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Molding, Carving, and Paneling Machine.

This machine, of which Fig. 1 is a perspective view, is designed for molding irregular forms and panels upon surfaces in the manufacture of furniture, cars, organs, buildings, etc., of which work it will perform an unlimited variety of styles, combining the advantages of three distinct machines, performing three distinct lines of work.

1st. It is a shaper or irregular molding machine.

2d. It is a carver, cutting and molding any design, or panel upon the surface of work in the solid wood, for which a form or pattern has been prepared; cutting grooves in any direction, either plain or molded; and doing as great variety of work upon the surface, in as expeditious a manner as has been done heretofore upon the edge, by the shaper, and saving the many glue joints heretofore necessary.

3d. It molds brackets and delicate fret-work, however complicated, in a perfect manner; dovetails drawers strongly and neatly, and, in short, has a general and broad application in the useful manufactures.

By reference to Fig. 1 will be seen a guide point, A, suspended over the cutter, B, whose centers are in line with each other. The guide point is vertically adjusted by a screw wheel, C. The cutter, B, is attached to the spindle, D, which obtains its motion from the belt on primary shaft, E. A form or templet is prepared, as shown in No. 1, Fig. 4, and is attached to No. 2, on the side opposite to where the cutting is to be done. The piece is placed under the guide point, which is then lowered to the pattern. The cutter being, when not in use, below the table, is now brought up by pressing the foot upon the lever, F, Fig. 1 connecting with the bridgetree, G, to the desired hight, which is regulated by the adjusting rod, H. These means govern the depth to which the cutters penetrate. The form is then moved around against the guide point, and its shape and design transferred to the piece worked, as at No. 2, Fig. 4.

Fig. 5 represents a pew end, ornamented on one side by molding, and grooved, by the cutter, K, Fig. 3, on the other, as shown by dotted lines, to receive the seat and back.

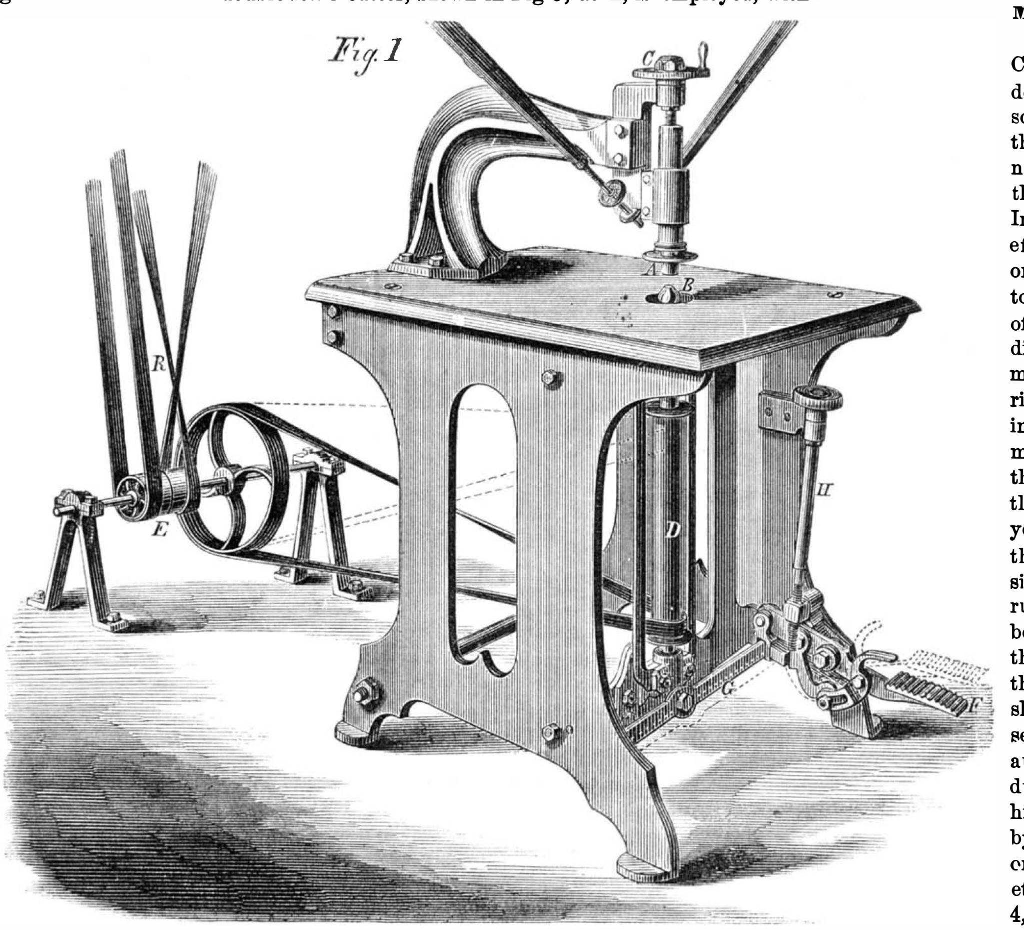
Any number of designs may be cut without change of machinery. The cutter, N, is held in the chuck, M, Fig. 3, and any of the cutters placed upon the spindle, as at B, Fig. 1, may be changed and replaced instantly.

For molding upon the edge, the guide point is run up out of the way or entirely removed, and the stem chuck, I, is placed upon the spindle instead of M, as before described; the cutter, O, is then slipped on the stem, and is held by the nut, P, and washers, Q.

These cutters are made from solid steel turned into any desired shape, and cut in either direction, right or left, as do all the cutters used on this machine. All these cutters work as freely as the ordinary open cutters. Reverse motion is given to the spindle by means of the belts, R, which secures the motion of the cutter with the grain of the wood. The usual open cutters may be used when desired. This style of machine has many advantages; namely, it has but one spindle, giving free surface of table; the cutters always run smooth, and are not liable to sliver or break the wood; and, chiefly, its scope of work is much greater than that of any similar machine yet introduced. Its sphere of work is limited only by size of material and pattern, as any distance can be cut in one direction.

Molding brackets or fret-work is done, as shown at Fig. 6. A spindle head is placed upon the arched arm, S, Fig. 2. The spindle is driven by a belt passing over pulleys, T, from the primary shaft, heretofore described. For this work the double-stem cutter, shown in Fig 3, at L, is employed, with which the smallest openings may be molded. An adjustable table is placed upon the bed, and the double stem-cutter adapted to the work is inserted in the spindle by which any style of fret-work may be molded, on the inside as well as on the outside edges, as well as thick stuff is now done on the ordinary shaper.

Fig. 1



M. T. BOULT'S MOLDING, CARVING, AND PANELING MACHINE.

Fig. 2

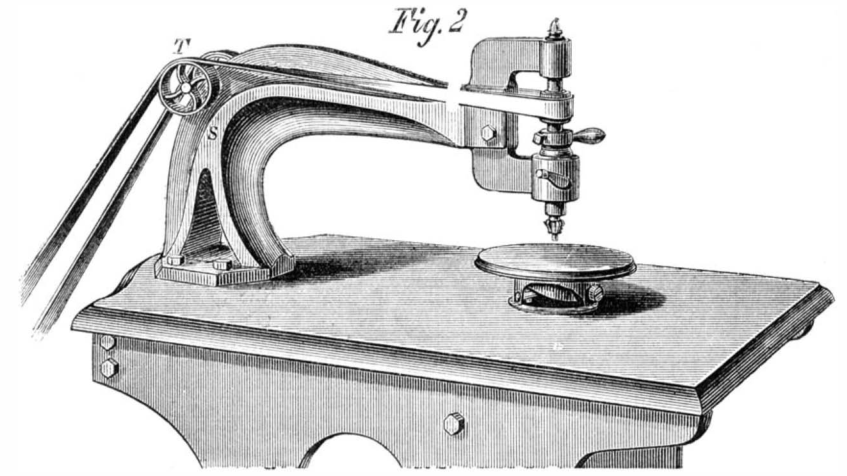
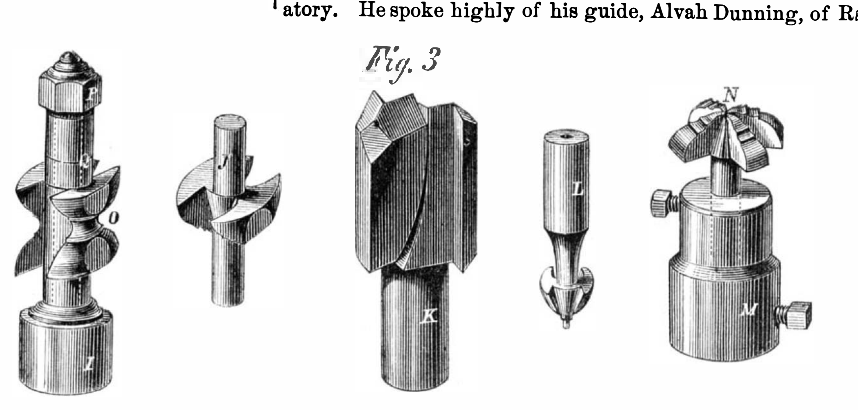


Fig. 3



1

Fig. 4

2

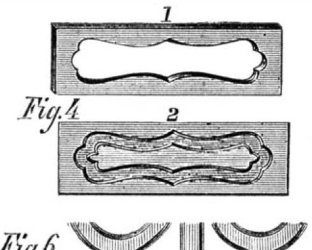


Fig. 5

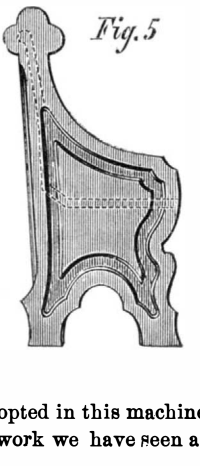
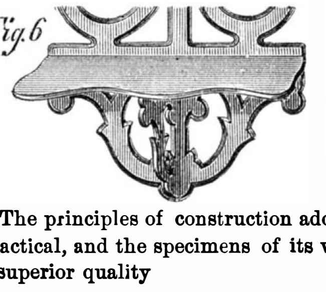


Fig. 6



The principles of construction adopted in this machine are practical, and the specimens of its work we have seen are of a superior quality

This machine is covered by several patents, obtained during the past two years, and applications for others are now pending through the Scientific American Patent Agency. Any information in regard to machines or rights may be obtained by addressing the patentee, M. T. Boult, Battle Creek, Mich., or the manufacturers, Messrs. Burnham & Hyde, of the same place.

Mount Seward in the Adirondacks.

The recent explorations of Verplanck Colvin, of Albany, in the Adirondack wilderness, have developed some valuable scientific facts. The principal result was the ascent of Mount Seward, which seems never to have been ascended and measured, the guides, together with the celebrated Indian, Mitchell Sabattis, affirming to that effect, and no record appearing of any visit or measurement. The mountain is difficult to reach, lying in a peculiarly rugged piece of the forest known to the Indians as "the dismal wilderness." He climbed the mountain from the Preston Ponds on Cold river, and after severe exertions, the ascending and descending of many lofty summits, succeeded in reaching the peak of the mountain. The ascent occupied a little over two days. Snow and ice of last year were found in small quantities upon the open summit; he is disposed to consider this as an exception rather than a rule. On the night of the 14th of October he camped near the summit, and from thence saw the aurora; the wind during the display was strong and variable, and shortly after a change in it, there would seem to be a corresponding motion of the aurora. The temperature was very low during that night. The next morning the highest point was reached with great labor by chopping through and finally walking on top of dwarf balsam trees. The barometrical observations established a hight of 4,370 feet above the level of the sea; much less than Prof. Emmons estimated (5,100), which was little more than a guess, as he never ascended the mountain. Mr. Colvin entered the wilderness at the east from the Hudson river, and on his return penetrated westward to Lewis county, returning to Albany by way of Utica, passing from south to north and then from east to west through the wilderness during this survey. His instrument was a mercurial cistern barometer of the best construction; the station for corrections was the Dudley Observatory. He spoke highly of his guide, Alvah Dunning, of Raquette Lake, commending his energy and skill. A formal report of this expedition is to be made to the State authorities, through the Regents of the University.

To Polish Marble, etc.

Marble of any kind, alabaster, any hard stone, or glass may be repolished by rubbing it with a linen cloth dressed with oxide of tin (sold under the name of putty powder). For this purpose a couple or more folds of linen should be fastened tight over a piece of wood, flat or otherwise, according to the form of the stone. To repolish a mantelpiece it should be first perfectly cleaned. This is best done by making a paste of lime, soda, and water, well wetting the marble, and applying the paste. Then let it remain for a day or so, keeping it moist during the interval. When this paste has been removed the polishing may begin. Chips in the marble should be rubbed out first with emery and water At every stage of polishing the linen and putty powder must be kept constantly wet. Glass, such as jewelers' show counter cases, which become scratched, may be polished in the same way.

IRON AND ITS MANUFACTURE.

[Abstract from an address delivered at the Fair of the American Institute, by A. W. Humphreys, President of the Sterling Iron and Railway Company.]

The method employed by all the early workers of iron was that still employed in India, Borneo, and Madagascar, consisting in heating, as heating through the aid of rude bellows, rich ores of iron, in contact with incandescent charcoal. The mass of iron thus produced is called a bloom, from the old Saxon word *blooma*. This method obtained until the discovery of cast iron, which in its development led up gradually to the smelting process, or indirect method of producing iron from its ores.

THE INVENTION OF THE BLAST-FURNACE.

To properly trace the history of the present iron manufacture we have only to go back about 500 years, to the development of the process of making pig-iron by the blast-furnace, at a date which cannot be fixed with precision, but about the beginning of the fifteenth century. It is probable that the gradually increased hight of the little furnaces or forges, formerly in use, with the greater intensity of blast, also gradually increased, finally led to the complete melting of the ore, and so, by the final addition of some earthy flux, cast-iron was obtained; but where and by whom the change was turned to any practical account, is unknown, though the first furnaces erected to make only pig-iron seem to have been in France, or what is again, unfortunately, the debatable land between France and Germany; and one of the earliest English makers of pig-iron imported a workman from France to teach him the art. But if France can claim the origin of the manufacture, England soon took and has since maintained the front rank in the quantity made, though to Sweden we still look for a superior quality of many descriptions of iron. The quantity of iron made in England was for a time seriously checked by want of fuel. Down to the beginning of the eighteenth century, charcoal had been the only fuel employed to any extent in the manufacture of iron, and the immense forests of Russia gave her, for a time after the manufacture was established there, a certain advantage, and she sent large quantities of iron to England, where the drain of timber for iron-making had been so great, that in 1581 stringent laws were passed to prevent the consumption of timber in any new iron-works within 22 miles of London, or 14 miles of the Thames, such legislation being necessary to prevent a famine of fuel, the whole kingdom being then dependent on wood; this and some additional legislation having failed of its object, it was finally forbidden to use any timber for charcoal for making iron.

Some fuel was necessary, and the Dudleys spent much time and money in their experiments in the use of pit-coal, finally succeeding in making iron by its use, but, through various obstacles, many of them thrown in the way by jealous charcoal iron makers, not being able to establish it as a regularly accepted article.

For nearly 80 years after the final abandonment by Dudley of his persevering trials and partial successes, nothing was accomplished toward the practical solution of the problem, until, finally, in 1735, Abraham Darby, of Colebrookdale, succeeded where so many others had failed, and the manufacture began a fresh period of prosperity, though still only partial, for the introduction of mineral coal necessitated further improvements which the state of the mechanical arts made still impracticable, and England continued partially dependent on Sweden and Russia. In 1750, Smeaton erected, at the Carron Works, the first large blowing-cylinders, and these, furnishing the larger quantity of air necessary with pit-coal, or rather the coke from the pit-coal—raw coal being yet unused—showed iron-masters in what direction lay the chief difficulty hitherto preventing the complete success which had been expected to follow Darby's discovery; while, at about the same time that Smeaton was constructing his large cylinders, Watt was improving the steam-engine; and he had so far perfected it, with the aid of Boulton, that in 1788 iron masters were beginning generally to employ his double engine, which supplied the power necessary to work the large blowing-cylinders, thus completing what Darby had begun; but it extended no further than the blast-furnace and the manufacture of pig-metal. Another step had been needed for the speedy and economical conversion of pigs into bars; this was supplied theoretically by a patent issued to Peter Onions, in 1783, in which the *rationale* of the puddling process was described and the principles involved fully covered. The next year Henry Cort, of Gosport, took out a patent covering the practical use of the puddling process, and the use of grooved rolls, and to Cort is generally ascribed the merit of both inventions; and he has been styled the Father of the Iron Trade; although, as a matter of fact, the mode of puddling described by neither Onions nor Cort is precisely followed at the present time. Cort spent a large sum in perfecting and introducing his inventions, and had what seemed the shrewdness to get a Government official interested in his patent, and to furnish a part of the capital necessary, and Onions sunk out of sight. Cort's Government friend was caught, however, in a defalcation, or "irregularity," having, in fact, stolen the money he advanced to Cort. The Government seized the patent; it was locked up in court, and Cort finally died a poor man, ruined by what has proved to be the means of wealth to England.

PROGRESS OF THE MANUFACTURE IN ENGLAND.

These improvements laid the foundation of England's supremacy as an iron-producer; they speedily came into general use, and the production of iron, aided by the fostering care of the Government and the unusually high price of foreign iron, rapidly increased. As the completion of these improvements, about 1790, was the commencement of the present era of iron-making in England, it may be worth while to consider, for a moment, her previous and succeeding position in this industry, from a commercial point of view. The quantity of iron made in the Kingdom nearly sufficed for the consumption of Great Britain until the passage of the stringent fuel laws above spoken of, and there were neither imports nor exports of any great quantity until the seventeenth century. Statistics of the whole product of the British Island previous to 1715, are not to be had; in that year there were estimated to be about three hundred furnaces in operation, and the price of pig-iron was about £6 per tun; from the dearness of fuel and the operation of the laws against the employment of charcoal at iron-works, the production gradually fell off, until in 1740 there were only 59 furnaces in operation, producing 17,350 tuns per annum of pig-iron, while the net imports of iron of all descriptions, mainly from Russia, Sweden, and the American colonies, were about 20,000 tuns. Then came Darby's success with pit-coal, and the make immediately began to increase, and continued to do so moderately, until, in 1788, the total production of Great Britainwas 68,300 tuns,, and her net imports about 15,000 tuns. Then came Smeaton and Watt, and Cort; the duty on bars was put at 56 shillings per tun, the value of bar-iron being about £18 per tun, and the manufacture fairly began the prosperity it has ever since retained, with occasionally a dull period of a year or more. In 1796 an additional duty of £1 per tun was laid upon bars, a rise of about 30 per cent took place in Russia, and the manufacture increased so fast that, to quote Tooke, "the produce of iron proceeded so rapidly, that, with the aid of further duties, amounting almost to a prohibition of importation, it not only kept pace with the increasing demand, but actually nearly superseded the use of foreign iron in this country, and furnished a surplus for exportation." In 1797, the production was 125000 tuns. So strong had been the stimulus, that, in 1801, there were building or in blast, 47 new furnaces, 125 being then the total number of the old ones. Let it be borne in mind that no new process had been discovered since 1790, nor had any special improvements been made, meantime, in furnace machinery; the increase was due entirely to the increased demand, to a rise in foreign iron caused mainly by this increased de nand, and by the action of the Government in so arranging the duties that Great Britain might herself reap the full benefit of the changed circumstances, carefully sustaining the feeble steps of this branch of industry while thus in its infancy. In 1806, the total number of furnaces in Great Britain was 173, making 258,000 tuns per annum, an average of less than 1,500 tuns to each furnace. In 1825, there were 364 furnaces, of which 261 were in blast, making 581,000 tuns per annum. The duty, at this time, on bar-iron, was £6 10s. per tun, having been gradually raised to this figure since 1796, and Great Britain, from being an importer, had so changed her relative position in the iron world, that her net exports were 90,000 tuns.

THE USE OF HEATED AIR.

There was still no further change in modes of manufacture, but in 1828, Mr. J. B. Neilson, of Glasgow, took out his patent for the use of heated air, instead of the cold blast, which had alone, until then, been used to support internal combustion in the blast-furnace. Whatever merit we may gladly concede to the predecessors of Mr. Neilson for their improvements, it is certain that no single invention in the manufacture of pig-iron has been followed by so great benefits or occasioned so marked advance as the use of the hot blast; although it deserves to be called a discovery rather than an invention, for, in the words of Dr. Percy, "there is no reason to believe that the patentee had, at first, any adequate conception of the value of his invention, and the great influence it was destined to exert upon the smelting of iron." But the iron-masters were not slow to perceive the great advantages it offered, and promptly availed themselves of them, so that by 1835 it is said that the heated blast was in use at every furnace in the Kingdom, with a single exception, and the quantity of coal necessary to smelt a tun of iron was reduced in three years, from $8\frac{1}{20}$ tuns, coked, to $2\frac{1}{4}$ tuns, used raw, actually consumed in the furnace, and 8 cwt. required to heat the blast, or a total of 2 tuns 13 cwt. of raw coal, the Calder works having demonstrated, in 1831, the needlessness of coking when hot blast was employed, while later the expense of any extra fuel for heating the blast was dispensed with, the waste gases from the top of the furnace being used for that purpose. This latter improvement originated in France, where, in 1811, M. Aubulot took out a patent for their employment and utilization, reserving to himself, however, only their use as far as connected with his own business, the cementation of steel—giving to iron-masters, with singular generosity, not only all the benefits they could derive in other ways from his patent, but carefully instructing such as chose to apply to him, in the best way he knew of collecting the gas, although he foresaw at least a part of the enormous advantages which would finally result from his idea. But little was actually done with the waste gases, however, to assist in smelting, until, in 1845, Mr. Budd took out a patent in England for the utilization of the gases for heating the blast, and soon applied his principle, not only to the stoves, but to the generation of steam in the boilers, at his furnaces, and since that time it is almost the universal practice to employ only the heat from the combustion of these gases for those purposes, and at some furnaces their employment is carried still further, and ore is calcined by them in kilns especially adapted for that purpose; though whether there is as yet any real economy in this, at large furnaces, remains, to a certain extent, an open question. The people of the United States have especial reason to hold Mr. Neilson in grateful remembrance, for, without hot blast it would be almost absolutely impossible to smelt iron with anthracite coal, the experiment of doing so with cold blast having been thoroughly and carefully, but unsuccessfully tried in the United States, in France, and in Great Britain, the earliest recorded trials having been made as early as 1820, near Mauch Chunk, Pa., and the next in France in 1827; but it was only when aided by hot blast that Mr. Crane, in Wales, with ovens built by Mr. Neilson himself, finally achieved success with this king of fuels, in 1837, though Geissenheimer had in 1823 taken out a patent in the United States for the use of anthracite, but with no practical results. Again, at Mauch Chunk, in August, 1838, this time with hot blast, and, it is asserted, without a knowledge of Mr. Crane's success, an attempt was made to employ the Pennsylvania anthracites, and a blast of five weeks is claimed to have been perfectly successful, the furnace being owned by Bauman, Guiteau & High. They stopped, from want of ore, in January, 1839, and, after somewhat enlarging the furnace, again blew in at the end of the following July, and continued in blast till November of the same year, having produced about two tuns of iron per day, when working best, with a blast heated to about 400 degrees. The size of the furnace was $5\frac{1}{2}$ feet bosh by $21\frac{1}{2}$ feet high. The quantity of coal consumed per tun of iron made, I am unable to state.

The Pioneer furnace, at Pottsville, was the next furnace successfully employing anthracite coal, and the same site is still occupied by an anthracite furnace owned by Messrs. Atkins Bros., though the old stack was torn down in 1858, and a larger furnace built on the same foundations. It was blown in by Benjamin Perry, with some general assistance from David Thomas, in July, 1839, and completed his first blast in January, 1840.

