and being lightly rolled together, and inclosed in a portion of a leaf or "binder" in the ordinary manner, is placed in the machine, which, being closed, immediately rolls it down to the proper shape. The wrapper, previously cut to the required form, and having a little gum tragacanth put on to the mouth end, as in ordinary cigar making, is then fed in obliquely under the front edge of C, and is beautifully and evenly wound about the filling; and the mouth end which enters the header is shaped with the utmost nicety and dispatch. All that remains to complete the cigar when taken from the machine is to cut it to the required length. From five to six sets of rollers are furnished with each machine, for different sizes and shapes of cigars, and the taking out of one set and the insertion of another occupies only about five minutes.



CIGAR-MAKING MACHINE.

The machine is small and portable, and may be placed on any table, a favorite way being to use a table and treadle like a sewing machine when steam power is not employed, as is sometimes the case in large establishments. The power required is very slight indeed, and the labor of propelling by the foot is scarcely worth mentioning.

A girl, after a few weeks' practice, can make fifteen hundred cigars per day; or, with an assistant to bunch fillings, can make two thousand. These cigars are every way as perfectly made as can be done by hand, and are very pleasant to smoke, as we can personally vouch.

The machine will work tobacco so tender that it cannot be worked by hand at all; and the tobacco being prepared and moistened in bulk, the filthy practice, common among cigar makers, of taking water into the mouth and squirting it upon the tobacco to moisten it, is entirely abolished, as well as the kindred practice of biting off the points of the mouth end of cigars in the teeth.

The machine does not smoke, and consequently the manufacturer is not taxed to furnish eight or ten of his best cigars to each cigar maker per day, which amounts in the aggregate to thirty or forty cigars per each thousand produced. It is estimated that this saving alone will more than pay for the cost of license to use these machines. Cigars now costing eighteen dollars per thousand to make, can be made on this machine equally well, if not better, at a cost for labor of only four dollars. Anybody can run it successfully with a week or ten days' practice, and girls or children can be taught to use it with very little trouble. A saving is claimed on the wrappers, as they can be cut to greater advantage, and are not liable to break during the process; and thus the most expensive kind of stock is economized. We do not entertain the least doubt of the great merit of this invention. We have seen a large number of the machines running, and rapidly turning out well-made cigars where none but girls, having only a few weeks' practice, were employed, and therefore are enabled to speak from actual observation. This machine is the subject of seven separate patents issued at different times within a short period.

For further particulars all parties interested are invited to address the American Cigar Machine Co., at 113 and 115 Liberty street, New York, or to call and examine for themselves a large number of machines there kept constantly running in the manufacture of cigars.

Scientific Nonsense.

The following choice piece of scientific nonsense has just been sent to the *Scientific Opinion* by its author, Mr. J. Hampden, of Swindon, England:

"What is to be said of the pretended philosophy of the nineteenth century, when not one educated man in ten thousand knows the shape of the earth on which he dwells? Why, that it must be a huge sham! The undersigned is willing to deposit from £50 to £500 on reciprocal terms, and defies all the philosophers, divines, and scientific professors in the United Kingdom to prove the rotundity and revolution of the world from Scripture, from reason, or from fact. He will acknowledge that he has forfeited his deposit if his opponent can exhibit, to the satisfaction of any intelligent referee, a convex railway, river, canal, or lake. Failing to do this by or before the 25th of February, the advertiser to claim the amount deposited, which shall be spent in exposing the falsehood and fraud of the Newtonian philosophers."

Manufacture of Glass.

A novelty in glass making has been brought out by Albert Pütsch, Herman Pütsch, and George Leuffgen, of Berlin. It consists in using glass pots made of iron instead of fire clay. The inside of the iron vessel is to be lined with fire-proof material, but it may in some cases, be left partly or entirely without such lining. In some cases, the bottom or lower part only is made of iron, while the sides are of fire-proof material; but in all cases, no matter the shape of the vessel, it is necessary to keep the sides and bottom cool, either by atmospheric air or by artificial streams of air or water. The top of this vessel or tank is arched over, leaving the necessary openings for working, and for the entrance and exit of the flame, which passes over the surface of the materials contained in the tank, and melts them. The fireplace may be of any suitable form and construction, and the tank supported in the ordinary manner.

Abolition of the Franking Privilege.

We have repeatedly called attention to the abuse of the franking privilege, and urged upon Congress to remedy these abuses by abolishing the privilege altogether. Our disinterestedness in this course is attested by the fact that, should this privilege be abolished it would cost us thousands of dollars on the matter which now passes free to and fro between us and the Patent Office. Notwithstanding this, we here avow, as we have heretofore avowed, that we prefer to sustain this extra expense rather than that the Government should be cheated, as it has been, in the abuse of the present law.

A bill abolishing the privilege has passed the House; let the Senate now show equal alacrity in completing this much needed reform.

THE NIIN OF YUCATAN.

From the Report of the United States Commissioners of Agriculture.

A communication from Dr. Arthur Schott, late of the Scientific Commission of Yucatan, furnishes some descriptive statements concerning an insect, and the nature and uses of a grease-like or wax-like product, with the result of a chemical examination of its properties.

Among the numerous interesting natural productions of Yucatan, not the least remarkable is the niin (pronounced *neen*), the knowledge of which, and of its technical application, has survived the national independence of the gifted Maya race. The niin is the grease of an insect bearing the same generic name. The niin may be considered akin to the cochineal, also the product of a similar insect; but they differ essentially in their nature, one serving as a well-known dye, while the other finds its application as a drying oil.

The nature of the niin will be clearly understood by the annexed scientific analysis, made by Mr. V. G. Bloede, analytical chemist, of New York. The matter examined by that gentleman consisted of a small quantity which Dr. Schott brought some time before from the city of Merida, Yucatan.

The analysis is as follows:

The Yucatan niin is a yellowish-brown, fatty mass, having a peculiar oily odor. In its general properties it seems closely allied to hog's lard or suet. It is neutral to test-paper, neither presenting acid nor alkaline reaction, though when exposed to the air it acquires a very faint tendency to manifest the former. Its melting point is about 120° Fah., though, when once melted, it still remains in a semi-fluid state with the temperature as low as 80° or 85° Fah. When cooled to 10° Fah., it becomes hard and brittle, like suet. At ordinary temperature, that is, about 60° Fah., it is of a thick, pasty consistency, like ordinary lard. Its specific gravity at 60° Fah. is about ·92.

Its Solvents.—In regard to solvents, the niin presents the same general properties as any ordinary animal fat. It is not soluble in either hot or cold alcohol, even after extended maceration. It is freely soluble in both hot and cold ether, with which it forms a yellow, oily liquid. It is very soluble in turpentine, with which it forms an oily liquid possessing peculiarly valuable properties for mixing delicate oil colors, of which I shall speak hereafter. It dissolves freely in benzine; chloroform, also, is among its best solvents.

Chemical Properties.—The niin, in its classification in organic chemistry, must undoubtedly be ranked among the drying oils, though its absorption of oxygen takes place rather more slowly than with many other oils. Nor is this slowness in drying accelerated to any extent by boiling it with oxide of lead. It is the first, or nearly the first, example we have of a thoroughly drying animal butter or solid fat. Like some others of the animal fats, it contains a distinct volatile acid peculiar to itself. As, for instance, butter contains butyric and caproic acid; goat's fat, hircic acid; so the niin contains an acid of a peculiar, pungent smell, which might be aptly termed niinic acid. Its chemical composition differs little from ordinary animal fats. Like others, it contains a fluid oil—oleine—and a solid containing stearic, margaric, and other fatty acids. A portion of the acids may be obtained by dissolving the niin in turpentine or ether. The oily portions pass into solution, while a solid precipitates, consisting of the acids indicated, which may be separated from the fluid by filtration.

Saponification.—A peculiarity of the niin seems to be its difficult saponification. The strongest ammonia procurable has no saponifying action on it. Even if the fat be digested in ammonia for several days, no liniment is formed, but a marked transition from yellow to red seems to be the only change produced. This change of color depends merely on the action of ammonia on the coloring matter of the niin, which, like the yellow turmeric (*Curcuma longa*), changes to red as it assumes an alkaline reaction.

With potash, too, it saponifies but slowly and imperfectly, and a concentrated lye is necessary. With soda it forms a soap only after extended boiling with a strong lye. It is only after several hours' boiling with oxide of lead that it forms the so-called "lead soap," and then the product is very imperfect. From these facts we can at once deduce that the niin cannot be considered a "good saponifying fat," but belongs to the "drying oils."

Effects of High Heat.—When the niin is melted in a porcelain dish, and the resulting oil exposed to a continued and high heat (between 250° and 350° Fah.) for an hour, or until a considerable portion of it has evaporated, the residue in the dish will then be found to have assumed a tough, flexible, varnish-like condition—a gelatinous mass no longer soluble in turpentine, or affected by heat or cold, at least to a great extent.

If a piece of this gelatinized niin is placed on a piece of porcelain, moistened with turpentine, and ignited, another remarkable change takes place; for, if the plate is slightly inclined as the mass burns, a thick, yellow, resinous oil or gum flows from it, which possesses most remarkable adhesiveness, closely resembling a thick solution of india-rubber, but which does not dry, retaining its half-fluid consistency for several days. This is a most singular change, and one that is worthy of further investigation.

Change of Air.—When the turpentine solution of the niin is exposed to the air in thin strata for a few days, it acquires the properties of a resinous varnish; in fact, the change is so complete, that when some of the solution is poured on a piece of glass it dries almost equal to fine shellac varnish. This change is due to the absorption of oxygen. If further developed, this property will undoubtedly make the niin of the greatest commercial value. The film of varnish is very elastic, and at the same time hard, which renders it superior to some of the other gums. An alcoholic solution can also be formed, but this is more difficult.

Suggestions as to Use.—The extreme oiliness of the niin will undoubtedly make it very valuable for various purposes in the arts; and its "drying" solution in turpentine has no equal for mixing fine colors for artists. This turpentine solution of the niin produces a remarkable brightness in the colors prepared with it, and they dry rapidly. But the chief value of the niin, which will give it commercial importance, is its property of forming a resinous varnish when treated as before described, rendering it superior to shellac for some purposes. Another valuable application of the niin could be found in the manufacture of water-proof fabrics. A piece of the most porous Swedish filtering paper, saturated with a solution of the niin diluted in turpentine, will not allow a drop of water to pass through, even after standing in it for days. An excellent way of water-proofing would be to saturate the article with melted niin, and then expose it in an oven to considerable heat until the grease gelatinizes. By these means the niin becomes insoluble not only in water, but also in most of its solvents. If the niin can be obtained, as Dr. Schott says, in "unlimited" quantities, it will, doubtless, in time become of great commercial value.

[For the Scientific American.]

THE COTTON GIN AND ITS INVENTORS.

BY ELZY HAY.

An agricultural article recently published in one of our leading newspapers, contained a casual allusion to Eli Whitney, as the inventor of the modern saw gin for seeding cotton. This was by no means an unnatural or flagrant mistake, as probably not one person in a thousand is aware of the fact that our modern saw gin is not Mr. Whitney's invention, but an improvement upon it. The former, of which I have seen more than one relic, was merely a wooden cylinder with wire teeth or claws running round it in circles. The idea of the saw gin was borrowed from Ohio, as will be related further on. Mr. Whitney sued the earlier inventors and manufacturers for violating his patent, and their defenses were based on the ground that the saw was no infringement of the wire tooth patent. One of Mr. Whitney's original cotton gins, as executed and operated by himself, was in the possession of my father until some fifteen or twenty years ago, when it was lost at an agricultural fair at Augusta, whither it had been sent for exhibition. I remember it well, as among the contents of an attic room where I used sometimes to play in childhood, and a feeling recollection of getting my ears boxed more than once for stealing wire from it to string paper "limber jacks" on.

I have heard my father relate many interesting facts as to the origin and early history of the cotton gin, which he received from persons who were cotemporaries and associates of its inventor. There are probably not a dozen other men living to whom these facts are known, and it may be well to record them here before they are lost in the dim regions of traditionary lore.

Eli Whitney, it is well known, was a tutor in the family of General Greene, of revolutionary memory, at the time he invented the cotton gin; and here are some facts concerning him my father received from a grandson of the General. Whitney's Yankee ingenuity, as exhibited in various amateur tinkerings at refractory door fastenings, broken clocks, etc., inspired the family with such confidence in his skill, that on some occasion, when the watch of Mrs. Miller, a member of General Greene's household, got out of order, she gave it to Mr. Whitney to repair, no professional watchmaker being within reach. He performed the work successfully to the great delight of Mrs. Miller, and the admiration of the whole family.

A short time thereafter, a gentleman called at the general's house to show a fine sample of cotton wool, and remarked while exhibiting it, that there was a fortune in store for somebody who should invent a machine for separating the lint from the seed. Mrs. Miller, who was present, turned to Whitney and said, "You are the very man Mr. Whitney, for since you succeeded so well with my watch, I am sure you have ingenuity enough to make such a machine."

After this conversation Mr. Whitney confined himself very closely to his room for several weeks, at the end of which he invited the family to inspect his model of a cotton gin. It was constructed as I have already described, with wire teeth on a revolving cylinder, but as there was no contrivance for for throwing off the lint after it was separated from the seed, it wrapped round the cylinder, thereby greatly obstructing the operation of the machine. Mrs. Miller, seeing the difficulty, seized a common hair clothes brush, applied it to the teeth, and caught the lint. Whitney with delight exclaimed, "Madame, you have solved the problem, with this suggestion my machine is complete."

The important part thus played by a woman in the history of the cotton gin is unknown, I believe, except as a family tradition, even in her own State. My father was also informed by a gentleman once connected with Whitney in business, that the latter obtained his first idea of the invention from a gin used to prepare rags for making paper, which he saw in a wrecked vessel. Gen. Greene, in whose family he lived at the time, resided in one of the "sea islands" along the Georgia coast.

Unfortunately for Mr. Whitney, the prophecy of the gentleman with regard to the fortune in store for the future inventor of a cotton gin, was never realized in his case, for he was engaged in constant law suits against infringements of his patent right, and lived and died poor. As a Georgian, I regret to say that his adopted State never bestowed any substantial testimonial of appreciation upon the inventor of a machine by which she has profited so largely. Tennessee, Alabama, and South Carolina, it is said, manifested their appreciation of his merits by material and substantial donations; while Georgia, with sorrow I write it, has been worse than silent, for her juries refused him verdicts to which the judges declared he was entitled, against the violators of his patent.

So uncertain was the enforcement of the patent laws in those days, that Whitney resorted to the same expedient for the protection of his right that used to bring upon medieval inventors charges of sorcery and witchcraft. I mean the expedient of secrecy.

About the year 1794 or 1795, he settled in a place some six miles from the quiet little village of Washington, in Wilkes county, and established there one of the first, if not the first cotton gin ever worked in the State. He, and his partner Durkee, erected at this place a large cotton store house, which now does service as a barn, and a gin house at present used as a kitchen by Mrs. Tom Burdett, wife of the present proprietor, and the scene of preparation for dinners and "goodies" generally, that would make appropriate offerings to the memory of him who invented cooking stoves. The gin house had narrow grated windows, so that visitors might stand outside and watch the cotton flying from the gin without observing the operation of the machine, which was concealed behind a low screen. Among other visitors we are informed that on the occasion of a certain militia muster in the neighborhood, the rustic battalion was permitted to file through the house, while Whitney's gin was in operation, and see the flakes of cotton thrown off by the brush, but none were permitted to examine further. What a different errand the grandsons of those rustic militia-men, filing past the first cotton gin, were one day to march forth upon!

Women were permitted by Whitney to enter his gin house, and examine the machinery if they liked, as they were not supposed to be capable of betraying the secret to builders—an opinion for which modern females of the strong-minded school will no doubt bear him a grudge—and not altogether without reason, perhaps, when we consider the material assistance he received from a woman in perfecting his invention. This fact of the free admittance of women, was taken advantage of by Edward Lyon, "a smooth-faced young man" residing in a distant part of the country, to gain admission to Whitney's establishment, disguised in female attire. He communicated the secret to his brother John, who immediately set to work and produced his improvement upon Whitney's invention, in the shape of the modern saw gin. The saws were made for him by "little Billy McFerran," an Irish blacksmith in Wilkes county, who died some 25 or 30 years ago. This was the first saw-gin ever made. The saws were first shaped in semicircles, and fastened round the cylinder in pairs, so as to form complete circles when finished.

As early as 1797, a gin factory was established by a man named McCloud, and all Whitney's suits against him were unsuccessful. An old gentleman, who purchased a saw gin from McCloud, told my father that it worked nearly as well then as now (his *now* was thirty years ago) except that it napped badly. It was propelled by water, and ginned 2,500 pounds of seed cotton per day. Previous to this, the gin in ordinary use, was the simple contrivance of two wooden rollers revolving in opposite directions, which preceded Mr. Whitney's invention. It was worked by hand, and ginned only 75 or 100 pounds a day; and it was necessary, besides, to keep a man all the time employed in turning rollers, the friction burnt them out so fast. This machine is still used in ginning the best qualities of "sea-island" cotton, the advantage being that it does not cut the staple, as the saw-gins do.

The honor of having invented the first cotton gin is sometimes disputed with Eli Whitney in favor of Mr. Bull, a gentleman from Baltimore, who settled in Columbia Co., Ga., and introduced the saw gin there, in the year 1795. He first used perpendicular saws, but afterwards changed them for circular, in imitation, no doubt, of Whitney and Lyon. Mr. Bull was an enterprising and ingenious man, and first introduced iron packing screws into this State. These were so expensive, however, costing no less than $1,500 to $1,800, that they were soon abandoned for the common wooden screw now in general use on plantations. His invention of the perpendicular saw gin, was, there seems no reason to doubt, independent of Whitney's though posterior to it, the latter having come into operation in 1793. The circular saw, as afterwards used by him, was no doubt borrowed from Whitney or Lyon. Thus then, though Eli Whitney never reaped the profits of his great invention, it seems clear that he must be left in undisputed possession at least of the barren honors.

[In the extended litigations to which the infringements on Eli Whitney's patent gave rise, it was finally decided that the use of saws instead of the wire teeth at first employed by Whitney, did not constitute a new invention, and that those who used them without license from Mr. Whitney were infringers upon his rights, as patentee of the original device. The assertion of our contributor that Mr. Whitney was not the inventor of the saw gin, is therefore hardly just to that ingenious and gifted inventor, although full credit is given him for the original invention. The man who, subsequent to Whitney's invention, first employed saws, did not invent a saw gin, he only invented a "dodge" whereby he hoped to be able to reap where Whitney had sown.—Eds.

The Writings of Count Rumford.—The American Academy of Arts and Sciences, through the Rumford Committee, have in preparation for publication in four volumes a complete collection of the writings of Count Rumford, whose works have never yet been brought together and edited, and a biography of the Count, which will fill another volume, and be properly illustrated.

[For the Scientific American.]

IRON SHIPBUILDING AND AMERICAN COMMERCE.

BY PROF. HENRY E. COLTON.

Whatever force the many reasons assigned for the decline of the American shipping interests may have possessed, there is no doubt that the introduction of iron as a material for the construction of the hulls of vessels has been the great cause Very soon after the discovery of the process of puddling iron and rolling it into plates, we are told that some bold experimenter formed a rude canal boat from those plates; it was not, however, until 1837 that any actual experiment of the new material was made on the ocean. At that time, a vessel of about 270 tuns was built of iron, at Liverpool, and made a trip to Rio de Janeiro, returning with a cargo of coffee dry and safe. Previous to this the possibility of putting together plates of iron into shape for vessels' hulls had been demonstrated on the Thames, on various canals in England, and even for a coasting vessel. The building of the ironsides in 1838 was, however, not the actual commencement of the use of iron, previous operations had been mere experiments. Naturally the innovation met with much opposition. It might do in smooth water but that it would never stand the strain and rough waves of the ocean was the opinion of a large majority. Fairbairn, in 1849, writes that he had up to that time built 100 vessels with iron hulls, which had proven successful, but complains that the British commercial authorities have made no actual recognition of their good qualities and superiority over wooden vessels. It was not until 1854 that the English "Lloyd's" deemed them of sufficient importance and value to merit a rating by rules and regulations. Now it is but rarely a vessel is built of wood in England, and then only some small craft for river or coast service.

In 1838, we have seen that there was only one shipbuilding firm bold enough to build an iron ship for venture on the ocean. Now there are on the Clyde (Glasgow) alone 37 such firms which in 1868 turned out 26 iron paddle steamers, 77 iron screw do., 1 composite do., do., 44 iron sailing vessels, 9 composite do., and 13 wood do., and 61 iron barges, etc.; on Jan. 1, 1868, they had on hand orders for 57 iron screw steamers, 11 paddle do.; and 26 iron sailing vessels, 12 composite do., and 11 wood do. The same year there were 14 firms operating on the Mersey (Liverpool) which, in 1867, launched 32 iron steam and sailing vessels, and had then on the stocks 18 more, also built a number of iron barges, etc. On the Tyne (Newcastle) there were about 20 firms who built, in 1867, 81 iron ships. There are also at Southampton a number of iron shipyards, but not so briskly employed. The London yards are almost deserted.

The greater proportion of steamers in the above is noteworthy, as also the great excess of screw propellers. Of the English tunnage, more than one third is steam. In 1867 it contained 2,808 steamers of which 1,896 were iron, 877 wood, 28 steel, 4 iron and steel, 3 composite. Of these 1,564 were propelled by paddle-wheels, and 1,244 by screws. Exclusive of inland river, and lake craft, the steam tunnage of the United States does not amount to more than about one third that number, and of them hardly 50 are iron, and many of these are old blockade runners captured during the war, built for that purpose and poorly adapted to ordinary traffic.

Without hulls of iron the introduction of the propeller screw would have been of little moment. No such immense lengths of steamers as now cross the Atlantic, in such rapid time, could have been built of wood and driven by the screw. The great advantages of economy of space and fuel which its use gives would have been lost to the commercial world. Hence we now but seldom see any steamer intended for freight or the general passenger traffic constructed with the side paddle wheels, and even the rather aristocratic French line have had all but one of their side-wheel steamers changed to propeller screws. Such having been the perfection acquired in machinery and model that equally as, or more rapid time, is now gotten with them as ever with side-wheels.

The superiority of English vessels of the present day, therefore, exists in the material of construction, the more general use of steam, and the substitution of the propeller screw for the side-paddle-wheel. With our characteristic energy and enterprise we will soon regain all we have lost in the commercial line, and even ourstrip our neighbors across the water, if we adopt the improvements which they so forcibly present to us. The English "Lloyd's" has rules for rating and insuring iron vessels dependent upon *thickness* not strength of material, and as the average American iron will bear a strain about one third greater than the average English, in building a ship of iron of the same thickness we are using at least one fourth more weight than necessary to make a vessel of equal strength with one constructed in England. Hence to build a ship by their rules we have a greater expense for material. Some modification of this system is evidently necessary for vessels at least in our own trade. They took the models of our fast clippers from us, and we may by energy and perseverance be able to bring them up to a higher standard of material or different rules for construction.

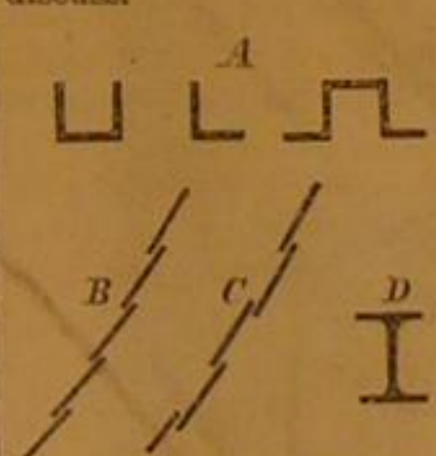
Our registry laws require that all vessels to be capable of registry shall have been built in the United States. These might be modified so that all vessels now owned here be allowed registry, which privilege to end as soon as American ownership ceases; but we are sure no American mechanic, manufacturer, or inventor would be willing that vessels built and owned abroad should be brought in on the same footing and have equal privileges with those the result of our labor and capital.

Another resolution of the N. Y. Chamber of Commerce proposes to admit free of duty all iron and other material used in building ships. We shall not discuss this as it involves the political question of free trade *vs.* protection; but, leaving out of the idea of its injustice to other manufacturers who might claim that they in this dull time were not making as much profit as before the war, we do not believe that in that admission is the radical cure of the diseased commercial interests of our country. The true remedy and that which will enure to the benefit of all Americans is the building of steamers and sailing vessels of iron, on the best medels, with the best machinery, of our own material, with our own work men, and our own capital. Learn all we can from abroad and improve that knowledge. It should not be said that the nation of mechanics which has produced the steamboat, the telegraph, the sewing machine, the reaper, the monitor, and hundreds of other new ideas that have astonished the old world, is behind in the construction of an economical marine engine, the arrangement of a boiler or the model of a ship, and it will not be so said a few years hence. In this nation of active thinkers a want is no sooner stated than hundreds of minds are at work to supply it.

The needs of the shipbuilding interests are the adaptation of machinery, still further if possible, to the construction of iron ships; a boiler and engine which will give a fair average speed with a consumption of 10 to 20 tuns of coal per day; these with the conjunctive use of steam and sail will accomplish all we need to manufacture and run vessels cheaply. Models unsurpassed for beauty or utility we have already. It is evident, however, that in the struggle for economy of construction the future shipyards of the United States will be where there is least freight on coal and iron, and cheapest living expenses. Our observation and experience lead us to believe that outside of Government work, the well paid American laborer does more work, dollar for dollar, than the poorly paid Englishman.

The advantages of an iron vessel are: A greater amount of cargo can be carried on a less draft of water; they will last for 20 years if well made and rate A 1; and so far as any one knows for 50 years, as vessels are now running in good order which were built by Fairbairn in 1840-42. The only deterioration is the oxidation of the metal, and careful painting every six or twelve months will in a measure prevent this. Further, that whether so cheap now the time will come when no wooden vessel can compete with them in any item. Taking into consideration their durability, they are cheaper now. An iron vessel may be beached or sunk and not be materially injured. Two instances of this have lately occurred—the *San Jacinto* beached on Hatteras, and the *Circassian* on Long Island shore. The first is already making her regular trips, the other soon will be. Every reader is acquainted with its advantages as a material for ships of war.

There is a variety of ships now being built in England called composite. The ribs, braces, and all framework are of iron, the sheathing plank of wood. They find great favor with some, as the wood may be sheathed with copper, hence furnishing a bottom better than any paint for a long voyage. They have disadvantages which we shall not here discuss.