The above statements regarding the first use of anthracite seem to me well authenticated by documents written by the parties interested, at, and immediately after, the dates mentioned above, and I believe may be relied on, though there has been some controversy upon whose brow should rest the *corona muralis* of success in this peaceful struggle, and I have taken corresponding pains to determine the conflicting claims

THE USE OF ANTHRACITE COAL.

In a general way, it is sufficient to say that from 1839 dates the employment of anthracite coal for smelting iron in the United States, and the production of this description of iron has, with various ebb and flow, finally reached the handsome quantity of 971,000 tuns made in 1869. The primal development of the use of anthracite we must concede to Mr. Crane, in Wales. The American iron-masters long ago left their Welsh competitors far behind in the production of this particular description of pig-iron, whether there be considered the quantity made, the size and general completeness of the furnaces, or the quality of metal produced, the generally poor character of the Welsh coal, and its excessive decrepitation upon the application of heat, having been powerful hinderances to the growth, at the place of its birth, of this particular branch of iron industry, Wales having made, in 1869, but 38,000 tuns of anthracite pig-iron. With hot blast and the use of anthracite begins the real history of the extensive manufacture of iron in America. But this sketch would be quite incomplete and unsatisfactory without an attempt to follow, as accurately as possible, the progress of the early iron-workers on this continent, though the record is quite imperfect, our forefathers having had quite enough to do to maintain their individual footing, without giving themselves much anxiety about general statistics; and whoever traces carefully the fluctuating fortunes of the predecessors of the present iron-masters of this country will find that the soldier patriots of Valley Forge were not the only men whose faithful picket-duty in the cause of American Independence was attended with immense personal sacrifice and heroic self-denial.

In order to appreciate what has been done since 1840, let us glance at the then condition of the iron-making process: The ore was charged, with its accompanying fuel, into the open tunnel-head of furnaces of about 12 feet bosh and about 45 feet high; combustion of the fuel and reduction of the ore was effected by means of a blast of say 500 degrees, at a pressure of about three pounds; a part only of the waste gases were at all utilized by being taken from some distance below the top of the stack, before they had become really "waste," frequently deranging the proper working of the furnace, while the portion thus taken was of but very little use, by reason of its insufficient mixture with atmospheric air and subsequent only partial combustion; the result was a consumption of a tun and a half to two tuns and a half of fuel per tun of iron produced, and the quality of the metal made was decidedly variable, and the production per week about 70 tuns. The pig-iron was then puddled entirely by hand, to make wrought iron, and the purified product rolled into merchant bars, not a rail having been rolled in the United States until 1843. Steel was only made by the old-fashioned processes, either slowly, and at great cost, or, if more quickly, of variable and inferior quality. The lines of demarcation between the only three forms of iron then recognized, cast-iron, wrought-iron, and steel, were strongly pronounced and definite.

It would be unfair not to mention the first use of the raw bituminous coal west of the Alleghenies, as the production of iron with this fuel will ultimately quite surpass in quantity that made with anthracite. David Himrod is said to have been the first to employ it, uncoked, in 1845, being driven by a strike of his workmen to either attempt this or blow out his furnace. He tried the raw coal, and with complete success, thereby opening the door to the manufacture in 1869 of 550,000 tuns of iron made with bituminous coal.

Since 1840, the blast has been gradually made hotter and hotter, and the means of economically and regularly giving the air a temperature of 1,000 or more degrees, have naturally attracted much attention, resulting in the patenting of various stoves, of which Player's and Cowper's plans may be considered leading methods of accomplishing this end—Player's operating by burning the gas from the furnace in a separate combustion chamber, below the pipes, through which the cold air passes to be heated, and allowing only the heat to come in contact with these pipes, instead of permitting combustion to take place in the oven inclosing the pipes, as was the old plan, and the results have been very favorable, though it is fair to state that part of the gain from the use of Player's oven arises from the increased number, and somewhat changed shape of the pipes themselves.

Cowper's patent, said to be a revival of an old Scotch idea, is but little known, practically, in this country, though favorably used in England, and is founded on the Siemens' regenerative principle, a cellular mass of brick-work being first raised to a high heat, and this heat then imparted to the blast, which is made to pass through it, while a similar mass of brick-work is being heated, ready for use as soon as the first shall have become partially cooled. Whitwell's ovens, acting on the same principle, avoid some of the objections raised against Cowper's stove, the principal one being that it clogs readily with dust and is expensive to clean. This Whitwell obviates by making his brickwork into largish compartments instead of cellular. It is claimed that the blast can be heated to 1,800 degrees by this stove, and a regular working heat of 1,400 degrees be steadily maintained. To estimate properly the great importance of improved devices for heating the blast, it should be constantly remembered that for every tun of materials charged in at the tunnel-head at least three tuns weight of air is blown in at the bottom through the tweeres; and it requires but little further consideration to impress on any one the great difference that must be exerted upon the work of the furnace if this air is put into the furnace already heated, or is introduced cold, and the work of heating it thrown upon the fuel in the furnace, which should find abundant employment in smelting the ore only. There is also an unexplained advantage in the use of heated blast, it being a fact that, if the air supplied to a common laboratory blow-pipe be heated to say 500 degrees, many substances previously infusible by the common blow-pipe flame are readily melted. Why, is yet unknown.

The complete closing of the tops of furnaces is another great improvement with most ores; and, as a rule, whenever a flame is visible at the tunnel-head, we may be sure that a large waste is taking place. The best device yet arranged is what is known as the bell and hopper, or cup and cone, which consists of an inverted truncated hollow cone of cast-iron, the cup or hopper filling the throat closely at the top, but considerably smaller at the lower end than at the throat. In this is suspended a cast-iron cone, by a chain attached to its apex, and so arranged as to be raised or lowered at pleasure; its largest circumference being larger than the downward end of the cup, closes the top of the furnace completely, when raised against the cup, and, when lowered, leaves an opening of several inches all around it. Through this the furnace is charged, and as each charge passes through, it is immediately closed by raising the cone, and kept shut until time to admit another charge. The furnace gases, prevented by the tightly-closed cup from passing out of the furnace-top, and collected in the open space around its lower end, pass out to the hot blast rooms, boilers, and wasting-kilns, through proper flues. The principal object of the closed top is that all the gases may be secured for use; but it has other incidental advantages, the cone distributing the raw materials much more evenly than practicable with simply a large hole in which to dump them, while the ability to close or open the throat assists in the general control of furnace action. An excellent English authority says that 600,000 tuns of coal are saved in their Cleveland District alone, per annum, by the use of closed tops.

Passing at once from the top to the bottom of the furnace, we find an attempted improvement, not yet generally introduced, in Lurman's closed hearth. This plan builds up the hearth in a complete circle, leaving only a small hole at the bottom for the iron to run out, and, where the cinder notch usually is, a tweer, one and one-half inches in diameter, is inserted, through which the slag runs off as fast as formed. The advantages claimed, and, in some places where this hearth is introduced, fully realized, are a hotter hearth, there being no heat wasted to keep up the temperature in the useless channel between the hearth and the dam; while the tweers, instead of blowing into the cinder, as is frequently the case, are inserted at a level of about nine inches above the slag outlet, so that the materials to be smelted have the full and uninterrupted effect of the blast; less time is required for casting, while the hearth is kept so hot as to have no tendency to "grow up," and, there being no fire-hearth, there is no crust to break up, thus saving much time; and, as the hearth has no opening through which the materials can blow out, a much higher pressure of blast may be maintained.

Quite in the region of theory, as yet, is the plan of Herr Schintz, of Strasbourg, a metallurgist who has made the action of blast furnaces a special study, and who has suggested innovations which have a plausible appearance of success. It is of course known that of all the atmospheric air blown into the furnace, whether hot or cold, a large proportion consists of nitrogen, which assists not at all in the combustion of fuel, and is of very doubtful utility, in any way, in the furnace, while it is certainly harmful in diluting the useful gases, and occupies a deal of space that could be much better employed, to say nothing of the fuel necessary for heating the nitrogen, along with the hydrogen, in common air. Herr Schintz's theory has for its object the elimination of part of the great surplus of nitrogen by working the furnace partially with solid fuel, in the ordinary way, and partly with carbonic oxide, manufactured in separate generators and forced into the furnace through separate tweers with ordinary blast. It is applicable, as far as developed, only to hot-blast furnaces, and the details are too long to find a place in this paper, but the plan is worthy the intelligent consideration of iron-masters, being theoretically correctly founded.

THE FURNACES OF TO-DAY.

The size and shape of the furnace have gradually undergone great changes, the whole interior having been originally square in horizontal section, and the hearth was made square, or a parallelogram, long after the upper portion of the furnace became circular. When the interior was square, the exterior was naturally so, and was generally formed of stone masonry, heavy and massive, but the heavy masonry seems to have no special advantages beyond making a picturesque ruin when abandoned, and the later furnaces, in England and our own Western States, are of what is called the cupola style, the heavy masses of stone at the corners having given place to simple iron columns, supporting a large iron ring, on which is built the stack, the exterior of the fire-brick, which forms the hearth, being open all around, and the stack itself consisting of the fire-brick lining, with a course or two of red brick external to it, and surrounded by boiler plate securely riveted together, the whole looking not unlike a brewer's huge vat, standing on four legs. The vertical section of the interior varies with the fuel and ores to be employed, and somewhat, also, according to local fashion; the precise shape, in any locality, is best attained by careful observation of the furnace, when blown out. The constant tendency of the best English practice has been to enlarge the hearth, and with beneficial results, though on the continent of Europe, generally, the small hearths are still adhered to. The throat has also been much enlarged from the size common thirty years ago, and the proportionate hight of the furnace also increased, where the fuel is strong enough to bear it without danger of being crushed by the increased weight of the larger mass of ore, or the pieces of the crude materials so fine as to obstruct the blast, both which changes have unquestionably much increased the economy of fuel.

Now, then, after a lapse of thirty years—since 1840—a combination of the various changes and improvements gives furnaces of 27 feet bosh and 105 feet high; a blast heated at will to 1,400 degrees, blown, with a pressure of from five to seven pounds per square inch, into the upper portion of a roomy, circular hearth, tightly closed except the absolutely necessary apertures to permit the egress of scoriæ and metal, and after supporting combustion, which must produce a heat of at least 3,000 degrees, and mingling with and partially forming the gases evolved, reaches the tunnel-head at a temperature of about 500 degrees, and there, finding the throat entirely closed, is compelled to seek its exit through side flues, and do still further service—after being mixed with atmospheric air—in heating a fresh supply of air, or generating steam to force it, in its turn, through the same route; the result being a production at a single furnace of 700 tuns per week, or from one stack, in 1870, more than double the quantity all Great Britain made in 1740, and made by the use of less than a tun of fuel per tun of iron.

The total quantity of pig-iron made in the United States in 1869 had a greater value, in this crude state, at average prices, than all the gold and silver produced in our country, by some $5,000,000. Throughout Europe, the advance in iron metallurgy has been scarcely less marked than here and in England.

	Tuns.		Tuns.
In 1845, France produced.....	440,000	In 1845, Belgium produced....	150,000
In 1869, France produced....	1,380,000	In 1869, Belgium produced....	363,000
In 1845, Germany produced..	180,000	In 1845, Austria produced.....	175,000
In 1869, Germany produced..	1,220,000	In 1869, Austria produced.....	395,000

The total quantity of iron made in the world in 1869 varied but little from 11,700,000 tuns.

The Poetry of Mechanism.

Hon. S. S. Cox, of this city, recently gave a lecture upon the above topic at Steinway Hall, under the direction of the General Society of Mechanics and Tradesmen. He said that at first thought poetry might seem the antipodes of mechanics, but on further examination there would be found a perfect accord between the two, and that in all mechanism there was poetry in the highest sense of the term. The poet was lifted up by the vigor of his own invention, and was at once the greatest of inventors and yet the least of liars. But in all the poems which have ever been written there is no such poetry as sings in most of the wondrous pieces of mechanism with which the world is acquainted.

There was a true poetry in the natural mechanism of the universe, a rhythm and meter in all the great works of the Creator—in sun and stars, in rock and wood, in river and mountain; all had a poetry of their own, to which the sweetest written songs were tame. He would divide his subject into two parts: first, the elemental harmony—a mechanism not made by man; and secondly, the poetry of the mechanism of actual forms of forces of matter. He then dwelt at length upon the harmony of nature, each element of which, considered either separately or in its relations to the great whole, was full of poetic fervor; and then passing to the second branch of his subject, he took up the inventions of most of the master mechanical minds known to the world, showing their inception to have sprung from true poetic invention of the mind.

Yet with all his inventive power man could not originate; only God could furnish the power, and man could use it. If man could generate the power all machines would begin of themselves, and perpetual motion would be possible, but that could never be without violating a universal law, and all power must be drawn from the source of power, the God of nature. The lecturer then called the attention of his audience to some of the most wonderful of the inventions of the world—the distaff replaced by the spinning-wheel, and that in turn by the jenny, the introduction of steam as applied to machinery, the locomotive, the power loom, the printing press, the telegraph, and many others.

The poetry of iron, he said, was, above all, the poetry of the world; and if iron was taken away, the world would lapse into barbarism. And next to the iron itself were the men who worked it. In the olden times the first in importance among the captures of conquerors were the anvils of the opposing nation, and in all ages the smiths have played a conspicuous part.

The Americans, he said, were an inventive race, and their poetic fervor showed itself in this way: they would have made more verses if they had not taken out so many patents. He then spoke of the wondrous mechanism of the human which was the most wonderful of all machines, and in every part ofi t there was the true poetry of motion and harmony of design. Mr. Cox concluded his lecture with the assertion that the mechanism of the universe, by reason of its compensations, would endure forever.

"Fusee Satan."

M. Laurent, the distinguished civil engineer and chemist of the rue de Londres, Paris, has invented a rocket which will be a formidable engine of defense. He has christened it the fusee Satan. To the end of an ordinary rocket is attached a very slight receptacle of tin, having exactly the shape of a conical bullet. In this receptacle is arranged a chamber filled with a composition based, we believe, upon sulphuret of carbon, which composition, once lighted, gives out considerable heat. A fusee communicates from this chamber with the top of the rocket. The tin bullet is filled, just before being used, with petroleum oil. The lighted rocket rises in the air and traverses the space necessary to arrive over a certain spot. Arrived above its object, the rocket sets fire to the fusee, the composition in the chamber of the bullet takes light, bursts its envelope, and at the same time fires the petroleum, which falls like a sheet of flame and continues burning. This sheet of flame fills a space of sixteen to twenty-four square meters, according to the size of the rocket. No. 1 throws one liter of petroleum, No. 2 two liters, and No. 3 three liters. They can be thrown a distance of six kilometers, and aimed with great precision, being balanced by means of a long stick attached to each rocket, which maintains the elevation given to it at the time of discharge. Some interesting experiments were made recently with this weapon at St. Cloud. In less than ten minutes a considerable space of ground was covered with a sea of fire. A committee, composed of superior officers of artillery, presided over the experiments, and the general at their head was appalled by the terrible nature of this engine of destruction.

Just imagine this sea of fire falling upon the Prussian masses, burning everything, setting light to the cartridges in the soldiers' pouches and to the ammunition vans of the artillery. The committee, in its report, says the journal *La France*, has declared in its opinion no civilized nation could make use of these rockets except for reprisals; and it would be only in case of the Prussians firing upon us with petroleum bombs, such as they used at Strasbourg, that we should be entitled to retaliate with the new rocket. However this may be, the Committee of National Defense has given the inventor a large building on the Batignolle (formerly a girls' school), and has ordered the immediate manufacture, on a large scale, of Satan rockets. From day to day 200 workmen will be actively employed, and within a few days they will have a sufficient stock to enable them to repay the Prussians in their own coin, if, as at Strasbourg, they make use of unlawful weapons.

Mental Taxation a Cause of Dyspepsia.

Mental anxiety and pecuniary embarrassments, such as loss of property by fire, by failure in business, or by bad debts, and also domestic troubles, disappointed affections, and the loss, or the treachery, of friends, will frequently cause dyspepsia; too close, and too active intellectual labor is also a frequent cause. Editors, authors, and literary persons often engender dyspepsia in this way.

Much brain labor requires much blood at the brain, and an ever-working intellect uses up so much of both blood and nervous force that there is not enough remaining to do the work of digestion.

On the other hand, deranged digestion is sometimes produced by too little exercise of the brain. Persons are frequently met with who have been in active business life, and, having accumulated enough to satisfy their ambition, have retired from business. Now although the brains and bodies retire from active life, yet the poor stomachs very often have their tasks increased. If a man has been for a long time ascustomed to eating heartily and working hard, either with body or brain, he had better not relax his working habits without at the same time having a corresponding relaxation in his habits of eating. "He who will not work neither shall he eat," is not only a Bible injunction, but a law of the human constitution, the disobedience of which is often attended with such derangements of digestion, and other bodily infirmities, as to render either property or life of but little value.—*Dr. Miller on Dyspepsia.*

SEVERAL of the eyeless fish of the Mammoth Cave of Kentucky have been presented to the Dublin Zoological Gardens. They were caught on the 18th of August, in Echo river, four miles and a half from the sole entrance to the cave. During their month's residence in light some trace of eye has been developed.

Improved Hand-Washing Device.

The annexed engraving represents a simple and useful dé vice for the purpose of washing the hand and arm of those who have been unfortunate enough to lose one of these most important members. Of all inconveniences to which a one-armed man is subject, none is so great as that of the washing of his remaining hand, which, in fact, is considered an impossibility without the aid of some device. The convenient contrivance shown in our engraving has been long used by the inventor (a one-armed man), who recommends it to like unfortunates. It is simple in construction and not liable to get out of order, and may be applied to either washstand or basin as desired.

Fig. 1 represents a perspective view of the device with the sponge removed from the plate, F, and Fig. 2 is a front view of the same.

A sponge or other suitable material is fixed to the upper surface of the frame which slides in grooves on the upper surface of a bed-plate, the latter being attached to the side of a washstand or other fixture. The implement is affixed in an inclined position, so as to let the water expressed from the sponge to run off through a chamber in the bed-plate.

A designates the bed-plate. It consists of a curved plate, from one of whose sides depends an ear, C, which receives a clamping screw, D. The bottom of the bed-plate has two studs, B B, separated a little distance from each other, and standing far enough behind the pendent ear to permit the edge of a washstand, G, to come between them, as shown in Fig. 2.

The bed-plate, A, is curved in cross section, and its upper face is depressed throughout its whole length to receive the perforated sliding plate or frame, F. The sides are made tapering so as to form a dovetail connection with the bed-plate, A. The perforations of the plate, F, serve a two-fold use: first, to allow a sponge, E, to be fastened by strings or wire through said perforations; and, secondly, to permit water from the sponge to run through to the surface of the bed-plate, A, and discharge into the basin.

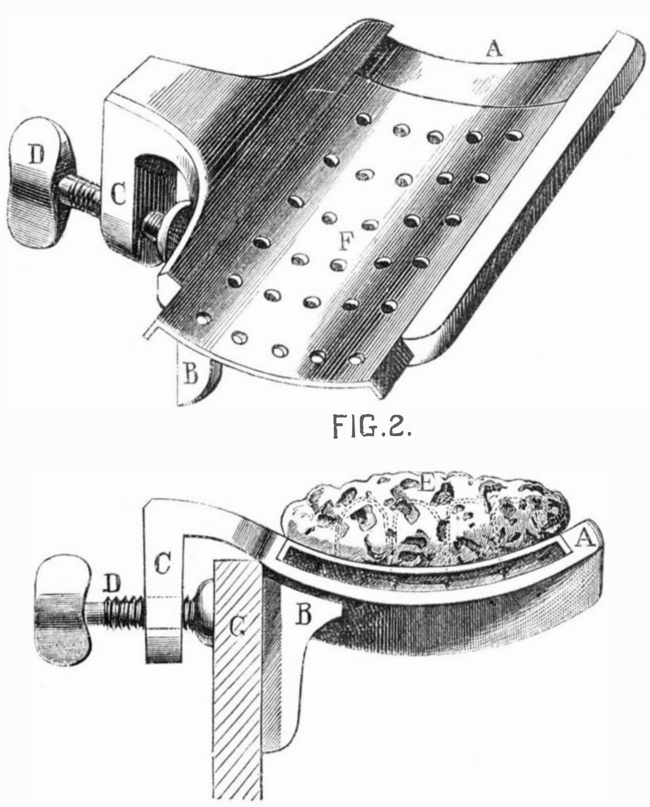
If it is desired to use the washing surface of the apparatus after the manner of a wash-cloth, water and soap are applied to the sponge, E, then remove the frame or plate, F, containing the sponge, from the bed-plate, and hold it in the hand with the lower side of the plate next to the palm. In this position the sponge can be used to wash the different parts of the body.

The bottom of the bed-plate is solid and any water which comes from the sponge is conveyed off in the channel in the bed-plate.

Patented, through the Scientific American Patent Agency, July 4, 1865. For further particulars address the inventor, Gust ve Dieterich, Box 773, New York City.

FIG. 1.

FIG. 2.



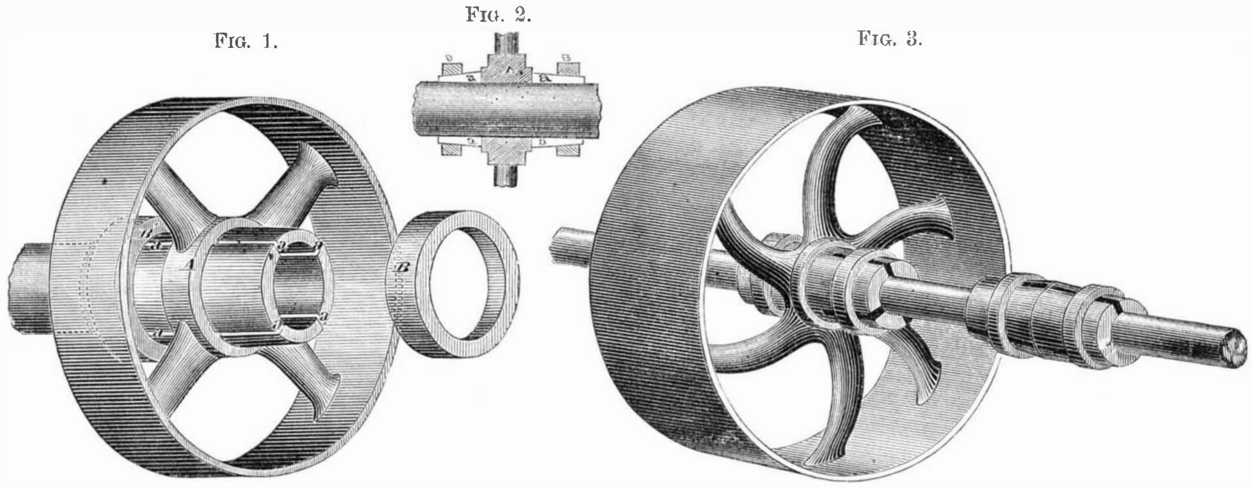
DIETERICH'S HAND-WASHING DEVICE.

Securing Pulleys, Gear Wheels, Etc., to Hollow or Solid Shafting.

When the common taper key, or the set screw, is employed to secure pulleys to shafting, only two points of bearing on the shaft are made. The use of either of these devices on a hollow shaft has a tendency to collapse or indent it, and renders a better device for this purpose a desideratum, which it is the object of the invention shown in the accompanying engraving to supply, and also to furnish a fastening by the use of which the pulley shall not be forced out of its concentric posititon whether the shaft be hollow or solid.

The device consists in slotting the hubs of the pulleys, and clamping the parts thus slotted by rings to the shaft. The details of the method will be readily understood in reference to the engravings; Fig. 1 being a perspective view of a pulley with one of the rings detached; Fig. 2 an axial section with both rings in place, and Fig. 3 a perspective view of the pulley in position on the shaft, and also showing the extension of the principle to pulley coupling.

Fig. 1. Fig. 2. Fig. 3.



DEVICE FOR SECURING PULLEYS, GEAR WHEELS Etc.. TO HOLLOW OR SOLID SHAFTING.

The hub, A, is made tapering at both ends, and the slots, *a*, are cast in the hubs. The rings, B, are formed on a mandrel to the proper taper—five eighths of an inch—and driven on to the hub, as shown, the hub being turned to fit the rings. The driving on of the rings causes the slotted parts of the hub to rigorously embrace the shaft, and thereby secure the pulley by a uniform pressure on all sides of the bearing.

For shop rights or royalty, or for any further information, address the manufacturers, Reinshagen & Buckman, Queen City Machine Works, No. 87 Eighth street, Cincinnati, Ohio.

Proposed Iron Bridge over the Housatonic River.

The New York and New Haven Railroad Company will soon commence the construction of a handsome iron truss bridge of great strength over the Housatonic river, about five miles east of Bridgeport. Its entire length will be 1,091 feet, consisting of two stationary spans of 190 feet each, three stationary spans of 168 feet 4 inches long each, and a draw or swing span 206 feet long. The piers will be built of stone, and of such a form as will be best calculated to resist large masses of floating ice, when it breaks up and floats down the river during the spring freshets. When the draw shall be opened, there will be a clear space on each side of eighty-five feet for the passage of vessels. The iron girders, one on each side, will be twenty-two feet high, and sufficiently wide apart for two tracks, with a space of six feet in the clear between them. The columns, girders, and beams are to be of cast iron. The wrought iron work is to be capable of withstanding a tension strain of not less than 60,000 pounds to the inch without breaking. The floor beams are to consist of two heavy Phœnix I-beams properly trussed.

It is agreed on the part of the contractor, that it shall not require more than two men to open or close the draw with ease inside of two minutes, and in case it shall be found on completion that more than two men shall be necessary to perform the work of opening or closing the draw in the time prescribed, a stationary steam engine is to be provided for the motive power to turn it, and the turn-table is to be so constructed that in case any part thereof liable to break or wear out by ordinary use of the draw, may be replaced without interrupting the use of the swing span.

The bridge, when entirely finished and declared ready for the passage of trains over it, is to be subjected to a load of 5,000 pounds per lineal foot, without deflecting in any part more than one inch on any of the spans, and when removed all parts of the bridge to resume their original position, and no greater deflection is to occur to any part of the bridge while a train is passing over it. The company reserves the right to select at random pieces of wrought iron from each of the sizes and forms used in the construction of the bridge, and subject the same to a test strain of 60,000 lbs. per sectional inch.

The bridge will form a straight line across the river and level grade. It will be constructed on the north side of the present railroad bridge, and as near as it can be without the work being interfered with.

The cost of the iron superstructure will be $140,000. Including the piers and approaches, the cost of the bridge is estimated at something over $300,000. The bridge, with the exception of the draw span, is to be completed by the end of October, 1871, and the swing span is to be finished within one month after the close of navigation next year.

We are glad to report the progress of these substantial railroad improvements.

Manufacture of Paper.

The offer of a reward by the Mulhausen Society of Industry for the best treatise on the manufacture of paper and choice of paper stock has secured a highly valuable contribution from Mr. O'Reilly, in which he remarks that it is gratifying to see that in the manufacture of paper, as well as in all other arts, there has been great progress during the last hundred years. Chemistry and mechanics have each contributed their part. The former has afforded us improved methods for washing, bleaching, blueing, and coloring the stock, which must yield a different product from what was made by the ancients The mechanical improvements have been many, and tend to facilitate and cheapen the manufacture of paper. The use of ultramarine, which at one time was almost as valuable as gold dust, is a contribution from chemistry that the most sanguine believer in the progress of science could not have foretold. To see the beautiful blue color that Raphael so highly prized now made so cheaply as to be available in every laundry and in extensive manufactures, is one of the triumphs of modern science.

The same science that has given us our color has also taught us that the cellulose of all plants is the same as that contained in rags; and, in fact, the fiber of some plants will give us a paper that cannot be made from rags.

Not all plants, however, are adapted to the making of paper. Much depends upon the bark, membrane, and fiber, and there is a difference in the purity of the cellulose in various plants. The chemical tests also show a modification in the fiber of plants. The cellulose of cotton yields a blue color immediately with tincture of iodine; that of flax does not turn blue until an acid has been added, and hemp requires both acid and considerable time before the blue color makes its appearance. These reactions point to the presence and absence of starch and glucose in different species of plants.

Chemically pure cellulose is perfectly white, more or less translucent elastic with a mean specific gravity of 1·5. It is insoluble in water, alcohol, ether, and volatile and fixed oils. It is unchangeable in dry air, but when moist it becomes yellow; in consequence of the formation of ulmic acid. In the sunlight moist cellulose suffers changes that have not been fully explained, and these alterations are modified and retarded by coloring or any organic matter. The action of acids upon cellulose is full of interest. Sulphuric acid changes it into a species of parchment, and if the action of the acid be permitted to go on for some time, the cellulose is transformed into starch, dextrine, and glucose. Very concentrated sulphuric acid chars paper and converts it into ulmic acid. Nitric acid has violent action upon cellulose, and changes it into explosive compounds, and longer contact converts it into oxalic acid. Hydrochloric acid dissolves cellulose in small quantities.

A mixture composed of 80 per cent hydrochloric acid and 20 per cent nitric acid has been shown, after a great number of experiments, to be the best adapted for the disintegration of woody fiber. In twenty-four hours it converts the cellulose of wood into a spongy, soft mass, that can be easily separated by the fingers. The color is not changed, and all of the incrusting and foreign matter of the wood is destroyed.

As the result of his experiments he concludes that woody fiber, treated as above, afterwards carefully washed, pressed in a mortar again washed and neutralized with a 10 per cent soda lye, bleached with a 10 per cent chloride of lime bath, would yield long, soft, strong, silky fiber for the manufacture of paper. But notwithstanding the success of the experiment in a small way, all attempts to apply it on a large scale have proved unsuccessful. The wood was mixed with the *aqua regia* in large stone reservoirs, and it was found to be impossible to prevent leakage; then arose the difficulty with the red fumes of nitrous acid that produced a most deleterious effect upon the workmen. After the wood is disintegrated it must be hastily washed or the acid would wholly destroy it, and there was difficulty in performing this operation, as the acid would attack iron rapidly and thus introduce chloride of iron into the stock, which would certainly ruin it for the manufacture of paper. There was also a great loss of soda growing out of the neutralization of the pulp after it had been disintegrated.

With regard to boilers, he prefers those with double bottoms to any other invention for preparing the stock, and he lays much stress upon the gradual increase and decrease of the temperature. He also gives an account of the successful employment of ammonia water in the treatment of certain kinds of fiber. In reference to the various ways of bleaching the pulp preference is given to the employment of the chlorine gas and of hypochlorites. If the hypochlorite of alumina were a salt that could be made in sufficient quantity and at a reasonable cost, it would be better than any other as a bleaching agent, but under the circumstances its use must now be confined to a superior quality of paper where the cost is of less importance. Bleaching by chloride of lime appears to have been universally adopted, although of late years much has been said about the use of permanganic acid as in every way preferable.

PERPETUAL MOTION.

NUMBER I.

The search after "perpetual motion"—so-called—through centuries of vain effort, have brought only failure, still captivates those who believe in the possibility of such a machine, exacting time and money from its votaries. To the end that it may be seen how hopeless are all such efforts, and that inventive genius may be turned into more profitable channels, we have decided upon publishing the present series of articles.

It is not designed to make these papers a connected history of the numerous attempts which have been made at solving this problem. Our object will be principally to place before our readers some of the most plausible devices that have deceived people into waste of time and money, that others may shun these false paths; for it is noteworthy that not one of the devices which have been brought to our notice by modern inventors, in the course of our long and large practice as patent solicitors, has not had its prototype in some invention that preceded it. "There is nothing new under the sun," said Solomon the wise, and certainly so far as "perpetual motion" machines are concerned, Solomon was right.

Many people are not very clear in their ideas of what is meant by "perpetual motion," and the term itself is one of those unfortunate ones calculated to mislead those who do not use language critically.

The perpetual motion so long sought by inventors is not something that moves or will continue to move forever, or that will move till it wears out. A water wheel placed on a never-failing stream, is a perpetual motion, if this be the true meaning of the term. Neither is it a machine that once set in motion by an external force, will retain its motion forever, or until it is stopped by the action of another external force, though even such a machine has never been constructed by human hands. A wheel armature suspended from a magnet having just power enough to keep it from falling, and placed in vacuo, is probably the nearest approach to such a machine ever attained by mortals. The pendulum hung on knife-edges in vacuo will retain its motion nearly as long. Theoretically, if we can eliminate from any moving body all resistances, it would never cease moving and would become literally a perpetual motion, though not the thing sought. The motions of the tides, the rotation of the earth, and the motions of the heavenly bodies, will continue for ages, but of these there is not one of which an astronomer would dare to predict that it will never cease.

So far as we can see, there is no single motion in nature that can be called perpetual, though change is perpetual, and motion somewhere, either of molecules or masses, must, according to the conclusions of modern science, always exist. Such can be the only conclusion drawn from the doctrine of the "conservation of force," of which the great Faraday said that it is the highest physical law of which the human mind can form any conception.

The perpetual motion of which visionaries have dreamed, and for which enthusiasts have labored, is a machine that will, under ordinary circumstances, start itself and increase its motion till it reaches a maximum, overcoming the resistances of air and friction, and possessing a surplus of motion to spare for the impulsion of other machines not self-moving. That there may be no mistake, in terms, let us adopt the name of "self-mover" for this supposed desideratum. It is not a new term, but is the only one that does not mislead thought in the consideration of the subject. Of the term "perpetual motion" Prof. Nichol, in his "Physical Sciences," says:

"If this famous appellation had simply meant perpetuity or indestructibility of force, it would have stood for an important and undeniable truth. No force is lost in the Universe; we never discern the loss, but only the conversion of force, *e. g.*, when a machine is brought to a stand through friction, all that has occurred is—the force applied to move the machine, has—through the resistance we call friction—been converted into a mechanical equivalent of heat; and this heat, by communication and radiation, is in existence playing its equivalent mechanical part. But this is not the common or practical conception attached to the term perpetual motion. It has ever signified as follows:—a machine, whose characteristic is, that the initial or primary force shall be restored or replaced by the very movement it produces. Now, setting aside the fact, that, in every machine of earthly materials, part of the initial force must ever be converted into heat and dissipated through effect of friction, it is clear that, were such a machine consummated, the effect would be not motion, but equilibrium or rest. A machine is a mere medium of connection between power at one end, and effect at the other; and were these two equal, the machine would simply stand still. The negation of the possibility of perpetual motion may therefore be accepted as an axiom in mechanical science. Mr. Grove has recently shown, in a most ingenious essay read before the Royal Institution of London, that important uses may be made of this axiom as an aid in scientific research. He has illustrated, by many important instances, that, considered as a test, it might enable us to discern in any experiment, to what degree of approximation we have obtained, from any given natural force, the total quantity of power it is capable of affording; and that it might also serve, on the discovery of any new phenomenon, to show, up to what point that phenomenon might be put in relation with phenomena formerly known."

From what we have said it will be inferred that we believe a self-moving machine to be an impossibility; but while we entertain this view, we do not forget that many able minds have held an opposite opinion, and that it has been even claimed that in two instances such machines have been actually constructed. These instances will receive notice in their proper place hereafter. We do not, then, "sit in the seat of the scornful," in regard to those who have attempted to reach the goal which has by its delusive promises led many an unfortunate inventor on to his ruin. Nor will we dogmatically assert that our opinions are infallible. All we say is, that we believe those opinions founded on sound scientific principles, and that whoever tries to produce a self-mover, is wasting his time, money, and powers, to no purpose.

John Wilkins, the Bishop of Chester, who died in 1672, and who, during his life, wrote upon the subject, classes the means employed to reach the desired object, under these heads:

1. By Chymical Extractions.
2. By Magnetical Virtues.
3. By the Natural Affection of Gravity.

He says:

"The discovery of this hath been attempted by Chymistry. Paracelsus and his followers have bragged, that by their separations and extractions they can make a little world which shall have the same perpetual motions with this microcosm, with the representation of all meteors, thunder, snow, rain, the courses of the sea in its ebbs and flows, and the like. But these miraculous promises would require as great a faith to believe them, as a power to perform them; and tho' they often talk of such great matters,— * * * yet we can never see them confirmed by any real experiment; and then, besides, every particular author in that art hath such a distinct language of his own (all of them being so full of allegories and affected obscurities), that 'tis very hard for any one (unless he be throughly versed amongst them) to find out what they mean, much more to try it.

"One of these ways (as I find it set down) is this:—Mix five ounces of ☿ with an equal weight of ♃; grind them together with ten ounces of sublimate; dissolve them in a cellar upon some marble for the space of four days, till they become like oil olive; distil this with fire of chaff, or driving fire, and it will sublime into a dry substance; and so, by repeating of these dissolvings and distillings, there will be at length produced divers small atoms, which, being put into a glass well luted, and kept dry, will have a perpetual motion.

"I cannot say anything from experience against this; but methinks it does not seem very probable, because things that are forced up to such a vigorousness and activity as these ingredients seem to be by their frequent sublimings and distillings, are not likely to be of any duration. The more any thing is stretched beyond its usual nature, the less does it last; violence and perpetuity being no companions. And then, besides, suppose it true, yet such a motion could not well be applied to any use, which will needs take much from the delight of it."

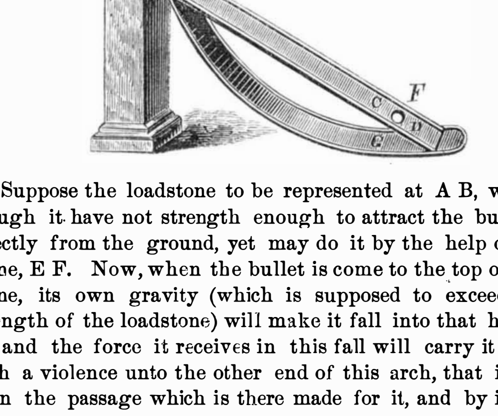
This example is enough, we think, to satisfy our readers of the absurd character of the attempts to obtain a self-mover by "chymical extractions," and though chemistry has advanced to the front rank of sciences since that time, any attempt to get a perpetual motion through its aid would be even more absurd to-day than in Wilkins' time, since it is, in a great measure, through the aid of this science that molecular physics has advanced to the knowledge of the "conservation of force."

The second class of means, viz: by "Magnetic virtues," is exemplified by a device of which we give herewith an engraving. Fig. 1.

Of this, and similar attempts, our author says:

"But amongst all these kinds of inventions, that is most likely, wherein a loadstone is so disposed that it shall draw unto it on a reclined plane a bullet of steel, which steel, as it ascends near to the loadstone, may be contrived to fall down through some hole in the plane, and so to return unto the place from whence at first it began to move; and, being there, the loadstone will again attract it upwards till coming to this hole, it will fall down again; and so the motion shall be perpetual, as may be more easily conceivable by this figure:

FIG. 1.



"Suppose the loadstone to be represented at A B, which, though it have not strength enough to attract the bullet C directly from the ground, yet may do it by the help of the plane, E F. Now, when the bullet is come to the top of this plane, its own gravity (which is supposed to exceed the strength of the loadstone) will make it fall into that hole at E; and the force it receives in this fall will carry it with such a violence unto the other end of this arch, that it will open the passage which is there made for it, and by its return will again shut it; so that the bullet (as at the first) is in the same place whence it was attracted, and, consequently, must move perpetually."

But however this invention may seem to be of such strong probability, yet there are sundry particulars which may prove it insufficient: for—

"This bullet of steel must first be touched, and have its several poles, or else there can be little or no attraction of it. Suppose C in the steel to be answerable unto A in the stone, and to B; in the attraction C D must always be directed answerable to A B, and so the motion will be more difficult; by reason there can be no rotation or turning round of the bullet, but it must slide up with the line, C D, answerable to the axis, A B.

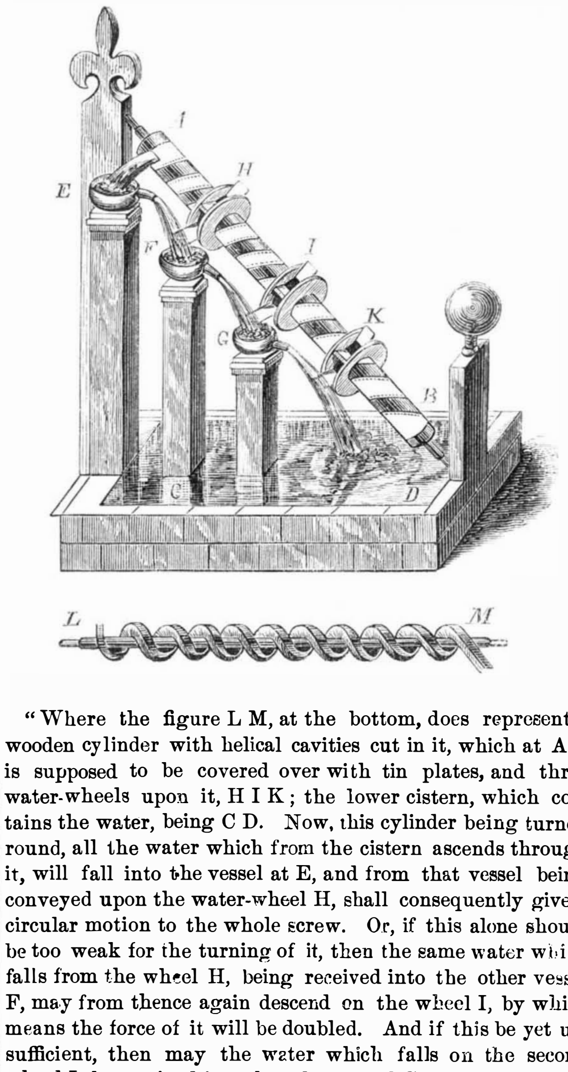
"In its fall from E to G, which is *motus elementaris*, and proceeds from its gravity, there must needs be a rotation of it; and so 'tis odds but it happens wrong in the rise, the poles in the bullet being not in the same direction to those in the magnet; and if in this reflux it should so fall out, that D should be directed towards B, there should be rather a flight than an attraction, since those two ends do repel, and not draw one another.

"If the loadstone A B have so much strength, that it can attract the bullet in F, when it is not turned round, but does only slide upon the plane, whereas its own gravity would rowl it downwards; then it is evident the sphere of its activity and strength would be so increased when it approaches much nearer, that it would not need the assistance of the plane, but would draw it immediately to itself without that help; and so the bullet would not fall down through the hole, but ascend to the stone, and, consequently, cease its motion: for, if the loadstone be of force enough to draw the bullet on the plane, at the distance F B, then must the strength of it be sufficient to attract it immediately unto itself when it is so much nearer as E B. And if the gravity of the bullet be supposed so much to exceed the strength of the magnet, that it cannot draw it directly when it is so near, then will it not be able to attract the bullet up the plane, when it is so much further off.

"So that none of all these magnetical experiments, which have been as yet discovered, are sufficient for the effecting of a perpetual motion, though these kind of qualities seem most conducible unto it; and perhaps, hereafter, it may be contrived from them."

From among many devices under the third class, we select the one shown in Fig. 2, whereby the desired motion is sought through the action of fluid weights:

FIG. 2.



"Where the figure L M, at the bottom, does represent a wooden cylinder with helical cavities cut in it, which at A B is supposed to be covered over with tin plates, and three water-wheels upon it, H I K; the lower cistern, which contains the water, being C D. Now, this cylinder being turned round, all the water which from the cistern ascends through it, will fall into the vessel at E, and from that vessel being conveyed upon the water-wheel H, shall consequently give a circular motion to the whole screw. Or, if this alone should be too weak for the turning of it, then the same water which falls from the wheel H, being received into the other vessel F, may from thence again descend on the wheel I, by which means the force of it will be doubled. And if this be yet unsufficient, then may the water which falls on the second wheel I, be received into the other vessel G, and from thence again descend on the third wheel at K; and so for as many other wheels as the instrument is capable of. So that, besides the greater distance of these three streams from the center or axis by which they are made so much heavier, and besides that the fall of this outward water is forcible and violent, whereas the ascent of that within is natural,—besides all this, there is thrice as much water to turn the screw as is carried up by it.

"But, on the other side, if all the water falling upon one wheel would be able to turn it round, then half of it would serve with two wheels, and the rest may be so disposed of in the fall as to serve unto some other useful delightful ends.

"When I first thought of this invention, I could scarce forbear, with Archimedes, to cry out *eureka, eureka;* it seeming so infallible a way for the effecting of a perpetual motion that nothing could be so much as probably objected against it; but, upon trial and experience, I find it altogether insufficient for any such purpose, and that for these two reasons:—

"1. The water that ascends will not make any considerable stream in the fall.

"2. This stream, tho' multiplied, will not be of force enough to turn about the screw.

"1. The water ascends gently, and by intermissions; but it falls continually, and with force; each of the three vessels being supposed full at the first, that so the weight of the water in them might add the greater strength and swiftness to the streams that descend from them. Now, this swiftness of motion will cause so great a difference betwixt them that one of these little streams may spend more water in the fall than a stream six times bigger in the ascent, tho' we should suppose both of them to be continuate; how much more, then, when as the ascending water is vented by fits and intermissions, every circumvolution voiding so much as is contained in one helix; and, in this particular, one that is not versed in these kind of experiments may be easily deceived.

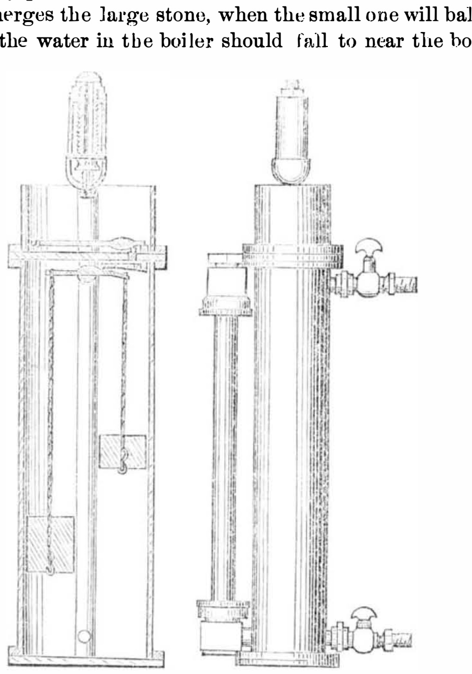
"But, secondly, tho' there were so great a disproportion, yet, notwithstanding, the force of these outward streams might well enough serve for the turning of the screw, if it were so that both its sides would equiponderate the water being in them (as Ubaldus hath affirmed). But now, upon farther examination, we shall find this assertion of his to be utterly against both reason and experience. And herein does consist the chief mistake of this contrivance; for the ascending side of the screw is made, by the water contained in it, so much heavier than the descending side, that these outward streams, thus applied, will not be of force enough to make them equiponderate, much less to move the whole."

HIGH AND LOW WATER ALARM FOR STEAM BOILERS.

This invention consists in the employment of weights, suspended in a cylinder, for the purpose of giving an alarm in the case of high or low water, or over-pressure of steam, and in the use of a hollow cap as a receptacle for the safety valve.