The ribs of iron vessels have three shapes, as at A, in the diagram. The standards and braces are usually shaped as at D. The iron planking is put on, as at B, by some builders, but that is more generally abandoned for this style, shown at C. The last is called gutter built, the former clencher built.

At the Atlantic Iron Works, Boston, a number of iron vessels have been built. The Novelty Works, New York, have built several—two of them good sized ocean propellers. Several yards in this city built monitors during the war. One or more have been built in Buffalo. But the chief iron shipyards of the United States and in fact only those employed extensively for that work, are at Chester, Pa., and Wilmington, Del. There is not a month but one or the other of these yards turn out a steamer, and they claim that they can build vessels within five per cent of the cost in England.

These yards are now very active, several river steamers are on the stocks, the Philadelphia, N. Y. & Boston Nav. Co. have fifteen steam colliers contracted for and being built, a large iron steamer for the Old Dominion Steamship Co., to be finished by spring, several propellers for Mr. Lovillard, a few side-wheel steamer just finished for Mr. Clyde, and others spoken of. These yards have turned out beautiful models, both for river and ocean service.

The day of wooden ships has passed and the present stock must at least be replaced by iron built crafts. Such a course with proper management will give us eventually the supremacy of the seas and add another triumph to the superiority of our material, skill, and labor.

Two Curious Needles.

The King of Prussia recently visited a needle manufactory in his kingdom in order to see what machinery, combined with the human hand could produce. He was shown a number of superfine needles, thousands of which together did not weigh half an ounce, and marveled how such minute articles could be pierced with an eye. But he was to see that in this respect even something still finer and more perfect could be created. The borer—that is the workman whose business it is to bore the eyes in these needles—asked for a hair from the monarch's head. It was readily given and with a smile. He placed it at once under the boring machine, made a hole in it with the greatest care, furnished it with a thread, and then handed the singular needle to the astonished King.

The second curious needle is in the possession of Queen Victoria. It was made at the celebrated needle manufactory at Redditch, and represents the column Trajan in miniature. This well-known Roman column is adorned with numerous scenes in sculpture, which immortalize Trajan's heroic actions in war. On this diminutive needle, scenes in the life of Queen Victoria are represented in relief, but so finely cut and so small that it requires a magnifying glass to see them. The Victoria needle, moreover, can be opened; it contains a number of needles of smaller size, which are equally adorned with scenes in relief.

[For the Scientific American.]

ALBUMEN.

BY C. WIDEMANN.

The consumption of albumen as applied to different purposes is enormous; in calico printing alone for fixing on cloth the new aniline colors, Alsace, in France, alone uses 150,000 kilogrammes, or about 330,000 pounds a year of egg albumen, representing 37,500 eggs or the product of 250 000 hens. It is also used extensively in photography; a photographer in this city uses four barrels of eggs a day, the yolks of which are sold to the surrounding hotels for cooking purposes.

It is manufactured thus: The white of the eggs are desiccated to assure their preservation and also to reduce the bulk so as to facilitate their shipment, with little expense, to this country. The process of desiccation is as follows; namely, the egg is broken, the white separated from the yolk; in winter or spring by the cold weather the white is left to remain five or six days in cans, when it is beaten with a wooden "spatula" and filtered through a piece of linen in order to retain the impurities and the sperm, it is then desiccated by pouring the liquid thus prepared in very flat dishes, generally of zinc placed on cast-iron tables, heated by steam to 30° Centigrade. To facilitate the separation of the dry albumen from these dishes they are, before being used, rubbed with a greasy rag.

Every dish generally holds from one to two quarts of egg white, and after two or three days' desiccation the albumen is ready to be packed; 24 dozen eggs yield about 12 quarts egg white, 8 quarts yolk yielding a little over two pounds of dry albumen.

This operation is performed to better advantage, both as to quality and yield in the months of March, April, and May; during the summer months the eggs are more expensive, and the quantity of the albumen less.

A great many substitutes have been employed to take the place of egg albumen, among which I shall mention the serum of the blood and the spawn of fishes—I mean the eggs laid by the female fish in large quantities at a certain time of the year after the process of fecundation.

The albumen is easily obtained from the serum of the blood, and answers very well as a substitute for egg albumen in calico printing.

In separating the liquid in which the clots of blood are seen floating 10 to 15 hours after the animal was killed, a a light yellow liquid is obtained, which is then allowed to stand for 6 or 10 hours more. This second liquid is decanted from its precipitate which has been formed during this operation, and is then dried in the same manner as egg albumen at a temperature of 40° Cent.; if the serum had remained colored after the second precipitation it must be treated with a small quantity of isinglass, which has the property of separating all impurities by a veritable coagulation; all these operations are carried on in deep dishes; the clear liquids thus collected are desiccated as above.

The albumen from the spawnings of fishes can be obtained from the dry spawn as it is usually found in the market or from the fresh spawn taken immediately from the fresh fish and from the salted fish.

To use dry spawn, it is first ground into a coarse powder, then washed with water; this water is left to settle so as to allow all the impurities to collect at the bottom of the vessel, decanted and desiccated at 40° Cent. in the usual way.

Generally the albumen obtained from the fresh spawn is of better quality than that obtained from the dry or salted spawn, though it takes more care to separate the blood and certain greasy or oily impurities from it. It is desiccated in the usual way.

In operating with salted spawn it is thoroughly washed to eliminate the salt, then ground and dissolved in water, and treated as above.

A very large quantity of albumen is used in this country; there is a little egg albumen made in the West, but very irregularly; as for the blood albumen it is all imported.

Egg albumen brings in the market from \$2·50 to \$2·75, gold, the blood albumen from \$1·25 to \$1·40, gold, per pound.

As a general rule the blood in this country is considered as a waste; even in the large pork slaughter houses of the West it is lost, and very seldom used, even as manure, though being one of the best of fertilizers.

The reason I believe why blood albumen is not manufactured in this country is that there is no regular central slaughter house, every butcher having the right to kill his own meat, and so it has been difficult for those who have thought of establishing an albumen manufactory or Prussiate manufactory to collect a large quantity of blood with little cartage expenses.

But now that New York possess "Communipaw," I do not see, as the expenses of getting up such a manufacture are very small, why the calico printers and others using albumen continue to supply themselves from abroad at such high figures.

The Amazon River drains 2,500,000 square miles, and is navigable 2,200 miles from its mouth.

Planing, Tongueing, and Grooving Machine.

Our engraving is an excellent representation of one of the most important and complete machines of its kind now in existence. The amount of careful study and inventive skill which have been expended in bringing it to its present improved form, is indicated by the fact that it has been the subject of no less than nine distinct patents, the earliest bearing date April 13, 1852, and the latest July 24, 1866. Each of these patents covers some important advance on the previous construction of the machine, and as it is now presented to the notice of our mechanical readers, it is perhaps safe to say that its capacity and working efficiency are exceeded by no other planing machine in maket.

A machine of this kind—supposed to be the largest ever made—capable of planing stuff thirty inches in width, is in operation at the piano factory of Steinway & Sons, in this city; and from personal inspection of this machine, and other smaller ones in full operation, we are confident that everything claimed for it is fully justified by facts.

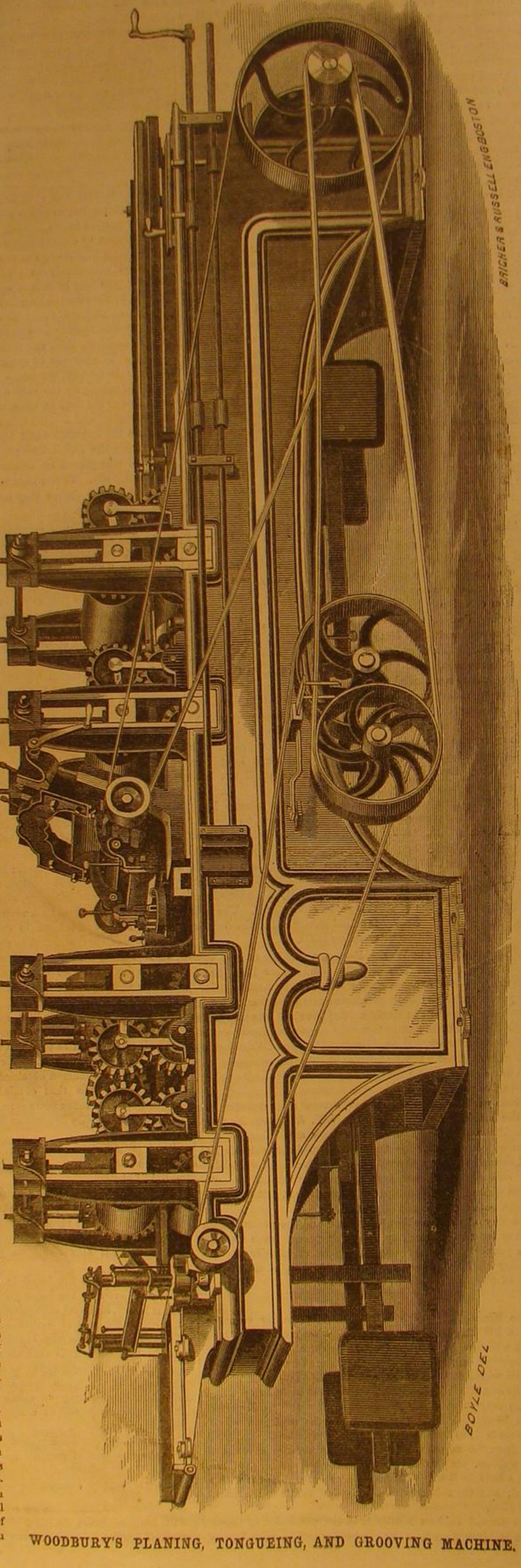
It is claimed that for dressing all kinds of lumber and for performing all the various operations for which it is adapted, this machine stands without a rival in Europe or America. It has been the effort, in perfecting the machine, to construct all parts in the most simple manner, to avoid complications, and to make all parts easy of adjustment. At the same time strength and durability have been constantly kept in mind.

Six sizes are made, with four, six, and eight feed rolls. The lighter machines weigh about 4,000 lbs., the heaviest about 11,000 lbs. This large machine works stuff from 2½ up to 30 inches in width, and from half an inch up to 8 inches in thickness. The engraving is that of the No. 1 machine having eight feed rolls. The frame is 17 feet long.

Among some of the most important improvements on this machine, and exclusively claimed for it, may be mentioned that the feed rolls are geared at both ends (Fig. 2), thereby making a very strong and even working feed, which is very important on machines of this class. The gears at each end of the feed rolls are connected with rails running across the machine, and are also made fast to the frame on both sides; thus preventing any cramping of the gears.

The links connecting the expansion gearing are made of wrought iron instead of malleable iron, as is the case with many other machines.

Where gears are used on only one end, a lifting action is produced which causes the board to be fed through in an oblique direction. This difficulty is avoided by gearing the feed rolls at both ends, causing an equal pressure on both edges of the board, feeding it through

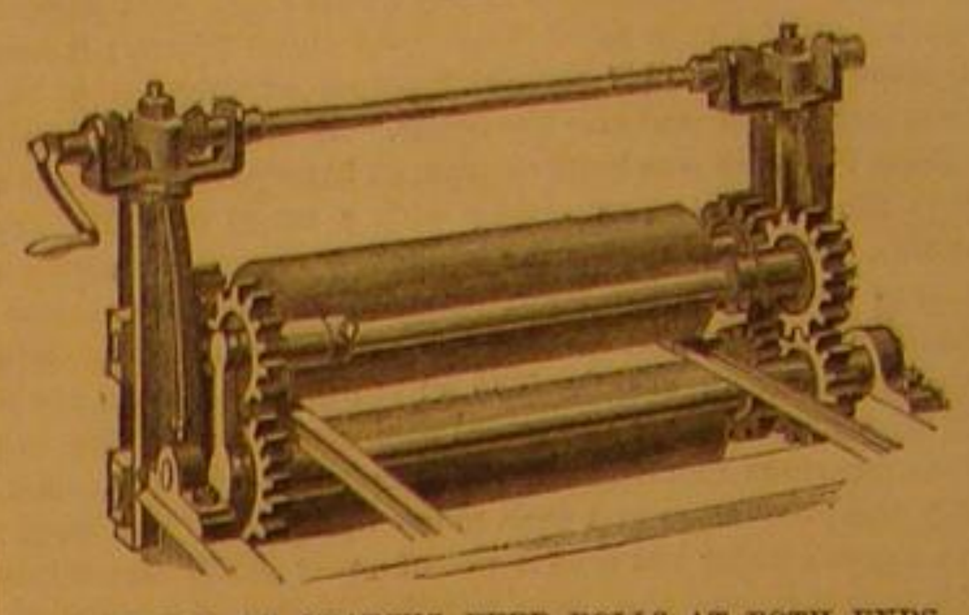


WOODBURY'S PLANING, TONGUEING, AND GROOVING MACHINE.

straight; the gears wear even, and are more than twice as durable.

Another improvement is the hinged presser bar (Fig. 3), which works close to and directly in front of the upper cutters, and which prevents the tearing and splitting of the lumber when cross-grained, or when hard wood is worked. This presser bar is provided with suitable weights, so that it readily yields to inequalities in the thickness of lumber.

Fig. 2.

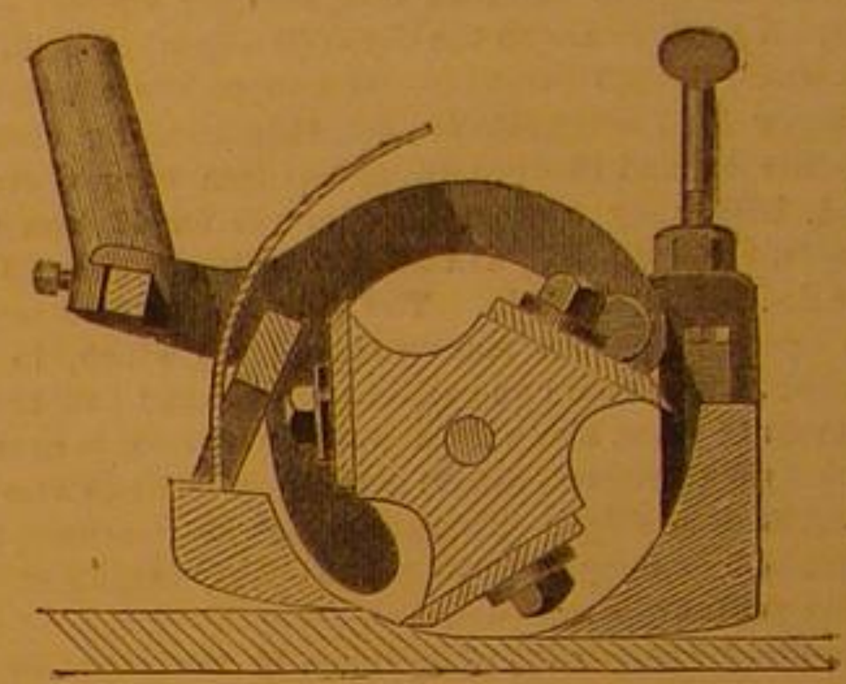


METHOD OF GEARING FEED ROLLS AT BOTH ENDS.

Another improvement is the double adjustment of the "matcher frames" across the machine, which enables the operator to work narrow stuff on either side of the machine or on the center; thus using the full length of the knives. This adjustment is very simple.

The machine is provided with a scale and rails extending from the cross screws to the front end of the machine, so that the operator can adjust the matcher heads anywhere without stepping away from the "work-end" or front of the machine.

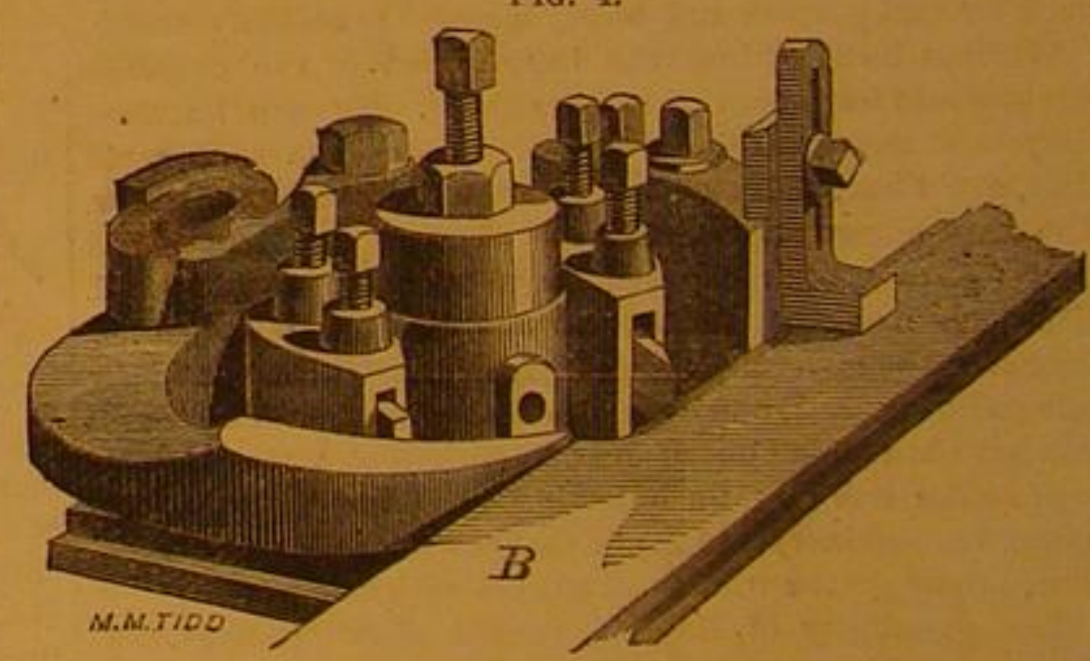
Fig. 3.



SECTION OF TOP PRESSER-BAR.

The "chip-breaker" or "clip," is hinged on the side cutter-head frame (Fig. 4), working on the same principle as the top-presser bar, which prevents all splitting of the edges of boards; and, holding the "stuff" close by the cutters, enables the machine to be fed, it is claimed, twenty per cent faster than any other machine, and at the same time to do its work better.

Fig. 4.

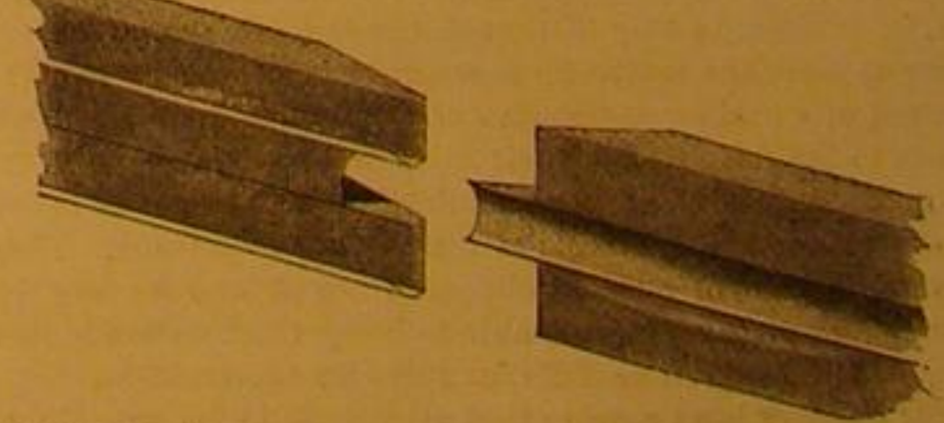


CHIP BREAKER SIDE HEAD.

Fig. 5 represents the tongueing and grooving cutter for the side cutter head.

The under cutter-head is attached near the end of the machine so that it is easily accessible for changing or sharpening. It is also provided with suitable adjustable "rest-bars" or bed plates.

Fig. 5.



TONGUEING AND GROOVING CUTTERS FOR SIDE CUTTER HEADS.

Fast and loose pulleys are used on the feed shaft, being much preferable to a solid clutch on a heavy machine, and much more durable. The feed rolls and presser bars are all weighted, an improvement over the rubber springs used on other machines.

The machine is provided with patent self-oiling boxes on all the journals; the latter being thus fully protected from the dust, and requiring very little attention to keep the machine in perfect order.

The machines have also a swivel guide for matching tapering lumber. This is connected with any sized machine in a strong, substantial manner; and with this attachment the machine will work stuff tapering six inches or more in a length of ten feet. The bed plate directly under the upper cutter head is a false plate so that it can be easily removed and dressed over in case it becomes worn out of true.

This machine has received first prizes wherever exhibited for competition.

These machines are now running in many of the first class mills in all parts of the country, and the one above mentioned just put up in Steinway & Sons' manufactory will repay a visit to see.

For further particulars address S. A. Woods, sole manufacturer of Woodbury's patent planer and matcher, 91 Liberty street, New York, and 67 Sudbury street, Boston. [See advertisement in another column].

MANUFACTURE OF COTTON SEED, COTTON SEED CAKES, AND MEAL.

BY C. WIDEMANN, CHEMIST, PARIS, FRANCE.

No. II.

It was at first proposed—and it has been tried by many—to work cotton seed along with linseed, so as to obtain an oil, which, in being boiled with oxidizing agents, would replace for painting purposes the linseed oil, and, being cheaper, would be used extensively. This has been dropped at the present time but will no doubt be taken up again.

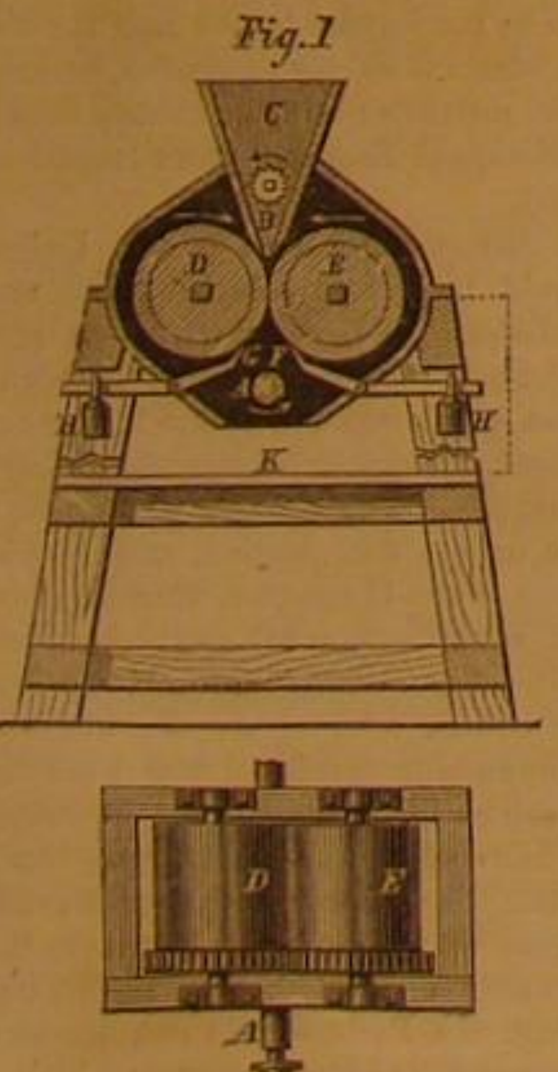
It is very difficult to ascertain the exact yield of oil produced, and this yield varies a great deal according as the seed is of better or poorer quality and richness, according to the weather of the season in which it has been sown, dry weather giving a smaller seed but richer in oil. From my own experience I shall take the following figures:

For 2,000 pounds cotton seed, or 1 tun, cotton from the last ginning, 21 pounds; husks, 979 pounds; meal, yielding from 32 to 36 gallons of oil, 270 pounds; cakes, at 7½ pounds per gallon, 730 pounds. Total, 2,000 pounds.

Let us take now the seed at the entrance of the oil mill. As it arrives in the bags it ought to be immediately unpacked and aired by shoveling it from one place to another, and this should be done very frequently as the fermentation sets in very rapidly. This is known by putting the hand in the seed; if heat is felt the seed has to be worked as quick as possible, and in every case removed and cooled by airing. It therefore requires a large store room to manage it properly. The average weight of one bag is 92 pounds, and the average work done by a good pressman and a Taylor's press, for ten hours' work, is 250 bags or 11½ tuns. Generally oil mills work night and day, as there is a great advantage in not letting the presses and mill cool down.

The cotton seed to be freed from the foreign matters it may contain, is passed in through a screen; a large cylinder made of wire cloth, the holes being sufficient to let the seed escape and retain the foreign substances. It is next carried to the top of the building where it passes through the gins. After this it goes through the huller. The huller generally used is of two sizes; the large size is sufficient for the supply of two presses of three sets for night and day labor. The smallest size is sufficient for one day's work with two presses. From the huller the kernels and husks are passed again through a screen, and then through a blower, which separates entirely the husks from the kernels. The kernels are then carried to the grinding mill and are passed through crushing rollers which I shall now describe. This machine, Fig. 1, is composed of two cylinders in cast iron, D E, covered with steel, hollow, and working at equal speed, with a distance between them which can be regulated at will. One of these cylinders receives motion and transmits it to the other by a pinion. A hopper of wood, C, is kept full of seed, and feeds the rollers by means of a little fluted wooden roller, B, the acceleration of which is regulated at will.

Fig. 1

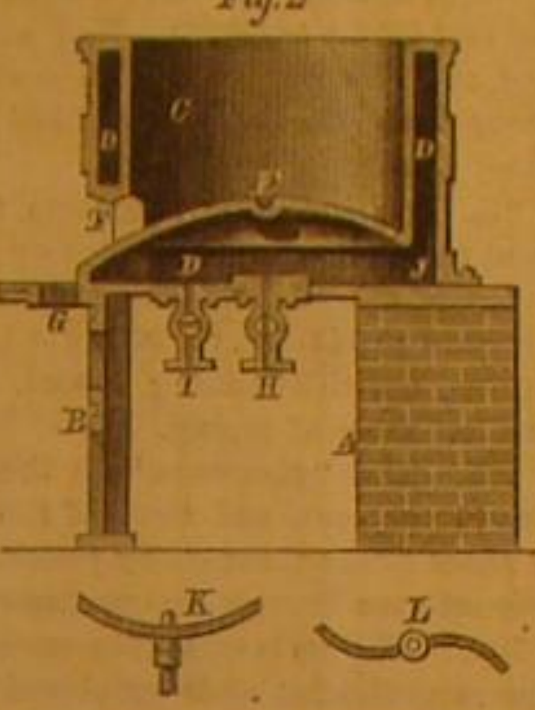


A machine of this description, the cylinders 26 inches in length and 6 inches in diameter, with a speed of 40 to 50 revolutions per minute, crushes per day 12½ bushels of seed and supplies two pairs of mill stones. It is worked by one horse power. I say mill stones, because the seed was formerly passed under double upright millstones so as to grind the kernel thoroughly; but this has been abandoned by most manufacturers as a good crusher answers the purpose sufficiently well, especially if the distance of the two rollers is well regulated. The crushing is then perfect and the meal comes out sufficiently fine. This is tested by grinding it between the teeth. If fine enough it must be perfectly free from perceptible grains. It is next placed in the heaters, and upon this operation depends both the yield of oil and its quality. In Marseilles, where labor is cheap, the meal is first pressed cold, as the oil obtained thus is very fine, possessing a very sweet taste, like olive oil, and may be used like the latter for the table. Oil designed for the table ought to be expressed cold. After the cakes are reground, the meal is heated and repressed. The second yield of oil is of inferior quality to the first yield.