A double cylinder is connected by two cocks to the boiler; one half way above the water line, and the other the same distance below it. Two weights, which may be of stone, or any other suitable material, are suspended from the ends of a lever by cords or wire of unequal length. One of these weights should be greater by one third than the other, in weight. The object of this is that the large stone or weight, when immersed in water, shall weigh less by one third, or, more properly speaking, displace one third of its weight, so that the smaller weight will balance the larger.

The operation of this invention is as follows: The safety valve is first weighted to the pressure the boiler is to carry, say, sixty pounds. The water is then let in the machine until it submerges the large stone, when the small one will balance it. If the water in the boiler should fall to near the bottom



of the large stone, the difference in the weight, operating on a cam lever and a supplementary lever, will raise the safety valve, and admit the steam to the whistle. If water be again pumped into the boiler, and raised high enough to submerge both stones or weights, the gravity of the weights becomes relatively what it would be if both were out of the water, again raising the valve and giving the alarm, either of these causes being determined by inspecting the glass gage.

This invention was patented Feb. 11, 1868, by Joseph H. Springer, of Philadelphia, Pa.

Another Patent Agent in Trouble.

Commissioner Fisher, just previous to his retirement from the Patent Office, ordered the name of Otto Leissring, a patent agent doing business at Washington, to be stricken from the rolls of attorneys practicing before that Office. The "gross misconduct" of which Leissring is charged is that he fraudulently withheld moneys paid to him as final government fees upon allowed applications.

Lissring, in a letter to the Commissioner of Patents, dated October 27, 1870, acknowledges the error of his ways, and puts in the following somewhat novel defense:

"I herewith inclose affidavits to you of my not being able to appear before the office; and I must willingly acknowledge that I have erred in not paying my fees as I ought to have done.

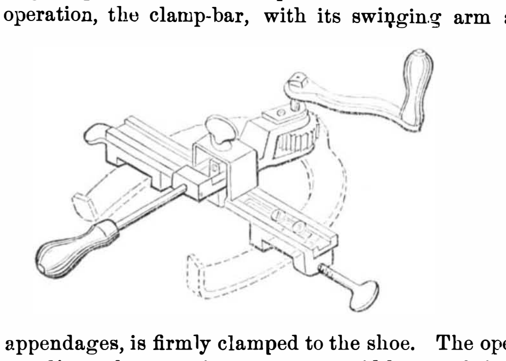
"The first time I took the fee that I ought to have paid in there was a telegraph from Green Bay, Wisconsin, stating my brother was dying and to come on immediately, and I started; which has been the principal cause of all my present trouble. My brother left over $60,000, and all of which will come to me, and I have had to go on there twice, which has cost me considerable; and I have expected to get $10,000, stated in the affidavit, long before this, but, on account of the war in Europe and sickness of my mother there, my papers were delayed, and they have only come to me within the past ten days, and I have sent them on to Wisconsin as stated in my affidavit, and I am expecting them back every day, and as soon as they return I will be in possession of $10,000, deposited in bank in this city for insurance on my brother's life.

"I will give you further information soon as I am able to appear before you."

DEVICE FOR SHARPENING HORSESHOE CALKS.

Our engraving shows a novel machine for sharpening horseshoe calks, while the shoe is secured to the horse's foot, thereby obviating the necessity for removing the shoe for that purpose. It consists in the employment of an adjustable clamp, adapted to be secured to the shoe, and armed with a rotary, circular, or cylindrical file. The device is the invention of John Johnson, of Barrington, New York, and was patented by him January 28, 1868. The rotary file is adjustable relative to its holding-clamp and the shoe in such a manner as to adapt it to operate upon the several calks without changing the position of the clamp.

In operation, the clamp-bar, with its swinging arm and



other appendages, is firmly clamped to the shoe. The operator then adjusts the swinging arm upon said bar, to bring it into the desired relation to the calk to be operated upon, when, seizing the handle, the desired pressure of the file against the calk may be given, while, at the same time, by vibrating the handle, the file is made to traverse back and forth over the calk, and the required rotation being given thereto through the crank, the calk is readily and rapidly filed away, until the desired degree of sharpness is secured.

Patents--No Examination.

The New York *Tribune*, in a recent editorial referring to patents and inventions, says our patent laws seem to need an amendment which will assimilate them, in an important respect, to the British. The Patent Office here, as there, should simply register claims to have made inventions or discoveries in their order, without undertaking to pronounce upon their novelty or value; and all questions thence arising should be taken directly to the courts, and there settled. This is the British rule on the subject, and it is much better than ours. Let the inventor make whatever claims he will, and let the courts determine their validity. Our laws give the Commissioner and his examiners entirely too much power—power which the best functionaries might abuse, through defect of information or error of judgment—which the worse certainly *do* and *will* use most unrighteously. Let them be cut down.

THE prospectus of the Industrial Exhibition Company, now before the public, embodies a magnificent scheme. Four full blocks of ground for a site; a building eight stories high, and containing 2,844,000 square feet, or over six acres of floor room, to be filled with all manner of curious and instructive objects; eleven acres of glass-covered court, forming one vast hot-house and garden; and an art gallery 3,760 feet or two thirds of a mile long and 150 feet wide; these are the prominent attractions promised, besides others of minor importance. The capital required is $2,000,000, and on this the estimates of the projectors show an expected net income of $6,291,000, or something over 300 per cent. Some of our most substantial citizens have taken hold of the speculation.

SPONTANEOUS COMBUSTION.—A correspondent from Bridgeport, Conn., states that recently in the establishment of the Winchester Arms Co. at that place, some rifling chips were taken from the draining pans and thrown in the scrap heap, when, in a very few moments, they burst into a fierce flame which required much water to extinguish. The rifling chips mentioned were fine steel shavings covered with oil.

AN INVENTION WANTED.—An English cotemporary calls attention to the fact that the ordinary method of cleaning door steps, which requires the operator to kneel on the cold damp stones, gives rise to a disease familiar to hospital physicians, which it calls "*housemaid's knee.*" It says some instrument for this purpose, which will not necessitate kneeling, is an invention much needed.

GAS BURNERS.—The streets of New York are lighted by 18 017 gas burners, owned by the different companies as follows: Manhattan, 7,084; New York, 3,241; Harlem, 4,000; Metropolitan, 3,692. Each burner consumes three feet of gas per hour, and burns 3,833 hours and 20 minutes per year. The price paid the companies is $53 per annum for each lamp. Each lamp-post cost the city $20, and each lamp $4·50 to construct. The number of feet of gas burned per annum by the city in lighting the streets is 134,360,483; the cost of material is $441,416·50; the annual cost of gas is $954,001. The Manhattan Co. has two hundred miles of main pipe; the New York, one hundred; the Metropolitan, ninety-five, and the Harlem, ninety-eight.

Correspondence.

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

Transferring Surface Lines in the Hoosac Tunnel.

MESSRS. EDITORS:—In your issue of October 29 is an article on the Hoosac Tunnel and the difficulty involved in transferring the surface lines to the bottom of the shaft. If the transit is made with rings instead of plates, so as to permit an unobstructed view downwards, it certainly seems to me that the engineer, by the aid of a calcium or magnesium light, could fix as many points in the vertical plane as he desired, and with more accuracy than with plummets. Cross hairs are evidently most accurate.

It may not be practically possible to see down clearly a depth of 1,030 feet, but I have set points at night with a light at a greater distance than that on the surface. If it is practicable the engineer can constantly verify his work from the mouth of the shaft. C. E.

Keosauqua, Iowa.

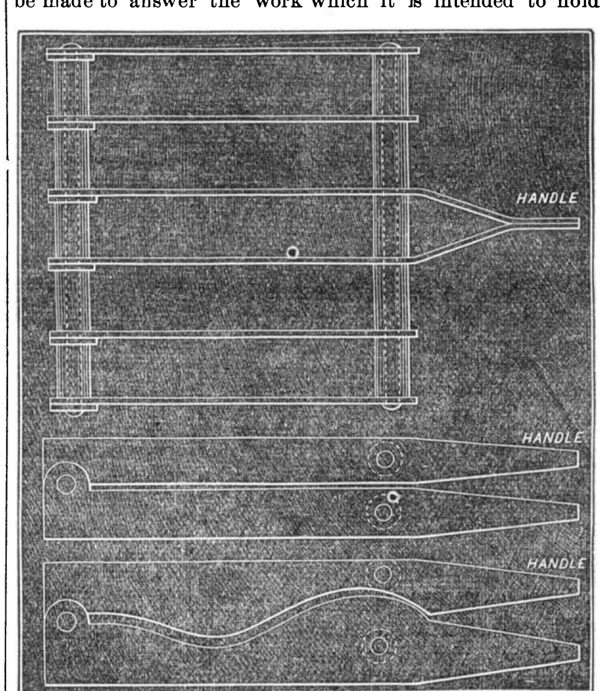
Don't Use Zinc and Lead Paints in Apple-Grinding Machines.

MESSRS. EDITORS:—I have just received an apple-grinder from New York State, and when it arrived I found the inside was painted with a heavy coating of zinc white. Of course I procured some benzine and cleaned it; but, as many would use such a machine in just the condition received, I think some measures should be taken to prevent manufacturers from using such substances. Although zinc may not be as poisonous as lead, it is chemically foreign to the body, and injurious to the health. The same company of which I obtained the grinder advertises a feed-cutter in which the knives cut against strips of copper, which I think is a very objectionable feature. H. A. SPRAGUE.

Charlotte, Maine.

Tempering Thin Steel Tools.

MESSRS. EDITORS:—In answer to J. H. M., of N. Y., how to harden thin steel without springing, you will find inclosed a diagram of a machine made out of hoop iron, or better, old buck saws. A certain number of them put together, as shown, and riveted; the width and length must be made to answer the work which it is intended to hold



between its jaws. Either straight or curved pieces can be held nicely. The inside edges of the tongs or gridiron, or whatever name you may call it, should be filed sharp that the water or bath prepared will have full action on the surface of the articles hardened. I would recommend for hardening a bath as follows: Water at a temperature of from 30° to 40° F.; or better, a bath composed of sal ammoniac, spirits of niter, and white vitriol, each one ounce, alum two ounces, salt eight ounces, lard oil one pint, and water one gallon.

For mill picks, heat to a cherry red, cool quick, and draw no temper. For taps and dies, heat to a cherry red, and draw the temper till the shade is of a light blue color. For wood tools, draw till the shade is a copper color. For springs, heat to a black red, and draw till the shade is a dark blue color. For marble chisels the shade should be a light yellow.

Portland, Me. GEORGE JONES.

Severe, but is it Just?

MESSRS. EDITORS:—In the experience of a California miner, who emigrated to South Africa in search of diamonds, given in your issue of Nov. 12, occurs the following passage: "We find that the blacker the negro is the more honest he is; whenever they get a little white blood in them they will steal," etc. Now, is not this a rather damaging accusation against the white blood? If "a little" will make a negro a thief, what must be the moral status of the full-blooded white man? This is severe, but I hardly think it just.

Cleveland, Ohio. J. W.

NEW DRESS.—The next issue of the SCIENTIFIC AMERICAN will appear in new type, cast expressly for this paper by Farmer, Little & Co.

A MONSTER gun of 35 tuns is being cast in Woolwich England. It will be rifled with nine grooves, and the ordinary cartridge will contain eighty pounds of powder.

SAMUEL F. B. MORSE.

BY JAMES PARTON.

During the voyage of the packet ship *Sully* from Havre to New York, in October, 1832, a conversation arose one day in the cabin upon electricity and magnetism. Dr. Charles S. Jackson, of Boston, described an experiment recently made in Paris with an electro-magnet, by means of which electricity had been transmitted through a great length of wire, arranged in circles around the walls of a large apartment. The transmission had been instantaneous, and it seemed as though the flight of electricity was too rapid to be measured. Among the group of passengers no one listened more attentively to Dr. Jackson's recital than a New York artist, named Samuel Finley Breece Morse, who was returning from a three years' residence in Europe, whither he had gone for improvement in his art.

Painter as he was he was nevertheless well versed in science, for which he had inherited an inclination. His father was that once famous geographer and doctor of divinity, of Charlestown, Massachusetts, whose large work upon geography was to be found, half a century ago, in almost every considerable collection of books in America. Besides assisting his father in his geographical studies, Samuel Morse had studied chemistry at Yale College under Professor Silliman, and natural philosophy under Professor Day. After graduating from Yale in 1810, he went with Washington Allston to London, where he received instruction in painting from Sir Benjamin West. Returning to the United States in 1815, he pursued his vocation with so much success that he was elected the first president of our National Academy, and held the office for sixteen years. In 1829 he went again to Europe for further improvement; and it was when returning from this visit that the conversation took place in the cabin of the *Sully*. During all the years of his artist life he had retained his early love for science, and usually kept himself well informed of its progress. Hence the eagerness with which he listened to Dr. Jackson's narrative.

"Why," said he, "when the doctor had finished, "if that is so, and the presence of electricity could be made visible in any desired part of the circuit, I see no reason why intelligence might not be transmitted instantaneously by electricity."

"How convenient it would be," added one of the passengers, "if we could send news in that manner."

"Why can't we?" asked Morse, fascinated by the idea.

From that hour the subject occupied his thoughts, and he began forthwith to exercise his Yankee ingenuity in devising the requisite apparatus. Voyages were long in those days, and he had nothing to do but meditate and contrive. Before the *Sully* dropped her anchor in New York harbor he had invented and put upon paper, in drawings and explanatory words, the chief features of the apparatus employed, to this hour, by far the greater number of the telegraphic lines throughout the world.

The system of dots and marks, the narrow ribbon of paper upon a revolving block, and a mode of burying the wires in the earth after inclosing them in tubes, all were thought of and recorded on board the packet ship. The invention, in fact, so far as the theory and the essential devices were concerned, except alone the idea of suspending the wires upon posts, was completed on board the vessel. A few days after landing, the plan, now universally adopted, of supporting the wires was thought of by the inventor, though he still preferred his original conception of the buried tubes.

The reader, of course, is aware that the mere idea of transmitting intelligence by electricity was not original with Samuel Morse. From the time when Dr. Franklin and his friends stretched a wire across the Schuylkill river, and killed a turkey for their dinner by a shock from an electrical machine on the other side of the stream, the notion had existed of using the marvelous fluid for transmitting intelligence; and long before the *Sully* was launched some attempts had been made in this direction which were not wholly unsuccessful. Science had done her part. It remained for the inventor to devise an apparatus which would utilize scientific truth, and Samuel Morse was the individual.

An artist arriving at home after a three year's residence in foreign countries is not apt to be furnished with a great abundance of cash capital; nor is he usually able to spend any more time in unproductive industry. Three years passed before Mr. Morse had set up his rude apparatus of half a mile of wire and a wooden clock, adapted to the purpose by his own hands, and sent a message from one end of his wire to the other, legible at least by himself. He used to exhibit his apparatus now and then to his friends, and he spent all the time he could spare from his profession in perfecting it. For some time it was placed in a large room of the New York University, where, in the fall of 1837, large numbers of persons witnessed its operation.

The invention attracted much notice at the time, as I can just remember. Every one said, How wonderful! How ingenious! and boasted of the progress man was making in science; but scarcely any one believed that the invention could be turned to profitable account, and no man could be found in New York willing to risk his capital in putting the invention to a practical test. By this time, however, Mr. Morse had become fully possessed by the inventor's mania, which shuts a man's eyes to all obstacles, and forces him to pursue his project to the uttermost.

Having no other resource, he went to Washington in 1838, arranged his apparatus there, exhibited its performance to as many members as he could induce to attend, and petitioned Congress for a grant of public money with which to make an experimental line between Washington and Baltimore, a distance of forty miles. It is weary work getting a grant of money from Congress for such a purpose; and it *ought* to be, for Congress has no constitutional right to give away the people's money to test such an invention. A committee reported upon it favorably, but nothing further was done during the session.

He crossed the ocean to seek assistance in Europe. His efforts were fruitless. Neither in France nor in England could he obtain public or private encouragement. It seemed out of the sphere of government, and capitalists were strangely obtuse, not to the merits of the invention, but to the probability of its being profitable. They could not conceive that any considerable number of persons in a country would care to pay for the instantaneous transmission of news. Returning home disappointed, but not discouraged, he renewed his efforts, winter after winter, using all the influence of his personal presence at Washington, and all his powers of argument and persuasion.

March the third, 1843, the last day of the session, was come. He attended all day the House of Representatives, faintly hoping that something might be done for him before the final adjournment; but as the evening wore away the pressure and confusion increased, and at length hope died within him, and he left the capitol. He walked sadly home and went to bed.

Imagine the rapture with which he heard, on the following morning, that Congress, late in the night, amid the roar and stress preceding the adjournment, had voted him thirty thousand dollars for constructing his experimental line! Eleven years and a half had passed since he had made his invention on board the ship. Perhaps, on that morning, he thought it worth while to strive and suffer for so long a period to enjoy the thrill and ecstasy which he then experienced.

But his troubles were far from being over. Clinging still to his original notion of inclosing the wires in buried tubes, he wasted nearly a whole year, and spent $23,000 of his appropriation in discovering that the plan would not work. He resorted at length to the system of wires suspended upon poles; and on the 1st of May, 1844, messages were transmitted between the two cities, and the electric telegraph was an accomplished fact!

Many years elapsed before the invention was of much advantage to Mr. Morse. Rival inventors entered the field, and rival companies spoiled the business. It was not until the consolidation of most of the companies into two or three that the business of transmitting messages by telegraph was very profitable to any one. During the last few years the inventor has been enriched; but I presume there are at least fifty persons now living who, without having contributed an idea to the invention, have made more money by it than the inventor.

What an astounding development the business has attained in the United States! We have one company the capital stock of which is $41.000,000, and the receipts during the year 1869 $7,500,000, of which more than $2,500,000 were profit. This company has 121,595 miles of wire, 3.469 stations, 2,607 instruments for reading by sound, 1,334 recording instruments, and 22 000 magnetic battery cups. It transmitted last year 40,000,000 messages, and an amount of newspaper matter equal to about 30,000 columns of the New York *Ledger*. There is one telegraphic office in the city of New York in which 125 operators are employed, and you may see them at work if you step in at the corner of Broadway and Liberty street. It is not unusual for this office to receive and send 30,000 messages in one day. Not far from the *Ledger* office there is a small sign-board over one of the cable offices, which I should suppose Mr. Morse could never read without emotion. It is this:

"Telegraphic messages sent to all parts of Europe, Asia, and Africa."—*James Parton, New York Ledger.*

The Fifth Avenue Cathedral.

The great Roman Catholic Cathedral, covering the entire square between Fifth and Madison avenues, and Fiftieth and Fifty-first streets, is rearing its vast proportions above the ground level with increased rapidity. The entire area of ground occupied by the edifice proper is one and a half acres. The huge enterprise, commenced about five years ago, during the lifetime of the late Archbishop Hughes, is now progressing towards completion as rapidly as circumstances will admit, under the direction of Archbishop McCloskey. The time estimated as necessary to finish the work is about twenty years. At present considerably over one hundred men are employed in quarrying, stone-cutting, masonry, and general labor. The marble used is quarried at Pleasantville, on the Harlem Railroad, and is brought directly on the premises by a special branch track. It is of the very best quality for building purposes, being of fine, large crystals, of an even consistency and uniform color. Some of the blocks are very heavy, weighing from ten to fifteen tuns each.

The walls have now reached a hight of fifty-four feet to the triforum, and are ready to receive the cornices and parapet. Next season the columns for the clear story and the arches, will be reared; the entire front wall will also be completed. The transepts are now finished. The large Gothic windows, some twenty feet above the ground level, are all finished, and indicate the grandeur of the flood of light that they will admit through gorgeous stained glass. The mullions, traceries, etc., are all very delicately and beautifully wrought, but are not to be compared to the splendor of the greater upper windows in the clear story, yet to be erected.

A meager idea of the stupendous work can be gleaned from these items: The distance from the floor to the ceiling is to be 110 feet. The edifice is cruciform in shape; it is 185 feet wide at the transepts, and 330 feet in length. There will be two towers and two spires, each 330 feet high—the ground length of the building.

The side walls are between three and four feet thick; the tower walls between twelve and fourteen feet thick; the clear-story walls are to be three feet thick. About $800,000 have already been expended, and $2,500,000 will be required for its completion. The grand central entrance on Fifth avenue, lately completed, is a marvel of stately beauty and architectural finish. It is seventy feet in hight, thirty-three feet in width, with opening doors twenty-five by fifteen feet in dimensions. The marble work is most elaborately wrought. Rich carvings—the archiepiscopal coat of arms, the miter, keys, etc., form the key-stone piece; lilies of the valley, grapes of Eschol, grains of wheat, wreath of ivy, myrtle, olive branches, etc., ornament the sides. Incomplete as it is in every part, already the Cathedral is a thing of won drous and fairy-like beauty. Its grand doorway is a marvel of art, its walls like carven snow in their purity, and with infinite grace are blended in their buttresses and pillars massive strength with ethereal lightness of effect. Inside the walls the picture is a strange one. Much of the ground is grass-grown, and piles of debris, masses of carved blocks of marble, mountains of brick and cement, cover the earth here and there. Work is going on but in a lazy, dreamy sort of way. There is no hurrying crowd of workmen; there are no unseemly noises of puffing engines, creaking derricks, and shouting laborers. A single lonely-looking horse sedately lounges along a path prepared for him, slowly hoisting up bricks and mortar to the men at work upon the interior of the walls. A yoke of patient oxen and still more patient driver languidly move big blocks of marble hither and thither on a low sledge. There is no haste; the men work as those who work for all time, and propose to take all time to do the work in. One has an almost irresistible inclination to lie down and go to sleep somewhere about the place. The loudest noise to awaken him, if he did, would be the chirping of the countless sparrows flitting all about, and his dreams would inevitably be of ghostly ruins in a land of eternal rest and silence. When complete, however, it will be the finest church edifice in America.

It is contemplated soon to commence operations on two new buildings, the archiepiscopal palace, on the corner of Madison avenue and Fiftieth street, and the pastoral residence on the corner of Madison avenue and Fifty-first street. These will be very large and of elegant design; the same marble, material, and architecture in correspondence with the Cathedral style will be used.

"The Most Murderous Machine."

The *Gaulois* of Paris lately published a paragraph stating that "The man who shall invent the most murderous machine, and the one easiest to use and handle, shall receive from the French nation a prize of 500,000 francs." This offer recalls to mind a passage in Lord Buchan's life of Napier, the inventor of logarithms, born in 1550, died 1617. In a note Lord Buchan quotes from St. Thomas Urquhart's Tracts (Edinburgh, 1774), who states that Napier had "an almost incomprehensible device, which, being in the mouths of the most of Scotland, and yet unknown to any that ever was in the world but himself, deserveth very well to be taken notice of in this place, and it is this—he had the skill, as is commonly reported, to frame an engine which, by virtue of some secret springs, inward resorts, with other implements and materials fit for the purpose, inclosed within the bowels thereof, had the power (if proportionable in bulk to the action required of it—for he could make it of all sizes) to clear a field of four miles circumference of all the living creatures exceeding a foot in hight that should be found thereon, how near soever they might be found to one another; by which means he made it appear that he was able, with the help of this machine alone, to kill 30,000 Turks without the hazard of one Christian!"

Of this, it is said (continues his lordship), that on a wager he gave proof upon a large plain in Scotland, to the destruction of a great many head of cattle and flocks of sheep, whereof some were distant from others half a mile on all sides, and some a whole mile." * * * (But) "when he was most earnestly desired by an old acquaintance and professed friend of his, even about the time of his contracting the disease whereof he died, that he would be pleased, for the honor of his family and his own everlasting memory to posterity, to reveal unto him the manner of the contrivance of so ingenious a mystery, subjoining thereto, for the better persuading him, that it were a thousand pities that so excellent an invention should be buried with him in the grave, and that after his decease nothing should be known thereof—his answer was, that for the ruin and overthrow of man there were too many devices already framed, which if he could make to be fewer he would with all his might endeavor to do; and that, therefore, seeing the malice and rancor rooted in the heart of mankind will not suffer them to diminish the number of them, by any new concert of his they should never be increased." "Divinely spoken, truly," adds his lordship, and divinely say we. Yet this was precisely the sort of machine, "the most murderous and the most easily handled," at present in request at Paris.