In this country, where labor is high, manufacturers prefer to obtain at first as much oil as they can with the least handling possible. As I said, the meal is placed in the heaters after grinding; these heaters are constructed in different ways. I have seen some made of a large table heated by steam, with iron rings four inches high placed concentric to each other, and a stirrer in the center worked by power from the steam shaft above. Only a small portion of meal is heated at a time, I should say enough to fill a press bag; but I am not satisfied with these heaters as they present too large a cooling surface to the air.

The best heaters are those attached to the presses, and they heat for the 15 boxes of the three sets of presses. They are made of cast iron. The whole apparatus, Fig. 2, is supported by brick work, A, and by a cast iron support on the other side of the frame, B. C is a cast iron basin with a convex bottom, at the middle of which is a receiving hole, E, to receive the stirrer, K. D is a steam jacket. This basin and steam jacket are cast in one piece and fixed on the platform, T, by means of bolts. The steam is admitted to the steam jacket through H, the condensation water escaping through the pipe, I. A sufficient quantity of meal being introduced into C, the stirrer is set in motion and the steam let in; and when the temperature of 82° to 88° Centigrade, or 180° to 190° Fahrenheit is obtained, the gate, F, is opened, a bag placed at the entrance, G, and the meal is then let into the bag.

Fig. 2



The bags are made of a certain kind of woolen duck, manufactured expressly for that purpose. The best woolen yarn is used for their manufacture, and only two parties make them in this country. The cloth is about 32 to 34 inches wide, and is sold by the pound at a price running from $1·10 to $1·40. The weight of a yard of the cloth generally used is from 1 pound to 1 pound 4 ounces, and it can be used as well for linseed as for cotton seed. The bags are made in the mills by the pressmen themselves, and sewed on a wooden pattern to fit the squeezers. The old bags are sold at 6 to 8 cents per pound when they are quite out of order, as they can be repaired and are repaired with the same yarn they are made of by the pressmen, or women engaged for that purpose. A great saving could be made in cloth if parties would manufacture them as neatly as other bags, instead of in the coarse way they are now made in the mills.

The bag being properly filled, that is to say, not quite to the top, it must be thrown in double to close it in the squeezer, the meal being well distributed all along it. The squeezer is then introduced in the box of the hydraulic press, Fig. 3. The squeezers, Fig. 4, are made of horse hair cord and covered with leather, to which a handle is riveted. The rivets ought to be of iron, as copper is very soon oxidized by the action of acid fats. These squeezers are quite expensive, and are sold from $26 to $28 a piece. They last one year and a half to two years. They are easily repaired, but have to be kept in good order and cleaned as soon as the dust, or meal, and other impurities have begun to adhere, by hammering them with wooden hammers. I shall not describe the presses as they are nearly like all other hydraulic presses, differing only in some improvements of the packing of the plungers, in the adaptation of check valves, etc. The pressure must be one and one half tuns to obtain a good cake, or 85 pounds per square inch. The cake must not be more than half an inch thick or very little over, and should weigh from 7 to 7½ pounds. The presses, when charged, are left for twenty minutes and then the squeezers are taken out.

Fig. 3

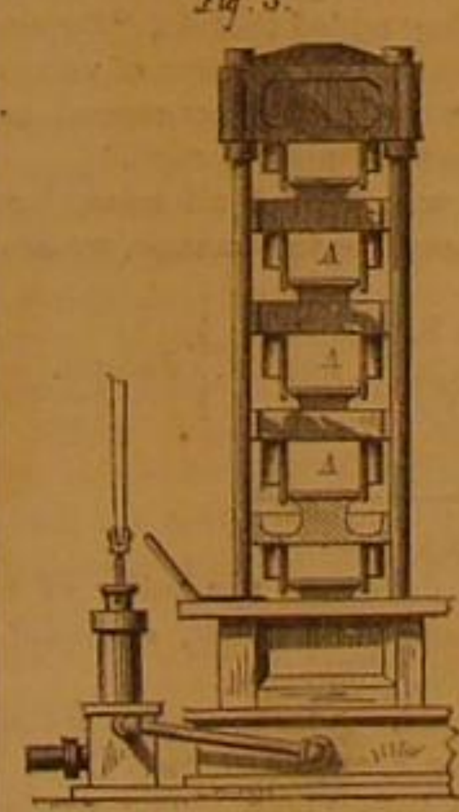
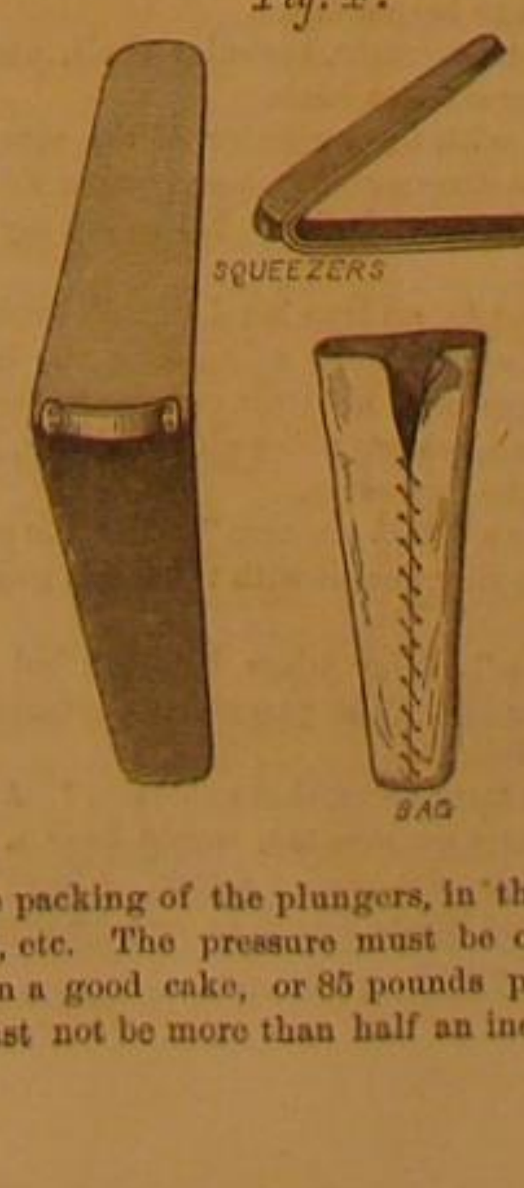


Fig. 4



The cake is taken out of the bag by setting the bottom of the bag against a board and turning it inside out. The cake is carried to a special room, where a man with a kind of half circular knife, Fig. 5, trims the edges and cuts the top and bottom. Sometimes the cuttings are reground and repressed, as these parts have never been as well pressed as the middle part. The trimmed cakes are then placed on frames upon their edges, and left to dry; care being taken not to have them put too close to each other, so that the air may have free circulation all around them. Cakes would soon decay through the action of the moisture remaining in them. It is very important the meal should retain its temperature, and some works to that end have had iron pipes passing behind and between the sets, so as to heat the whole structure. It is always observed that the set near the heater yields a larger quantity of oil than the last set. This is a consequence of the heat communicated to the press from the heater.

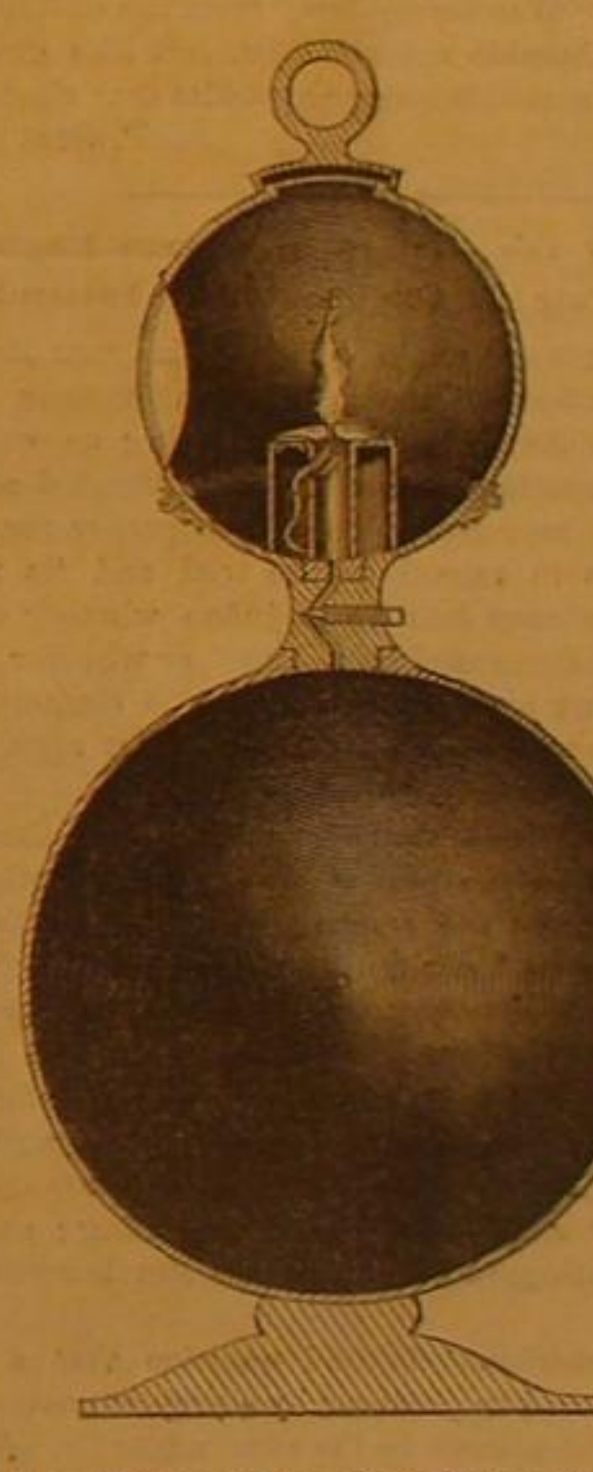
Fig. 5.

Correspondence.

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

Safety Lamp for Miners.

MESSRS. EDITORS:—The SCIENTIFIC AMERICAN of September 25, 1869, contains an article on the Avondale disaster, and a notice of a lamp recommended by W. H. Bessemer. I inclose a drawing of a lamp made by me as far back as 1829 on the same principle as that recommended by Mr. Bessemer. From my knowledge of miners I have always considered that there could be no safety while they had the control of the



lamps. I therefore made one like the drawing, part of which I still have. The globe containing the condensed air is 10 inches in diameter, the lamp 6 inches, with a joint made tight by leather (better rubber), and locked; the lamp was made to burn the oils common in those days, and would throw the light a great distance, so that it might be placed in safety and yet give a better light to the miner than the Davy. At the top was a piece of wire gauze for the exit of the products of combustion; the whole was made of copper.

The miners of those days thought themselves quite safe with the Davy, and all I got was the name of a schemer, and sundry lectures on my folly, when, soon after, leaving England, I had other things to attend to.

I could never get anybody to see any good in my invention. Perhaps I have been too far ahead of time, as many explosions have been required to prove the Davy not altogether safe. FREDERICK LEAR.

Willsborough, Mo.

The Wandering Jew, or Cow Killer.

MESSRS. EDITORS:—My attention has been arrested by the article bearing the above title, on page 43, current volume of your journal. Both names are new to me, having never heard them applied to an insect, which, by the description is clearly that of the large red stinging ant, a species of *Mutilla*, a genus among the order of *Hymenoptera*.

Thomas Say describes six species found within the United States, while thirty-eight species are noticed in Rees' Cyclopedia. They are solitary in their habits. The females are always found on the ground, abounding mostly in hot, sandy situations. The males resemble other sand wasps, being pro vided with wings. The females are destitute of wings and ocelli, but are provided with a powerful sting; and woe to him who may have a demonstration of it on his own person. They are not very common, but I have occasionally met with them on the ground. They are quick in their motions and hide beneath a stone or clod of earth, so that you know not where to look for them.

The following, Fig. 2, is a sketch of a specimen I captured upwards of fifteen years ago near Mount Joy, Lancaster County, Pa. Fig. 3 is one I captured at Cape May, July 1858; Fig. 1 being the head and antennæ.

Fig. 1

Fig. 2

Mutilla coccinea: scarlet, abdomen is marked with a black belt. It inhabits North America. The wings are black, but in general it is an apterous insect.—(*Rees.*)

Fig. 3

This accords well with my Fig. 3. Fig. 2, thorax and anterior portion of the abdomen scarlet, with a distinct black cross and the posterior segments black, I cannot find described.

The *M. Bifasciata* of New York State, is black; head and thorax red, abdomen with two red bands; the wings are violet black.—(*Rees.*)

The *M. Vigilans* of Pennsylvania: *z* black, large abdominal segment, excepting its posterior and anterior margin, rufous.—(*Say.*)

A Mexican species, *M. Erythryna* (*Klug*) is scarlet red, beneath black, wings blackish.

One of this family, I suppose, is the insect that your correspondent calls the "Wandering Jew," from the outline given by him. I, as an humble entomologist, felt like gratifying his wish to know something more about its true character.

Lancaster, Pa. P. STAUFFER.

Vindication of the Judges on Steam Engines at the Late Fair of the American Institute.

MESSRS. EDITORS:—Certain criticisms, in your last number, upon the action of the judges on engines at the late Fair of the American Institute, being so evidently based upon information derived from interested and unreliable sources, we have deemed it proper for us to state certain facts in regard to the trial and its results, that your readers may be able to judge whether our decision was "stultifying and ridiculous," or whether it was not eminently just and proper under the circumstances. These facts can be verified by the official report upon file at the rooms of the Institute.

1st. There was no test made by coal, nor was there any original intention on the part of the judges, or others, of making such a test, for the reason that the amount of coal burned during the trial could not be ascertained with any reasonable amount of accuracy. There were forty-five square feet of grate surface, and the entire quantity of coal burned during an eight hours' trial, would cover this surface to a depth of less than one foot. As for leveling off a glowing fire of that size to a "line of bricks," the idea is too absurd to be entertained by any one familiar with firing; and that "this was done with great care by all parties interested" is not true.

2d. It being established beyond question that a given quantity of steam will be produced by a proportionate weight of coal, which will always be the same under the same circumstances; the weight of water evaporated being an exact measurement of the steam produced and the coal burned: therefore, *by consent of all parties interested*, the cost of the power was determined by the water used, "measured by a meter open to the inspection of all."

3d. Experiments made with this meter at different velocities of discharge, show a different *rate* of variation with each considerable change in speed, but at the speed used during the trial, and which was practically the same for each of the principal engines, both the rate was *constant and the measurement practically correct*—the possible variation being within a small fraction of one per cent. As a *comparative* measure under such circumstances it was more reliable than any other means of determining the evaporation except by actual weighing of the water.

4th. The difference in the management of the fires on the two days when the Babcock & Wilcox, and the Corliss engines were tested, which was noticed at the time and which has since been fully stated and explained to the judges by by the agent of the boiler used, was sufficient to account for any reported difference in the amount of coal burned, and for the observed difference in the quality of the steam. It would therefore have been imperative upon the judges to have ruled out the coal, had it not been previously excluded by mutual consent.

5th. The cost of the power in coal, allowing the usual estimate of *nine pounds of water to each pound of coal was, for indicated power*, for the Babcock & Wilcox engine, 2·831 pounds per hour per horse power, and 2·895 pounds for the Corliss engine, a difference of 2·21 per cent in favor of the Babcock & Wilcox; for *net effective power*, 3·248 pounds for Babcock & Wilcox, and 3·209 for Corliss, a difference of 1·2 per cent in favor of the Corliss engine.

6th. The difference between "indicated" and "net effective" power is due to the power required to drive the engines alone, which was much more for the Babcock & Wilcox than for the Corliss engine; but this was not so much due to the difference in the construction of the engines, as to the fact that the foundations of the Babcock & Wilcox engine were impaired by the overflow from a neighboring drain, thus throwing the engine out of line; and also to a heavier fly-wheel having been placed upon this engine.

7th. The *quality* of the steam was *not* the same for the different days—it being very evident that the steam supplied to the Corliss engine was considerably drier than that furnished to either of the other engines. This was particularly observed by at least one of the judges. The amount of loss from this source was calculated from the quantity of steam shown by the indicator diagrams, as compared to the total weight of water supplied to the boiler, and this calculation shows that the Corliss engine had an accidental advantage in this respect, as compared to the Babcock & Wilcox, of about *thirteen per cent* (90·99 to 79·47). Had allowance been made for this *fact*, the economy of the Babcock & Wilcox engine as compared to the Corliss, would have been *fifteen per cent* on indicated power.

8th. The indicator diagrams taken at the trial show the most rapid opening and closing of the valves, the greatest range of cut-off, and the nearest approximation to boiler pressure (5·542 lbs. to 9·567 lbs.), in the Babcock & Wilcox engine, notwithstanding it took its steam through twenty-two feet more of piping.

9th. The "clearance" in the Babcock & Wilcox engine was 1½ per cent, and that of the Corliss was 3·1 per cent of space swept through by piston. The former is the least amount ever brought to our knowledge.

10th. The style of valves used in the two engines is distinct, and the flat slide employed in the Babcock & Wilcox engine is not only preferable to the curved slides of the Corliss, but the constant throw of the same is conducive to equal wear and continued tightness, while the varying throw of the Corliss valve has the opposite effect.

11th. The regulation of speed was practically equal in the two engines, being excellent in both cases.

With these facts before them the judges had no difficulty in deciding which was the *best engine*, and they plainly indicated that opinion by awarding the first premium to the Babcock & Wilcox engine "for the *most perfect automatic expansion valve gearing*;" supposing, in their simplicity, that the engineering world at least, would know that this embodied all the difference in the principle of construction of the engines in competition. But they also felt the force of the argument that the trial having been made under certain rules, and the Corliss engine having shown the best results by the strict rendering of those rules, though that result was purely accidental; it, therefore, should have a first premium for those results. In giving this premium, however, it was expressly stated that it was "for best results on net effective power shown at the trial, being from one to two per cent better than any other in competition;" and they added thereto, "for superiority of workmanship, and general arrangement of valves and valve gearing;" it being a very good arrangement as compared to other engines, but not the "most perfect."

Trusting that these statements will correct all misunderstandings which have arisen in regard to this matter, we are

Respectfully yours,

THOMAS S. SLOAN,
HAMILTON E. TOWLE, } Judges.
ROBT. WEIR,

New York, Jan. 29, 1870.

Steam Boiler Explosion.

MESSRS. EDITORS:—About ten days ago, the boiler of a donkey engine, on board the steamer *Parthenia*, exploded, while lying at the dock, in Hartford, Conn.

The damage done was considerable. A large portion of the upper deck was blown off, the cabin demolished, etc.

Only one person was on board, a young man. The fire in the boiler was started by him, as the owners say, against orders.

The penalty of disobedience falls severely on him; as he is badly hurt, and is now confined at the hospital. He had the presence of mind to put out the fire, which was scattered in all directions, before help arrived.

The boiler was an upright, turbular shell, about two feet in diameter, five or six feet high.

In conversation with the engineer of the steamer, only a few days before the disaster took place, he expressed his doubts of the safety of this same boiler. He called my attention to its construction.

The head was set in, an iron band shrunk around the outside, the tubes doing the work of holding the head against the pressure. There were no rivets or bolts in the head. This head was blown out, taking tubes along with it, I suppose, as I saw none after the explosion.

Although it was a "*high pressure*" boiler, the engineer said he would not dare stay near it with the steam gage indicating thirty pounds.

It was a "cheap" boiler when bought; but has proved a costly one in the end. The papers say the damage amounts to two thousand dollars.

Is there any mystery about that explosion? A small boiler like that, if properly constructed, would bear a pressure of one hundred pounds with perfect safety. I have seen similar boilers, with riveted heads, tested at one hundred and fifty pounds, with cold water. * * *

Hartford, Conn.

THE FRENCH SYSTEM OF STORM MAPS.

From the February Number of "Old and New."

Behind, or rather beside, the Pantheon in Paris, at the corner of a street that runs towards the Observatory, at the far end of the Gardens of the Luxembourg, and in the ground floor and corner room, as if it were an American apothecary shop or grocery store, the traveler, curious in such things, will find a woman sitting at the receipt of custom, taking down subscriptions for the daily bulletin of the meteorological observations carried on at the Observatory. I have recently learned, however, that the task of making these observations is now transferred to the new observatory, of which M. St. Claire Deville is the learned and distinguished superintendent.

When we crossed the ocean in October, 1866, from New York to Brest, in the *Ville de Paris*, we knew that the passage would be stormy, for the time of sailing fell on the bad day of the weekly storm system of that year. And so it turned out. We got engaged in the southern rim of a tremendous "northeaster" just departing, like ourselves, from the States for England, and we sailed nine days in its company, sometimes gaining on it, sometimes beaten back by it, until one night, not having seen the sun for six days, we lay to in front of a lighthouse, not knowing where we were, only that we certainly were not where we should have been—off Ushant. When morning broke, the shore appeared. It was the coast of Cornwall. We turned therefore at a right angle, and steamed across the mouth of the English Channel, and arrived at Brest one day later than we should have been had we made Ushant light.

This lost day permitted our disagreeable companion, the northeaster, who seemed utterly indifferent to our society, to go ahead; and then the sun came forth, and the beautiful and curious cliffs and monuments of Brittany, and the rare scenery of the port of Brest, remunerated us for the delay.

Had we been on a voyage from Labrador to Norway, we should have been on the northern rim of the storm instead of the southern; and it would have been a southwester, instead of a northeaster, and have driven us forward, all the way, *pêle mêle*.

I was so curious to follow the subsequent course of this erratic monster, that on my arrival in Paris, I subscribed to the Meteorological Bulletin, and got the back numbers for two weeks.

Looking on the chart for the day before we saw the English light—there, sure enough, was the front rim of our storm drawn in curved lines from north to south, and bellying eastward, over the northwest corner of Europe. The next day's chart showed it further advanced and raging into the North Sea; and each successive daily chart marked its position further and further east-southeast, until its form was broken up and lost between the Black and Caspian Seas.

The winter I spent in part at Pau in the Pyrenees, and every morning I had at my breakfast table the mapped climate of all Europe of the day but one before. And every week I had a new storm to follow, from its first appearance on the west coast of Ireland, to its disappearance three or four days later in the Levant, or across the Ural mountains.

Sometimes there appeared signs of a disturbance in this regular march, which I could not comprehend, and then the order would be resumed and regularity maintained as before.

In St. Petersburg a similar storm map has been published for some years, even better adapted for the student than the French. In England there was until recently a distribution of storm information, in advance of time, to all the seaports of England, by telegraph from Greenwich; but the labor and expense were supposed to be inadequate to the results; the designer of the system, on whom it chiefly depended, became engaged in other scientific pursuits; and the daring fishermen and economical merchants of England were impatient of control. So it has ceased.

Along the stormy and dangerous coasts of the United States such a system would be of incalculable value, and ought to have been established by Government long ago. One wealthy merchant of Boston or New York, however, could by himself keep up an establishment of the kind they have at Paris, until it became self-supporting—and not have to wait long for that to happen. The Bulletin of Paris is a quarto sheet of four pages, on the first, second, and third of which are tables of the state of the barometer, thermometer, and sky, the rain-fall and wind-force, at all the places from which telegraphic dispatches had arrived that day, and lagging dispatches of the day before.

The third page, kept permanently furnished with a map of Europe, printed in blue, shows on this map, but in strong black lines, the curves of barometric pressure, geographically drawn through or near the places from which the telegram of the day has come. These telegrams are studied in the evening, and thrown into curves, printed over night, and distributed in the morning. In Paris, a man can see at a glance the condition of the atmosphere as it was all over Europe the day before.

The lines of barometric pressure are all concentric in a greater or less degree, because they show the sides of the great waves of air which are rolling forward over the surface of the earth, and pressing unequally on the innumerable barometers of Europe. Each curve is marked 700, 705, 710, 715, etc., meaning millimeters of mercury. In America we should mark them tenths and hundredths of an inch. Arrows also appear on the map, showing the direction and force of the winds.

BALLOONS.—This subject has been so thoroughly discussed in our columns that we feel obliged to drop it for the present.

For the Scientific American.

ON ZINC.

BY PROFESSOR CHARLES A. JOY.

HISTORY.

Zinc is a metal of the present century. Seventy years ago there were not so many pounds of it required for the wants of the whole world as there are tuns manufactured at the present time. Its production has increased two thousandfold, and we must look upon it as one of the most useful of all the metals in the whole round of chemistry.

It is true that the ancients made brass from copper and calamine; but they were not aware of the existence of metallic zinc in the mineral they employed to combine with the copper. The word zinc itself does not appear to have been used before the year 1540, and by some authorities it is traced to Zincken or Zacken, meaning the chimney stack in which the oxide collected when zinc-bearing ores were roasted. When this flue dust became known as a metal it received opprobrious names, such as "the spurious son of copper," and hence a bastard metal. Some called it coagulated mercury, and the miners thought it was unripe lead ore, and if it were left a few ages longer it would mature to something useful. It appears to have been brought to England from India towards the end of the sixteenth century, and to have received at that time the name of "spelter," which it still bears. That the Germans did not know how to make brass from the ores of zinc is conclusively shown in the history of the mines at Wiesloch, in Baden, which were worked for lead from the eleventh to the fourteenth century, during all which time the zinc ore was thrown away and finally collected in vast heaps about the mouth of the mine. These mines were re-opened in 1850, and an immense amount of zinc was obtained from the refuse that had been previously regarded as worthless.

The first German establishment for the manufacture of brass from copper and calamine, was at Goslar, in the sixteenth century. In England we have the record of all patents issued since the year 1681, and we find that the earliest mention of brass was in 1728, when a patent was granted for "a method for the more advantageous manufacturing copper oares through all the intermediate operations till it be brought into fine copper, and from thence into brasse, to be cast into plates, rodds, kettles, and other utensills in metall moulds." And we read, in 1758, that "spelter and brass might be made from a mineral which had not thentofore been made use of for such purposes. The mineral black-jack, mock-jack, or brazill, can be used to make spelter."