MAMMOTH PEARS FROM SOUTH CAROLINA.—Mr. S. C. Means, of Spartanburg, S. C., has sent us a number of very large and beautiful pears, the largest of which weighs 1¾ pounds. The fruit keeps, he states, till May. As it is not in condition to eat at present, we cannot speak for its flavor, but Mr. Means states that they are excellent in this respect. He has no name for his fruit, but they clearly resemble the pears which are being brought overland from California to this market.

Improved Earth Closet.

The attention which has been lately given to the earth closet system, is stimulating inventive talent to devise means for more conveniently applying it to general use. We herewith illustrate a new commode, which comprises many conveniences over others we have seen.

Fig. 1 is a perspective view of this commode; Fig. 2 a horizontal cross section made just below the seat, and comprising a plan view of the means whereby the earth is carried over and deposited upon the excrementitious matters; and Fig. 3 is a vertical section, designed to better show the operation of various parts of the device.

The earth is placed in a chamber, A, Figs. 1 and 3, the bottom of which consists of a metallic slide, B, Figs. 2 and 3. When the commode is not in use, all the parts occupy the position shown in Fig. 3, that portion of the metallic slide lying underneath the chamber being a continuous plate, fitting tightly against the bottom edges of the walls of the chamber.

The anterior portion of the slide, shown at C, Figs. 2 and 3, consists of recessed shallow chambers, D, Fig. 2, the bottoms of which are closed by pivoted slats, E, Figs. 2 and 3. These slats drop down into the position shown in Fig. 3, when the commode is not in use, and the lid of the seat is closed.

Fig. 1

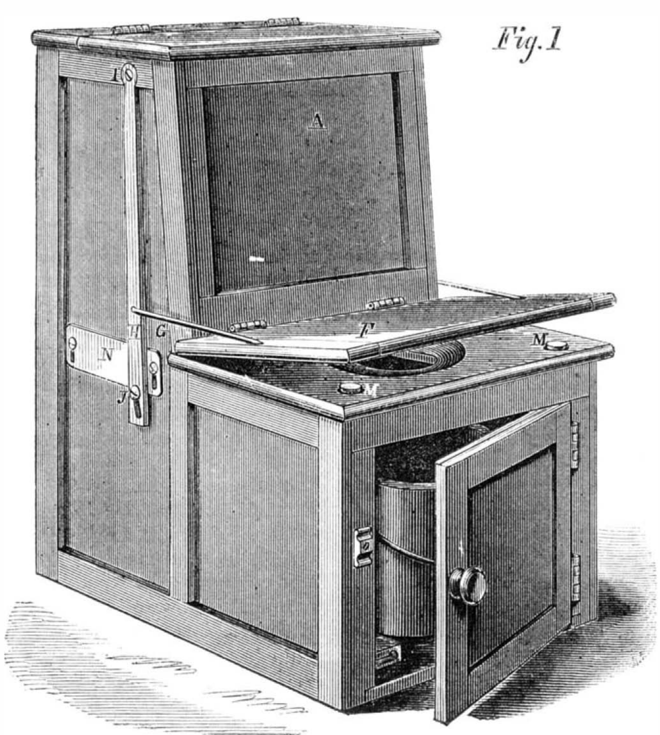
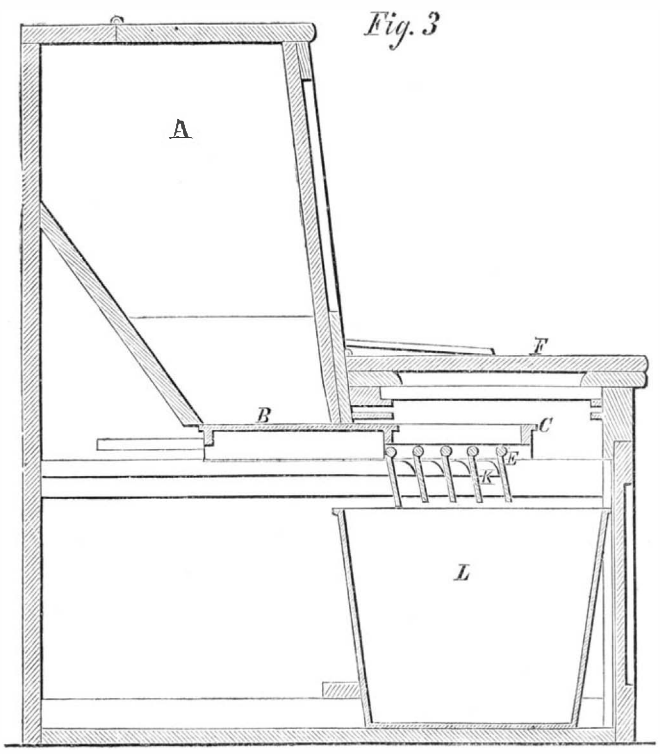


Fig. 3



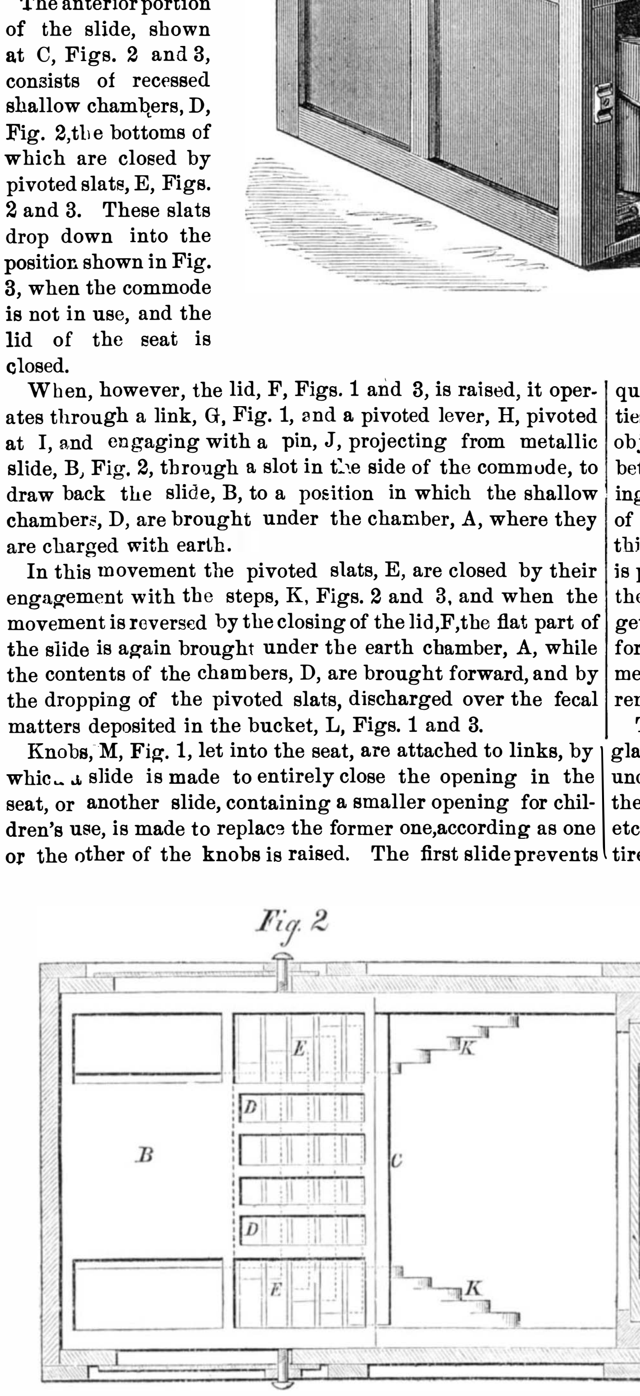
WAKEFIELD'S EARTH CLOSET.

When, however, the lid, F, Figs. 1 and 3, is raised, it operates through a link, G, Fig. 1, and a pivoted lever, H, pivoted at I, and engaging with a pin, J, projecting from metallic slide, B, Fig. 2, through a slot in the side of the commode, to draw back the slide, B, to a position in which the shallow chambers, D, are brought under the chamber, A, where they are charged with earth.

In this movement the pivoted slats, E, are closed by their engagement with the steps, K, Figs. 2 and 3, and when the movement is reversed by the closing of the lid, F, the flat part of the slide is again brought under the earth chamber, A, while the contents of the chambers, D, are brought forward, and by the dropping of the pivoted slats, discharged over the fecal matters deposited in the bucket, L, Figs. 1 and 3.

Knobs, M, Fig. 1, let into the seat, are attached to links, by which a slide is made to entirely close the opening in the seat, or another slide, containing a smaller opening for children's use, is made to replace the former one, according as one or the other of the knobs is raised. The first slide prevents

Fig. 2



the emission of fetid exhalations, and, also, prevents the escape of dust while the earth is deposited in the bucket.

An automatic vertical metallic slide, N, Fig. 1, also operates to close the slot in the side of the case, in which the pin, J, plays, and prevents the escape of exhalations from it.

A device, not shown, for placing earth, coal ashes, etc., in the chamber, A, enables this operation to be performed without the escape of dust into the apartment in which the commode is placed. Patented May 17, 1870, by Chas. A. Wakefield. Address, for rights, licenses, or agencies, Wakefield Earth Closet Co., 36 Dey st., New York.

BUTTERMILK.—Persons who have not been in the habit of drinking buttermilk consider it disagreeable, because it is slightly acid, in consequence of the presence of lactic acid. There is not much nourishment in buttermilk, but the presence of the lactic acid assists the digestion of any food taken with it. The Welsh peasants almost live upon oat-cake and buttermilk. Invalids suffering from indigestion will do well to drink buttermilk at meal times.

How Glass Paper Weights are Made.

Every one knows those paper weights of solid, colorless glass, in a hemispherical shape, in the center of which are bouquets, portraits, and even watches and barometers, etc., but few persons know how or by what means these things are incarcerated in the center of the glass. There is a great distinction to be made, not merely between the objects, but also between the materials of which they are composed. As those representing flowers and bouquets in glass—those from which the name is derived—are the most ancient and the best known, we will begin with them.

The first thing to be done is to sort and arrange a certain quantity of small glass tubes of different colors in the cavities of a thick molten disk, disposing them according to the object to be represented. This done, the tubes are inclosed between two layers of glass. To do this they begin by placing on one side of the disk which contains the tubes, a layer of crystal, to which the tubes soon become attached. When this is done the disk is removed and a second layer of crystal is placed on the opposite side. The object being placed in the center between these two layers of glass thus soldered together, it becomes necessary to give the ball its hemispherical form, which is done when the crystal is again heated, by means of a concave spatula of moistened wood. It then only remains to anneal and to polish it on the wheels.

That a glass ornament, being covered with a layer of hot glass, should receive no injury or change of color, may be easily understood from its extremely refractory nature; but it is not the same with objects in metal, such as watches, barometers, etc., which a far less degree of heat would oxidize or even entirely destroy. The mode of manufacture, therefore, of these latter objects is quite different from that of the first. It is easy to prove this. If we look at a paper weight, provided the interior be of glass, the upper and under part of the recipient will also be of glass. If we now examine a paper weight containing a watch or barometer, under the lower part of the ball will be found a piece of green cloth, the use of which is to keep in place the objects which, instead of only forming one body with the covering of glass which surrounds them, are only placed in a cavity made beforehand in the center of the half spherical ball. In a word, to take out the glass ornaments, it would be necessary to break the paper weight, whilst to take out the others it would suffice to take off the cloth. As for the paper weights in which are placed portraits, usually of a yellowish color, these profiles are made of refractory earth, and many thus bear well a heat which only softens glass. Manufactured successively at Venice under the name of millefiori, and then in Bohemia, these paper weights have been carried to perfection only by French artists. The sole difficulty in their manufacture is in avoiding internal air bubbles, which would the more deform the objects, as any defect would be much increased by the thickness of the glass.

Pin Making in Birmingham, England.

Birmingham, into which the pin-manufacture was introduced about a hundred years ago, is now the headquarters of the pin-manufacture. Then a single pin passed through fourteen pair of hands in the operations of straightening the wire, pointing, cutting into pin lengths, twisting wire for heads, cutting heads, annealing heads, stamping heads, cleaning pins, whitening, washing, drying and polishing, winnowing, paper-pricking, and finally papering up. Adam Smith, arguing on the advantages of the division of labor, can find no better illustration than that afforded in the making of a pin. "Not only the whole work is a peculiar trade, but it is divided into a number of branches, of which the greater part are likewise peculiar trades. One man draws out the wire, another straightens it, a third cuts it, a fourth points it, a fifth grinds it at the top for receiving the head; to make the head requires two or three distinct operations; to put it on is a peculiar business, to whiten it is another; it is even a trade by itself to put them into the papers: and the important business of making a pin is, in this manner, divided into about eighteen distinct operations, which in some manufactories are all performed by distinct hands, though in others the same man will sometimes perform two or three of them. I have seen a small manufactory of this kind, where ten men only were employed, and where some of them consequently performed two or three distinct operations. But though they were poor, and therefore but indifferently accommodated with the necessary machinery, they could, when they exerted themselves, make among them about twelve pounds of pins in a day. There are in a pound upwards of four thousand of a middling size.

Those ten persons, therefore, could make among them upwards of forty-eight thousand pins in a day."

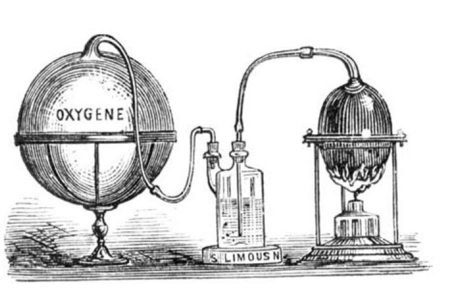
Adam Smith would now have to seek elsewhere for illustrations of the benefit of a division of labor, thanks to Wright, the American, who brought out, in 1824, a machine producing a perfect pin during the revolution of a single wheel. This machine, improved in many ways, is that employed at the largest pin-factory in Birmingham at the present day.

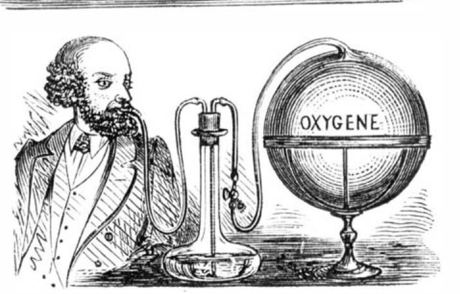
Pin papers are generally marked by means of a molded piece of wood, the molds corresponding to those portions representing the small folds through which the pins are passed and held.

The paperer, usually a girl, gathers two of the folds of the paper together, and places them—a small portion projecting—between the jaws of a vise, having grooves channeled in them, to serve as a guide for the placing of the pins. When filled, the paper is released, and held so that the light strikes upon it, when the eye at once detects every defective pin, and the ready hand removes it. One house consumes three tuns of brass wire per week in producing these ever-wasted utilities, the consumption of which in this country alone is calculated at fifteen millions per day.

APPARATUS FOR MAKING AND INHALING OXYGEN

The use of oxygen gas as a remedial agent and its administration by inhalation, have been attended with success in





certain pulmonary diseases. Our engravings illustrate a very simple apparatus, designed to facilitate the use of this remedy. Fig. 1 shows the apparatus employed to generate the gas. The material (chlorate of potassa) is placed in a retort, fixed in a convenient stand, and the heat is obtained from a spirit lamp or a Bunsen gas burner. The gas is passed through a Wolfe's bottle containing water which washes it and cools it, and it then passes into a spherical receiver, also fixed in a convenient stand. In inhaling the gas it is drawn through flexible tubes from the spherical receiver, passing in its course through a washing bottle or flask, as shown in Fig. 2, before entering the lungs. The invention of this apparatus is due to M. Limousin.

PERPETUAL MOTION.—We commence this week the publication of a series of illustrated articles on self-motors, which will be continued from week to week for several months. It will form a very curious history, and no doubt will be a painful reminiscence to some.

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NEW YORK, SATURDAY, DECEMBER 3, 1870.

Contents:

(Illustrated articles are marked with an asterisk.)

SCIENTIFIC AMERICAN.

1871.

Special Club Premium.

A New Volume of this journal will commence on the first of January next. Any person sending us yearly clubs for ten or more copies will be entitled to receive, free of postage or express charge, one copy of the celebrated engraving, "MEN OF PROGRESS," for every ten names.

This large and splendid Steel Plate Engraving is one of the finest art works of the day, possessing a rare and peculiar value over ordinary pictures, by reason of the life-like accuracy of the personages it represents. The scene of the picture is laid in the great hall of the Patent Office, at Washington. The grouping is spirited and artistic. Among the persons represented are the following eminent inventors:

S. F. B. MORSE,....Inventor of Electric Telegraph
CYRUS H. McCORMICK,....Inventor of Reaper.
THOS. BLANCHARD,....Inventor of Lathe for Irregular Forms.
WILLIAM T. G. MORTON,....Inventor of Chloroform.
SAMUEL COLT,....Inventor of Revolving Fire-Arms.
CHARLES GOODYEAR,....Inventor of Rubber Fabrics.
FREDERICK E. SICKLES,....Inventor of Steam Cut-Off.
HENRY BURDEN,....Inventor of Horse-Shoe Machine.
JOHN ERICSSON,....Inventor of the first Monitor.
JAMES BOGARDUS,....Inventor of Iron Buildings.
JOSEPH SAXTON,....Inventor of Watch Machinery.
PETER COOPER,....Inventor of Iron-Rolling Machinery.
JOSEPH HENRY,....Inventor of Electro-Magnetic Machine.
ISAIAH JENNINGS,....Inventor of Friction Matches.
RICHARD M. HOE,....Inventor of Fast Printing-Presses

These noble men, by their own efforts, raised themselves from the depths of poverty, and by their wonderful discoveries, conferred incalculable benefits upon the human race, entitling them to rank among its greatest benefactors. It is but fitting that the remembrance of their achievements, and the honored forms of their persons, as they lived and walked among us, should be perpetuated by the highest skill of art. The picture, which is three feet long and two feet high, forms an enduring and desirable object for the adornment of the parlor. It was engraved by the celebrated JOHN SARTAIN, from a large painting by SCHUSSELE, and all the portraits were taken from life. Every lover of Science and Progress should enjoy its possession. Single copies of the Engraving $9; Three copies, $25.

One copy of the Scientific American for one year, and a copy of the Engraving, will be sent to any address on receipt of $10.

MUNN & CO.,
37 Park Row, New York City.

ACCORDING to *Voss' Gazette*, the German soldiers now in France and fit for service number 690.000, while there are 160,000 horses. The daily requirements of these forces are 250,000 loaves of bread, 185 oxen, 400 cwt. of bacon, 540 cwt. of rice, 160,000 quarts of brandy, and 40 cwt. of coffee, 68,000 cwt. of hay, and large quantities of oats and straw.

HEATING OF BUILDINGS.

Although we have often been called upon to discuss the proper methods of heating and ventilating buildings, yet with the approach of each successive winter we receive numerous queries in regard to the comparative merits of various systems, and the best means of remedying the defects in each. These inquiries show that with this, as with other practical topics, "line upon line and precept upon precept" only can keep the people at large from falling into error. It is unnecessary, therefore, to offer any apology for returning at this season to a subject which, in its intimate relations to the health and comfort of all, stands scarcely—in this climate—second to that of food or clothing.

There are two, and only two, ways by which a room may be heated—namely, by radiation and convection. It is true conduction may play an intermediate part in the communication and distribution of heat to the radiating apparatus, and walls of rooms as well as the solid objects usually placed therein, but as this part is an unimportant one practically, we shall pass it without further remark.

Of the two general principles upon which all domestic heating apparatus is based, the better one, in its effects upon comfort and health, is radiation, provided the principle be applied so wisely that ill effects are not involved in its use. Of various kinds of apparatus for the application of this principle, the more common in use in this country are cast-iron wood and coal stoves, open fireplaces and grates, and steam and hot water heating apparatus. Without going into the question of relative economy in regard to these various devices, we shall consider them only in relation to their effect on health and comfort.

Against close cast-iron stoves there lie the serious objections that they do not afford proper ventilation; that when coal is used they are liable to emit deleterious gases; that in giving them fuel and removing ashes they introduce an irritating and disagreeable dust (an objection which also lies against open fireplaces and grates), and that it is difficult to maintain an equable temperature by their use. They nevertheless, from their small cost and the possibility of their use in small apartments and situations where more perfect apparatus cannot be employed, enjoy a wider favor than any other form of heating apparatus in use, and are doubtless destined to maintain their popularity, unless some inventive genius shall give to the world something which combines their advantages with the removal of their defects. We are certain such an invention could not fail to secure at once universal favor and adoption.

The chief improvements made in stoves of late years, and for which patents have been taken out, are changes in the designs and trifling alterations in the form of cast-iron stoves. If any one has thought of the possibility of cheaply rendering their joints and plates permanently impermeable to gases, it is certain that possibility remains undemonstrated by any practical invention. Methods of supplying fuel and removing ashes without the escape of dust are also very desirable, and, it would seem, not very difficult to devise and apply at small cost.

The improvement of ventilation in connection with the use of stoves is also a matter which should claim the attention of inventors. In this respect the open fireplace or grate has an immense advantage over the close stove. Nothing yet introduced for heating can retain that pure, fresh quality of air which is maintained in rooms heated by grates.

Next to the grate ranks the steam-heating apparatus for comfort and health. Properly adjusted, and with a small jet of steam escaping into the apartment to supply the needful moisture, it comes very nearly to the perfection of the open grate. But with this, as with all methods of heating where the heating apparatus is itself not a ventilator, the ventilation must be provided for by special means.

In hot-air furnaces there need be no special provision made for ventilation, as the proper circulation of air, when admitted, as it ought always to be, from the outer atmosphere to the heater, requires the constant exit from wall flues of the heated and vitiated air from the interior. There is, however, in air heated in this way an irritating and disagreeable quality which has made such an impression upon us wherever we have encountered it, as to lead us to believe that either there is some radical defect in the method, or that it is generally imperfectly applied. Our opinion is, that, as a rule, heaters of this kind are expected to furnish heated air for too large a cubic space, and are hence made to carry too highly heated plates. Plates thus heated are permeable to carbonic oxide, generated in the combustion of coal, a very poisonous gas. They also, by overheating the air, increase its capacity for water, which, though an attempt is made at compensation by placing water vessels in the flues through which the air must pass to reach the apartment, still fail to remove its disagreeable quality so as to render it equal in pleasantness to that heated by radiation from steam pipes or grates.

There are, nevertheless, conveniences in the application of these heaters which do not pertain to steam-heating apparatus, and from which they have secured great popularity. They need much less attention than steam heaters, and can be more economically applied to ordinary dwellings.

In cleaning such heaters and adjusting them for winter use, great care should be taken to make every joint air-tight, so that the gases of combustion may be kept from contaminating the air which passes over the flues. The fire-box should be carefully examined to detect cracks, and if found defective, replaced by a new one. Neglect in this respect will be sure to be followed by evil consequences. Admissions and exits for air should be protected from the effects of adverse winds by revolving vaned hoods. With these precautions, and with sufficient heating surface to render forcing of the fire unnecessary, such heaters will do good work, a will be found in general more economical than steam heaters

But whatever apparatus may be employed, none will prove fully effective without intelligent supervision. To leave the care of these devices wholly in charge of ignorant servants is about as safe a course as to place a box of arsenic alongside of the salt. Poisoning either quick or slow will pretty surely result in either case.