But by far the most important discovery relating to zinc was made by Sylvester and Hobson, in 1805. This was "a method of manufacturing the metal called zinc into wire and vessels. Zinc is made malleable and may be drawn into wire by working it at a proper heat or by annealing: 210° to 300° Fah. is such proper heat." It was in view of this discovery that we called zinc a metal of the present century; for, previous to this period, its applications had been of the most insignificant character as compared to the vast uses of the present time.

Between the years 1728 and 1859, 69 patents were issued in England chiefly relating to zinc furnaces. The SCIENTIFIC AMERICAN, for the last ten years, contains the record of twenty patents granted in the United States involving the manufacture and uses of zinc. It appears from all accounts that the first zinc made in the United States was by John Hitz, in 1838. He prepared it from New Jersey ore for the purpose of manufacturing some brass to be used for the standard weights at Washington. His method was a tedious and expensive one; but since that time great improvements have been made, and the industry has become a very important one in the United States; and as we have extensive deposits of blende and calamine, it is destined to assume still greater proportions.

OCCURRENCE.

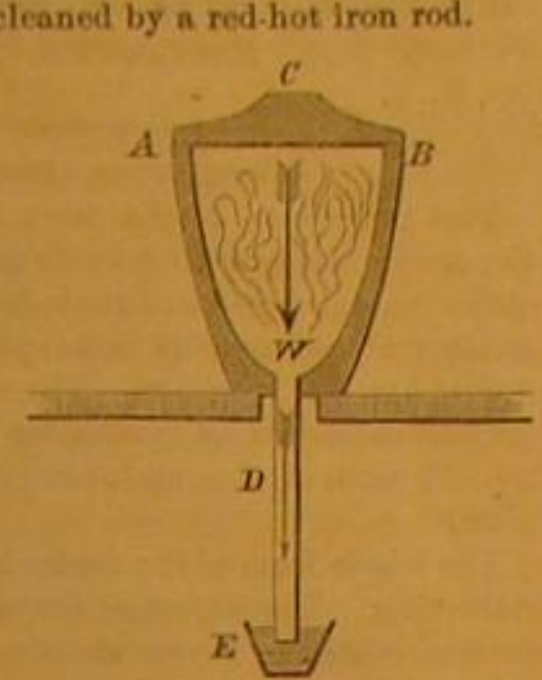
The variety of zinc minerals is not very great, but this is made up by the abundance of the few in which the metal is found.

The most conspicuous ores are blende, commonly called black-jack, which is a compound of sulphur and zinc; calamine, which may be a silicate or carbonate; zincite, an oxide; goslarite, a sulphate; and franklinite, composed of zinc, iron, and manganese, and found in New Jersey. The metal is not found in the animal or vegetable kingdom, as it would be destructive to the growth of vegetables or animals. The Germans call black-jack *blende*, because it used to blend or deceive the early miners. Its beautiful luster led them to expect to find a valuable metal; but, as all of their efforts to obtain anything from it remained fruitless, they looked upon the ore as a cheat, and called it *blende*.

PREPARATION OF ZINC.

Having sketched the history and occurrence of zinc, we come now to consider the methods of its preparation.

"The process is comparatively simple, and consists in first carefully hand-picking the ore to remove the galena, and then calcining it in a reverberatory furnace or rather oven. The roasted ore, deprived of carbonic acid, water, and sulphur, as the case may be, is then mixed with charcoal alone if prepared from calamine; but if from blende, a certain quantity of roasted calamine is also added, and the whole placed in earthen pots, or crucibles, very much like the pots used at glass works, but provided with a luted cover and also with an opening at the bottom, to which an iron pipe is fitted. After the heat has been applied sufficiently long, the volatile metals—such as arsenic and cadmium—make their way in vapor, *per descensum*, to the end of the iron tube, where they afford a flame, which the workmen distinguish by the name of the *brown blaze*; this is succeeded by a blue flame, called the *blue blaze*, which indicates the distillation of the zinc; and then the metal is condensed in the iron tube, and falls in drops and in a powdery state into a vessel placed to receive it; as may be easily imagined, the iron pipe sometimes becomes stopped, and is occasionally cleaned by a red-hot iron rod.



"A B is a large earthen crucible or pot containing a mixture of roasted zinc ore and coal or charcoal; C is the cover closely luted down; D is the iron pipe in which the zinc vapor condenses and falls into the vessel, E, containing enough water to cover the end of the pipe.

"The pipe is removed after each charge has been exhausted, in order to take out the *caput mortuum* or matter left in the crucible after distillation. The arrows show the direction of the metallic vapor, and the iron pipe is usually plugged with wood, W, which is soon reduced to charcoal, and while preventing the ore from falling out, does not stop the zinc vapor."

The above extract will serve to convey a general idea of the metallurgy of zinc; but the process is capable of important modifications, as the numerous patents on the subject abundantly show, and it is probable that we shall arrive at still simpler methods as the demand for the metal increases.

PROPERTIES OF ZINC.

Our knowledge of zinc has increased very nearly in the ratio of its employment in the arts, and the one may be said to grow out of the other; for the more we know of its properties the more easily can we imagine its uses. There are certain general facts in reference to its properties that may be found in every chemical treatise, but the recent progress of our knowledge is not contained in any single book, and can only be obtained by searching the journals of various countries. We have performed this search, and propose to give the results of our labor.

Zinc is a bluish white, brilliant metal, crystallizing in hexagonal pyramids with subordinate prismatic faces. The specific gravity of cast zinc varies from 6·8 to 7·1, and of forged from 7·19 to 7·2. It is less flexible than lead or tin when cold, and is very brittle at ordinary temperatures, and also when heated up to 410° Fah. It is malleable between 212° and 300°. Fah., the best temperature for this purpose being 248° Fah. It melts between 752° and 773° Fah, and can be readily distilled with exclusion of air. The metal possesses different properties according to the temperature at which it has been prepared; for example, when heated nearly to its point of ignition it is less flexible than when heated simply to fusion, and the point of fusion and rapidity of cooling affect its solubility in sulphuric acid. It would appear from these and other circumstances that the metal was capable of assuming different allotropic conditions. It expands more by heat than any other metal. In pure dry air or in water free of air, zinc remains perfectly bright, but in moist air or in ordinary water, it is rapidly coated with a film of oxide, which serves to protect it from further destruction. The impure metal is more readily dissolved in acids than the pure, and the evolution of hydrogen takes place very violently when a little bi-chloride of platinum is added. The action of foreign metals is explained on the principle of electric currents. Zinc which has been heated to a high degree and then suddenly cooled, is also more rapidly acted upon by acids.

Silver being taken at 100, the conducting power of zinc for electricity is 27·39; and for heat, silver being taken at 1000, the conductivity of rolled zinc is 641. One of the most important properties of zinc is its highly electro-positive character, which enables us to employ it to precipitate nearly all of the metals from their solutions. It has recently been discovered to possess great reducing power, especially for the chlorides and fluorides of the metals; and it is proposed to employ it to obtain the rare metals aluminum, magnesium, silicium, etc. It has also been found that it will displace phosphorus from bone ash, and a new method for the preparation of phosphorus is thus suggested. It dissolves gold and silver very readily, and it is proposed to substitute it for mercury in the working of the precious metals. Zinc does not alloy with bismuth nor with lead. Lead dissolves 1·6 per cent zinc, and zinc dissolves 1·2 per cent lead; zinc dissolves 2·4 per cent bismuth, and bismuth dissolves 8·6 to 14·3 per cent zinc. Zinc is acted upon by common salt with evolution of hydrogen, and the formation of a double salt of chloride of zinc and sodium and the separation of the oxide.

Zinc in concentrated sulphuric acid evolves sulphurous acid; in sulphuric acid and six parts of water, sulphureted hydrogen is given off, and pure hydrogen is only obtained from very dilute sulphuric acid. Zinc is a violent poison, and hence the action of a certain class of substances upon it ought to be carefully studied. Brandy, wine, vinegar, meat soup, milk, spring water, salt water, sugar sirups, dissolve zinc more or less, and consequently ought not to be stored in it.

Caustic soda, potash, and ammonia act very violently upon zinc, and this explains the reason why petroleum, which has been purified by means of soda, acts so powerfully upon zinc tanks, and often eats through them.

Zinc has great antiseptive properties, and is employed to keep timber from decay. When zinc is dissolved in hydrochloric acid a portion of the chloride is carried over mechanically by the hydrogen, producing a black mirror on porcelain similar to arsenic, thus exposing the chemist to an error that might have serious consequences. The action of hydrochloric acid upon zinc is immediately interrupted by chloride of mercury.

Zinc decomposes in contact with plaster, also in contact with iron. Eaves gutters should be supported by galvanized iron, and no sheet zinc should be laid on oak boards.

Zinc readily combines with phosphorus producing a valuable medicine, and a compound that can be usefully employed in the galvano-plastic art. The property of zinc that enables us to employ it in the construction of the galvanic battery was more particularly studied by Volta, and suggests the possibility of our having recourse to it as a motive power. At present the cost of zinc as an electric motor is 200 times greater than that of coal for the same power, but it does not necessarily follow that we shall never attain practical results in this direction, either by cheaper zinc or more ingeniously contrived machinery. The property of zinc to alloy with other metals, especially copper, is one of its most prized characteristics, and is the one longest known.

We have thus sketched the principal properties of zinc, and may hereafter recur to the applications of which the metal is capable.

The New "London Times" Printing Machine.

As the construction of the first steam newspaper machine was due to the enterprise of the late Mr. Walter, so the construction of the last and most improved machine is due in like manner to the enterprise of his son. The new "Walter Machine" is not, like Cowper's and Applegarth's, and Hoe's, the improvement of an existing arrangement, but an almost entirely original invention. Its principal merits are its simplicity, its accurate workmanship, its compactness, its speed, and its economy. While each of the ten-feeder Hoe machines occupies a large and lofty room, and requires 18 men to feed and work it, the new Walter machine occupies a space of about 14 feet by 5, or less than any newspaper machine yet introduced, and only requires three lads to take away, with half the attention of an overseer, who easily superintends two of the machines while at work. The Hoe machine turns out 7,000 impressions printed on both sides in the hour; but the Walter machine turns out 11,000 impressions completed in the same time.

The new invention does not in the least resemble any existing printing machine, unless it be the calendering machine, which has possibly furnished the type of it. At the printing end it looks like a collection of small cylinders or rollers. The paper, mounted on a huge reel as it comes from the paper mill, goes in at one end in an endless web, 3,300 yards in length, seems to fly through among the cylinders, and issues forth at the other in two descending torrents of sheets, accurately cut into lengths, and printed on both sides. The rapidity with which it works may be inferred from the fact that the printing cylinders (around which the stereotyped plates are fixed) while making their impressions on the paper, travel at the surprising speed of 200 revolutions a minute.

As the sheet passes inwards, it is first damped on one side by being carried rapidly over a cylinder which revolves in a trough of cold water; it then passes on to the first pair of printing and impression cylinders, where it is printed on one side; it is next reversed and sent through the other pair, where it is printed on the other side; then it passes on to the cutting cylinders, which divide the web of now printed paper into the proper lengths. The sheets are rapidly conducted by tapes in a swing frame, which, as it vibrates, delivers them alternately on either side, in two apparently continuous streams of sheets, which are rapidly thrown forward from the frame by a rocker, and deposited on the tables at which the lads sit to receive them.

The machine is almost entirely self-acting, from the pumping up of the ink into the ink box out of the cistern below stairs, to the registering of the numbers as they are printed, in the manager's room above.

Such, in a few words, is the last great invention made in connection with newspaper printing, which reflects no little credit on the enterprise of Mr. Walter and the inventive skill of the gentlemen of the *Times* staff—for it has been entirely designed and manufactured on the premises—to whom he has intrusted its execution.—*Morgan's British Trade Journal.*

Test for the Goodness of Glue.

Mr. Alfred Bird, of Birmingham, England, communicates to the *Chemical News* the following test for the goodness of glue, which he states he has found very valuable:

"Assuming that 'that' is the best glue which will take up most water—take 50 grains of the specimen, and dissolve it in 3 ounces of water in a water bath. When dissolved, set it by for 12 hours, to gelatinize; and then take an ounce chip box, place it on the surface of the gelatin and put 'shots' into the box, till it sinks down to a 'mark' on the outside. It will be found that, the stronger the glue the more shots it will take to sink the box down so that the mark shall be be level with the surface of the gelatin.

"In a trial with the finest glue I ever met with, 50 grains of glue, dissolved and gelatinized, with 3 ounces of water, supported, to the mark on the box, 6 ounces of shots, at a temperature of 58° Fah. On trying the same experiment with best Russian isinglass, 50 grains, dissolved in 3 ounces of water, supported 9 ounces of shots, the temperature being the same.

A NEW marble has been discovered in the Giant Mountains of Bôhemia, which is described as in every way equal to Carrara, both in whiteness and fineness of grain, and invaluable for sculpture.

A NEW ENGLISH OIL TESTING APPARATUS.

A new apparatus for testing the explosive or non-explosive character of petroleum oils as they are used in lamps, has been devised in England, but notwithstanding it seems a good one, no patent has yet been taken out for it. It consists of an ordinary spirit-lamp with small flame, A.

A water vessel, B.

An oil cup, C, two inches of which descends into the water bath, and which is filled with oil up to the rim, which surrounds the oil cup about one inch from the top, and which forms a rest for the cup in the water vessel.

D shows the space which is left for the collection of vapor as it is given off by the oil. This cup is fitted with a brass cover, through which, in a nicely fitted brass slide, the thermometer is passed into the oil. In this cover there are also two small holes, E, and these are covered by two circular pieces of brass, which are raised or lowered simultaneously by a gentle pressure of the thumb, upon the brass lever, F.

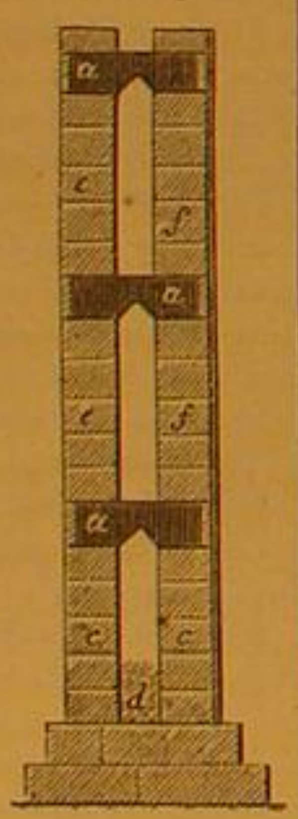
When the oil is under the test the brass caps are supposed to be down to prevent escape of vapor. When it is intended to apply the flame for the flash, the lever is touched, and the two brass caps fly back. A "small flame" is applied to one of the openings, and if no flash is obtained, these openings are again covered up, and the small flame applied again at short intervals until the flash is obtained.

The apparatus appears to meet several objections brought against the present mode of testing. For instance, it may be used anywhere without the fear of the vapor being blown away; and the flash may be applied without the fear of heating the surface of the oil with the flame. It is not open to any of the objections raised against screen or cover, and the waraing that "the flat rim be not covered with the liquid" can, in this case, be made no point of dispute.

In order to prove the correctness of any test, it is proposed to place a second thermometer in the water. Should this thermometer indicate the same temperature as the one inserted in the oil, both being correct, and the flash be then obtained, it is said that this demonstrates to a certainty that the real and true flashing point of the oil is that expressed by both thermometers. One objection certainly is met by this process of proving the test. In this case it cannot be said that any portion of the oil is raised by the latent heat of the water to a temperature higher than is indicated by the thermometer.

CONSTRUCTION OF HOLLOW WALLS.

An invention has been recently patented in England, having for its object an improved construction of hollow walls.



Our engraving is a vertical section of a wall built in this way. The wall ties are flat plates built into the vertical joints of the wall. The ties may be made of cast or wrought iron, zinc, or slate. They are made with notches on their lower edges to prevent water from flowing along them from the outer wall to the inner one. The width of the tie is somewhat more than the thickness of a brick, so that it bears upon the bricks both below and above it, and its length is such that it may be firmly imbedded in both the outer and inner wall. It also has perforated ends to allow the mortar to penetrate it. Walls constructed in this manner always keep dry on the inside and are excellent non-conductors of heat.

Faraday's Success as a Lecturer.

The *Chemical News* says of Faraday's success, as a lecturer, that it may be attributed to his careful attention to strict rules, of which the following were found among his notes:

Never to repeat a phrase.

Never to go back to amend.

If at a loss for a word, not to ch—ch—ch, or eh—eh—eh—, but to stop and wait for it. It soon comes, and the bad habits are broken, and fluency soon acquired.

Never doubt a correction given to me by another.

In addition to this strict attention to rules, Faraday took lessons in lecturing in 1823, and again in 1825 and 1826, before giving his first course of lectures in the institution.

DOMESTIC WATER FILTERS.

There are many situations where the blessing of good wells or running streams cannot be enjoyed, where the supply is bad, or the only resource is the roof and the eavestrough. Thanks to the persevering efforts of the inventor, no family need now to suffer from the lack of pure and wholesome water; for the "Family Filter" is a ready and effective apparatus by which rain and other waters may be quickly purified, and the taste of the nicest spring imparted.

For a long time we have had at our country residence the "Kedzie Family Filter," and we regard it as an excellent device. In form and size it resembles an ordinary oak barrel, is bound with iron bands, and contains filtering media of silex and carbon. The cistern or other water, poured in at the top, passes through the filter, and is drawn off, pure and limpid, from a faucet below. This filter is portable, durable, and satisfactory in every respect. Several different sizes are made. Patented 1864. Manufactured by Kedzie & Bunnel, Rochester, N. Y.

Improved Shovel Plow.

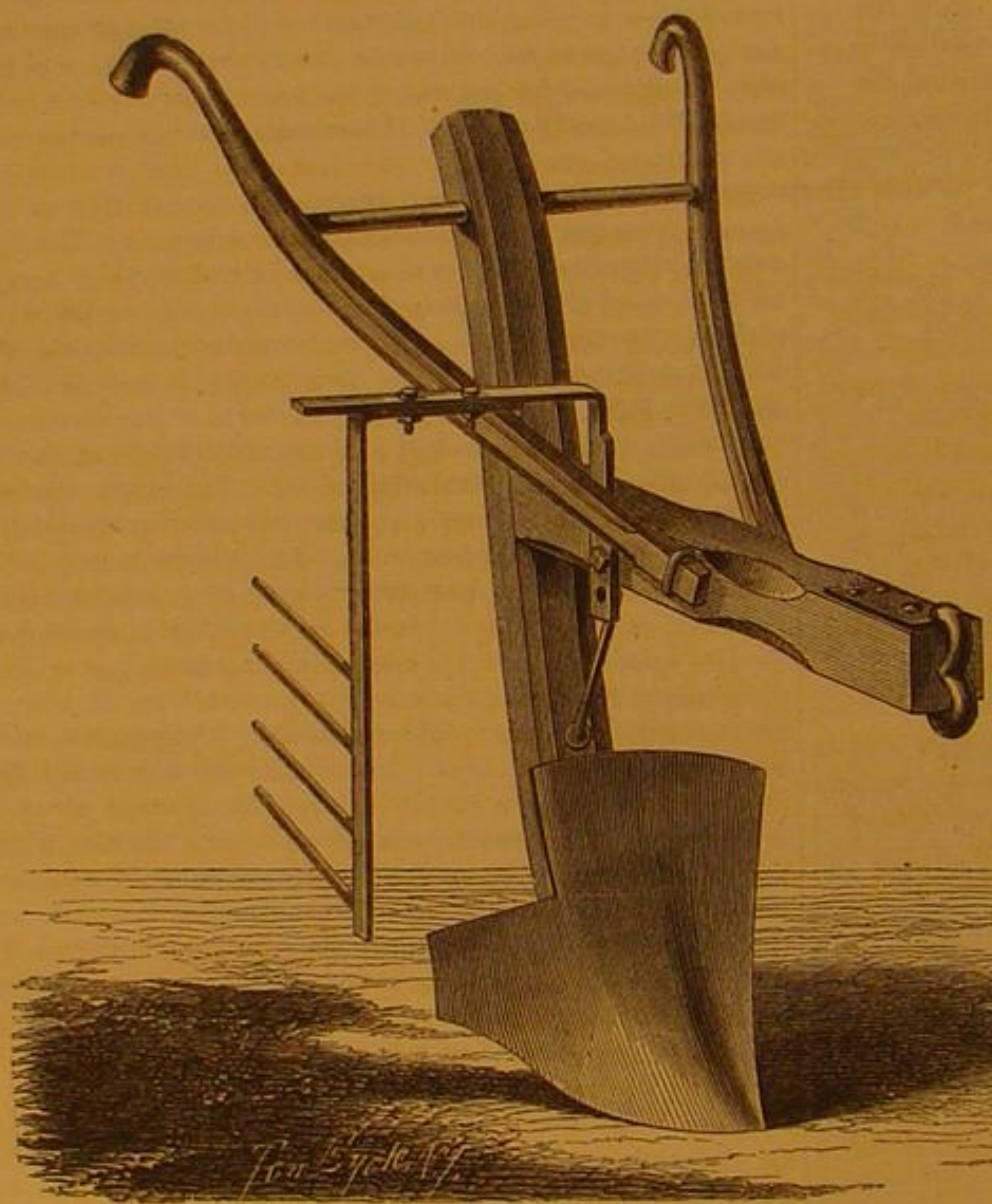
Past experience on the farm in the inconvenience which the device illustrated herewith is designed to obviate, would suffice to convince us of its value without the extraordinary number of testimonials from practical men, which the inventor has laid before us. There is no doubt that the inventor has succeeded in producing a decided improvement on the old form of the useful implement known as the shovel plow.

The whole form of the device is perfectly delineated in the engraving. The object of the device is to prevent the deposit of stones or heavy clods upon the young plants when cultivating, while the fine dirt shall be thrown up along the side of the hills, and thus approximate in effect, hand hoeing.

For this purpose he attaches an iron or steel arm to the beam of the plow, from which depends a grid, which, while it prevents the lateral throw of the large clods or stones, freely permits the passage of the fine loose earth. As the arm is jointed, as shown, the grid or guard may be laterally adjusted to suit the width of rows, etc.

The draft strain upon the lower part of the guard arm may be supported by a rod, one end of which hooks into a hole in the grid, and the other to the framework of the plow.

The guard-arm may also be adjusted to any hight to suit any depth it may be desired to plow. The forward part of the descending bar should be sharpened so as to pass readily through grass, weeds, and other obstructions. The improvement may be attached either to single or double shovel plows with equal advantage and facility.



JENNINGS' SHOVEL PLOW GUARD.

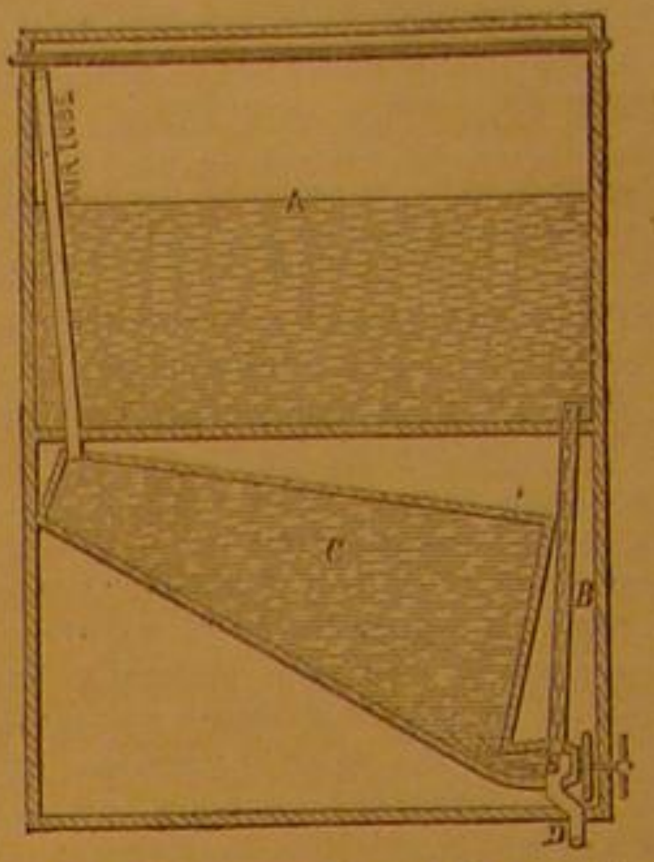
By the use of this improvement all injury to young and tender plants, by the falling thereon of heavy clods or stones, is obviated; and we should think that in many kinds of soils, there would be no need to follow it either with a hand hoe, or to straighten up plants.

The device was patented August 24, 1869, through the Scientific American Patent Agency, by Gregory Jennings, of West Cairo, Ohio, whom address for further information.

NEW APPARATUS FOR MEASURING OIL.

A new apparatus for measuring oil, an engraving of which we give, has been recently patented in England, which seems ingenious and effective, while it is at the same time safe and cleanly. Our engraving is a section of this ingenious device. It consists of an upper cistern, beneath which are placed one or more measures of different capacity, according to the requirements of the shopkeeper. The measures are self-filling.

The measure is supplied by the inlet, B, which conducts the liquid to the measure, C, but when the handle of the tap, E, is turned, the inlet is shut off, and the liquid allowed to run out of the measure into the vessel placed for its reception. Now, when the measure is emptied, of course it must be filled again before another measure of liquid can be drawn from it; so, to prevent waiting for the measure refilling, or the chance of making a mistake by turning the tap before the measure is refilled, and thus giving short measure, two measures of equal capacity are placed together, and the taps connected by means of two cog wheels, so arranged that when one measure is emptying the other is filling, and as the outlet pipes of both measures are conducted into one, another quantity can be measured as soon as the preceding one has run off, and can be continued as long as the supply is kept up in the cistern, which can be connected by means of a pipe to any cistern, cask, or reservoir, situated either in the same room or any place outside. Measures of any number or capacity can be fixed



to one machine. Each measure may be examined and adjusted, and the legal stamp affixed by the official sealer and stamper of weights and measures, and as the measures are all incased they cannot be tampered with, so that the purchaser may be sure of full measure, and the seller will not be liable to suffer by waste.