TO MAKE A CHEAP AND GOOD SMALL ICE HOUSE.

The essentials to a good ice house are three in number, viz: Its walls should be filled with good non-conducting and non-radiating material, its drainage should be perfect, and provision against air-leakage should be thorough.

The packing of ice in such a house is a simple matter need ing only the general direction to lay the ice with some loose fibrous or granular substance between the blocks, to prevent their freezing together, and in such a manner that the space be economized to the utmost.

The house may be built entirely above ground, or partially below it, on a side hill, if desired, or it may be built with a cellar, into which cold air is admitted from the ice stored in a room above. This will be found a great convenience to farmers in storing butter, milk, and fresh meats during the hot summer weather. The drawing off of cold air and replacing it by warm air, is, however, only to be done at an expense of ice; and if to preserve ice, as long, and with as little waste as possible, be the sole object, the cold air cellar or room had better be omitted.

The house may be built of logs, like the old style of log houses, with an inner wall of the same material, leaving a space of ten inches or more in width between the two walls, the chinks of both walls being filled with mortar. The space between walls may be filled with dry chaff, loosely packed, or sawdust, or cut straw answers the purpose very well. One of the most effective ice houses we ever saw, was made of logs, and stuffed with a mixture—about half and half—of cut straw and wheat chaff.

A frame building, with board covering, may be used, and, in many places, will be found more convenient than the logs. It will be equally effective if the joints are tightly battened, and the inner one papered throughout with old newspapers, two or three layers of which will stop all the air holes. Besides, paper is an excellent non-conductor.

Make the floor with an inclination sufficient to carry off all the drip, and make gutters all around it, near the walls, to conduct the water to the discharge pipe. A good cement bottom is best, as it can be made and kept air-tight. Make the drip pipe of inch lead pipe, and bend up the lower end, so as to form a trap which will hold water and prevent the influx of warm air. Such pipes may be, bent without flatten ing them by first filling them with melted resin. When cold bend them, and, after bending, melt out the rosin. In this way can be obtained a neat, round bend, without sharp breaks or indentations.

Insert the drip pipe and make the joint air-tight by cement or common putty.

Make the entrance, if possible, at the top of the building, with a vestibule, and an outer and inner door. Make the inner door hollow, and stuff it, like the walls. Make it shut tight by packing the joints with lists or selvedges of cloth obtained at the tailor shops. The outer door should be made air tight, but need not be stuffed. Make the vestibule large enough to enter and shut the outside door before opening the inner one (and *vice versa*); when taking out the ice during hot weather. Having done these things you will have a perfect and efficient ice house.

The hight of the building should not be great, as it increases the labor of storing; the other dimensions are to be regulated according to the quantity of ice to be stored. In storing the ice, it should be laid out only to the inside edges of the gutters in the floor, and a thin layer of dry straw, chaff, or saw dust should placed between all the surfaces, vertical and horizontal. This enables the ice to be quarried out in neat blocks when required for use.

Any one following these directions will find that, at a very small expense, they can store and keep ice as well as the best. An old dairyman once said to us, that his ice house was as profitable to him as his cellar, and we believe it. He was the owner and constructor of the log ice house referred to above, which, if not as comely as some, was as good and effective as any man need desire.

BOILER EXPLOSIONS.

The numerous disasters arising from steam boiler explosions which so frequently startle and alarm the public, and their avoidance, are subjects of such great importance, that however trite, anything said or written upon them may be, it will attract more or less attention and excite some interest. Perhaps on no subject has a greater amount of nonsense and absurd theorizing been promulgated. We feel, therefore, in justice to the importance of the subject, that a little volume which has lately reached our table,* and which bears on every page the impress of practical knowledge, sound theory, and absence of hasty and ill-advised conclusions, merits more than the ordinary brief notice we usually accord new books and publications.

The enumeration of causes of explosions given by its author is, however, in our opinion, incomplete. It is as follows: Low water, over-pressure, defects in materials, etc., scale or sediment, repulsion of water, and overheating of water. If to this category had been added the force of unequal expan-

* EXPLOSIONS OF STEAM BOILERS: How they are Caused, and How Prevented. By J. R. Robinson, Steam Engineer. Boston: Little, Brown & Company

sion we should not have found fault with its incompleteness. Unequal expansion, while in our opinion it rarely or never alone causes explosions, acts to produce a condition in which much less steam will destroy boilers, than could be the case were the steam unaided by its disruptive energy.

As however this force can only be combated by proper construction, the category of causes given includes all that boiler users can provide against, and as the author proceeds after the discussion of these causes, to plain and explicit directions for their prevention, we regard the work as one which ought to be in the hands of every man who owns or uses a steam boiler.

In his preface the author remarks, that "while it is true that the condition of many boilers now in use is such that it is a matter of surprise that so few boiler explosions occur, having their origin in excessive pressure, overheating of the surfaces above the water, in defects of materials of construction, and in the presence of scale and sediment, it is also true that there have been so many explosions not attributable to either of these causes, as to point unmistakably to the existence and operation of a power not indicated by the pressure gage."

From page 31 to 35 inclusive, are given accounts of a large number of such explosions, wherein upon minute examination none of the above-named causes could be determined to have existed. Mr. Robinson then proceeds to account for such explosions by referring them to "overheating near the bottom of the boiler, causing the water to be thrown with such force as to break the top."

In support of this view, Mr. Robinson quotes the following passage from Rankine's "Manual of the Steam Engine and other Prime Movers."

There is much difference of opinion as to some points of detail in the manner in which this phenomenon is produced; but there can be no doubt that its primary causes are, first, the over-heating of a portion of the plates of the boiler (being in most cases that portion called the *crown of the furnace*, which is directly over the fire), so that a store of heat is accumulated; and, secondly, the sudden contact of such overheated plates with water, so that the heat stored up is suddenly expended in the production of a large quantity of steam at a high pressure. Some engineers hold, that no portion of the plates can thus become overheated, unless the level of the surface of the water sinks so low as to leave that portion of the plates above it, and uncovered; others maintain, with M. Boutigny, that when a metallic surface is heated above a certain elevated temperature, water is prevented from actually touching it, either by a direct repulsion or by a film or layer of very dense vapor; and that when this has once taken place, the plate, being left dry, may go on accumulating heat and rising in temperature for an indefinite time, until some agitation, or the introduction of cold water, shall produce contact between the water and the plate, and bring about an explosion.

He also quotes from Bourne and from Colburn, both of whom maintain that the peculiar condition in question may be a cause of explosion, and the latter of whom says that in case of the rising of water because of the condensation of steam above the water, and regarding the force of the blow given by the water, "it would not be necessary to assume the existence of any defect in the boiler; for when the water once struck violently, the soundest iron would probably be broken and the strongest workmanship destroyed."

The committee of the Franklin Institute demonstrated by experiments that the repulsive temperature of a clean, rough iron surface like that of a clean iron steam boiler is 385° F., and of iron "highly oxidated, but clean," 433° F. Their experiments also showed that for polished copper the temperature of perfect repulsion is 338°

The temperatures of maximum vaporization is some 40° lower for iron, and 23° lower for copper. At the temperatures of perfect repulsion the water does not wet the metal.

By means of elaborate experiments, to which we shall refer in a future issue, Mr. Robinson claims to have demonstrated the following important facts.

The effect of pressure, accompanied by rapid circulation, so far overcomes the repulsion that "practically the point of perfect repulsion may be said to be raised by the pressure within the boiler; but this only holds true so long as there is perfect circulation of the water. When the circulation is not perfect, pressure has no effect upon the temperature of repulsion. A steam boiler, working under one hundred pounds pressure, the surfaces of which are of such a character that the temperature of perfect repulsion at atmospheric pressure is 385°, will be liable to just as perfect repulsion from any of its surfaces exposed to an intense heat, whenever that temperature is reached, unless the circulation of the water within the boiler is so good that it shall be continually brought into *forcible* contact with such surface."

Again, he finds that variations in the quality of water so slight that they neither affect its taste nor its color as seen through a glass, "affect the circulation in its relation to the point of perfect repulsion."

His experiments also show that whenever any part of the surface of a steam boiler much below the surface of the water is raised much above the temperature of maximum vaporization, the reduction of its temperature will be attended with such rapidity of vaporization as to endanger the boiler; and that, while in cases of perfect repulsion, there will always be recognizable signs of trouble within the boiler, indicated by the steam and water gages. In cases where the repulsion is not perfect, the danger may be incurred without any visible sign of its existence being manifested.

The way in which explosions occur from this cause is explained in the following quotation:

Let us take the case of a boiler in which the surfaces around the fire are clean and smooth, and very nearly uniform, and in which the circulation of the water is ordinarily good, but which has now got some element in the water that favors repulsion, or causes the water to circulate sluggishly, working with so strong a fire that the surfaces exposed to the most intense heat shall be raised to a temperature very near that of maximum vaporization, but not above it, so long as the steam pressure is maintained. Now, let the demand for steam be increased, so that there shall be such a sudden reduction of pressure that the descending current shall give off steam, and the circulation will be so broken up that the temperature of the surfaces around the fire will be raised above that of maximum vaporization: this will cause a decrease in the steaming power of the boiler, so that, without a greater demand for steam, the reduction of pressure will be more rapid, with its consequent interference with the circulation of the water, and thus the temperature of these surfaces be rapidly raised to that of perfect repulsion. Now, let the demand for steam be so far reduced that the boiler shall make steam as fast, or a little faster than it is used, and let a fire-door be opened and a strong current of cold air be thrown upon the overheated surfaces, their temperatures will be so reduced that the water will return upon them and complete the reduction to the temperature of maximum evaporization, with the consequent violent evaporization of such an amount that the steam so generated shall throw the water above it with such force as to break the shell of the boiler, and so cause its explosion.

Or, without the opening of the door, let the demand for steam be so reduced as to lead to a rapid rise in pressure, and the interference with the descending current ceases; the circulation of the water is soon so strong as to overcome the repulsive power; the overheated parts are reduced to the temperature of maximum vaporization, and the water is thrown by the steam generated under it with such force as to break the shell of the boiler, and so cause its explosion; without, in either case, any part of the boiler having been overheated so as to show it after the explosion, or so as to have reduced its tensile strength in the least.

Mr. Robinson is of opinion that most explosions of locomotive boilers on the road, or just after arriving at a station, occur in this manner.

We might protract this review to a much greater length than we have done, and go on to notice the methods of prevention prescribed by Mr. Robinson, but we forbear. Suffice it to say that the same practical sense which keeps the author from running off into speculative theories guides him in his directions for the construction, setting, and management of steam boilers. Many explosions have occurred which might have been prevented by the application of the information given in this part of the work.

A BRUTAL EXHIBITION.

Neither the presence and sanction of even such distinguished physicians and professsors as Drs. Hammond, Flint, Doremus, Mott, and Barker, nor that of "distinguished clergymen," nor the fact that these physicians were nominally present in the interests of science, can, in the minds of sober men, soften the brutality of such a spectacle as was presented to the New York public at the Empire Skating Rink on the day preceding Thanksgiving Day, the occasion of Weston's attempt to walk 112 miles in 24 hours.

We are ready to believe that if clergymen were present as reported, they were so in ignorance of the real character of the exhibition and with the belief that the occasion was to be one of scientific interest. The name of Dr. Doremus, whose fame as a lecturer, and more particularly as an exhibitor of brilliant experiments, before Young Men's Christian Associations, etc., has become widely extended, was perhaps taken as a guarantee that the exhibition would be free from anything immoral in tendency, or disgusting to a refined taste. If this was the case, how must the reverend gentleman have felt to witness a poor jaded human being whipped like a dog around the ring, to prevent his falling asleep from sheer exhaustion.

The published report said the "blood spouted" in response to the "fearful lashing," and that a whip was "*smashed*" on the tired legs, that would no longer obey the exhausted nerve force of the failing pedestrian.

If such things are necessary to increase our knowledge of human physiology, why should they be made public? Would not an examination of Weston's urine by Dr. Flint have been just as valuable had the luckless aspirant for pedestrian honors exhausted himself in private? Perhaps, however, the elimination of urea is more rapid when made under the stimulus of the shouts of a crowd, and the knowledge that much money is staked on the result. Will Dr. Flint inform us on this point? and will Dr. Doremus please tell an anxious public whether, in view of his statement to the crowd that "no alcoholic stimulants had been employed," a glass of brandy or wine publicly administered would have been more or less demoralizing than the sight of a man whipped till the "blood spurted," as a substitute for liquid stimulants?

SPIRITUALISM AND SCIENCE.

Many of our readers will recall a trial that took place in New York in reference to spiritual photographs, and the power of these invisible agencies to impress their counterfeit presentments on glass and paper. The result was rather favorable than otherwise to the spirits, as the imposters were not punished.

The subject is one that scientific men dislike to approach, as it offers so little that is satisfactory or instructive. We are reminded of it, however, by the appearance of a small monograph entitled, "The Physics and Physiology of Spiritualism. By William A. Hammond, M.D.," which work, on account of the reputation of the author, and the original researches contained in it, is worthy of particular notice.

Dr. Hammond has devoted special attention to the study of the diseases of the mind and nervous system for many years, and is, therefore, in a position to speak with authority upon the subject. He, at the outset, calls attention to the difficulties that surround the study of mental phenomena, and says. "The physiology of the nervous system is, by no means, even tolerably well understood. Science has, for ages, been fettered by theological and metaphysical dogmas, which give the mind an existence independent of the nervous system, and which teach that it is an entity which sets all the functions of the body in action, and of which the brain is the seat. There can be no scientific inquiry relative to matters of faith, facts alone admit of investigation; and hence, so long as psychology was expounded by teachers who had never even seen a human brain, much less a spinal cord or sympathetic nerve, who knew absolutely nothing of nervous physiology, and who, therefore, taught from a stand point which had not a single fact to rest upon, it was not to be expected that the true science of mind could make much progress."

Dr. Hammond is admirably sustained in these views by Professor Huxley, who says in his lecture on "The Physical Basis of Life," while alluding to the fears expressed by metaphysicians on the progress of so-called materialism, "The physiology of the future will gradually extend the realm of matter and law until it is co-extensive with knowledge, with feeling, and with action. The consciousness of this great truth weighs like a nightmare, I believe, upon many of the best minds of these days. They watch what they conceive to be the progress of materialism, in such fear and powerless anger as a savage feels, when, during an eclipse, the great shadow creeps over the face of the sun. The advancing tide of matter threatens to drown their souls; the tightening grasp of law impedes their freedom; they are alarmed lest man's moral nature be debased by the increase of his wisdom."

It is evident that these leading scientific men entertain little respect for the application of metaphysical reasoning to the explanation of physical phenomena, but they do have respect for facts, and the laws to be deduced from them, and whenever a new phenomenon is presented to them, they immediately put it to the test of experiment, and do not for a moment think of appealing to supernatural influences for an explanation of what they have seen. Our ancient philosophers having no facts to found their edifice upon, built upon the frail gossamer of their own imaginations, and to them every phenomenon of nature was a spiritual manifestation. Thus have come down to us traditions of spirits, spiritual rappings, spiritual influences, spiritual presence, communication with departed spirits, and the like, which are accepted as true by ignorant people, and not believed in for a moment by men of science.

For the purpose of dispelling this ignorance, such works as Dr. Hammond's are of great value. Facts are stubborn things, and, as Faraday was accustomed to say, "We must believe in facts." Dr. Hammond adduces many instances, from his own observation, of so-called spiritual influences, and shows them to be the results of disease, just as fever or the cholera can be traced to a disordered system. He says: "Physicians know very well that actual organic disease may be produced by the habitual concentration of the attention on an organ. The fancies of the hypochondriac may thus, in time, become realities. Many of the facts of spiritualism are clearly explainable by referring them to this influence."

He cites the case of a young lady, under his professional care, upon whom the principle of suggestion can be made to act with striking effect. It is only necessary to tell her that certain images are before her, when she directly sees them exactly as they are described. Voices are heard and odors smelt, and she has a sweet or sour taste in her mouth, precisely as they are suggested to her. Another feature in the production of spiritualistic manifestations is sleight-of-hand. The author says, that he recently invited several medical friends to witness, in his library, some surprising spiritualistic exhibitions by a first-class "medium," who read communications from the dead, made on folded slips of paper, and performed other feats to the astonishment of all present, which were wholly deceptions and tricks of the trade.

Another patient had the power to induce the hypnotic state at will, by reading a book for a few minutes, then closing it and fixing the eyes steadily, but not upon any fixed object. During this state, she was not affected by holding aqua ammonia to the nostrils, or by touching the eye with the finger. She was able to perform the usual feats of mediums, and Dr. Hammond, with his acute observations, was soon able to give an explanation. Her sleep was incomplete, and she was in a condition similar to that of a dreaming person, for the images and hallucinations were either directly connected with thoughts she had previously had, or were immediately suggested to her through her sense of hearing. Some mental faculties were exercised, while others were at rest. The phenomena were not those of pure somnambulism, but three other conditions are present in greater or less degree; these are hysteria, catalepsy, and ecstasy.

At most of the spiritualistic meetings which the author has attended, there have been hysterical phenomena manifested by some of the men and women participating in the exercises. Some of these cases afterwards came under his professional care, and were cured by a persistant administration of iron and strychnine, medicines which appear to possess great exorcising power as against the spirits.

In catalepsy we have an affection which is well calculated to fulfill many of the requirements of spiritualism. The muscles have a tendency to preserve any degree of contraction which may be given them. Sensation is generally suspended, and pins thrust into the body are not felt, and yet the intellectual faculties are often exercised to a remarkable extent.

As to the movement of chairs and tables against the force of gravity, the author says: "There is no doubt that they are due to hallucination, legerdemain, or actual fraud. A visit to the performance of any pantomime will give an opportunity for seeing as striking manifestations in this direction as any of those attributed to the agency of spirits."

To suppose that the law of gravitation can be set aside for the accommodation of spirits, would not be believed by an engineer who constructs machinery for lifting heavy building stones, and, although the scientific man may not be able to explain the tricks by which the law appears to be broken, yet he knows that there is fraud, and is not, for a moment, deceived.

This whole business of spiritualism has been the source of much mischief, and has brought insanity into many a family. Our readers ought to know, that no man of science, no sane man of intelligence, has any faith in it. Before the light of science the whole thing is shown to be an imposition. But, as Dr. Hammond says: "Spiritualism is a religion. As such it is held tenaciously by many well-meaning people. To reason with these would be a waste of words, just as much as would be the attempt to persuade a madman out of his delusion. Emotion, or interest, or accident might change them, but facts never."

There are some who halt between belief and unbelief, for the reason, mainly, that they have no clear conception of what knowledge is, and of how things are to be proved. Such persons would do well to read Dr. Hammond's book or consult him professionally, or ask the advice of scientific men anywhere, before plunging into the great folly of spiritualism.

SCIENTIFIC INTELLIGENCE.

USES OF GUN-COTTON.

When gun-cotton was discovered by Schoenbein, in 1846, great expectations were raised that it could be used for blasting and for military purposes, but owing to numerous accidents, it soon lost favor, and was scarcely used at all previous to 1862. In that year Baron von Lenk renewed the experiments with it, and finally succeeded in inventing a process by which it could be made available for artillery. He had it twisted into yarn, and applied it in that way. The English officers were not satisfied with the results of their experiments, and Professor Abel, of Woolwich, devised an improvement. He reduces the gun cotton into pulp exactly the same as paper stock, and by the same machinery. After conversion into pyroxyline, the stock can be worked up into endless paper, and in this way made available for cartridges. The pulp may be diluted in strength by the admixture of pure cotton. Common cotton waste may be employed. It can be compressed, and is thus far safer as it burns like tinder unless confined. It must be fired by detonation, and for this purpose a fuse had to be invented.

The compressed gun cotton is equal to five or six times its weight of gunpowder, is cheaper, lighter, can be stored wet, and dried when required. It is said to be good for torpedoes, but is not good in confined spaces.

TEST FOR CHLOROFORM.

A. W. Hofmann has discovered a remarkably sensitive test for the presence of chloroform. The liquid to be examined is mixed with aniline and a solution of caustic soda in alcohol; if chloroform be present, it will at once be recognized by the odor of isonitrile which is generated.

The hydrate of chloral, when treated with caustic soda and aniline in the same way, also at once reveals the liberation of chloroform. One part of chloroform in five to six thousand parts of alcohol can be recognized in this way, and it affords a method for distinguishing chloroform from chloraethyl.

INTERESTING EXPERIMENTS WITH SOLUBLE GLASS.

If to a solution of soluble soda glass, specific gravity 1·392, a solution of nitrate of soda in one part of water be added, we have at once a gelatinous precipitate of silicic acid; but if equal parts of the soluble glass and of a solution of nitrate of soda, in two parts of water, be employed, no precipitate will form in the cold; if the liquids be heated, silica is at once thrown down, and on cooling the vessel rapidly it goes again into solution.

Thus the alternate solution and re-precipitation of silica can be readily accomplished, as a neat lecture-room experiment.

IRON GUNPOWDER.

According to A. W. Hofmann, a mixture of one part sulphur, two parts iron filing (*ferrum limatum*), and three parts niter, will ignite by a glowing taper, and burn with brilliant light.

After it is cold the residue will probably give a red color, due to the ferrate of potash produced by the oxidation of the iron.

ORIGIN OF GRAPHITE.

Graphite, or, as it is sometimes called, plumbago, and block lead has been found in gneiss, mica slates, clay slates, limestones, and a variety of other rocks of different geological periods.

Its origin has long been a matter of conjecture, and scientific men have not been able to agree upon it. Professor Wagner ascribes it to the decomposition of cyanogen and of the cyanides. The black mass which sometimes separates from hydrocyanic acid, on being washed in nitric acid and dried, is found to consist of scales of graphite. Dr. Wagner infers from this that the artificial graphite that is formed on the cooling of many varieties of iron, has its origin in the same source, namely, cyanogen.

It is not the carbon which is held in solution in the melted iron, but the cyanogen compounds that give rise to the graphite.

In the manufacture of soda by Le Blanc's process there is always considerable graphite formed which is derived from the decomposed cyanogen compounds, and, in some of the large establishments of Bohemia, practical application is made of this incidental product in the manufacture of lead pencils.

This theory of the origin of black lead is worthy of attention, as it may lead to cheap methods for the artificial production of that valuable substance, and at the same time help to explain many difficult geological questions.

LETTERS FROM THE SOUTH.

RALEIGH, October 31, 1870.

Columbia, S. C.—Charlotte and Western North Carolina—N. C. R. R.—Gold and Silver Mines.—Chatham R. R. and the Deep River Section—Cotton Factories—Raleigh.

From Augusta to Charlotte, N. C., I traveled over the lately-consolidated line of the Charlotte, Columbia & Augusta R. R. The new part of this road, from Augusta to Columbia, is a smooth, well-laid track in modern style, but the remainder has old-fashioned and well-worn rails. Formerly the traveler had to go directly south to Branchville then north to Augusta, making an angle about equivalent to going to Hartford to get to Newburgh.

Columbia has been slowly rebuilding since the war. I am informed that 110 business stores have been built and 1,000 dwelling houses. The place, however, still retains some marks of the great fire. The famous capital building which was to have been the seat of future Confederate congresses has been partially fitted up, and is now occupied.

There is a large water power privilege near the city which was some time ago bought for a nominal sum by Senator Sprague, with the understanding that he was to complete the canal. He has just commenced work on it with 100 laborers. This commencement was delayed so long that many thought he bought it only to keep off others, and not for use. It is hoped now that he will properly improve it and erect factories. The country around on all sides is a large cotton producing section. There is near the city, on the Saluda river, a cotton factory of about 15,000 spindles, owned by Messrs. Childs & Johnston, and managed by Gen. Palmer, formerly of Illinois. It was burned by Gen. Sherman, but rebuilt and refitted by its present owners.