The advantages claimed for this instrument are accuracy, cleanliness, economy of space, and a saving of time in attending to customers; for instance, a person possessing a machine with half pint, pint, quart, and two quart measures, having customers in the shop requiring one of each quantity, their vessels can be putunder the measures and will fill at one and the same time, and as the liquid will stop running as soon as the exact quantity has run out, the attendant has no need to watch it, but can be helping his customers to something else in the meantime.

Manufacture of Tracing Paper With Petroleum.

Mr. Häusel, architect at Neustadt, Grand Duchy of Hessen, being once in need of tracing paper in a small village, where none could be obtained, thought of using, as a substitute, ordinary writing paper saturated with petroleum by means of a brush. The effect was a surprising success. It did not take him more than four or five minutes to paint a sheet of writing paper with petroleum and to wipe it off till it was dry. He thus obtained an excellent tracing paper, on which he could write and print just as easily as if it had not been treated with petroleum. Also drawing paper, when impregnated with petroleum, becomes sufficiently transparent to be used for tracings. Since Mr. Häusel made this discovery, he has never used any manufactured tracing paper, but has always preferred to use petroleum paper, which he can make himself at any time. He strongly recommends his method to all who can make use of it.

STEAM ENGINES AT THE AMERICAN INSTITUTE.

The Self-vindication of the judges on steam engines at the late fair of the American Institute, which appears in another column, is simply a reiteration of the apologies made in their published report for their very eccentric action in the awards of prizes. The committee seem to felicitate themselves upon the happy idea that our criticisms were based upon information obtained from interested parties. Unless the judges themselves wish to be understood as interested parties, we deny the impeachment. Our criticism has been based upon the report of the judges themselves; and our convictions are strengthened by the attempted vindication which they have felt compelled to make. They are entitled to a respectful hearing; but we are still of the opinion that the less they say upon the subject the better it will be for their reputation.

Mr. T. Lidstone writes to the *Builder* that having examined the gravestones of the family of Newcomen, the inventor of the steam engine which bears his name, he finds his name is spelled Newcom*in* instead of Newcom*en* as is the modern usage.

The Leclanche Battery.—We would say to the numerous correspondents inquiring in regard to the Leclanche Battery, that we have given all the information we possess, and can answer no further inquiries in regard to it.

It is stated that the action of the voltaic current for a month upon wine greatly improves it.

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Contents:

(Illustrated articles are marked with an asterisk.)

THE RUMFORD MEDALS.

The recent presentation of the Rumford medals to an eminent American engineer and inventor, has excited much attention in scientific and mechanical circles, and it seems appropriate to give a brief history of the origin of these medals and the nature of the honor conferred by their award.

Benjamin Thompson, Count Rumford, was born in Woburn, Mass., in 1753. He received only a common-school education, and entered a country store as a clerk at the age of 13. During his clerkship, which lasted some four years, he employed his leisure time in study (more particularly of medicine and physics) to such good purpose that in 1770 he was qualified to teach an academy in the town of Rumford, N. H., now Concord, the capital of the State. Two years later he married a wealthy widow, and also received a commission from the Governor of New Hampshire creating him major in the militia. Through personal jealousy on the part of older officers, he was charged with disaffection to the cause of the American colonies which resulted in his leaving Rumford for Woburn, and soon after the latter place for Boston.

He was subsequently tried at Woburn, and although not fully condemned, was neither fully acquitted. He finally left the American lines, and when Boston fell into the hands of the British, he became the bearer of dispatches to England containing the announcement of that event.

Remaining in England he became the secretary of Lord George Germain, at that time Secretary of State for the Department of the Colonies. He subsequently returned to America and raised a regiment of dragoons, receiving the rank of lieutenant-colonel. Again visiting England, and hostilities being at an end, he obtained leave of absence and traveled in Europe. Finally, settling in Munich, he interested himself in military and social improvements and reforms, performing important services, in consideration of which he received his title of Count Rumford, the latter part of the title being chosen by himself. Shortly after, his health being impaired, he traveled in Italy, and finding that he did not improve he visited England.

For a long time previous he had made the subject of heat a special study; and while he remained in England he continued his investigations with highly practical and beneficial results.

Returning to Bavaria, and finding that the climate still disagreed with him, he ultimately settled in Paris, where he spent the remainder of his life. He died Aug. 21, 1814.

His time in Paris was mostly devoted to scientific and philosophical inquiries and investigations. The most important of his investigations were upon the relation of heat to friction, and the experiments he performed were among the most remarkable of all those from which the basis of the modern theory of heat has been derived.

Some time previous to his death he instituted prizes for discoveries in heat and light. These prizes, consisting of a gold and a silver medal, were to be awarded by the Royal Society of London and the American Academy of Sciences. Their intrinsic value is $300, and they are only to be given by the American Academy of Sciences to authors of improvements or discoveries in heat and light, in any part of the continent of America or of the islands of America—preference always being given to such discoveries as shall, in the opinion of the Academy, tend most to promote the good of mankind. To this end Rumford donated the sum of $5,000 to this institution July 12, 1796.

At a late meeting of the Academy this prize was bestowed upon Mr. G. H. Corliss of Providence, R. I., for his improvements in the steam engine. The award was made by Dr. Asa Gray, in a very appropriate address in which the merits of Mr. Corliss' improvements and inventions were ably stated and which was very briefly, but gracefully replied to by Mr. Corliss, in accepting the medals.

This is the fifth medal awarded by the Academy, the recipients, and their discoveries and inventions being as follows, in the order stated:

1. Professor Hare, for his oxy-hydrogen blowpipe.
2. Capt. John Ericsson, for his hot-air engine.
3. Professor Treadwell, for his improvements in the construction of ordnance.
4. Mr. Alvan Clark, for his new mode of grinding and perfecting large lenses.
5. Mr. George H. Corliss for his improvements in steam engines.

We congratulate Mr. Corliss on the receipt of this high and well-deserved honor. He has long been widely and favorably known through his inventions, and the appropriateness of the honor conferred will be recognized by all acquainted with his improvements.

SOLUTIONS FOR HARDENING STEEL.

Of all the departments of the mechanic arts probably none is so completely enveloped in superstition and bigotry as that of hardening and tempering steel tools. We have scarcely ever met a man claiming skill in the art who had not some notion upon the subject which *his* experience seemed fully to confirm, or who did not advocate some practice for which he could assign no solid reason. Moreover we never recollect hearing anything recommended as more efficacious than simple water, that some one else would not be found to scout as utter nonsense, but who, at the same time, was a firm believer in something else perhaps even more absurd.

A certain individual, who shall be nameless, tempered stonecutters' implements in cow's urine, and expressed himself as perfectly able to change the character of the steel by using instead the urine of a calf. To our query whether he had ever tried the urine of a jackass, he replied that he had no doubt it had peculiar virtues; and we left him to pursue his experiments "on this line" feeling that many a shining light is hidden by the prejudices of an unbelieving world.

A page might be filled with the record of all the preparations, mixtures, charms, etc., by the use of which success in the tempering of steel has been attempted, and each of which has had its admirers.

A certain virtue has been, by many, supposed to reside in leather shavings, by which, it a tempering fire *be kindled* with them, immunity from cracking is secured; and Byrne states that a man who had tried it told him that, although before its use he was greatly troubled by cracking while tempering, since he had found out the virtues of leather as a preventive, not a single case of cracking had occurred, though he had used it for years.

Argument, of course, would be useless with such an individual; his experience (sic) would weigh with him more than anything that could be said by any one else, though the experience of the latter might have shown the utter worthlessness of the article in which the former placed blind and implicit faith.

The state of things which we have described is scarcely to be wondered at, when we reflect that all knowledge on the subject of hardening and tempering steel is empirical. Nothing is accurately known about it except that when steel is heated and suddenly cooled it becomes hard and brittle, and that by heating it again its hardeness and brittleness may be reduced to the degree required, and that this change of character is a molecular change of some kind yet to be determined.

The suddenness of the cooling is of course affected by the rapidity with which the cooling medium conducts or conveys away heat; and any change in the character of the medium which does not increase or diminish its conducting power would certainly seem to have little to support it. Of course the character of the objects to be tempered will indicate in some measure the mode employed. The watchmaker often heats his tiny drills in the flame of a candle, hardens them by sticking them into the cold tallow, and draws the temper by the same flame.

A little salt thrown into the water employed for tempering is quite generally supposed to add to its virtues, but a competent experimenter informs us that in a large number of experiments instituted to test the truth or falsehood of this notion he found nothing to support it.

Thin and small objects, which only need a small degree of hardness, may be advantageously hardened in oil for the reason that it cools them less suddenly, and therefore does not make them so hard as water would, while for large articles requiring to be very hard, quicksilver has been employed with success for precisely the opposite reason.

A recipe for hardening mill picks, which, slightly varied in its proportions, has quite a reputation, is as follows: Two gallons rain water, one ounce corrosive sublimate, one ounce sal-ammoniac, one ounce saltpeter, and one and one half pints of rock salt. The picks to be heated to a cherry red and hardened, and the temper not to be drawn. It is claimed that the salt gives hardness, and the other ingredients toughness to the picks; but no reason why they should do so seems tenable, as there certainly is no chemical reaction in the bath by which these results can be accounted for.

We hazard the opinion that simple water would be just as good, and that for all moderately-sized articles it is just as good as any solution that can be made, though of course in a matter depending so much upon personal judgment as the hardening and tempering of steel, we should not expect any man to succeed perfectly at first with any bath to which he had not become accustomed.

Correspondents frequently ask us to recommend to their use solutions for tempering; but with the views we have stated it will be seen we cannot conscientiously indorse anything of the kind; if given at all it has therefore been generally upon the recommendation of others rather than upon any convictions of our own in regard to the merits of such preparations.

STUDY OF FIRST PRINCIPLES BY INVENTORS.

Let us suppose a man skilled in the use of tools and able to construct what his brain conceives; or at least able to superintend its construction, and get it properly done. Let us further suppose our mechanic to have an inventive mind, capable of striking out new and useful methods of accomplishing work by machinery. Suppose this talent to be so great that its employment in invention is very desirable, and if properly directed, more likely to prove profitable than any other business in which he can engage. Now what kind of knowledge will this man need, in order that his native talent and acquired skill may work untrammeled? We answer he will need first a sufficient knowledge of mathematics to be able to gain a knowledge of first principles; and second, he will need to know the first principles of physics, as well as the first principles upon which modern methods of changing crude materials into finished fabrics are based.

The knowledge of the first principles of physics is necessary not only to render comprehensible the means of transmitting motion and its conversion into work, but also to prevent errors in conclusions in regard to proportions of the parts of machines, and the results which will follow combinations of parts. The knowledge of the first principles upon which modern industries are based is necessary; for, in most cases, these principles must underlie any new method he may be able to devise. Peculiarities of cotton, wool, silk, or linen machinery, originate in the different nature of fibers. Cotton fibers may be readily drawn longitudinally in either direction; wool fibers draw only one way, and need oiling or lubricating in order to be worked; flax fibers will not draw unless wetted; silk fibers are spun to hand by the worms, and are simple threads needing only to be wound, doubled and twisted previous to weaving.

We might go on through all the category of modern industries, and find in each an illustration of the truth that the principles upon which they are based are really first principles, which must be observed in any process designed to supersede them.

Thus the principle upon which sulphur and phosphorus are removed from iron is a fundamental one connected with the very nature of those impurities; namely, their greed for oxygen. And all the methods, from puddling up to the Bessemer, Heaton, and Ellershausen processes, devised to eliminate sulphur and phosphorus from iron, have been based upon the property mentioned. Bessemer puts in oxygen by pumping air into the molten mass; Heaton puts in oxygen chemically combined in nitrate of soda, which, decomposing by heat, liberates its oxygen to combine with the sulphur and phosphorus; Ellershausen puts in the oxygen combined with iron, as found in certain ores; while the old method of puddling consists in stirring the partially melted ore and exposing it to the free oxygen of the air. All these processes rest on a common basis.

The knowledge of first principles comprises what is generally understood by the term theory; and while we are ready to admit that theory alone cannot subserve the purposes of the inventor or the mechanic, we maintain that practice alone will not answer. The truly great inventor gets as much of both as he can.

The inventor should therefore familiarize himself with processes of all kinds, and should first seek to learn the general and fundamental principles which underlie the details, rather than the details themselves; as the details will be far more readily understood and retained in the memory by adopting this method of study, while an intelligent conception of the purpose of each will also be gained by subsequent study.

PUMPING DOWN BUILDINGS.---FALL OF THE DINING HALL OF KING'S COLLEGE, LONDON.

In a recent article entitled pumping down buildings, we alluded to the fall of King's College, London, as an instance of the results to be expected from tapping water bearing strata underlying heavy structures. We have received through our European exchanges further particulars in regard to this event and the causes which led to it, and they strikingly confirm all that we have said in our previous article.

It seems that the cast-iron girders of the building had been weakened by the cutting out of the top flange for convenience in fixing them. This flange, therefore, instead of constituting about half of the whole strength of the girder, became only an additional burden to be supported.

These girders had, however, withstood all strains brought to bear upon them some thirty years, yet when they broke, it was found they cracked at the points where the flange had been cut out, the fracture indicating that the metal was sound up to the time of the building. With the same usage the structure had ordinarily been subjected to, previous to the catastrophe, the building would undoubtedly have stood a century longer.

The prime cause of the fall was, without any doubt, what we stated in our former article. The surface upon which the building stood, and upon which other important and massive buildings now stand, including the massive cathedral of St. Paul's, consists of beds of brick clay of various depths under which lies a stratum of gravel also of varying thickness; and underneath this gravel lies a stratum of stiff blue clay. The *Builder* states that "through the bed of gravel or beach, penetrated as it is everywhere by water, the engineer of the Thames Embankment has cut a broad and deep trench to the clay below. The foundations of the granite quay wall rest on this geological rock, at the depth of 32 feet 6 inches below Trinity high water mark. To excavate and to keep clear these foundations, a steam engine of fourteen-horse power was in each section constantly at work, and the chain pump which it propelled, discharged a perfect river from the subterranean source. The flow of water thus caused would not desist from exerting its own mechanical influences, out of respect for the Lord Mayor, or for any of the officers, institutions, or buildings of the city of London. What the natural effect of this mighty pumping would be in theory, we all know. Gradual loosening of the permeable stratum, displacement of the smaller particles, consequent tendency of the larger ones to come down together, disposition of the whole water supplying area to move microscopically, infinitesimally it may be, but still with mathematical certitude. As to this there could be no doubt, although we had small thanks for saying so fourteen months ago.

"One point might have been considered doubtful, and that was how far the weight of any massive building compressing and consolidating this adjacent gravel, might have prevented the mischievous action of the infiltration (or rather, if there were such a word, exfiltration) of the water. On this point we have now not only information, but a flood of light, and a very unpleasant flood into the bargain."

How far the same cause which produced the disaster alluded to will affect other more important structures remains to be shown. Certain it is that eminent architectural authorities have predicted further calamity unless the most prompt and skillful measures are applied to their prevention. The embankment has stopped where it is, and precautionary measures in the provision of tie-rods, etc., have been made to such structures as show signs of having been injured.

TEST OF TURBINE WATER WHEELS AT LOWELL, MASS.

Whether a competitive test of anything can at this day be conducted anywhere under the shadow of the wings of the American Eagle in such a manner as to enlighten the public as to the merits of the thing tested, becomes annually more and more doubtful. To implicitly cling to such a faith in the face of two events of this kind which graced, or disgraced—which you will—the year 1869, argues such a trustful spirit on the part of the possessor of such a blind faith, as must certainly render him the most unsophisticated of mankind.

The two events referred to are the tests of steam-engines at the late fair of the American Institute, and the test of turbine water wheels at Lowell, Mass. The announcement of the latter in this journal last June, aroused more attention in the American mechanical public than any other event of the year. Not only ourselves, but Mr. James Emerson, whose dynamometer was employed to test the power of the wheels, were flooded with inquiries concerning it. Mr. Emerson states that the publication of this announcement "decided two points conclusively: first, the extensive circulation of the SCIENTIFIC AMERICAN, and second, the immense interest felt throughout the country in regard to the test." He says: "I have received letters of inquiry from the most out-of-the-way, unheard-of nooks and corners, from every State and Territory in this country, also from the British Provinces."

We wish that we could now say that the test had proved something as well as the announcement. The latter it seems proved two interesting and important facts; but, so far as we can learn, the test either has proved nothing, or it has proved what the parties interested do not care to publish.

The public was invited to attend this trial, and it was generally understood that it was to be conducted in an open and fair manner, and a report made in detail describing the construction and peculiarities of each wheel; if they were made of metal, and if so what kind; if they were finished better than those ordinarily made and sold, or if taken promiscuously out of the stock of the manufacturer. In short, to render the publication of a test of this kind of any practical use or interest to the public, all the conditions under which it is conducted must be known. We have received from Mr. Emerson a report of the result obtained by each wheel, but it is very meager and not by any means complete. Simultaneously with its receipt, our editorial mouth is stopped by the receipt of letters from different exhibitors, warning us against its publication, and stating that it is unauthorized. Writing in this dilemma to Mr. H. F. Mills, of Lawrence, Mass., who conducted the tests, and has, we believe, some reputation as an hydraulic engineer, and who is stated to be the only person authorized to make a report, we learn from him that the public were only invited to witness the test of a *single wheel*, and that a full report upon all the wheels tested will not probably be given.

This being the case, we find ourselves sufficiently human to rejoice in the statement of Mr. Emerson to the effect that, before the Lowell test closed, he went West to test a new wheel, which gave better results than any wheel tested at Lowell, and which will be brought to the East next season to compete with any or all of them. We hope this may be so; but really we find it a difficult matter to believe reliable tests will be made, or that if the tests should be reliable, that the reports will be. We wait with some curiosity to see how the new-comer will come out.

BLACK RIVER FLOOD CASE.

A case of more than usual interest to civil engineers, involving important hydraulic questions, has been pending before the State Board of Canal Appraisers for several months, and is now completed, as to the testimony, and the issues of claim and defense.

In April, 1869, a large reservoir, built by the State in 1856, at the head sources of the Black River, as a feeder to the Black River Canal, was carried away during a spring freshet. A large amount of property was injured by it, along the upper portion of the river; and claims for damage have been made along its whole line, or about 100 miles. The case is tried under a special law of the last session, and involves about $750,000 aggregate damages.

The theory of the claim is, that the State has been negligent in the construction and superintendence of the reservoir, and in consequence of this negligence the damages occurred; for that portion of the damages at and below Carthage, a point about 73 miles below the reservoir, the claim identifies the reservoir rupture as the cause.

On the other hand, the Counsel for the State aver that the rupture occurred during an unprecedented flood, which no engineering skill could have provided for, and that the reservoir rupture did not have sufficient time and power to cause the damages claimed below Carthage.

The Counsel more directly engaged were the Hon. C. H. Doolittle, of Utica, with Messrs. C. A. Sherman and J. T. Starbuck, of Watertown, for the claimants; and Messrs. L. H. Brown, of Watertown, Samuel Earl, of Syracuse, and Chas. Rhodes, of Oswego, for the State. The issue having been mainly dependent upon hydraulic principles of construction and action, the expert witnesses were Hon. W. J. McAlpine and Chas. H. Haswell, Esq., associated with Samuel McElroy, Esq., by whom the case was specially investigated on the part of the claimants; and Messrs. D. Greene, and L. L. Nichols on the part of the State, the latter having been more particularly identified with the case.

As part of the testimony, Mr. McElroy submitted an elaborate analysis of the case, discussing the questions at issue as to the construction and care of the reservoir, the theory of its rupture, and the descent of its flood to Lake Ontario. In this paper the several elements which control the action of the freshet and the descending flood, the topography of the river, drainage area, history and several states of the freshets, testimony as to times and extent of damage, and principles of flood-flow are fully treated, and furnish a large amount of information on a subject not often presented.

The point, however, in the case, which is the most prominent, is the development here on a large scale, of the theory and action of the "wave of translation," which has been the subject of much elaborate investigation by scientific men, but is, so far as now known, first introduced here in a legal case, as a direct cause of serious damage. During the trial, the theory presented by Mr. McElroy and fully indorsed by his associates, was emphatically confirmed by the celebrated English engineer, J. Scott Russell, Esq., who was consulted at Paris, and who is identified with various elaborate investigations of this hydraulic law.

It appears that for nearly one third the length of the river and about its center, there exists a long, wide, deep basin, which in powerful freshets is filled to a great depth, averaging in this instance, about 24 feet, three fourths of a mile wide, and thirty miles long, on a central line.

At the head of this basin or "pool" there is a high fall, called Lyon's Falls, of 70 feet in low water, and about 54 feet in freshets; the hydraulic slope to the Carthage dam being about 26 feet, on the 30 miles.

The theory of these experts is, that the main portion of the reservoir flood plunging over this fall, into a deep basin, discharging, as estimated, about two thirds of 560,000,000 cubic feet of water in six hours, and capable, in all, of displacing about $4\frac{1}{2}$ miles of the upper section, displaced at the lower end of the basin an equivalent body of water, some time before its actual particles could reach Carthage, in the time determined by the laws of the "wave of translation" or "displacement swell," as Mr. McElroy here designates it.

This analysis, in discussing the "principles of flow," shows that, while certain laws of hydraulic motion have been so thoroughly investigated, as to be "implicitly trusted," circumstances occur in flood movements which modify these laws. This general theory is then illustrated by examples from "confluent streams," "overfall weirs," and "submerged weirs," and the experience on the large aqueducts of the country. The paper then proceeds:

"In the upper valley of the Black River, we find the wave traveling with an advance 'bore,' which may or may not have been preceded by a more quiet sheet of water, the rush being distinctly marked at various points; from Dawson's to Bellingertown, and from Forestport to the Lee Bridge, the observed speed approximates to about one half the calculated central velocity; in the lower valley, similar phenomena of action were observed, the 'bore' being distinctly defined on the Carthage dam, at Rason's, Great Bend, and other points.

"In the long reaches, however, and the pool, the descending wave could not take possession of the channel, from the mass of more quiet water it successively encountered, and a different principle of relief is brought into action, by which mechanical impulse is transmitted in advance of actual molecular movement.

"The investigations of science have determined that all liquids and fluids have certain analogous laws of motion and action, and in the movement of light, sound, electrical currents, as also in water, action is frequently most perfect where actual movement of particles is impossible in the same degree. Nature has provided this wave action as a means of communication, which does not involve actual molecular delivery, in those cases where such delivery is inadmissible."

* * * * * *

Various examples are then cited; the experiments and deductions of Scott Russell are given; and the remarkable confirmations of the Hudson River and Long Island Sound tidal waves are described, with this application:

"Now this flood-wave mass was entirely able to sweep down the River Channels of Lyon's Falls, because it found a comparatively free path to travel in, and its whole body in the main, did so pass down; but when the 15,654,000 gross tuns of water, which represent it, plunged over the Lyon's Falls' dam with an impinging velocity of 58 feet per second, a comparatively quiescent body of water, more than seven times its weight, was interposed against its free progress further. According to the laws and examples we have cited, two distinct results followed: one, the displacement of a portion of the pool, equivalent to this falling body, at the other end, by the action of the "displacement swell;" and another, following as an inevitable sequence, was the increase of the former current of the pool towards Carthage."

It is then shown by applying D'Aubuisson's formula to this case, that the time of transmission of motion to Carthage through a basin of this depth is two hours, and the observed accelerated current is between six and eight miles per hour. Various phenomena which corroborate this action, are also cited.

The conclusion, identifying the reservoir flood with the progress of damages along the river, and confirming these calculations by a series of observed facts, is thus given:

"At Dexter (the river mouth), Parker, by 7 A.M., the 22d (April), records accumulated damages; at Watertown, shortly after 5 A. M., serious damages occurred; at Great Bend, by 2 A. M., there was a rise, 3 feet to 3 feet 9 inches, above level of 1862; at Carthage, about 1 A. M., the rush over the dam had swept away a stone wall, and other damages were done that night, doubtless by the same means; at Lyon's Falls, the great reservoir wave struck the pool, then at a stand, certainly by 10 P. M., with a probable advance before this; at Port Lyden ($3\frac{1}{2}$ miles above) the corrected testimony makes it plain that this advance may have passed at 7, that the 'bore' passed about 9, and that the full crest swept through at midnight. This forms a chain of evidence which fully accords with the deductions of science, with observations of the highest importance in other localities, and the testimony of localities all along these 70 miles, which differs only in minor details. It is impossible to escape from the conclusion which identifies these events with the same powerful cause, all the more destructive as riding down its successive descents on the fully prepared water way of a powerful freshet, without which it would have been shorn of a great part of its power and swiftness, and whose volume it gathered up and hurled along on its resistless path."

During the trial, an experiment was given by Mr. McAlpine, with a narrow trough about 8 feet long, filled with clear water, the lower part being then charged with blue coloring, and the upper part supplied with red colored water. This illustrated with great exactness, the law of displacement, long before the upper supply reached the lower ledge, and also illustrated the relation between the power of the upper supply and the lower delivery.

All the details of this case involve important principles, which will make a precedent for similar issues hereafter.

FOREMEN AND SUPERINTENDENTS.

The qualities which are essential to a good foreman or superintendent of a manufacturing establishment are rarely all combined in a single individual. When they are not naturally possessed in a high degree, they may, however, be so developed by education and self-discipline as to, in a great measure, supply natural defects. Such education and discipline, however, must, to be successful, be early commenced; and as doubtless many young mechanics who peruse these columns are aiming to qualify themselves for positions of trust and command, it may not be amiss to discuss briefly the qualifications of a first-class foreman and superintendent.

We do not regard it as absolutely essential, though, if possible, desirable, that the foreman of an establishment should be able to perform himself all the various operations, as conducted in it. It would be in many cases almost impossible that should be able to do this, but he ought to be able to determine when these operations are performed unskillfully, so that he may himself instruct, or select subordinates who are competent to instruct operatives how to do their work in the best manner.

In many large manufacturing establishments, and in all large manufactories of textile fabrics, the general supervision is vested in a manager or superintendent, while the different departments are supervised by foremen acting under, and by the authority of the general manager. It is impossible that all the operatives in such establishments should be skilled in their work. Many of them will be of necessity apprentices or learners, and as such will stand in need of direction and instruction. One of the duties of a foreman must therefore be that of an instructor, and an important and responsible duty it is, requiring for its proper execution, patience, power of imparting information with clearness, perception, not only of defects in work, but in the peculiar deficiencies of hand or mind which are primary causes of unskillfulness. And he must not only be able to detect, but to devise readily remedies for such defects where remedies are possible.

Of all the means by which instruction can be readily imparted, especially in those departments of the mechanic arts where skill is required to fashion crude materials into a great variety of forms, there is none of greater value than free-hand drawing. A few strokes with a piece of chalk or a lead pencil, performed by a trained hand will often do more towards imparting a clear idea of what is desired than an hour's talk; and a sketch of this kind has moreover the advantage that it can be left as a permanent guide, when mere oral instruction would be forgotten, and require repetition. Such sketches are for many purposes as good as more elaborate drawings; but the good foreman ought also to be able to prepare these when required. Without more or less skill in drawing there will always be more or less difficulty in the interpretation of drawings, and a good foreman ought never to be at a loss to do this readily and accurately when drawings are properly prepared.

We cannot too emphatically urge upon all young mechanics the importance of the early study of drawing, if they are ambitious to rise in their profession.

A foreman should be able to systematize labor and distribute it to the best advantage, so that the largest results shall be obtained at a minimum cost to his employer; and while able to enforce discipline, he should also have the faculty of conciliating and commanding the respect and good-will of those under his charge. To do this, he must cultivate habits of self-restraint, a love for justice, and due regard for individual rights. He must be firm without being obstinate, decided without arrogance, and capable of administering reproof without loosing control of his temper.

Finally, he should be well informed in all facts immediately or remotely pertaining to the industry which he assumes to direct, and should keep himself thoroughly posted in current information pertaining to it. With such qualifications success cannot fail to attend the efforts of any superintendent or foreman who possesses the other essential of a business man—industry and integrity.

DIVING AND DIVING APPARATUS.

No operation in submarine engineering is more important or attended with greater personal risk than diving. This art has, however, been so far advanced, and apparatus for diving has been so far perfected, that divers now descend to depths of over one hundred feet, and not only remain there with impunity, but actually perform work. It seems sufficiently marvelous that human beings can, without performing any useful work, remain at such extraordinary depths, not only carrying upon their persons an armor which weighs one hundred and forty pounds, but subjected to a pressure of nearly nine atmospheres; but when we reflect that under such trying circumstances, the diver is frequently called upon to perform operations of considerable nicety—as, for example, leveling—the feat becomes one far more wonderful than an ascent into the air by the most daring aeronaut.

In an aerial voyage the passage is made through an element congenial to animal life, and in the broad light of heaven. The body is unencumbered, and perfect freedom of movement exists in an emergency. In diving all these conditions are reversed. The descent is made into an element inimical to life; into isolated depths where the light of day does not penetrate, and where the mighty weight of water grips as in a vise, frequently benumbs, and renders more difficult the use of the already encumbered limbs.

Only individuals of peculiar temperaments can withstand the effects of great pressure in diving. A person of full habit would generally be attacked with bleeding from the lungs. His head would snap and ring with strange noises, and his copper helmet, with its little plate-glass windows, would be illuminated with more stars than Lord Ross' telescope reveals in the milky way. Individuals of the lean and hungry kind, provided their viscera are all sound, can undergo such compression with the least risk.

There are about thirty professional divers in the United States, and the annual mortality has been on the average about four of this number.

Such risks are, of course, taken only under the stimulus of high wages. The compensation of expert hands is four or five times that obtained by the same class of men in other occupations. The necessary risks are, however, sometimes increased by the reckless habits of some divers. The gang of men employed by Mr. Geo. W. Fuller, of Norwich, Conn.—one of the most scientific and accomplished divers in this country—which has been selected with great care, has never met with any fatal accident.

This is not, however, to be wholly attributed to the careful selection of men, but is also, in great measure, to be ascribed to the extreme perfection which Mr. Fuller's experience and skill have imparted to the apparatus employed by him. This gentleman has made diving a special study for years, and being gifted with great inventive talent as well as superior mechanical skill in executing his designs, he has yearly applied the experience of a large practice, in submarine engineering, recovery of property from wrecks, surveys of marine bottoms, etc., to the improvement of his apparatus.

He now employs a four-cylinder air-pumping engine to supply air to the submerged divers, which in beauty of finish, accuracy of workmanship, and perfect freedom from all possibility of leakage, we have never seen equaled. The packing of the plungers, while pressing against the walls of the pump cylinders so lightly that any plunger will descend by its own weight, is still so absolutely tight that not the slightest leak can be detected under the heaviest pressures.

This packing is the invention of Mr. Fuller, who has also made great improvements in the shoes worn by divers. These he now makes with toe caps of bell-metal, and the edges of the soles and sides of the shoes are also protected by the same material. The soles are weighted with lead, the bottoms being also armed with the bell-metal to protect them from wear. These improvements render the shoes far more durable and serviceable than the old style.

The attachments of the weights to the back and front of the armor have also received their share of improvement, which renders them much more secure and more quickly performed.

The lantern is a beautiful piece of workmanship, and we shall not attempt a minute description of it. It is fed by air from the surface precisely as the diver's lungs are supplied by an air tube from the pumping engine above. In descending its flame becomes brighter and brighter, until at the depth of a hundred feet it glows with the whiteness and brilliancy of the calcium light. This result is attributable to the condensation of the air, which increases the amount of oxygen contained in a given volume.

The hoisting apparatus has also been so far perfected by the efforts of Mr. Fuller that it is now generally adopted by all the heavy wrecking companies in the country. The Coast Wrecking Company assert that this machine has never yet found its equal.

It is safe to say that the advancement in the art of diving achieved by Mr. Fuller could only have been accomplished by a man combining the practical experience of the diver, with intelligence and skill as a practical mechanic.

So far as we are aware, he is the only man in the country who combines these requisites. Every part of the apparatus employed by him has received the closest study, and a minute of any suggestion arising from new exigencies or requirements in practice is always made on the spot where it occurs for future careful consideration. In this way Mr. Fuller has accumulated a large mass of interesting information upon which we have liberally drawn for the substance of this article. At some future time we may return to the subject, which cannot by any means be exhausted in a single article.

TUNNELS VS. BRIDGES.

The East London Underground Railway is now running its trains regularly under the Thames river through the celebrated Thames Tunnel. This gigantic work was constructed at an expense of $4,000,000, greenbacks; and although originally designed for an ordinary carriage way, such is its massive character that it was found strong enough to support the heaviest locomotives. The length of this tunnel is 1,200 feet; the hight of exterior walls, 38 feet; width, 22½ feet. Two tracks are laid, and the running of the trains gives great public satisfaction.

In the face of such a successful example of subaqueous railway, which is an improvement of the most unquestionable character, always solid and secure, we behold the public spirited men of New York and Brooklyn at this moment engaged in trying to establish communication between these great cities by means of a single span suspension bridge, which, to say nothing of the immense cost and years of labor involved, will never be free from danger of falling, and can never satisfy the public wants. Every storm that blows will try its foundations; every change of temperature will weaken its wires.

The tunneling of the East River is just as practicable as the Thames. A strong and capacious tunnel can be built between New York and Brooklyn for less money, and in less time, than the suspension bridge; and when the tunnel is complete, nothing short of an earthquake can impair its safety.

Gentlemen of the bridge, we advise you to get an amendment to your charter; convert your caisson excavation into a well, from which to bore a tunnel under the river. Your bridge, if ever built, will be a monument of your stupidity in adopting the poorest method of communication, when you might just as well have selected the best—to wit, the tunnel.

WHAT IS SAID OF OUR PRIZE ENGRAVING.

We have sent out large numbers of premium engravings to those who have succeeded in getting up clubs in accordance with our terms; and it is gratifying to us to receive so many testimonials of its high quality as a work of art. We make a few extracts from letters of our correspondents, showing how they appreciate the picture.

E. L. Keeler, of Allegheny, Pa., writes as follows:

"With the greatest thanks, I take the earliest opportunity to inform you that I have received the beautiful engraving you sent me. I and my family prize it very highly. It is an engraving that every American citizen should have. It should adorn the walls of the most humble cottage. Such a group of benefactors cannot be too highly prized. Think of the thought, meditation, trials, and privations that most of these men have passed through, and the thousands now blessing what their genius has given to the world; then say who would not be proud of such a prize. I received my papers; the members of my club are highly pleased with them also. I enjoy reading them very much."

J. S. Atkinson, of Ormsby, Pa., who has already received four copies of the engraving, writes as follows:

"Please inform me how many further additions to our list would entitle us to another copy of 'The American Inventors,' and further, how many additional would entitle us to two copies? We admire them so much that we desire to procure one or two for complimentary presentation."

Henry Wheeler, of Silver Creek, N. Y., says: "'Men of Progress' reached me safely. It is a beautiful picture." Alonzo D. Lamson, of Shelburne Falls, Mass., acknowledges the safe arrival of the picture, and says "I am much pleased with the picture." F. W. Sinclair, of Mottville, N. Y., says: "The premium picture reached me in perfect order, and fully repays me for the time spent in getting a club, to say nothing of the satisfaction of introducing your valuable journal to so many of my neighbors."

We shall continue to offer this splendid engraving as a premium for clubs, at our publication rates, or if any single person wishes to procure a copy, he can do so by remitting $10, which will also entitle him to a year's subscription to the SCIENTIFIC AMERICAN.

The Atmospheric Germ Theory.

In a lecture upon the above subject by Joseph Liston, F. R. S., Professor of Surgery in the University of Edinburgh, he gives the following interesting account of one of M. Pasteur's experiments, which proves that the gases of the air cannot of themselves occasion the growth of organisms even in a very favorable nidus for their development; and also that, in the regions inhabited by plants or animals, whether in cities or in the country, each cubic inch of atmosphere really does contain living germs floating in it. "A flask was prepared having its neck not only drawn out into a pretty narrow tube, but bent at various angles. The fluid is then boiled as in the former experiments; but the end of the neck, instead of being sealed, is left open, so that air passes into the flask on withdrawal of the lamp. The vessel being then left undisturbed, the diurnal changes of temperature, involving alternate expansion by day and condensation at night of the gases in the flask, necessitate a daily interchange between the air in the body of the flask and the external atmosphere. Yet the fluid, though exposed in this way to air perpetually changed, remains for an indefinite period quite transparent, without trace of organic development. There can be but one interpretation of this fact. The oxygen, whether in its ordinary condition or that of ozone, with all the other atmospheric gases, including many which may exist in such small quantities as to be undiscoverable by the chemist, must pass, each in its own proportion, unchanged into the body of the flask. It is impossible that a dry glass tube, can stop any gas. For, though the tube is moist from condensation of aqueous vapor in the first instance, it is soon dried by the air that passes in and out through it. It is therefore inconceivable that any atmospheric gas can have been arrested by the tube. But it is conceivable, considering the very gradual character of the movements of the air in consequence of the diurnal changes, that dust, even though very fine, may be arrested by the angles. We may perhaps wonder that particles of such extreme minuteness as the germs of atmospheric organisms should be so detained; but no one can say it is impossible, and no other possible explanation presents itself. The experiment proves with certainty that the gases of the air, however abundantly supplied, are of themselves unable to originate the growth of torulæ and other minute organisms which appear in a decoction of yeast freely exposed to the atmosphere, and also that the essential source of such development must be suspended particles or germs. But in order to render the experiment, if possible, still more conclusive, the committee of the Academy completed it by sealing the end of the flask after the fluid had remained clear for a sufficient length of time to show that no organism could grow in it, and, inverting the flask, shook it until some of the liquid passed into the angles of the bent tube, after which the vessel was again left to itself. And now, occurred something which you may perhaps be disposed to regard as too good to be true, but which is true nevertheless. In the course of no long time, the fluid in the angles of the tube exhibited indications of organic growth, demonstrating that the sources or germs of of such development had, as a matter of fact, been arrested there."

Successful Experiments With a New Explosive at the Hoosac Tunnel.

Capt. Von Schelika and Lieut. Von Dittmar, both of the Prussian army, and the latter the inventor of the explosive known as "dualin," have been giving a practical illustration of its quality at the Hoosac tunnel, which has proved very successful. The experiments included trials of its power upon rocks, simply placing a few ounces on the surface and covering it with dirt—upon a boulder in the open field, the hole being drilled in the usual way and the dualin lightly "tamped" in, and in the regular work of the tunnel, at the west and central shafts. In every instance the explosive did all that is claimed for it, and proved itself a most powerful agent for breaking things. The same weight of the dualin is more effective than nitro-glycerin, while it is also considerably cheaper, and absolutely safe in the handling. Its obvious advantages over nitro-glycerin are so great that a considerable quantity of it has been ordered already, and it is probable that it will soon be exclusively used by the Messrs. Shanly in their work on the tunnel. Its great advantage is in the safety with which it can be used, even allowing for accident or carelessness. While possessing many of the properties of nitro-glycerin, it is so prepared and combined with other substances as not to be exploded by concussion—indeed, when not confined and fire is applied to it, it does not explode, but simply burns. Lieutenant Dittmar brought over with him, from Germany, 100 pounds of dualin in a carpet-bag, and we are sure he would not have treated nitro-glycerin in that confident manner. There have already been numerous fatal accidents from nitro-glycerin, at the tunnel, and any explosive that will be equally effectual, and yet safe to handle, will be a real boon to the workmen, if to no one else.—*Springfield Republican.*

COFFEE HULLING.—H. H. Houghton, U. S. Consul at Lahainee, Sandwich Islands, wishes to obtain some information about machinery for taking off the outside pulp from coffee, and also for taking the inside hull from the berry.

[For the Scientific American.]

ON REFRIGERATING MIXTURES AND THE DEPRESSION OF TEMPERATURE PRODUCED BY DISSOLVING SALTS IN WATER.

New and very thorough experiments have been made on this subject by Mr. F. Rüdorff, who has published the results obtained in the reports of the German Chemical Society.

Mr. R. there announces the following considerations and conclusions:

The depression of temperature produced by the dissolution of salts in water will generally be the more considerable the more salt is dissolved. But as a certain quantity of water does not at a certain temperature dissolve any more than a well-defined quantity of salt, the lowest temperature will be obtained by mixing salt and water in such proportions that they will form a saturated solution at that low temperature which is expected to be thereby produced. Any amount of water or salt in excess of this proportion will only increase the quantity of matter which has to be cooled down, and therefore prevent the mixture from attaining the lowest possible temperature. This circumstance has been disregarded in all previous experiments made on this subject, and it is owing to this neglect that the results obtained by different experimentalists did not perfectly agree.

If, on the other hand, salt and water are used exactly in the proportion necessary to produce a saturated solution, it lasts very long till the whole of the salt is dissolved, and the influence of the higher temperature of the surrounding air becomes then perceptible, depressing the cooling effect of the mixture. This shows how important it is to effect the solution in as short a time as possible. It is therefore advantageous to use the salt in the shape of an extremely fine powder, to stir the mixture and to have a little more salt in it than is required for saturation, a small excess of salt being less injurious than an excessive prolongation of this dissolving process.

The table given below shows for a number of different salts the most favorable percentages to be used. It also contains the general results of the experiments made by Mr. Rüdorff. These experiments were conducted in the following manner:

The finely-powdered salts and the necessary quantity of water were kept for 12 to 18 hours in a room of even and constant temperature, and before being mixed. The water was then poured over the salt and stirred with a sensitive thermometer. The mixture reached its lowest temperature in less than one minute.

The results given in the table are averages from several experiments, the results of which did not vary over two tenths of one degree Cels.

The quantity of water used was from 250 to 500 grams. The influence of the mixing vase and of the air on smaller quantities of solution is quite marked, and is always perceptible when less than 300 grams of water are used. All experiments made with more than 300 grams of water were not perceptibly influenced by the surrounding temperature; their results agreed perfectly with each other.

NAMES OF SALTS.	Quantity soluble in 100 parts of water.	Quantity mixed with 100 parts of water in the experiment.	Temperature in degrees Cels.		
			Before mixing.	After mixing.	Difference.
Alum	10·	14	10·8·	9·4·	1·4·
Chloride of sodium (common salt)	35·8	36	12·6	10·1	2·5
Sulphate of potassa	9·9	12	14·4	11·4	3·0
Phosphate of soda, crystalline	9·0	14	10·8	7·1	3·7
Sulphate of ammonia	72·3	75	13·2	6·8	6·4
Sulphate of soda crystalline	16·8	20	12·5	5·7	6·8
Sulphate of magnesia, crystalline	80·	85	11·1	3·1	8·0
Carbonate of soda, crystalline	30·	40	10·7	1·6	9·1
Nitrate of potassa	13·5	16	13·2	3·0	10·2
Choride of potassium	28·6	30	13·2	0·6	12·6
Carbonate of ammonia	25·	30	15·3	3·2	12·1
Acetate of soda, crystalline	80·	85	10·7	− 4·7	15·4
Chloride of ammonium	28·2	30	13·3	− 5·1	18·4
Nitrate of soda	69·	75	13·2	− 5·3	18·5
Hyposulphite of soda	98·	110	10·7	− 8·0	18·7
Iodide of potassium	120·	140	10·8	−11·7	22·5
Chloride of calcium crystalline	250·	250	10·8	−12·4	23·2
Nitrate of ammonia	55·	60	12·6	−13·6	26·2
Sulpho-cyanide of ammonium	105·	133	13·2	−18·0	31·2
Sulpho-cyanide of potassium	130·	150	10·8	−23·7	34·5

Mr. Rüdorff found, by special experiments, that the depression of temperature created in the mixture is less whenever a larger proportion of salt is used than that given for each kind in the above table. He also found that the depression of temperature was more variable when the salt had not been pulverized very fine.

As the solubility of some of the salts mentioned in the table rises considerably with the temperature; and as the cold produced by a refrigerating mixture depends on the solubility, or rather on the easiness and quickness with which the salt is dissolved, different results will be obtained with a different initial temperature of the mixing materials. For example, in dissolving a proper percentage of saltpeter in water the temperature sunk in one case from 23·0° to 10·2°—12·8°; in another case from 13·2° to 3°—10·2° only. It may be seen from this that a difference in the initial temperature of the material used in such experiments must produce a difference in the results finally obtained.

The low temperature created by the dissolution of a salt in water can never be below the freezing point of the solution, but it may reach that point under favorable circumstances.

In dissolving.	The temperature decreased.	Freezing point of the saturated solution.
Saltpeter	from 0° to − 2·7°	− 2·8°
Carbonate of soda	" 0° to − 2·0°	− 2·0°
Nitrate of ammonium	" 0° to −16·7°	−16·7°

Among the substances named above the sulpho-cyanide of potassium is particularly adapted to show the depression of temperature produced by the dissolution of a solid substance. When 500 grams of sulpho-cyanide of potassium are dissolved in 400 cubic centimeters of water and stirred with a large glass half filled with water, the latter will be converted into a solid cylinder of ice within two or three minutes. Sulpho-cyanide of potassium would therefore be very useful in the manufacture of ice.

The numbers contained in the first column of the above table are those found by Mr. Mulder, with the exception of the two last ones, which Mr. Rüdorff determined by special experiments. He found that 100 parts of water dissolve at a temperature of 0° Cels. 177·2 parts, and at 20° Cels. 217·0 parts of sulpho-cyanide of potassium; and that 100 parts of water dissolve at 0°, 122·1 parts, and at 20°, 162·2 parts of sulpho-cyanide of ammonium.

How Gems are Cut in Ceylon.

A writer in *Once a Week* gives the following description of the fabrication of imitative gems and the cutting of gems in Ceylon:

"The Moor traders are very expert in the manufacture of false gems. On the occasion of the building of a church in Kandy, a Moorman bought up all the broken colored glass from the painted windows; and on being asked for what purpose, confessed that it was 'to make precious shtone for English steamer-passenger at Galle.'

"They also imitate the rough stones, and occasionally even deceive the more experienced. They are sometimes themselves taken in. On one occasion a Moorman endeavored to induce one of a party of native diggers to sell him a sapphire surreptitiously, to which the Cingalese agreed; and the next day the Moorman came prowling about and watching the digging and sifting, till a beautiful rounded blue stone appeared shining among the wet gravel; a bargain was struck by a few signs, and the money and stone exchanged with the utmost secrecy. The Moorman disappeared to gloat over his knavery and his gains; but to his dismay, found that his beautiful gem was a piece of roughed glass, which the Cingalese had provided himself with and quietly slipped into his basket.

"The Ceylon ruby is seldom free from a tint of blue; and it is a remarkable fact that while the blue color can be expelled from such stones by heat, the red color is indelible, and the native jewelers avail themselves of this peculiarity to improve the color of their rubies.

"It is very common to find stones one half blue and the other half colorless, and some have merely a crust of blue on one or more sides. The native lapidaries take advantage of this in cutting, and by leaving the colored part on the under surface, form a foil which gives a fine blue to an otherwise valueless stone.

"The opalescence above mentioned is found in rubies and sapphires as well as in topaz; it is worse than any flaw in depreciating their value; a crack or cavity can be cut out, but opalescence, which is most difficult to detect in an uncut stone, reveals itself in the cutting, and often runs in a pencil through the whole breadth or length of a gem, destroying its clearness and color, and rendering it comparatively worthless. When such stones are cut hemispherical *en cabochon* at a certain angle to the axis, they form the star stone, showing a star of six rays in a strong light. This is very pretty as a fancy stone, but is of no value as a gem.

"We will now take a look at the proceedings of the native lapidary. His means and appliances are few, consisting of a pair of laps attached to spindles by a composition of resin and sand melted together. One lap is of lead, on which pounded corundum or adamantine spar is used for reducing the stones and shaping them in the rough. The other is of copper, for polishing the facets. Instead of diamond powder they use for this purpose a fine silex extracted from the calcined husks of rice. The laps are lodged in a frame and worked by a bow. The native lapidaries use no gem pegs or mechanical instruments for regulating the angles, but work entirely by eye and touch, and it is wonderful the precision they attain, although it is difficult for them to bring the gems to a perfect level by hand, and consequently all native-cut stones are known by a slight beveling of the facets. In the towns they have now adopted the European horizontal laps and fittings. The stone to be cut is fixed on the end of a stick with the same luting of resin and sand, and applied by the left hand to the vertical plate, while the right hand works the bow.

"In cutting a stone, the natives sacrifice everything to size. Gems, to show their most beautiful light and color, should be cut across the axis; but as in most cases the stones are longest in the direction of the prism and pyramid, they cut them parallel to the axis, and their brilliancy is lost. They rarely use a slicer, and the waste of gems is consequently great—the whole mass being ground away to form the end, which is largest and clearest.

"I have before noticed the combination of colors in sapphire—the Ceylon ruby being never found without a tint of blue. To expel this, when the stone is formed or polishing, it is rolled in a ball of wet lime, and placed in a pan of charcoal, which is gradually raised to a white heat with a primitive bellows or blowpipe made of a tube of bamboo; after being kept at a white heat for about twenty minutes or half an hour, the ball is taken out and allowed to cool, and when broken open, the stone will have lost the blue tint without injuring the crimson. By the same process, the tint of blue can be expelled from a stone which is nearly white; if, however, there is any crack or flaw in the stone, it is liable to fly to pieces. I should imagine that the natives discovered this evanescent quality of the blue color by accident. I knew a gentleman who had been very successful in digging, and had a number of fine blue sapphires; unfortunately his bungalow was burnt down, and among the ashes of his furniture he found many of his gems, but all as white as glass.

Manufacture of Elastic Sponge.

We extract from the *Hub* some particulars of the manufacture of elastic sponge for upholstering purposes.

"The raw sponge is received in hard dirty masses, filled with sand and bits of shell. Being soaked in a large tank of water, it expands into such condition that its quality may be determined, and it is sorted into two kinds; the "soft" for mattress stock, and the "hard" for cushions. The cleansing process, which is an exceedingly important one, then begins in another room. In order to effect this, the sponge is first cut and washed, by passing for an hour through a huge tub, in which there is a series of knives through which the sponge is made to pass by means of the movement given to the water by a wheel. The water, too, is constantly changing, so by this process the sponge is nicely cut, and its filth separated in part. It is next soaked for twenty minutes in a tank of water, containing two degrees (hydrometer) of soda ash, and heated to 150°. It is next passed into a tank containing a hot solution of very strong detergent soap, where it is soaked for half an hour with constant and violent agitation. It then returns to the first tub, where it is washed another hour and cut more finely.

"The cleansing process is then complete, and after the water has been pressed out by a passage through rollers, it is carried by the elevator to the "drying room," two stories above, where a high degree of temperature is maintained, and it is dried in large revolving cylinders. It is then clean and without smell, but hard and inelastic in character, and in its present condition, totally valueless for the purpose of stuffing. It was at this point that the inventor's skill was necessary. The pores of the sponge closed when the water had evaporated, and no permanent elasticity could be had unless these could be held open permanently. Glycerin, being a non-evaporative substance, was found to answer the purpose. The remainder of the process is then as follows:

"The dry hard sponge is placed in a solution of glycerin and water, in the proportion of about half and half, and after passing through heavy rollers it is again dried in the cylinders. The aqueous portion then evaporates, and leaves the bits of sponge dry and sweet, and so permeated with the glycerin, that a permanent elasticity is maintained. It is then at last taken to the packing room, highly compressed into bales of about forty pounds each, and is ready for market. It will be seen upon examination that the principle of the manufacture is very simple; it is necessary only *to cleanse and saturate with glycerin*, but the working out of the details, by which these two ends have been performed satisfactorily, has been the work of years. Elastic sponge, like all novelties, has had its lessons to learn and its drawbacks. These were natural consequences of its novelty, and were necessities. An invention is never born perfect. Just as a child must grow from infancy to maturity, so an invention of novel character must improve by age and experience, before it can succeed to perfection. But the days of its experiments seem to be over, and it has settled down into a standard article, upon which reliance can be placed."

The Diameter of one Pulley, the Length of Belt, and Distance between Centers of Pulleys being Given, to Find the Diameter of the Other Pulley.

Mr. John Mersom, of Charleston, S. C., sends us the following method for solving the above problem, which we place before our readers for criticism, as we have not found time to determine its truth or falsity. He says:

"The question divides itself into two parts, as the pulley whose diameter is required is greater or less than that of a pulley which is known. When this point is uncertain, multiply the radius of the known pulley by 3·1416, and increase the product by the distance between the centers of shafts. If this sum is greater than half the length of the belt, the required pulley is less than the given one; but if less, than the required pulley is the greater. In both cases divide the difference between the trial number and half the length of the belt by the distance between the centers of the shafts. In the first case call the quotient, A, and the second, B, and apply the following rules:

"1st. Take double the number A from 2·4674011 and subtract the square root of the remainder from 1·5708, and call the difference D.

"2d. Multiply the number D by the distance between the centers of shafts, and the remainder taken from the radius of the large pulley will give the radius of the less one.

"3d. When the required pulley is greater than the given one, add double the number B to 2·4674011, from the square root of the sum, subtract 1·5708, and call the remainder E.

"4th. Multiply the number E by the distance between the centers of shafts, and the product added to the radius of the given or less pulley, will give the radius of the required or greater pulley."