There are a number of other cotton factories in the State north of Columbia, numbering in all about 20,000 spindles. The railroad through Rabun Gap to Knoxville is expected to open new routes of travel and for transportation of produce. It will certainly open to the world a fine grazing country in Western North Carolina.

Charlotte is one of the oldest town in the United States, but within a few years past it has received a new life, and now promises to be one of the most flourishing inland cities of the South. On two sides it has a cotton growing region, on the rest as good wheat lands as can be found anywhere. While far up in the mountains is a grass and stock raising country equal to any in the world.

There are now three railroads centering there, a fourth is being built from Atlanta, and a fifth from the north. It can never, in its immediate limits, be a great manufacturing place, as it has not water power, and coal is far distant, yet it has enterprising inhabitants. The country around affords excellent water powers, and it may be the central distributing point for future factories on those sites.

The North Carolina Railroad commencing here was originally intended to be the great State line to build up her resources and redeem past errors. It has been of immense benefit, it is true, but was badly planned. It is 225 miles long, commences at Goldsboro and ends at Charlotte. An air line between the two points would not be over 150 miles. From Salisbury, on its line 40 miles north of Charlotte, starts out the Western North Carolina Railroad which is to cross the mountains at Swannanoa Gap on to Asheville, and thence eventually to Ducktown, Tenn., and Dalton, Ga. It is completed to the foot of the mountains, and the track will soon be laid to the eastern end of the tunnel. By a singular blunder of engineering the summit is made outside the tunnel on the west end, hence the contractor can work only from one side, and its completion is delayed.

The section of North Carolina which this road is opening to the world is noted for the fertility of the soil, its delightful climate, and beautiful and grand scenery, as also immense deposits of various minerals and metals. I was shown by Prof. C. P. Smith, of Franklin, Macon Co., formerly of the State Geological Survey, some beautiful rubies and amethysts he had found in his county, as well as very fine corundum. Iron and copper is in abundance, while the finest of marble, white, black, flesh color, and variegated exists in immense masses, and is easily quarried. But the great wealth of this country, heretofore almost an unknown region, is, in its climate and soil, and their adaptability to the grasses and dairy farming. Already several successful cheese factories have been established there. The North Carolina Railroad runs through one of the best sections of the South. Its eastern and southwestern ends, both are in cotton-growing sections, while the middle is a fine small grain country, affording many good manufacturing sites. Several cotton factories are on its line, and the company's shops in its center are noted for the excellence of the work done there and the superior character of the buildings. The country through which it runs is also a great mining region, chiefly gold. Near Charlotte there are a number of gold mines in quartz veins successfully and profitably worked by Northern men with the improved modes and machinery. I would not, however, advise any one to imitate their example, as it is the most precarious kind of work.

Near Lexington is the Silver Hill mine whence the ore comes from which the Bartlett Lead Co. make their pigments. I went down in their mine 645 feet and saw a vein of ore 12 feet wide. It is certainly one of the most astonishing veins in this country, and the deepest mine now worked this side the Mississippi.

The copper mines of this section have never paid well except in Wall street; some of them are good if properly worked. In Rowan is the famous Gold Hill mine from which millions of dollars of gold have been taken, and more left behind on top, in the debris and underground. This mine affords a fair illustration of the uncertainties of gold mining. A friend of mine once took out $25,000 worth of gold in two days. It so elated him that he spent twice as much in trying to find another such pocket.

South of Raleigh is the Deep River country, where the coal fields are located. It is reached by the Chatham Railroad from this place, and by steamboat and railroad from Wilmington. These coal mines have, unfortunately, like too many other mines in North Carolina, been worked more on speculation than for business. They were worked during the war on the latter plan, and one mine afforded fully 30,000 tuns of coal per year. By these very speculative movements mining in North Carolina has been put in bad repute, but a change is now likely to be made as the mines get into few hands.

The Silver Hill mine alluded to is an instance of what can be done on a business basis. Yet there the whole country immediately around the mine is filled with the sulphurous fumes from desulphurizing the ore for shipment. The company ship about 4,000 tuns of ore per year, they throw off into the air in North Carolina, and thus waste at least 2,000,000 lbs. of available sulphur, which for making sulphuric acid should be worth at least $30,000.

The owners of a copper mine in the Deep River country, called the Clegy Mine, east of the coal measures, adopt a different course. They ship about 3 tuns of ore per day. It is taken to Baltimore, there desulphurized, and the fumes utilized for making sulphuric acid, then the residuum is melted. This mine is an exception to the usual North Carolina copper mines. No gold has ever been found in its ore, and it was copper from the top, whereas those of Guilford and that region, on the surface are sulphurets of iron carrying gold, and change to sulphuret of copper. Those of Western North Carolina are the gray sulphuret and black oxide. This Clegy mine I could not but admire; every house was neatly painted or whitewashed, and the general air of cleanliness and order was quite refreshing. Under the ground the same system of affairs existed, the mine was opened right. Capt. John Ends is the efficient superintendent of this property; it is but fair to say, though, that the vein is almost vertical, and hence gives great advantage in opening regular workings.

In this same region there are immense deposits of iron ore, rivaling anything in Missouri or the Lake Superior country. They were worked by three furnaces during the war, but no work at all is done now, though two of the furnaces are standing. The cause of this may be the same that has crippled the credit and resources of North Carolina for a few years past, as this section became unfortunately mixed up in the speculations of the swindling bond ring. The superb water power at Lockville remains almost idle, and the still greater one on the Cape Fear below is worse than unimproved.

Agriculturally this region produced cotton and all the grains very well; some of the lands are very rich. South of Deep River, about 40 miles, is the town of Fayetteville, once the most flourishing town of the State, having one at time 8 cotton factories in her suburbs. Now there are only 2, one of about 4,500 spindles the other 2,500. They both pay large dividends, showing that others could be erected with profit. There are in the State now 25 cotton and woolen factories; previous to the war there were 34. They probably run about 80,000 spindles.

The country around Raleigh is a wheat, corn, and cotton growing region. The State capital, Deaf and Dumb, Blind, and Lunatic Asylums are located here, and a penitentiary is being built. There is one good foundery, an agricultural implement, and a sash and blind factory, and the shops of the R. & G. and Chatham Railroads. Great things are looked for in the completion of this last railroad, so as to bring coal to the city, and a cotton factory to run by steam is talked of. Dr. Hawkins, its president, and also president of the R. G. & Weldon Railroad, is one of the best railroad managers in the South or anywhere else, and is a man of enterprise and energy, disposed to encourage Northern settlers and desirous of building up this State. I well remember the old Raleigh & Gaston Railroad, with its flat strap rail, when we used to jump off the cars, steal apples from a neighboring orchard, and then catch the cars again by not even walking fast. There is now a vast change. It is not only a good road, but also a paying one.

Raleigh has no water power in its immediate limits, but a few miles off are good sites. On two of them are flourishing paper mills, and on another a flour and cotton-seed oil mill. There are at various points in the State agricultural implement factories, more than in any other Southern State.

I now return to New York, and for the present I bid the South adieu. I trust my letters have at least instructed some of your many readers as well as brought light on some of the many resources of the South. She only needs Northern capital and Northern energy to fulfill her destiny.

H. E. C.

CURE FOR IVY POISONING.—A correspondent writes that the extract of lobelia or a poultice made of the fresh leaves is a cure for ivy poisoning. It should be remembered, however, that the external application of this plant in excess may produce obstinate vomiting and even greater symptoms of poisoning. We should ourselves hesitate to use it except under the advice of an experienced physician.

THE thousand Chinamen who are working on the Alabama & Chattanooga Railroad, it is said, do not give satisfaction, and the experiment is not likely to be repeated in that section.

NEW BOOKS AND PUBLICATIONS.

ADRIFT WITH A VENGEANCE. Carlton, Publisher, Madison square, New York city.

Kinahan Cornwallis, the accomplished editor of the *Albion*, has given us n this volume a very graphic and entertaining story, which combines incidents of social life, travel, and adventure in a most thrilling and interesting manner. Its pages are crowded with incident and adventure and "hairbreadth 'scapes" in South Africa, Australia, and upon the treacherous deep, enough to furnish forth many such volumes. In the arrangement of his drama and the disposition of the characters, the writer has made excellent use of his own varied experience and knowledge of life. We can cordially commend this book as one well suited to enliven the amily circle on the dull winter evenings.

SCRIBNER'S MONTHLY, for December, contains a series of unique illustration of "The Street Venders of New York," "June Birds and their Flights," and the "The Hoosac Tunnel." It is an excellent number.

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 chaaged.

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

House Planning.—Geo. J. Colby, Waterbury, Vt., offers information of value to all in planning a House. Send him your address!

Manufacturers of Blacking Boxes please send descriptive price list to R. H. Singleton, Nashville, Tenn.

Match splitting Machines wanted, by Paul Lechtenberg, Salt Lake City, Utah.

E. S. Hill, South Abington, Mass., can tell our correspondent how to blacken eyelets.

The Merriman Bolt Cutter—the best made. Send for Circulars. Brown & Barnes, Fair Haven, Conn.

Machinery for pulverizing sand and for crushing ores, is wanted by Pryor Lea, of Goliad, Texas.

$25,000 wanted by a M'f'g Co., in an extensive chemical wood treatment enterprize founded on important patents. Address S. & B., box 90, Postoffice, New York.

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

Millstone Dressing Diamond Machine—Simple, effective, durable. For description of the above see Scientific American, Nov. 27th, 1869. Also, Glazier's Diamonds. John Dickinson, 64 Nassau st., N. Y.

Pictures for the Drawing Room.—Prang's "Lake George," "West Point," "Joy of Autumn," "Prairie Flowers." Just issued. Sold in all Art Stores. "Three Tom Boys." "Bethoven," large and small.

Small Steam Engines and fixtures, complete; hand lathes; foot and drop presses, cheap. Address J. Dane, Jr., Newark, N.J., who will contract with parties desiring machinery built at reasonable rates.

Rawhide Sash Cord has no equal for heavy windows or dumbwaiters. Makes the very best round belting. Darrow M'f'g Co., Bristol, Ct.

"507 Mechanical Movements."—This Book embraces all departments of mechanics. Each movement finely illustrated and fully described. To mechanics and inventors it is invaluable for references and study. Price $1. By mail $1·12. Address Theo. Tusch, 37 Park Row, N.Y.

Manufacturers and Patentees.—Agencies for the Pacific Coast wanted by Nathan Joseph & Co., 619 Washington st., San Francisco, who are already acting for several firms in the United States and Europe, to whom they can give references.

To Cure a Cough, Cold, or Sore Throat, use Brown's Bronchial Troches.

For Sale—The entire right of the best adjustable wrench. Price $5,000. J. F. Ronan, at Chickering's factory, Boston, Mass.

Machinery for two 500-tun propellers, 60-Horse Locomotive Boiler, nearly new, for sale by Wm. D. Andrews & Bro., 414 Water st., N.Y.

A very Valuable Patent for sale, the merits of which will be appreciated at sight. Apply to or address Jewell & Ehlen, 93 Liberty st., N.Y.

Improved Foot Lathes. Many a reader of this paper has one of them. Catalogues free. N. H. Baldwin, Laconia, N. H.

Foreman Machinist wanted. See advertisement.

Lighting Gas in Streets, Factories, etc., with Bartlett's Patent Torch saves great expense, all risks, etc. It is being adopted everywhere. Address J. W. Bartlett, 569 Broadway, New York.

Japanese Paper-ware Spittoons, Wash Basins, Bowls, Pails, Milk Pans, Slop Jars, Chamber Pails, Trays. Perfectly water-proof. Will not break or rust. Send for circulars. Jennings Brothers, 352 Pearl st., N.Y.

Belting that is Belting—Always send for the Best Philadelphia Oak-Tanned, to C. W. Arny, Manufacturer, 301 Cherry st., Phil'a.

For Fruit-Can Tools, Presses, Dies for all Metals, apply to Mays & Bliss, 118, 120, and 122 Plymouth st., Brooklyn, N. Y. Send for catalogue.

Parties in need of small Grey Iron Castings please address Enterprise Manufacturing Co., Philadelphia.

Excelsior Stump Puller & Rock Lifter. T. W. Fay, Camden, N.J.

Building Felt (no tar) for inside & out. C.J. Fay, Camden, N. J.

Best Boiler-tube cleaner—A. H. & M. Morse, Franklin, Mass.

The Best Hand Shears and Punches for metal work, as well as the latest improved lathes, and other machinists tools, from entirely new patterns, are manufactured by L. W. Pond, Worcester, Mass. Office 98 Liberty st., New York.

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

Keuffel & Esser, 116 Fulton st., N.Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves.

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventive. No foaming, and does not attack metals of boiler. Price 25 cents per lb. C. D. Fredricks, 587 Broadway, New York

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

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews Patents in another column.

Incrustations prevented by Winans' Boiler Powder (11 Wall st. New York,) 15 years in use. Beware of frauds.

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.

The Largest Newspaper Mail

Which goes to any one firm in this country, is received by Geo. P. Rowell & Co., the New York Advertising Agents. Their place of business is at No. 40 Park Row.

QUERIES.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers, and hope to be able to make this column of inquiries and answers a popular and useful feature of the paper.]

1.—Can you inform me how fast steam passes through a pipe of a given size, say one inch in diameter, twenty feet long, and one hundred pounds pressure to the square inch in the boiler? How many cubic feet of steam will pass through such a pipe per minute?—P. C. C.

2.—I feel very grateful for the new space set apart in your very valuable and always interesting paper for persons seeking information to ask, and those who know to answer. I am a manufacturer in metals, and your paper has been worth to me, during the twelve years I have read it, more than six thousand dollars directly. I hope I may never be deprived of its perusal weekly. Can any of your numerous readers inform me of a cheap and neat way of coating black on small articles of brass in lots of fifty gross at a time.—W. A. M.

3.—I wish to gear from an upright water-wheel shaft to the horizontal crank shaft of my saw mill directly by bevel gears. The question is raised whether I can overcome the back lash caused by the action of the saw by a balance wheel, and make it run successfully. One millwright thinks I can, while two think I cannot. The upright shaft will run 150 and the saw shaft 300 times per minute.—J. B. W.

4.—All the other conditions being equal, which has the greatest ultimate range, without regard to accuracy, a rifled or smooth bore gun?—G. R.

5.—Where can I obtain india-rubber varnish? or get a recipe for making it? It must be transparent and durable.—L. H. B.

6.—I am a boat builder by profession, and use a good many galvanized nails, bolts, etc. In what way may I galvanize them myself? What kind of zinc must I use, and where can I obtain it? What are the details of the process?—J. M. S.

7.—Can some of your correspondents give the proportions of pulleys, distance between centers, and width of belt necessary for the best performance of a quarter twist belt? I propose to run one of these proportions—will it work well? Driving pulley, 30 inches; revolutions, 150; driven pulley, 24 inches; revolutions, 187; distance between centers, 14½ feet; width of belt, 10 inches.—J. F. K.

8.—Is the pressure on the cylinders of a locomotive greater when suddenly reversed under motion, and thereby caused to slip bodily forward on the rails, than when in starting the drivers are made to slip owing to inertia of load? and is any portion of the increase due to momentum, other things being equal, and the rapidity of friction the same?—H. W. C.

9.—I wish to know the U. S. standard weight of a tun of bituminous coal; also what a wagon body of the following dimensions will hold: 8 feet 7 inches long, 3 feet 3 inches wide, 12 inches deep. What are the standard dimensions of a coal box that will hold 2½ bushels? The reason I ask these questions is this; there are several persons that sell coal here, and I think their measures are wrong.—W. H. P.

10.—I have entirely lost the use of my lower limbs, but have full use of my hands. Now I want some kind of a vehicle that I can run on the street with. Will you please to send me the address of some one that keeps for sale or manufactures such a vehicle?—G. M. D.

11.—How can I make a fine black varnish for carriage harnesses? I have tried the recipe you gave in No. 18, but it makes the leather a dead, dull black, just the same as oil would do.—N. L. M.

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.

SILVERING CHEAP LOOKING-GLASSES.—"A. M." should place a sheet of glass, previously washed clean with water, on a table, and rub the whole surface with a rubber of cotton, wetted with distilled water, and afterwards with a solution of Rochelle salts in distilled water (1 of salt to 200 of water). Then take a solution, previously prepared by adding nitrate of silver to ammonia of commerce; the silver being gradually added until a brown precipitate commences to be produced; the solution is then filtered. For each square yard of glass I take as much of the above solution as contains 20 grammes (about 309 grains) of silver, and to this add as much of a solution of Rochelle salt as contains 14 grammes of salt, and the strength of the latter solution should be so adjusted to that of the silver solution that the total weight of the mixture above mentioned may be 60 grammes. In a minute or two after the mixture is made it becomes turbid, and it is then immediately to be poured over the surface of the glass, which has previously been placed on a perfectly horizontal table, but the plate is blocked up at one end, to give it an inclination about 1 in 40; the liquid is then poured in such a manner as to distribute it over the whole surface without allowing it to escape at the edges. When this is effected, the plate is placed in a horizontal position, at a temperature of about 68° F. The silver will begin to appear in about two minutes, and in about twenty or thirty minutes sufficient silver will be deposited. The mixture is then poured off the plate, and the silver it contains afterwards recovered. The surface is then washed four or five times, and the plate set up to dry. When dry, the plate is varnished, by pouring over it a varnish composed of gum damar, 20 parts; asphelate (bitumen of India), 5; gutta-percha, 5; and benzine, 75. This varnish hard on the glass, and the plate is then ready for use.—E. W., of Pa.

IRON CASTINGS.—"Young Molder's" difficulty may arise from various causes; the facing sand may be either too wet or too dry, or the mold too hard rammed, or the metal too slow poured into the mold. To prevent the first two, this must be left to his own judgment, as some qualities of sand can be wrought wetter than others; if too wet it will cause the iron to bubble and invariably scab; if too dry the blackening and sand will run before the metal, and in some cases will wash large pieces out of the face of the mold, particularly around the gate. Hard ramming will cause the mold to scab, the ramming depending on the weight of the casting; if heavy, must be rammed hard to prevent it from swelling, consequently the mold must be well vented and pricked in the face. Make up your pouring gate firm and clean, pour your metal quick and hot; never mind though skin is rough. By attending to the above it will assist you in making the castings solid.—J. T. H., of N. Y.

DRY PLATE PROCESS.—Would-be Photographer's query can easily be answered by referring to Anthony's *Photographic Bulletin* for March, page 30. This process is in use by Mr. T. C. Roche, the well-known veteran photographer, and his success with this formula was so marked that, to save much time and many questions, he was induced to publish it.

LACKERS.—I give the following recipes for "Indicator's" benefit: Deep gold lacker: 3 ounces seed lac, 1 ounce turmeric, ¼ ounce dragon's blood, 1 pint alcohol. Gold lacker: 1 pound ground turmeric 1½ ounces gamboge, 3½ pounds gum sandarach, ¾ pound powdered shellac, 2 gallons rectified spirits wine, 1 pint turpentine varnish. Digest for a week, frequently shaking the mixture, then decant and filter. Brass color: 1 ounce gamboge cut small, 3 ounces Cape aloes, 1 pound pale shellac, 2 gallons rectified spirit. I do not know of a pale colorless lacker —F. R., of Mass.

SCATTERING SHOT GUN.—J. J. T., of Texas, wishes a remedy for a scattering shot gun. Let him clean out his gun and scour the inside bright; then run on a little solder round the inside of the muzzle from one fourth to one half an inch down the barrel, and about the thickness of tin-foil. He will then have no further trouble. I think there is no difference in the sizes of shot about scattering, so long as they are not mixed. Mixed shot will scatter, because the large shot fly faster and farther than the small ones, besides being heavier and less liable to deviation from their course by currents of air.—A. C. D., of N. Y.

WHITE LIGHT.—Regarding J. O. K.'s query, many in this city have told me that they use the lime or calcium light for reading in the evening, saying that when the wear and tear of eyesight under the infliction of common gas is taken into consideration the lime light is the cheapest, and throws a clear white light. I find the kerosene lamp much preferable to gas, and use it for fine lathe work in the evening. Since I commenced it my eyesight does not trouble me in the least, and before that I had to suspend operations after dark.—E. B. B of N. Y.

SCALING BOILERS.—Some time ago I saw an inquiry in your paper in regard to methods of scaling boilers. I removed the scale from a ten horse-power boiler by boiling potatoes in it, as women remove scale from tea-kettles.

TO MAKE RUBBER BELTS STICK.—Put on a coat of boiled linseed oil, or hold on a piece of cold tallow while the belt is running, and then sprinkle on fine chalk. This will not hurt the rubber, because the belt does not absorb cold tallow.—C. E. G., of Ct.

H. M. P., of N. J.—Court plaster is made by applying several coats of a solution of isinglass with a little tincture of benzoin added, whilst warm, with a brush, to a piece of silk stretched on a frame, each coat being allowed to dry before the next is put on. It is supposed to be so called from having been used in former times by Court ladies for their patches.

F. E. H., of Mass.—The "fatting" of linseed oil for gold size is the result of the absorption of oxygen in the process of boiling, from the atmosphere, and also from the dryers added. The English method of preparing this size is to grind together red oxide of lead with the thickest drying oil that can be procured. To make it work freely it is mixed with oil of turpentine to the proper consistence. We cannot state the time necessary to bring the oil to the proper thickness, as it depends upon many variable circumstances.

M. F., of O.—Water free from mechanical impurities like that used in water-hammers, will not freeze quite as readily as that which contains nuclei for the commencement of crystallization. It will freeze, nevertheless, and might break the glass by its expansion. We have, however, had such an instrument in which the water has been frozen several times, without breaking.

J. B. R., of Mass.—The exposition of your query in a clear manner, would occupy more space than we can give to it. You should consult works on electro-magnetism, of which any good bookseller can furnish you with a list. We will say, however, that if a battery be made to supply a current to more than one magnet, the sustaining power of each will be less than the sustaining power of a single magnet, where the whole force of the battery is applied to it alone.

C. H. G., of N. Y., asks us to explain the following: In a saucer I dissolved one drachm nitrate of silver in one ounce of water, in another saucer I dissolved one ounce of hyposulphate of soda in one ounce water. I poured half of the hyposulphate of soda into the nitrate of silver, which turned to a thick, creamy paint. I then poured the remaining hyposulphate of soda into the paint, which again changed to a thin black fluid." *Answer.*—Some oxide of silver was at first precipitated, which was re-dissolved on addition of the hyposulphate.

J. N. W., of N. Y.—In a stream with sharp curves filled with water to the tops of its banks, there will be overflow at each sharp bend, and for some distance back of the bend, provided the velocity of the stream is sufficiently great. The effect of the bends is to obstruct the flow and set back the water, thus causing overflow.

J. S. M., of Tenn.—Meerschaum pipes and nearly every kind of tobacco pipes may be quickly and thoroughly cleaned, by connecting the stems by a small rubber connecter with a steam tap, and allowing the steam to blow through them The oily and gummy matters will all be softened and blown out.

D. T., of Md.—The use of glass bearings for the journals of car axles is not a new idea. It has been tried, and found not to answer a good purpose. Precisely the difficulties encountered, we cannot positively say, but that they failed is certain.

L. B. C., of Miss.—The following is recommended as a good method for making garden walks. Procure a sufficient quantity of stone broken rather fine; spread it out, basin fashion, and into the basin pour some heated tar; mix well. Then lay over your paths smoothly, sprinkle powdered quick lime over the top, and roll.

P. H., of Mo.—The moss-agate, or mochastone, is a transparent variety of agate, which is marked with an appearance like tufts of moss. This was formerly supposed to be a vegetable structure, but has now been shown to be a deposit of ferric oxide.