APPLICATIONS FOR EXTENSION OF PATENTS.

Head and Tail Blocks for Saw Mills.—E. H. Stearns, of Erie, Pa., has petitioned for an extension of the above patent. Day of hearing March 30, 1870.

Hay and Cotton Press.—Simon Ingersoll, of Brooklyn, N. Y., has applied for an extension of the above patent. Day of hearing March 30, 1870

Machine for Sowing Fertilizers.—Warren S. Bartle, of Newark, N.Y., has petitioned for an extension of the above patent. Day of hearing April 6, 1870.

Machine for Tunneling and Quarrying.—George G. Merrill, of Shelburne Falls, Mass., has petitioned for the extension of the above patent. Day of hearing April 6, 1870.

Furnace for Smelting Iron.—Thomas H. Powers, Milwaukee, Wis., has applied for an extension of the above patent. Day of hearing April 20, 1870.

Business and Personal.

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

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4·00 a year. Advertisements 17c. a line.

Peck's patent drop press. For circulars, address the sole manufacturers, Milo Peck & Co., New Haven, Ct.

For Sale—Three valuable patents. Ed. Fitzki, 1783 Penn. ave., Washington, D. C.

Wanted—A good patent-right salesman. Address Box 144, Cuba, N. Y.

Notice—For Sale or Rent—Machine shop (established forty years since) together with 40-horse engine and boiler, and shafting. Direct communication with an Iron Foundery. Terms liberal. Address Postoffice Box 985, New Haven, Conn.

Manufactors of Watchmakers' Tools, or of small cast steel castings, not to weigh over 2 lbs., and tempered, send business card to M. D. Kelly, Cadiz, Ky.

Wanted—A Mechanical Draftsman in machine works. Send working sketch, terms, and reference. G. C. Howard, 17 S. 18th st., Phila.

Manufacturers having a good business, and otherwise responsible, can obtain real estate, with water front, on Norwalk harbor, on easy terms. Apply to Geo. S. Bell, South Norwalk, Conn.

For Hub-mortising Machines, address Exeter Machine Works, Exeter, N. H.

Hackle, Gill Pins, etc., at Bartlett's, 569 Broadway, New York.

Steam Crane Cars, or Derrick Cars, wanted by Baltimore Bridge Co., 49 Lexington st., Baltimore, Md.

Wanted to manufacture on Royalty or Contract—Light but useful articles in cast or sheet metal, or wood. City Novelty Co., 404 Library st., Philadelphia, Pa.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

Kilns for drying Corn Meal.—Makers will please correspond with A. Moffitt, Ashburn Mills, St. John, N. B., describing the kind, and stating how many bushels of corn they are calculated to dry in twelve hours, price, etc.

Needles for all sewing machines at Bartlett's, 569 Broadway, N. Y.

An Experienced Mechanical Draftsman desires a situation. Address R. F. Thomas, 513 Brown street, Philadelphia, Pa.

Wanted—One Stationary Steam Engine complete, 30 to 60-horse power—a second-hand one, if in perfect order, will answer. Address F. M. Stearns, Grindstone and Scythe Stone Manufacturer, Berea, Ohio.

Round and Square decarbonized bar and sheet steel, in lots to suit, 11c. per pound. Philip S. Justice, 42 Cliff st., N. Y.; 14 N. 5th st., Phil'a.

G. W. Lord's Boiler Powder, 107 W. Girard ave. Phila, Pa., for the removal of scale in steam boilers is reliable. We sell on condition.

Aneroid Barometers made to order, repaired, rated, for sale and exchange, by C. Grieshaber, 107 Clinton st., New York.

For best quality Gray Iron Small Castings, plain and fancy Apply to the Whitneyville Foundery, near New Haven, Conn.

Keuffel & Esser, 71 Nassau st., N. Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves

Foot Lathes—E. P. Ryder's improved—220 Center st., N. Y.

Those wanting latest improved Hub and Spoke Machinery, address Kettenring, Strong & Lauster Defiance Ohio.

For tinmans' tools, presses, etc., apply to Mays & Bliss, Brooklyn, N. Y.

Mill-stone dressing diamond machine, simple, effective, durable. Also, Glazier's diamonds. John Dickinson, 64 Nassau st., New York.

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Machinists, boiler makers, tinners, and workers of sheet metals read advertisement of the Parker Power Presses.

Diamond carbon, formed into wedge or other shapes for pointing and edging tools or cutters for drilling and working stone, etc. Send stamp for circular. John Dickinson, 64 Nassau st., New York.

To ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's manufacturing news of the United States. Terms $4 00 a year.

Winans' boiler powder, 11 Wall st., N. Y., removes Incrustations without injury or foaming; 12 years in use. Beware of Imitations.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

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

All reference to back numbers should be by volume and page.

N. P., of Ohio.—It is not necessary to success in an invention of the kind of which you write, that it should be superior in convenience and utility to all similar inventions to insure its success. If equally useful its chance is as good as the others, and if with equal convenience and utility it has superior grace of design, being highly ornamental, it has elements of success, which, coupled with good business management, will make it surely profitable. The same is true of all fancy articles, such as paper holders, paper knives, ornamented inkstands, curtain fixtures, and other things which combine ornament with use.

T. C. K., of Pa., writes us an interesting letter on shooting of fish under water, which we cannot make room for. He recommends the use of round shot, and thinks they are not so liable to diverge from a straight line as long shot. In shooting at fish he maintains it is necessary to make the proper allowance for the refraction of light, but also as much more for divergence. He also recommends the use of balls made of lead with one fifth part zinc to harden them. These balls will, he says, not flatten when shot into water with any strength of charge or at any angle.

S. B., of Pa.—You are right in supposing that the drawings of machinery in our paper are done by the aid of the camera lucida.

Wm. R. B., of Ind.—The white enamel used on the dials of watches, clocks, meters, etc., is a sort of glass rendered milky and opaque by an admixture of the oxide of tin. You will find very copious information on the preparation and application of various colored enamels in Dr. Ure's "Dictionary of Arts, Manufactures, and Mines." The process cannot be adequately described in a brief article. It is one in which many nice points are to be observed and somewhat extensive apparatus employed, and to reach success in which requires much experience and judgment.

L. J. C., of Ky.—You can find out all about rain gages in text books on natural philosophy and meteorology. The depth of water collected in a tub with straight and vertical sides, would be a fair indicator of the amount of rain falling at that point, minus the amount evaporated. Instruments are constructed to prevent evaporation. The mean amount of rain falling over the entire surface of the earth is not known. You will find an article on the subject on page 343 Vol. XIX of the Scientific American.

J. L., of R. I.—Cast iron is made malleable by annealing in ovens constructed specially for the purpose, with certain decarbonizing materials, hematite being a common material for this purpose. The time required varies greatly, according to the size of the articles, etc. You will find full information on this subject in the "Practical Metal-worker's Assistant." Published by Henry Carey Baird, Philadelphia, Pa.

W. A. C., of N. H.—The appearance of something in motion along heated pipes, etc., is caused by the refraction of light as it passes into and out of the heated column of air surrounding the pipe. The surface of this refracting medium being broken up into waves and ripples, produces the same effect upon the light as would be produced by a running stream of water, only in a less degree. Neither of the explanations you describe is correct.

J. C. L., of Cal.—Copper makes an excellent steam boiler but a very expensive one. It may be used with iron in the same boiler, but it expands more than iron, and allowance must be made for this in construction. The expansion of copper is 1 in 582 in length, and 1 in 194 in bulk. That of iron is 1 in 846 in length and 1 in 282 in bulk.

H. H., of New York.—What is called marine glue will probably answer your purpose. It is quick-drying and water-proof. This is made by dissolving by heat 1 part india-rubber in naphtha, and when it is dissolved, adding two parts of gum shellac. Pour it while hot on metal plates to cool. To use, melt and apply with a brush.

H. B. D., of Miss.—You can obtain a temperature of about ten degrees Fahrenheit, without the use of ice and salt, by dissolving in water an admixture of equal parts of niter and sal ammoniac, provided the water is not warmer than fifty degrees and not too much of it is used.

W. W. B., of La.—We know of no better or cheaper plan of cutting out burnt places in boilers than the use of the cold chisel and hammer.

A. C. P., of N. Y.—We copied the article, word for word, from the *Chemical News*, and cannot add anything to the description of the "Leclanche Battery."

Recent American and Foreign Patents.

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

Mode of Preparing Seed for Planting.—Henry Lassing, New York city.—This invention relates to a new and useful improvement in preparing and protecting seed for planting, whereby the seeds of all kinds of cereals, as well as potatoes and other similar roots and bulbs, are protected from vermin and fertilized after planting.

Process of Rectifying Whisky During Distillation.—Henry Fake, Williamsburgh, N. Y.—This invention relates to a new method of withdrawing the fusel oils from their intimate combination with whisky, while the same is in the process of distillation. The separate process of rectification is thereby avoided, and whisky without any traces of fusel is produced.

Velocipede.—Jesse A. Crandall, Brooklyn, N. Y.—This invention relates to certain improvements in the construction of velocipede frames, and also in the arrangement of a convenient steering apparatus.

Fountain Pen.—G. A. Becker, Seymour, Conn.—This invention relates to improvements in fountain pens, and consists in an arrangement of the piston, whereby the ink is drawn into the barrel, so that a passage may be readily opened after the ink is drawn in, to admit atmospheric pressure from the top to cause the ink to feed. It also consists in an improved arrangement in connection with the delivery passage, of a cut-off plug or valve, for regulating the feed or stopping it entirely when required.

Spindle Lock.—Rudolph S. Foster, Madison, N. J.—This invention relates to improvements in locks, and consists of a new and peculiar construction of locks for application to the shanks or spindles of knob, latch, or other bolts, under an arrangement whereby the knob spindles may be arranged to work the said bolts on the inside, either as common latch bolts, or as locking bolts, working a guard to secure the bolt in the locked position, at the same time maintaining the bolt in a locked condition as to the outside. The invention also comprises an improved mode of securing the knob shanks to the spindles.

Dash-Board—John Bland, Thomaston, Ga.—This invention relates to improvements in dash-boards for buggies and other wagons, and consists in an improved construction of the same in sheet metal, in substitution of the parts commonly made of leather, whereby it is designed to provide much cheaper dash-boards in first cost, and much more durable ones.

Can Opener.—H. C. Alexander, New York city.—This invention has for its object to improve the construction of the improved can opener, patented by the same inventor, Nov. 16, 1869, and numbered 96,761, so as to make it simpler in construction, cheaper, and more convenient in manufacture.

Sawing Machine.—Charles F. Rice, Brookfield, Mass.—This invention has for its object to furnish an improved machine, designed especially for sawing shingles, but equally applicable to other sawing, which shall be simple in construction and convenient and effective in operation.

Pulverizing Attachment for Plows.—Anthony A. Rhoads and Wiley Tash, Berlin Ill.—This invention has for its object to furnish an improved attachment for ordinary turn plows, by means of which the soil may be pulverized as it is turned by the plow and while it is still moist.

Journal Boxes and Journals.—Jeremiah McIlvain, Churchville, Md.—This invention relates to new and useful improvements in boxes for shaft journals, and in the journals themselves, whereby the journals are kept cool and properly lubricated.

Gravel Heater.—William A. Gay, Newark, N. J.—This invention relates to a new and useful improvement in apparatus for heating gravel for roofing, concrete pavements, and for all the purposes to which it is adapted.

Automatic Lighting Attachment for Lamp and Taper Burners.—William H. Weeks, New York city.—This invention has for its object to furnish an improved lighting attachment for taper and lamp burners, by means of which the wick or taper may be instantly and conveniently lighted, and which shall, at the same time, be so constructed as to raise the taper or wick by the same operation.

Combined Plow, Planter, and Cultivator.—Thomas J. Smith, Holly Springs, Mich.—This invention has for its object to furnish a simple and convenient machine for preparing the ground, planting corn, peas, cotton, etc., and cultivating the plants, and which shall be so constructed that it can be readily adjusted for these different purposes.

Wagon Brake.—Charles M. Howell, Andover, N. J.—This invention relates to improvements in brakes for wagons and other articles, and consists in the arrangement with a pair of brake shoes suspended on crank shafts from the bottom of the wagon box of a pair of operating levers pivoted on the hind axle and connected by rods to arms on the shafts, also connected by rods to an evener connected to the arm of an oscillating shaft near the front of the box and worked by a hand lever rising up at the side.

Lifter for Kitchen Use.—T. S. Coffin, Harrington, Me.—This invention relates to improvements in lifters for kitchen use, and consists of a pair of lifting jaws, with handles crossing each other and pivoted together, the said jaws being arranged in a peculiar way for use as a stove cover lifter, a hook for lifting lids taking hold of bails, or for use as clamps for holding rods, pipes, or other articles for filing, and other like operations.

Tension Wheel for Sewing Machines.—J. S. Warner, Ogdensburg, N. Y.—This invention relates to improvements in the construction of tension wheels for sewing machines, and consists in making them of two disks of metal having hubs or projections, and small grooves on one side the latter being near the periphery, and another disk of thin metal having radial slits extending from the periphery to a circle of about the same diameter as the hubs of the other disks, and the parts between these slots curved alternately in opposite directions, all clamped together by screws, or otherwise, with the thin slitted disk between the hubs of the other two and the edges of the projecting parts fitting the grooves in the sides of the other disks.

Animal Trap.—H. Seehausen, Memphis, Tenn.—This invention relates to a new and useful improvement in traps for catching animals, and consists in arranging a drop door in a suitably constructed cage or box, which door is elevated, when the trap is set and held in position by means of a rod attached to an apron, which apron is raised by the animal and the trap sprung.

Bale Tie.—James W. Rogan, Memphis, Tenn.—This invention relates to a new and useful improvement in ties for baling cotton and other articles.

Mortising Machine.—John Cox, Portland, Oregon.—This invention consists of two metallic standards, set each on a pair of curved legs, and at a sufficient distance from each other to admit of placing between them a metallic frame in the form of the arc of a circle, which frame has sockets on its sides large enough to inclose the said standards, and has a longitudinal slot of sufficient width to receive a lever which is provided at the extreme lower end with a set of cog teeth gearing with a toothed comb rising from the upper side of the cutter, so that when the lever is moved to and fro upon its pivot the cutter will receive an oscillating movement sufficient to cause it to enter the wood to be mortised.

Automatic Barrel Filler.—S. C. Catlin, Cleveland, Ohio.—This invention relates to a new and improved apparatus for filling barrels and other vessels with oil or other liquids, and consists in providing certain mechanical devices, and arranging them in such a manner that the flow of oil or liquid into the barrel shall be automatically stopped when the barrel is filled or nearly filled.

Burglar-Proof Safe.—E. M. Hendrickson, Brooklyn, N. Y.—The object of this invention is to prevent safes for banks, insurance companies, and other institutions, as well as for private individuals, and for all purposes for which safes are used, from being blown open by means of powder, nitro-glycerin, or other explosive material or compound, and the invention consists in forming perforations or apertures in and through some portions of the safe for the escape of the gas generated by such explosive material without injuring the safe.

Process of Extracting, Manufacturing, and Refining Sugar.—Jules Emile Boivin and D. Loiseau, Paris, France.—This invention relates to the application and preparation of a new compound for extracting or manufacturing sugar from cane juice, beet juice, sirup, molasses, or other saccharine solution, and for refining or purifying raw cane, beet, or other sugar, or substance containing sugar, or of sirup, molasses, or other saccharine solution. The invention consists in the new composition employed and in the novel method of applying the same.

Water Wheel.—John Zimmerman, Owatonna, Minn.—This invention relates to improvements in that class of water wheels consisting of spiral vanes attached to a shaft, and working in a hollow cylinder. The invention consists in an improved form of the said spiral vane and mode of attaching it to the shaft.

Slotting Tool.—William Seaton, Putnam, Conn.—This invention consists in the attachment of a tool holder to the ordinary tool-carrying device of a planer, to project therefrom parallel with the planer bed, so as to work through the eye of a wheel standing on its face on the planer bed, and carrying a tool at the projecting end transversely thereto, and so attached to the planer as to be readily adjusted around its axis for cutting at any part of the eye of the wheel.

Presses.—I. N. Patten and D. G. Marden, Memphis, Tenn.—This invention relates to new and useful improvements in presses for hay, cotton, and other like substances, and consists of improvements in the means for working and holding the follower. The said means consisting of clamping or holdfast blocks, working on rods standing parallel with the line of movement of the follower, and eccentric rollers, worked by hand levers, so arranged that one set of the clamping or holdfast blocks connected to the follower will engage the rods and hold the follower, while the other set connected to the eccentric rollers are adjusted along the rods for a new hold; the rollers are connected by links to the follower in a way to force it down as the rollers are turned.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

3,661.—Apparatus to Promote Circulation in Steam Boilers.—R. Sinclair and W. B. Mack, Detroit, Mich. Dec. 18, 1869.

3,686.—Boxes or Cases for Packing and Carrying Eggs.—J. B. White, Buffalo, N. Y. December 20, 1869.

3,687.—Plow and Cultivator.—J. S. Godfrey, Leslie, Mich. December 20, 1869.

3,697.—Manufacture of Steel.—John Absterdam, New York city Dec. 21, 1869.

3,719.—Pneumatic Engine.—R. Spear, New Haven, Conn. December 23 1869.

3,720.—Governor.—R. Spear, New Haven, Conn. December 23, 1869.

3,736.—Metal Tubing.—S. P. M. Tasker, Philadelphia, Pa. December 24, 1869.

3,755.—Combustion of Smoke and Gases in Furnaces.—G. W. Rawson —, Mass. December 28, 1869.

3,651.—Apparatus for Heating Feed-Water Heaters—W. B. Mack Detroit, Mich. December 17, 1869.

3,672.—Composite Pavement.—D. W. Bailey, Chelsea, Mass. December 18, 1869.

3,711.—Apparatus for Sharpening the Cutters of Mowing Machines —Messrs. La Due, Blish & Co., Chicago, Ill. Dec. 22, 1869.

3,734.—Traction Engine.—C. Merriman and Owen Redmond, Rochester N. Y. December 23, 1869.

3,737.—Apparatus for, and Method of Heating Water, and Purifying the same for Use in Steam Boilers, etc.—E. R. Stillwell, Dayton, Ohio. December 24, 1869.

3,756.—Sectional Steam Boiler.—P. Abendroth, J. Griffith, G. W. Wundram, and T. H. Muller, New York city. Dec. 28, 1869.

3,762.—Tilting Vessels and Stands.—J. Gibson, Albany, N. Y. Dec. 29 1869.

3,772.—Harness-Operating Mechanism for Power Looms.—E. B. Bigelow, Boston, Mass. December 30, 1869.

U. S. Patent Office.

How to Obtain Letters Patent FOR NEW INVENTIONS.

Information about Caveats, Extensions, Interferences, Designs, Trade Marks; also, Foreign Patents.

FOR a period of nearly twenty-five years, MUNN & CO. have occupied the position of leading Solicitors of American and European Patents, and during this extended experience of nearly a quarter of a century, they have examined not less than fifty thousand alleged new inventions, and have prosecuted upward of thirty thousand applications for patents, and, in addition to this, they have made, at the Patent Office, over twenty thousand preliminary examinations into the novelty of inventions, with a careful report on the same.

The important advantages of MUNN & CO.'S Agency are, that their practice has been ten-fold greater than that of any other Agency in existence, with the additional advantage of having the assistance of the best professional skill in every department, and a Branch Office at Washington, which watches and supervises, when necessary, cases as they pass through official examination.

CONSULTATIONS AND OPINIONS FREE.

Those who have made inventions and desire a consultation are cordially invited to advise with MUNN & CO. who will be happy to see them in person at the office, or to advise them by letter. In all cases, they may expect an HONEST OPINION. For such consultations, opinion, and advice, NO CHARGE is made. A pen-and-ink sketch and a description of the invention should be sent.

TO APPLY FOR A PATENT,

A model must be furnished, not over a foot in any dimension. Send model to MUNN & CO., 37 Park Row, New York, by express, charges paid, also, a description of the improvement, and remit $16 to cover first Government fee, and revenue and postage stamps.

The model should be neatly made, of any suitable materials, strongly fastened, without glue, and neatly painted. The name of the inventor should be engraved or painted upon it. When the invention consists of an improvement upon some other machine, a full working model of the whole machine will not be necessary. But the model must be sufficiently perfect to show with clearness the nature and operation of the improvement.

PRELIMINARY EXAMINATION

Is made into the patentability of an invention by persona search at the Patent Office, among the models of the patents pertaining to the class to which the improvement relates. For this special search, and a report in writing, a fee of $5 is charged. This search is made by a corps of examiner of long experience.

Inventors who employ us are not required to incur the cost of a preliminary examination. But it is advised in doubtful cases.

COST OF APPLICATIONS.

When the model is received, and first Government fee paid, the drawings and specification are carefully prepared and forwarded to the applicant for his signature and oath, at which time the agency fee is called for. This fee is generally not over $25. The cases are exceptionally complex if a higher fee than $25 is called for, and, upon the return of the papers, they are filed at the Patent Office to await Official examination. If the case should be rejected for any cause, or objections made to a claim, the reasons are inquired into and communicated to the applicant, with sketches and explanations of the references; and should it appear that the reasons given are insufficient, the claims are prosecuted immediately, and the rejection set aside, and usually **Without Extra Charge to the Applicant.**

MUNN & CO. are determined to place within the reach of those who confide to them their business, the best facilities and the highest professional skill and experience.

The only cases of this character, in which MUNN & CO. expect an extra fee, are those wherein appeals are taken from the decision of the Examiner after a second rejection; and MUNN & CO. wish to state very distinctly, that they have but few cases which can not be settled without the necessity of an appeal; and before an appeal is taken, in any case, the applicant is fully advised of all facts and charges, and no proceedings are had without his sanction; so that all inventors who employ MUNN & CO. know in advance what their applications and patents are to cost.

MUNN & CO. make no charge for prosecuting the rejected claims of their own clients before the Examiners and when their patents are granted, the invention is noticed editorially in the SCIENTIFIC AMERICAN.

REJECTED CASES.

MUNN & CO. give very special attention to the examination and prosecution of rejected cases filed by inventors and other attorneys. In such cases a fee of $5 is required for special examination and report, and in case of probable success by further prosecution, and the papers are found tolerably well prepared, MUNN & CO. will take up the case and endeavor to get it through for a reasonable fee, to be agreed upon in advance of prosecution

CAVEATS

Are desirable if an inventor is not fully prepared to apply for a Patent. A Caveat affords protection, for one year, against the issue of a patent to another for the same invention. Caveat papers should be carefully prepared.

The Government fee on filing a Caveat is $10, and MUNN & CO.'s charges for preparing the necessary papers are usually from $10 to $12.

REISSUES.

A patent when discovered to be defective, may be reissued by the surrender of the original patent, and the filing of amended papers. This proceeding should be taken with great care.

DESIGNS, TRADE MARKS, AND COMPOSITIONS

Can be patented for a term of years, also, new medicines or medical compounds, and useful mixtures of all kinds. When the invention consists of a medicine or compound, or a new article of manufacture, or a new composition, samples of the article must be furnished, neatly put up. Also, send a full statement of the ingredients, proportions, mode of preparation, uses, and merits.

PATENTS CAN BE EXTENDED.

All patents issued prior to 1861, and now in force, may be extended for a period of seven years upon the presentation of proper testimony. The extended term of a patent is frequently of much greater value than the first term; but an application for an extension, to be successful, must be carefully prepared. MUNN & CO. have had a large experience in obtaining extensions, and are prepared to give reliable advice.

INTERFERENCES

Between pending applications before the Commissioners are managed and testimony taken; also, Assignments, Agreements, and Licenses prepared. In fact, there is no branch of the Patent Business which MUNN & CO. are not fully prepared to undertake and manage with fidelity and dispatch.

FOREIGN PATENTS.

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FOR THE WEEK ENDING JAN. 25, 1870.

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99,046.—CAN OPENER.—H. C. Alexander, New York city.
99,047.—PRINTING TELEGRAPH.—M. F. Adams, Boston, assignor to E. B. Welch, Cambridge, Mass.
99,048.—STOVEPIPE DAMPER.—Henry Baker (assignor to himself and C. G. Kerr), Lancaster, Pa.
99,049.—ELEVATOR FOR HOISTING HUMAN BEINGS, MERCHANDISE, ETC.—C. W. Baldwin, Boston, Mass.
99,050.—INSTRUMENT FOR PLUGGING TEETH.—M. L. Battle, Bainbridge, Ga.
99,051.—POCKET FLASK.—Arthur Tappan Becker, Cohoes, N. Y.
99,052.—VARIABLE VALVE GEAR.—George M. Bird, Dedham, Mass.
99,053.—MILKING APPARATUS.—A. C. Black, Kaukauna, Wis. Antedated Jan. 16, 1870.
99,054.—DEVICE FOR APPLYING BRAID TO FABRICS IN SEWING MACHINES.—Eloi Bouscay, Jr., Norwalk, Ohio. Antedated Jan. 11, 1870.
99,055.—SPINNING MACHINE.—Paul Bramwell, Arrow Rock, and W. C. Bramwell, Independence, Mo.
99,056.—BED BOTTOM.—W. R. Briggs, Boston, Mass.
99,057.—CUTTING PINCERS.—Peter Broadbooks, Batavia, N. Y.
99,058.—SPRIND-BED BOTTOM.—A. H. Ceiley (assignor to J. B. Gardiner), Springfield, Mass.
99,059.—MILLING MACHINE.—Luke Chapman (assignor to the Collins Co.), Collinsville, Conn.
99,060.—WASHING MACHINE.—S. W. Clarke, New Milford, Conn.
99,061.—LIFTER FOR KITCHEN USE.—T. S. Coffin, Harrington, Me.
99,062.—MANUFACTURE OF ARTIFICIAL STONE.—François Coignet, Paris, France, assignor to Coignet Agglomerate Company, Richmond, Ind.
99,063.—PROPELLER.—Aaron Colton, Sycamore, Ill. Antedated Jan. 12, 1870.
99,064.—MORTISING MACHINE.—John Cox, Portland, Oregon.
99,065.—PUNCHING AND SHEARING MACHINE.—Wm. Culver, Vineland, N. J.
99,066.—HORSE HAY RAKE.—N. W. Curtis, Johnsburg, N. Y.
99,067.—SEWING MACHINE.—J. A. Davis, Watertown, N. Y. Antedated Jan. 22, 1870.
99,068.—COFFEEPOT ATTACHMENT.—Marinus De Graff, Chicago, Ill.
99,069.—EXPLOSIVE AGENT CALLED "XYLOGLODINE."—Carl Dittmar, Charlottenburg, Prussia.
99,070.—MANUFACTURE OF XYLOGLODINE AND OTHER EXPLOSIVE AGENTS.—Carl Dittmar, Charlottenburg, Prussia.
99,071.—MACHINE FOR DISINTEGRATING WOOD FOR PAPER PULP.—Hezekiah Dodge, Albany, N. Y.
99,072.—SHOE FOR HORSES.—Hay Downie, Corstophine, and I. B. Harris, Edinburgh, Scotland.
99,073.—CARPET-CLEANING MACHINE.—D. A. Drew, Philadelphia, Pa.
99,074.—CLIP FOR ELLIPTIC SPRINGS.—Wm. Evans (assignor to himself and Wm. Coleman), Pittsburgh, Pa.
99,075.—EXTENSION-TABLE SLIDE.—Michael Fleck, Milwaukee, Wis.
99,076.—NIGHT LATCH.—R. S. Foster, Madison, N. J.
99,077.—GRAVEL HEATER.—W. A. Gay, Newark, N. J.
99,078.—CARTRIDGE.—Edwin Gomez, New York city.
99,079.—CARTRIDGE.—Edwin Gomez, New York city.
99,080.—CORK EXTRACTOR.—Charles Gooch, Cincinnati, Ohio. Antedated Jan. 17, 1870.
99,081.—STILL FOR HYDROCARBONS AND OTHER SUBSTANCES.—John Gracie, Pittsburgh, Pa.
99,082.—PORTABLE LUBRICATOR.—Henry Hammond, Hartford, Conn.
99,083.—MOLDING AND GLAZING FORMS MADE OF PLASTIC MATERIAL.—Samuel Hart, Marietta, Ohio.
99,084.—BOOT STRETCHER.—John Harwood, Albany, N. Y.
99,085.—BURGLAR-PROOF SAFE.—E. M. Hendrickson, Brooklyn, N. Y.
99,086.—COMBINED BASE KNOB AND DOOR FASTENER.—H. H. Heskett and M. E. Ferguson, McLean county, Ill.
99,087.—STEP FOR SPINDLE TO SPINNING MACHINES.—J. P. Hillard, Fall River, Mass.
99,088.—MANUFACTURE OF COMPOSITION ROOFS.—C. F. Hinman, Chicago, Ill.
99,089.—COMBINED HARVESTER AND THRASHER.—David Howell, St. Helena, assignor to himself and Charles A. Lowe, San Francisco, Cal.
99,090.—CARRIAGE JACK.—Thomas W. Johnston, Richmond, Me.
99,091.—BASE-BURNING STOVE.—John H. Keyser, New York city.
99,092.—COAL STOVE.—J. H. Keyser, New York city.
99,093.—GRAIN SEPARATOR.—Dennis Ladd, Chicago, Ill.
99,094.—MODE OF PREPARING SEED FOR PLANTING.—Henry Lassing, New York city.
99,095.—BLACKING BRUSH.—George W. Lishawa, Cincinnati, Ohio.
99,096.—VELOCIPEDE.—R. E. Lowe, Upper Alton, Ill. Antedated Jan. 9, 1870.
99,097.—HYDRANT.—J. R. Manny, Chicago, Ill. Antedated Jan. 15, 1870.
99,098.—MILKING STOOL.—Ephraim Martin and Samuel M. Chittenden (assignors to Daniel D. Chittenden), Baldwinsville, N. Y.
99,099.—CORD-MAKING MACHINE.—James McIntire, Hopewell Cotton Works, Pa., assignor to W. C. Dickey. Antedated January 14, 1870.
99,100.—COAL STOVE.—George Rodney Moore, Philadelphia, Pa.
99,101.—PRINTING PRESS.—William T. Morgans, Youngsville, N. Y., assignor to himself, G. J. Goleman, and C. H. Sedgwick & Son.
99,102.—DITCHING MACHINE.—G. W. Nevill, Richmond, Va.
99,103.—SOLDERING MACHINE.—D. P. Newell (assignor to himself, Solomon Washburn, and C. R. Otis), Chicago, Ill.
99,104.—TABLE CUTLERY.—J. H. Nichols and W. Bower (assignors to Beaver Falls Cutlery Company), Beaver Falls, Pa.
99,105.—METHOD OF FIXING PIGMENTS TO FIBROUS AND TEXTILE MATERIALS.—Alfred Paraf, New York city.
99,106.—CORN SHELLER.—William P. Patton and William A. Middleton, Harrisburg, Pa.; said Patton assigns his right to said Middleton.
99,107.—COOLING APPARATUS.—Charles F. Pike, Providence R. I.
99,108.—HARVESTER RAKE.—William Pimlott, Springfield, Ohio.
99,109.—DEVICE FOR BAKING BREAD.—A. I. Quackenbush and Guilford Hawn, Fort Plain, N. Y.
99,110.—SAW HANDLE.—William W. Richardson, Chicago Ill.
99,111.—BOBBIN HOLDER.—John Salisbury, Scituate, R. I. Antedated Jan. 14, 1870.
99,112.—FIELD FENCE.—David Sattler, Mifflin, Ohio.
99,113.—SLOTTING TOOL HOLDER.—William Seaton, Putnam, Conn.
99,114.—ONE-WHEEL SULKY.—James A. Sinclair, Woodsfield, Ohio, assignor to himself and Charles Messerly.
99,115.—PADLOCK.—F. W. Smith, Jr., Bridgeport, Conn.
99,116.—PADLOCK.—F. W. Smith, Jr., Bridgeport, Conn.
99,117.—SAFETY STOP FOR WATCHES.—S. C. Smith, Boston, Mass.
99,118.—COMBINED PLOW, PLANTER, AND CULTIVATOR.—T. J. Smith, Holly Springs, Miss.
99,119.—VEGETABLE AND FRUIT-PARING KNIFE.—Henry Soggs, Columbus, Pa.
99,120.—HORSE HAY FORK.—George N. Stearns, Syracuse, N. Y.
99,121.—HEDGE TRIMMER.—J. M. Van Nosdall and O. W. Van Nosdall, Newark, Ill.
99,122.—DEVICE FOR SEWING MACHINE.—J. S. Warner, Ogdensburg, N. Y.
99,123.—AUTOMATIC LIGHTING ATTACHMENT FOR LAMPS AND TAPER BURNERS.—Wm. H. Weeks, New York city.
99,124.—COMPOSITION FOR LINING ALE AND BEER CASKS.—John Werner, Mannheim, Baden.
99,125.—RAILROAD TICKET.—J. P. Whitehead, Chicago, Ill. Antedated Jan. 16, 1870.
99,126.—TREADLE FOR SEWING MACHINES.—Charles H. Wilcox, New York city, assignor to the Wilcox & Gibbs Sewing Machine Company.
99,127.—TOY PROPELLER.—Arthur M. Allen, New York city.
99,128.—APPARATUS FOR PULVERIZING PORCELAIN PASTE.—J. R. Alsing, Newcastle-upon-Tyne, England. Patented in Sweden, April, 20, 1867.
99,129.—PEAT AUGUR.—Aime Nicholas Napoleon Aubin, Montreal, Canada.
99,130.—PEAT-MOLDING MACHINE.—A. N. N. Aubin, Montreal, Canada.
99,131.—SAWING MACHINE.—Louis Bach and L. C. Christlip, Tiffin, Ohio.
99,132.—CHEESE PRESS.—Albert G. Bagg, Holland Patent, N. Y.
99,133.—SHEET GAGE FOR PRINTING PRESS.—Henry Barth, Cincinnati, Ohio.
99,134.—FOUNTAIN PEN.—G. A. Becker, Seymour, Conn.
99,135.—REVOLVING STEREOSCOPE.—Alexander Beckers, New York city.
99,136.—STEREOSCOPE.—Alexander Beckers, New York city.
99,137.—JOINERS' PLANE.—George Cyrus Beckwith, Boston, Mass.
99,138.—SEWING MACHINE.—Joseph Bennor (assignor to himself and Abraham Rex), Philadelphia, Pa.
99,139.—STONE-CHANNELING MACHINE.—V. W. Blanchard, Bridport, assignor to himself and A. J. Severance, Middlebury, Vt.
99,140.—DASH BOARD FOR CARRIAGES.—J. Bland, Thomaston, Ga.
99,141.—PROCESS OF EXTRACTING, MANUFACTURING, AND REFINING SUGAR.—J. E. Boivin and D. Loiseau, Paris, France, assignor to C. F. Chandler, New York city.
99,142.—RAILROAD TIE LIFTER.—Elijah Bomar (assignor to to himself and Wm. Young), Wartrace, Tenn.
99,143.—DESULPHURIZING OVEN.—J. C. Brewster, New York city.
99,144.—CASTING HOLLOW CYLINDERS.—J. W. Brittin, Black Rock, Conn.
99,145.—MANUFACTURE OF INSULATORS FOR TELEGRAPH POLES.—Homer Brooke, New York city.
99,146.—CORSET SKIRT SUPPORTER.—J. W. Brooks, Boston, Mass.
99,147.—INK-RETAINING ATTACHMENT FOR PENS.—Albert G. Brown, Hartford, Conn.
99,148.—WEIGHING SCALE.—Dennis Buoy, Danville, Pa.
99,149.—DIE PRESS.—Wm. Burke, Brooklyn, N. Y.
99,150.—MILK PAN.—N. C. Burnap, Argusville, N. Y.
99,151.—CURTAIN AND MAP FIXTURE.—J. W. Burns, Medway, Ohio.
99,152.—SHUTTLE FOR LOOMS.—W. H. Burns, Grafton, assignor to Jonathan Luther, Worcester, Mass.
99,153.—STEAM GENERATING HEATER.—C. A. Buttles, Milwaukee, Wis.
99,154.—IMPLEMENT FOR SLITTING AND JOINING RAGS FOR CARPETS.—B. F. Cady, Chittenango, N. Y.
99,155.—MORTISING MACHINE.—M. E. Campfield, Newark, N. J.
99,156.—HANGER FOR SHAFTING.—W. W. Carey and G. W. Harris, Lowell, Mass.
99,157.—PLANING MACHINE.—W. W. Carey and G. W. Harris, Lowell, Mass.
99,158.—NEEDLE AND ARM FOR SEWING MACHINE.—Mary P. Carpenter, San Francisco, Cal.
99,159.—AUTOMATIC BARREL FILLER.—S. C. Catlin, Cleveland, Ohio.
99,160.—MACHINE FOR REMOVING THE "BLOW OVER" ON GLASS JARS, ETC.—John Chambers (assignor to himself and D. Chambers), Birmingham, Pa.
99,161.—TOOTH BRUSH.—R. K. Chandler, Ruther Glen, Va. Antedated Jan. 17, 1870.
99,162.—CHIMNEY COWL.—L. N. Chapin, New Lisbon township, N. Y.
99,163.—SHOEMAKERS' TOOL.—J. A. Clippinger, Newtown, Iowa. Antedated Jan. 12, 1867.
99,164.—BIRD CAGE.—G. F. J. Colburn, Newark, N. J.
99,165.—RAILROAD RAIL AND BASE PLATE.—Watts Cooke, Peterson, N. J.
99,166.—VELOCIPEDE.—J. A. Crandall, Brooklyn, N. Y.
99,167.—SHEET GAGE FOR PRINTING PRESSES.—G. B. Cummings, Cambridge, Mass.
99,168.—CHEESE CUTTER.—G. W. Cushman, Aiken, S. C.
99,169.—PLATFORM SCALE FOR HAY OR CATTLE.—Daniel H. Dewey, Canton, Ill.
99,170.—SODA FOUNTAIN.—G. D. Dows (assignor to himself and C. Dows), Boston, and G. S. Cushing, Lowell, Mass. Antedated Jan. 12, 1870.
99,171.—WATER-PROOF FABRIC.—T. M. Drown (assignor to W. A. Drown), Philadelphia, Pa.
99,172.—FLEXIBLE JOINTS FOR WATER PIPES.—M. C. Duffey, Washington, D. C.
99,173.—EGG BEATER.—Timothy Earle, Valley Falls, R. I.
99,174.—BRICK KILN.—Wm. Ennis, Philadelphia, Pa.
99,175.—RECTIFYING WHISKY DURING DISTILLATION.—H. Fake, Williamsburgh, N. Y., assignor to himself and C. A. Todd, New York city.
99,176.—HARNESS-OPERATING MECHANISM FOR LOOMS.—G. S. Faulkner, Indianapolis, Ind.
99,177.—LOOM.—G. S. Faulkner, Indianapolis, Ind.
99,178.—KEY-HOLE GUARD AND PROTECTOR.—H. M. Flanagin (assignor to himself and J. R. Elkinton), Penn's Grove, N. J.
99,179.—LEVER AND STUMP PULLER.—J. G. Fox, Oregon, Wis.
99,180.—PRESERVING MEAT.—Henrik Gahn, Upsala, Sweden.
99,181.—HAY LOADER.—C. B. Garlinghouse (assignor to himself, S. F. Bateman, and Byrdine Harris), Carpentersville, Ind.
99,182.—DRYER.—Henry Garrett, Linneus, Mo.
99,183.—MACHINE FOR GRINDING PEARL BUTTON-BLANKS.—J. D. Hall (assignor to J. A. Gargay), Philadelphia, Pa.
99,184.—LIGHTNING ROD AND CONDUCTOR.—J. W. Hankenson (assignor to himself and Winslow Baker), Minneapolis, Minn.
99,185.—HARNESS SADDLE HOOK.—Robert Hart, Dunkirk, N. Y.
99,186.—DRYING, PRESERVING, AND COLORING WOOD OR OTHER FIBROUS MATERIAL.—Herman Haupt, Philadelphia, Pa.
99,187.—SLATE FRAME.—Wm. Hersee, Buffalo, N. Y.
99,188.—PACKING CASE FOR TOBACCO.—S. F. Hess, Rochester, N. Y.
99,189.—APPARATUS FOR STEAMING YARN.—J. H. Higgins, New York city.
99,190.—DOUBLE WASH BOARD.—H. F. Hilderbrand, Baltimore, Md.
99,191.—JEWELERS' CHUCK.—L. S. Hill, Grand Rapids, Mich.

99,192.—BATTERIES FOR ELECTROTYPING.—P. S. Hoe, New York city.
99,193.—AIR PUMP.—J. W. Hopkins (assignor to himself and Wm. H. M. Pye), Brooklyn, N. Y.
99,194.—WAGON BRAKE.—C. M. Howell, Andover, N. J.
99,195.—RAILWAY CAR AXLE.—Frank Hudner, New York city.
99,196.—HOLDBACK FOR CARRIAGES.—Jameson Hunlock, Wyoming Valley, Pa.
99,197.—WINDOW SCREEN.—D. N. Hurlbut, Chicago, Ill.
99,198.—GRAIN DRILL AND BROADCAST SOWER.—Joseph Ingels, Milton, Ind.
99,199.—FRICTION CLUTCH.—Simon Ingersoll, Brooklyn, N.Y.
99,200.—PAPER PAN, BOWL, BOX, AND DISH.—J. W. Jarboe, Green Point, N. Y.
99,201.—METHOD FOR WOOD-WORKING.—Nicholas Jenkins, New York city. Antedated Jan. 14, 1870.
99,202.—VARIETY MOLDING MACHINE.—Nicholas Jenkins, New York city. Antedated Jan. 14, 1870.
99,203.—RING SPINNING FRAME.—B. H. Jenks, Bridesburg, Pa.
99,204.—PERFORATED CIGAR BOX.—Ralph S. Jennings, New York city, assignor to himself and C. F. Jones, Woodside, N. J.
99,205.—MILL FOR GRINDING CORN, ETC.—J. J. Johnston, Allegheny, Pa., assignor to himself and John Lockie, Washington, D.C.
99,206.—CHURN.—J. B. Johnston, St. Matthews, Ky.
99,207.—SLEIGH.—C. P. Kimball, Portland, Me.
99,208.—CULTIVATOR.—J. G. Knapp, Madison, and Sam. D. Libby, Blooming Grove, Wis.
99,209.—MACHINE FOR ROUNDING SHOT.—Charles Koehler, Rosiclare, Ill.
99,210.—RAILWAY CAR WHEEL.—A. Komp, New York city.
99,211.—MAGIC LANTERN.—A. Kruss, Hamburg, Germany.
99,212.—CLAMP.—J. S. Ladow, Mechanicsville, N. Y.
99,213.—SADIRON HEATER.—Elliot Lewis, Lockport, N. Y.
99,214.—DEVICE FOR DESTROYING INSECTS.—Wm. H. Lewis, New York, assignor to R. A. Lewis, Brooklyn, N. Y. Antedated Jan. 21, 1870.
99,215.—COFFEE CLEANER AND POLISHER.—H. C. Lockwood, Baltimore, Md.
99,216.—NON-CORROSIVE METALLIC ROOFING.—O. T. May, Canastota, N. Y.
99,217.—SEED PLANTER.—Noah Mendenhall, Greensburg, Ind.
99,218.—STONE PLANING MACHINE.—A. T. Merriman, Chicago, Ill.
99,219.—IRONING TABLE.—Samuel Merritt, Erie, Pa.
99,220.—STEAM ENGINE GOVERNOR CUT-OFF.—George Milbank, Chillicothe, Mo. Antedated Jan. 14, 1870.
99,221.—ROLLING MILL.—James Montgomery, New York city.
99,222.—BOILER STAND.—J. L. Mott, Mott Haven, N. Y.
99,223.—POWER LOOM.—T. H. Muller, New York city.
99,224.—POCKET-SAFE FOR FRICTION MATCHES.—J. S. Norton, Hartford, Conn.
99,225.—BASE BURNING STOVE.—F. Z. Obermeyer and Wm. Halle, Milwaukee, Wis. Antedated Jan. 29, 1870.
99,226.—ADDING MACHINE.—Homer Parmelee (assignor to E. D. Peck), Philadelphia, Pa.
99,227.—POST AUGER.—H. C. Partridge and James Preston, Bainbridge, N. Y.
99,228.—HAY AND COTTON PRESS.—I. N. Patten and D. G. Marden, Memphis, Tenn.
99,229.—PAINT OR COATING FOR ROOFS.—D. D. Pennoyer (assignor to himself and A. H. Brooks), Colebrook, N. H.
99,230.—AUTOMATIC WAGON BRAKE.—S. J. Pickerill and F. M. Pickerill, Indianapolis, Ind.
99,231.—APPARATUS FOR RAISING AND LOWERING WEIGHTS.—Jonathan Pickering, Stockton-on-Tees, England.
99,232.—SPRING NUT.—D. R. Pratt, Worcester, Mass.
99,233.—ELECTRO-MAGNETIC RAILROAD SWITCH ALARM.—T. A. B. Putnam, New York city.
99,234.—LOW-WATER INDICATOR AND FEED-WATER REGULATOR.—Robert Berryman, Philadelphia, Pa.
99,235.—WASHING MACHINE.—Thomas Rees, Judson, Minn.
99,236.—PULVERIZING ATTACHMENT FOR PLOWS.—Anthony A. Rhoades and Wiley Tash, Berlin, Ill.
99,237.—SHINGLE MACHINE.—C. F. Rice, Brookfield, Mass.
99,238.—GRAIN DRILL FEED.—J. L. Ritter, Liberty, Ind.
99,239.—COTTON BALE TIE.—J. W. Rogan, Memphis, Tenn.
99,240.—PRESERVING BUTTER.—J. F. Saiger, Shelby, Ohio.
99,241.—MANUFACTURE OF DOOR KNOBS, UMBRELLA HANDLES, AND OTHER MOLDED ARTICLES.—Wm. Sanderson and James J. De Barry, New York city.
99,242.—HANDLE FOR KNIVES, FORKS, ETC.—Wm. Sanderson, and J. J. De Barry, New York city.
99,243.—NECK YOKE.—C. S. Sanford, Lena, Ill.
99,244.—LIFTING JACK.—Benj. Schopf and Christian Schopf, Pittsburg, Ind.
99,245.—ANIMAL TRAP.—H. Seehausen, Memphis, Tenn.
99,246.—TABLE.—T. J. Shannon, Lawrenceburg, Ind.
99,247.—SHOVEL HANDLE.—John L. Shaw, Grand Rapids, Mich.
99,248.—MANUFACTURE OF PARCHMENT PAPER.—Alexander J. Sheldon (assignor to Colin Campbell), Buffalo, N. Y.
99,249.—CARRIAGE SPRING.—Carr Sheldon, Middleburg, N. Y.
99,250.—PROCESS FO RENDERING LARD, TALLOW, AND OTHER FATS.—Amor Smith, Baltimore, Md.
99,251.—PROCESS FOR TREATING FISH TO OBTAIN OILS AND FERTILIZERS.—Amor Smith, Baltimore, Md.
99,252.—APPARATUS FOR RENDERING FATTY ANIMAL MATTER.—Amor Smith, Baltimore, Md.
99,253.—PROCESS FOR RENDERING RANCID ANIMAL FATS, AND FOR DISINFECTING THE GASES EVOLVED.—Amor Smith, Baltimore, Md.
99,254.—APPARATUS FOR PRESERVING AND FREEZING.—Daniel E. Somes, Washington, D. C.
99,255.—FERTILIZER.—I. W. Speyer, Hamburg, Germany.
99,256.—BINDING ATTACHMENT FOR HARVESTERS.—Benjamin W. Squires and Charles M. Clinton (assignors to Sewell D. Thompson and David P. Goodhue), Ithaca, N. Y.
99,257.—RAILWAY CAR BRAKE.—Joseph Steger, New York city.
99,258.—CLOCK CALENDAR.—Wm. A. Terry, Bristol, Conn.
99,259.—MACHINE FOR THREADING BOLTS.—Nicholas Thomas, Chicago, Ill.
99,260.—PAINT BRUSH.—George K. Thompson, Greene, N. Y.
99,261.—CLOCK.—Thomas Thompson (assignor to him self and John T. Vinson), Washington, D. C.
99,262.—WATER PROOF SHOE.—W. H. Towers, Boston, Mass.
99,263.—WINDOW BUTTON.—S. Curtis Trubee, Brooklyn, N. Y.
99,264.—COOKING STOVE.—Charles Van De Mark, Phelps, N. Y.
99,265.—SMOOTHING-IRON HANDLE.—Theodore Van Tassell and Richard Starr Pollock, San Francisco, Cal.
99,266.—LIQUID METER.—Franz Wagner (assignor to himself, John W. Crump, and Wm. A. Lynch), New York city.
99,267.—ROOFING MATERIAL.—Pelag Werni (assignor to himself and James W. Morrison), Chicago, Ill.
97,268.—MACHINE FOR SHRINKING TIRES.—William Werts, Chicago, Ill.
99,269.—LATHE DOG.—J. B. West, Genesco, N. Y.
99,270.—FIRE EXTINGUISHER.—C. G. Wheeler, Chicago, Ill.
99,271.—CURTAIN HOLDER.—George W. Yount, P. P. Reister, A. L. Keeports, and Wm. Yount, Littlestown, Pa.
99,272.—SPIRAL CURRENT WATER WHEELS.—John Zimmerman, Owatonna, Minn.
99,273.—PRINTING TELEGRAPH.—Samuel S. Laws, New York city, assignor to the Gold and Stock Telegraph Company.
99,274.—APPARATUS FOR CARBURETING AIR.—James F. Spence, Brooklyn, N. Y., and Lovias D. Towsley, Newark, N. Y.
99,275.—BENCH PLANE.—Louis D. Tredway, St. Louis, Mo.
99,276.—PAINT BRUSH.—Jacob Rayls, Washington, Ill.

REISSUES.

3,804.—BREWING ALE, BEER, ETC.—James McCormick, Boston, Mass.
3,805.—LAMP BURNER.—Wm. F. Rippon and Geo. A. Johnson, Providence, R. I.
3,806.—SKATE.—Harshaw Scott, New York city, assignee, by mesne assignments, of Stockton H. Evans and Ludwig Gentsch.
3,807.—FURNACE FOR ROASTING AND TREATING ORES.—Division A.—Charles Stetefeldt, Austin, Nevada.
3,808.—PROCESS OF TREATING SILVER ORES.—Division B.—Charles Stetefeldt, Austin, Nevada.
3,809.—STEAM GENERATOR.—Henry L. Stuart, New York city, assignee of John F. Boynton.
3,810.—PRINTING TELEGRAPH.—The Gold and Stock Telegraph Company, New York city, assignees of Edward A. Calahan, Brooklyn, N. Y.
3,811.—HOISTING APPARATUS.—The Warrior Mower Company, Little Falls, N. Y., assignees of Henry Black.
3,812.—PRINTING TELEGRAPH.—Gold and Stock Telegraph Company, New York city, assignees, by mesne assignments, of Henry N. Baker.

DESIGNS.

3,820.—CARRIAGE BODY.—Abel S. Clapp, New York city.
3,821.—WRENCH.—A. Kindermann, Cleveland, Ohio.
3,822.—SCABBARD.—Virgil Price, New York city.
3,823 to 3,826.—DOOR ESCUTCHEON.—Joseph A. Ruff, Somerville, Mass., assignor to the Russell & Erwin Manufacturing Company, New Britain, Conn. Four Patents.

EXTENSIONS.

MACHINE FOR HEADING BOLTS.—William S. Booth, New Britain, Conn., administrator of H. M. Clark, deceased.—Letters Patent No. 14,086, dated January 15, 1856.
PLOW.—Benjamin F. Avery, Louisville, Ky.—Letters Patent No. 14,044, dated January 8, 1856.
HORSE HAY RAKES.—Mary G. Pratt, administratrix of Randal Pratt, deceased, late of Marple township, Pa.—Letters Patent No. 40,067, dated January 8, 1856; reissue No. 1,881, Dated February 28, 1865.
HORSE HAY RAKES.—Mary G. Pratt, administratrix of Randal Pratt, deceased, late of Marple township, Pa.—Letters Patent No. 40,067, dated January 8, 1856; reissue No. 1,894, dated February 28, 1865.
HORSE HAY RAKES.—Mary G. Pratt, administratrix of Randal Pratt, deceased, late of Marple, township, Pa.—Letters Patent No. 40,067, dated January 8, 1856; reissue No. 1,895, dated February 28, 1865.
APPARATUS FOR HEATING BUILDINGS BY STEAM.—Stephen J. Gold, West Cornwallis, Conn.—Letters Patent No. 14,138, dated January 29, 1856.
VALVE GEAR FOR STEAM ENGINES.—Charles H. Brown and Charles Burleigh, Fitchburg, Mass.—Letters Patent No. 14,125, dated January 15, 1856; reissue No. 2,754, dated August 27, 1867.

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