D. R. J., of Ala.—For large flow and low head, say ten feet or less, we believe the overshot water wheel will prove the most efficient. You can make a long wheel on a single shaft, or put in two, gearing into a single shaft.

O. H. L., of N. Y.—Wood gas has not found favor in this country.—Lime is usually employed to absorb the acetic acid from pyroligneous acid and as acetate of lime is a commercial article—see the article acetic acid in almost any encyclopædia.

R. J. S., of Ohio.—The best olive oil is, we believe, produced in the south of France. Much oil sold under this name, in this country, is adulterated with other fixed oils. Oil of poppies has been much used for this purpose.

D. L. G., of Va.—The conducting power of liquids, as a class, is very much less than that of solids. The conducting power of woods is in general from 2·5 to 4 times that of water.

S. J. W., of Iowa.—We have in our possession no such communication as the one to which you refer, and think it never came to hand.

G McD., of N. J.—A full account of the process of electro-plating with iron was given on page 346, Vol. XXI., of the SCIENTIFIC AMERICAN.

R. S. S., of Australia—Brakes operating substantially like the one you propose, have been made. It is not probable that you could obtain a patent.

H. E. W., of N. Y.—Aniline dyes must be fixed by albumen—they are then tolerably permanent, depending upon the shade of color.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

2,704.—SELF-LUBRICATING HUBS OR BOSSES FOR PULLEYS AND WHEELS.—D. McColley, Weston, Boston, Mass. October 13, 1870.

2,647.—REVOLVING AND OTHER HEELS FOR BOOTS AND SHOES.—J. Read Philadelphia, Pa. October 6, 1870.

2,663.—BEARINGS AND PACKINGS FOR SHAFTS, ETC.—E. D. Murfey, New York city. October 7, 1870.

2,675.—BREECH-LOADING FIRE-ARMS AND CARTRIDGES FOR THE SAME.—Hiram Berdan, New York city. October 10, 1870.

2,743.—SADDLE CLOTHS AND HORSE CLOTHING AND BLANKETS, AND IN PONCHOS OR OTHER COVERINGS.—Robert Spencer, New York city. Oct. 18, 1870.

2,762.—MANUFACTURE OF OIL AND OTHER PRODUCTS OF PETROLEUM.—C. Toppan, Wakefield, Mass. October 20, 1870.

2,764.—APPARATUS FOR WINDING THREAD ON TO BOBBINS.—Wm. Clark Newark, N. J. October 20, 1870.

Recent American and Foreign Patents.

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

PRESERVING EGGS.—John Kaye, Jr., Setzler's Store, Pa.—This invention relates to a new and useful improvement in the mode of preserving eggs whereby eggs may be kept perfectly sweet and fresh for months.

MANUFACTURE OF WROUGHT METAL WHEELS AND MACHINERY FOR THE SAME.—Barthelemy Brunon, Lyons, France.—This invention relates to a new method of manufacturing metal spoked wheels made of iron or such combination of iron that may be best suited for forging.

COMBINED ANCHOR AND BEAM SUPPORTER.—W. W. Goodrich, Rondout, N. Y.—This invention relates to a new and useful improvement in the mode of strengthening the walls of brick buildings, and consists in an anchor and beam or joist supporter combined.

FENCE POSTS.—A. M. Freeman, C. P. Idell, and Bergen Vanderhoven, Metuchen, N. J.—This invention has for its object to furnish a cheap, convenient, strong, and durable fence post constructed in such a way as not to be liable to decay.

VEHICLE SPRING.—J. H. Gould, Burlingham, Ohio.—This invention relates to new and useful improvements in springs for carriages and all kinds of vehicles.

UMBRELLA LOCK.—Henry Clarke, Baltimore, Md.—This invention has for its object to furnish an improved device for attachment to umbrella handles, which shall be so constructed and arranged that the ribs of the umbrella may be conveniently locked when closed, so that no one except the owner or some one knowing the combination can unlock and open the umbrella.

COMBINATION LOCK.—S. K. Seelye, Hudson, Mich.—This invention relates to a new and useful improvement in locks, more especially designed to be used for fastening barn and stable doors, or doors of out-houses, and to be made of wood, but which may be made of metal, and used to good advantage on dwelling house and other similar doors.

COTTON GIN.—Leonard Watrous, Mystic River, Conn.—The object of this invention is to prevent the saws and ribs of the saw cotton gin from corroding from exposure to dampness and moisture.

WOODEN HOOP BOXES.—S. S. Barrie, Green Point, N. Y. This invention relates to a new and useful improvement in wooden hoop boxes for containing salt, fruit, spices, and similar articles or substances, and it consists in a metal tip for securing the champered ends of the hoops.

BOLT CUTTER AND SHEARS.—Isaac Dubois, Boonesborough, Iowa.—This invention consists in a combination with a pair of handles, pivoted together in the usual way, of a pair of bolt trimming cutters and a pair of shearing cutters, more particularly adapted for cutting flat strips of metal.

DITCHING MACHINE.—S. S. Wood, Brooklyn, N. Y.—This invention relates to improvements in ditching machines, and consists in a set of scoops or spades, mounted on endless belts, so arranged on rollers or drums, near the front of a frame or carriage of peculiar construction, working on two wheels, fore and aft, and partly sliding along the bottom of the ditch cut, that the said spades, being rotated by gearing connected with one of the wheels of the truck, will scoop up the earth in advance of the frame thrown in front of them by one of the sides, which cuts off a strip of earth the bank of a furrow made by a common plow, and throws it in advance of the spades, which carry it upwards and backwards, and deliver it, previous to passing over the upper roller, to an endless belt, which moves up an oblique trough, inclined also to one side, and provided with a discharging brush working obliquely across the top, to throw the earth sufficiently away that none will fall in the ditch.

METALLIC SLEEPERS FOR RAILWAYS.—Cyrus Fisher, Canton, Mass.—This invention consists in the arrangement of a hollow metallic tie; boxes cast inside the same near each end, wooden blocks placed on rubber cushions in the boxes with their fibers running vertically for the purpose of sustaining the rails on slightly elastic and not easily broken supports, and covering plates.

WINDMILL.—Alexander R. Randal, Avola, Mo.—This invention relates to a wind-wheel in which the sails are hinged upon the spokes, and connected with springs in such a manner that they may be set so as to bear a wind pressure of any desired number of pounds, and swing back when ever the pressure exceeds this number, so as to practically contract the surface on which the wind acts, and, at the same time, enlarge the spaces between between the sails through which the wind passes, thus getting rid of the surplus pressure of the same; the sails returning to the position in which they were set whenever said surplus pressure ceases.

SAFETY GUARD FOR PISTOLS.—Randall D. Hay, Crooked Creek, N. C.—This invention relates to an improved mechanism for preventing premature or accidental discharge of pistols, and consists in the arrangement of a guard which is automatically interposed between the nipple and hammer, and is retractible in no other way than by means of the trigger. The guard being always on the nipple so as to prevent communication of the spark to the charge whenever the hammer accidentally falls.

WASHING MACHINE.—John H. Dustan, Spartansburgh, Pa.—This invention consists in a corrugated and slotted squeezer worked with a reciprocating motion towards and away from the corrugated end of the suds-box and combined, by a pitman, with an elbow lever, operating through an orifice in the box cover, and with the rock-shaft on the top of the box to which the elbow lever is attached, said rock-shaft being provided with a spring that draws back the squeezer after it has been moved forward by hand; the suds-box being combined with a chamber which receives the water forced by the wringer out of the clothes, and conducts such water either back into the suds-box or away from the machine.

SAFETY GUARD FOR FIRE-ARMS.—Randall D. Hay, Crooked Creek, N. C.—This invention has for its object to prevent the premature discharge of fire-arms, and the accidents continually resulting from this cause. The invention consists in a guard that automatically interposes itself between the hammer and nipple of an ordinary muzzle-loader, or between the firing-pin and the metallic cartridge in needle breech-loaders, or between any two parts in a fire-arm, whatsoever they may be, which, by striking together, produce an explosion of the charge.

ANIMAL TRAP.—Thomas E. Marable, Petersburgh, Va.—The invention in this case consists in so arranging a series of horizontal radial arms, in connection with a vertical standard, rotated by a weighted cord, that they shall sweep a horizontal platform, which is furnished with a trap door held up by a spring. A pin, projecting from the door, acts as a stop for one of the arms, and when the animal steps on the door, it is depressed, the stop-pin withdrawn, and the radial arms sweep the animal into a suitable receptacle.

WINE AND LIQUOR FILTER.—Julius Strauss, New York city.—This invention relates to improvements in filtering and clarifying wine, whiskey, and other liquors and filter therefor, and consists of a cylindrical vessel preferably made in the parts, one considerably shorter than the other, and having a perforated bottom with one or more nozzles projecting downwards from it, into which the holes discharge, said part connecting with the other serves mainly for a stand, so as to be readily disconnected, and the nozzles having filtering bags or sacks attached, for reception of the wine which, having pounded charcoal previously mixed with it, is poured into the upper vessel and allowed to percolate through the sacks.

WATER WHEEL.—Kenyon Cox and T. Cox, New York city.—This invention consists in the combination with radial buckets or pistons rigidly attached to the hub of the drawing shaft of a drum or ring made in sections of rings, preferably as many as there are pistons or buckets, and filled in grooves or guides at the ends of the case eccentric to the piston hub, which sections lap each other at the ends, and each has a hole at or about the center, through which a bucket extends; the whole revolving with the buckets and shifting on each other at the lapping ends as required by the constant changes of the buckets to the rim due to the eccentric arrangement of the one to the other, and closing the space at one side of the wheel against the passage of the water.

UNDERGROUND DRAIN.—Samuel H. Warner, Darbyville, Ohio.—This invention relates to improvements in underground drains, and consists in making the drains of plank in sections with a longitudinal, vertical dividing wall forming two spaces, one of which is open at the bottom, and receives the water which rises to the upper edge of the dividing wall, which is nearly as high as the wall side of the top of the drain, and passes on into the other space, in which it is conducted away.

VEHICLE WHEEL.—Thomas Jordan Smith, Connersville, Miss.—This invention relates to improvements in the construction of vehicle wheels, and consists in making a cast metal rim with socketed lugs on the inside for the ends of the spokes; also in making the hubs of two disks with recesses which form sockets for the other ends of the spokes when the two disks are bolted together; and also in providing detachable bearing blocks for the axle in recesses in the center of the hubs, the said bearings having a V or other formed groove receiving a corresponding collar on the axle which prevents end movement of the axle in the wheel. The said improvements are also applicable to spinning and other wheels.

BACK FOR PORCELAIN DOOR ROSES.—John J. Henderson, New York city.—This invention relates to a new cast metal back for porcelain door roses. and has for its object to so construct the same that both the thimble holding the rose, as well as the spindle of the lock, will find a reliable support in said back.

SKATE FASTENER.—Fred. C. Poole and Harry Howe, Boston, Mass.—This invention relates to a new heel fastening for skates of all kinds, and has for its object to make such fastening applicable to all kinds of boots and shoes, and adjustable in suitable degree.

HORSE HAY RAKE.—Oliver T. Nanny, Amity, N. Y.—This invention has for its object to frunish an improved horse hay rake, which shall be simple in construction, effective and reliable in operation, and easily operated.

OPERATING HIDE MILLS.—John G. Curtis, Emporium, Pa.—This invention relates to a new and useful improvements in mode of operating mills for softening or "milling" hides in the process of tanning leather, and it consists in combining a steam engine with the mill, so that the mill may be operated independently of any other machinery.

SCALE PROPELLER FOR STEAM BOILERS.—B. W. Reynolds, Evansville Ind.—This invention relates to a new and useful improvement in an apparatus for preventing the formation of scale on the bottom of steam boilers, and consists in producing a circulation of the water in the lower portion of the boiler, by means of an oscillating shaft, with movable or vibrating rings connected therewith.

NUT CRACKER.—Paul Ceredo, Dusseldorf, Prussia.—This invention consists of a lever, having at the end of its shorter arm (which forms the movable jaw) a bowl or socket of proper form to receive or hold a nut, and having its fulcrum in a slot in a vertical standard, so that nuts placed in said movable jaw may be crushed against an upper stationary one, and fall through the slot or orifice into a box or other suitable receptacle.

BEE-HIVES.—George T. Wheeler, Mexico, N. Y.—This invention relates to a new and useful improvement in bee-hives, and consists in the mode of supporting and securing comb frames, and in the construction and arrangement of the honey boxes.

ADJUSTABLE FRAME FOR WINDOW SCREENS, ETC.—Henry R. Dexter, Putnam, Conn.—This invention has for its object to furnish an improved frame for screens for windows, doors, and other openings, which shall be simple in construction, inexpensive in manufacture, easily secured in place, and at the same time so constructed that it may be easily adjusted to various sized windows, thus enabling the purchaser to readily adjust them in place, without its being necessary to employ a mechanic to fit them to their places.

AUTOMATIC HARVESTER RAKE.—H. A. Stringer and Alexander F. Ward, Chatham, Canada.—This invention has for its object to furnish an improved automatic raking attachment for reapers, which shall be simple in construction, effective in operation, and at the same time compact and not liable to get out of order.

APPLE-PARING MACHINE.—Wm. Robb, 2d., South Stoddard, N. H.—This invention relates to improvements in apple paring machines, and it consists in an improved arrangement of that class of machines in which motion is imparted to the apple-holding fork by moving the frame carrying it, and part of the driving gear around a central pivot, and along the rim of a fixed segmental toothed rim, for discharging the apple by sliding the fork back after the apple has been pared, and the toothed pinion worked by the toothed rack has passed beyond it, behind a stripper, which arres the the rotary motion of the apple and detaches it from the fork.

SPINNING, DOUBLING, AND TWISTING MACHINERY.—Thomas N. Dale, Jr., and George Kraink, Paterson, N.J.—This invention relates to improvements in machinery for spinning, doubling, and twisting silk fibers for the manufacture of organzines or warps, trams, or weft, for the manufacture of silk goods, also for spinning and twisting sewing silk and twist, the said improved machinery being designed to accomplish in one machine the several operations of spinning, doubling and twisting now commonly performed in three separate machines, each of which occupies about the same area of space as the improved machines, which we devised, to perform all the said operations simultaneously.

HORSE CLIPPING MACHINE.—John C. Wilson, New York city.—This invention has for its object to furnish an improved horse-clipping machine, which shall be simple in construction, convenient in use, effective in operation, and so constructed that, should any of the teeth be accidentally broken, the plate to which they belong may be readily detached and replaced with a new one, at trifling expense.

HYDRAULIC STOP VALVE.—Charles S. Bailey, Mobile, Ala.—This invention has for its object to furnish an improvement in the construction of hydraulic stop valves, especially of hydraulic presses, which will prevent the water oil, or other liquid being used, from flowing back from one press, cylinder, or pipe, when the pressure is being applied to another, operated by the same pump or pumps.

MACHINE FOR CUTTING WIN W-SHADE SLATS.—Francis A. Bixler, Nashville, Tenn.—The object of this invention is to so improve machines of this class that they will hold the stick more firmly in the proper position during their operation, while, at the same time, they will cut out the slat with the least possible expenditure of power.

HAND CORN PLANTER.—Peter McCollum, Fayette, Mo.—This invention has for its object to furnish an improved hand corn planter, which shall be so constructed as to scatter the kernels in the hill so that the plants need not be all pulled up in thinning out the hills.

ROTARY STIRRER AND COOLER.—Edward F. Ring, St. Louis, Mo.—The object of this invention is to provide, for public use, a machine by which lard, oils, or other substances of similar character, may be cooled rapidly and uniformly.

PLOW AND COTTON CULTIVATOR.—John R. Thomas, Mifflin, Pa.—This is a simple and convenient implement, so constructed that it can be adjusted to serve for all the various purposes required in plowing and preparing the ground, cultivating corn, cotton, etc., and marking off the land for planting.

SAWING MACHINE.—James R. Lambert, Sr., and James R. Lambert, Jr. Rockville, Ind.—This invention relates to a new sawing machine, which is so constructed that the saw will be properly guided, and not allowed to "whip."

CHILDREN'S DIAPER.—Mrs. Alice M. Hughes, Hudson City, N. J.—This invention relates to a new children's diaper, which is so made that it will conveniently fit children of larger or smaller size, and fully answer the object for which it is intended.

SALT FURNACE.—Calvin A. Shepard, Pomeroy, Ohio.—This invention consists in the application of a boiler, constructed of copper or wrought iron to the heating and evaporating of the water that is drawn from salt wells.

Official List of Patents.

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FOR THE WEEK ENDING Nov. 22, 1870.

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Patent Solicitors, No. 37 Park Row, New York.

109,367.—ELECTRO-NASAL DOUCHE.—S. E. Adams, Springfield, Ohio.
109,368.—SEAT FOR VEHICLES.—Daniel R. Allen, Cumberland, Me.
109,369.—GLASS LAMP.—J. S. Atterbury and T. B. Atterbury, Pittsburgh, Pa.
109,370.—MANUFACTURE OF LAMPS.—J. S. Atterbury and T B. Atterbury, Pittsburgh, Pa.
109,371.—HYDRAULIC STOP VALVE.—C. S. Bailey, Mobile, Ala Antedated Nov. 19, 1870.
109,372.—LIQUID METER.—Phineas Ball and Benaiah Fitts Worcester, Mass.
109,373.—WOODEN-HOOP BOX.—S. S. Barrie, Green Point, N. Y.
109,374.—SASH HOLDER.—G. F. Beardsley, Oxford, assignor to himself and A. S. Parker, Greene, N. Y.
109,375.—BROOM HOLDER.—W. H. Bixler (assignor to C. G Beitel), Easton, Pa.
109,376.—BRICK MACHINE.—J. R. Armstrong, Elkhart, Ind., administrator of the estate of T. E. Bonner, deceased.
109,377.—SLIDING SEAT FOR CARRIAGES.—R. F. Briggs, Amesbury, Mass.
109,378.—TRACE BUCKLE.—Leroy Brooks, Mount Pleasant, Iowa.
109,379.—SOFTENING SHEEP AND OTHER SKINS.—J. M. Brown, Lynn, Mass.
109,380.—MANUFACTURE OF WROUGHT METAL WHEELS.—Barthelemy Brunon, Lyons, France.
109,381.—BUTTER WORKER.—Joshua N. Brush, Eyota, Minn.
109,382.—CLOTHES HOLDER FOR CLOTHESLINES.—M. V. Bulla, South Bend, Ind. Antedated Nov. 12, 1870.
109,383.—TINNERS' FIRE POT.—F. M. Campbell and L. W Brown, Cleveland, Ohio. Antedated Nov. 9, 1870.
109,384.—SHEET-METAL COVER FOR SEWING MACHINES —R H. Chinn and J. F. Reigart, Washington, D. C.
109,385.—MACHINE FOR WASHING AND WRINGING CLOTHES. —Andrew Clark, Plymouth, Ohio.
109,386.—UMBRELLA LOCK.—Henry Clarke, Baltimore, Md.
109,387.—WASHING MACHINE.—D. C. Cooley, Wilkesbarre, Pa. Antedated Nov. 9, 1870.
109,388.—STEAM WHISTLE.—W. S. Cooper (assignor to Cooper, Jones & Cadbury), Philadelphia, Pa.
109,389.—POTATO DIGGER. — John W. Corwin, Lebanon, Ohio.
109,390.—WATER WHEEL.—Kenyon Cox and Theodore Cox, New York city.
109,391.—LATHING MACHINE.—George N. Creamer, Trenton N. J.
109,392.—BED PLATE FOR SAW MILLS.—A. J. Croft, Williamsport, Pa.
109,393.—OPERATING HIDE MILL.—J. G. Curtis, Emporium Pa.
109,394.—CAR SEAL.—John Dewe, Toronto, Canada.
109,395.—WINDOW SCREEN FRAME.—H. R. Dexter, Putnam, Conn.
109,396.—HEATING STOVE.—Andrew Dickey, Albany, N. Y., assignor to John S. Perry (trustee and executor), Andrew Dickey, and N. B. Perry.
109,397.—PRESS FOR THE MANUFACTURE OF ARTIFICIAL STONE —Lewis Dodge, Chicago, Ill.
109,398.—LAWN MOWER.—Whitfield H. Drake, Musconetcong, N. J.
109,399.—LAST.—C. S. Dunbrack, Swampscott, Mass.
109,400.—MILK CAN FASTENER.—Daniel D. Edgerton, Ava, N. Y.
109,401.—UTERINE SUPPORTER.—Robert Faulkner, Erie, Pa.
109,402.—PICKET-FENCE POST.—A. M. Freeman, C. P. Idell, and Bergen Vanderhoven, Metuchen, N. J.
109,403.—CORN PLOW.—Wm. French and J. C. French (assignors to Wm. French), Keokuk, Iowa.
109,404.—GAS BURNER.—Andrew Fulton, Albany, N. Y.
109,405.—ANCHOR BEAM SUPPORT FOR BRICK WALLS.—W W. Goodrich, Rondout, N. Y.
109,406.—VEHICLE SPRING.—J. H. Gould (assignor to himself and J. J. Campbell), Burlingham, Ohio.
109,407.—SHOE.—Francis Gurney, Newburyport, Mass.
109,408.—VELOCIPEDE.—Daniel Hanchett, J. C. Daney, and Reuben Stuart, Smithfield, Ill.
109,409.—ROSE FOR DOOR KNOBS.—J. J. Henderson, New York city.
109,410.—DIAPER.—A. M. Hughes, Hudson City, N. J.
109,411.—DENTISTS' REST.—R. F. Hunt, Washington, D. C. Antedated Nov. 5, 1870.
109,412.—ROPE HOLDER.—C. W. Huson, French Corral, Cal.
109,413.—SPRING BED BOTTOM.—Hanford Ingraham, Naples, N. Y.
109,414.—SHUTTLE FOR SEWING MACHINES.— Albert W. Johnson (assignor to Finkle & Lyon Manufacturing Co.), Middletown, Conn.
109,415.—HARVESTER RAKE.—I. A. Johnson (assignor to himself and F. H. Manny), Rockford, Ill.
109,416.—PREPARATION OF MICA.—H. M. Johnston and Frederick Beck, New York city.
109,417.—REVOLVING FIRE-ARM.—B. F. Joslyn, New York city.
109,418.—RAILWAY RAIL CHAIR.—C. R. Joyce (assignor to himself and Edwin Reeside), Alexandria, Va.
109,419.—BREECH-LOADING FIRE-ARM.—A. B. Kay, Newark, N. J.
109,420.—PRESERVING EGGS.—John Kaye, Jr., Setzler's Store Pa.
109,421.—MOP HEAD.—F. C. Kendall (assignor to himself and G. R. Barney), Hartford, Wis.
109,422.—COAL-HOLE COVER.—L. A. Kimberly, New Haven, assignor for one half his right to G. E. Kimberly, Guilford, Conn.
109,423.—LATHE CHUCK.—Wm. Haskell King, Newark, N. J

109,424.—COTTON AND HAY PRESS.—David Knowles, Philadelphia, Pa.
109,425.—WAGON IRON.—H. C. Kochensperger, Thornville, Ohio.
109,426.—SAWING MACHINE.—J. R. Lambert, Sr., and J. R. Lambert, Jr., Rockville, Ind.
109,427.—SEWING MACHINE.—Wm. R. Landfear, Hartford, Conn.
109,428.—COMBINED THRASHER AND GRAIN SEPARATOR.—J. S. Landis, Lancaster, Pa.
109,429.—SEWING THIMBLE.—A. H. Law, San Francisco, Cal.
109,430.—DRAWING FRAME.—Charles P. Leavitt, New York city.
109,431.—HALTER FOR HORSES.—Augustus Le Plongeon, San Francisco, Cal.
109,432.—CULTIVATOR AND SEEDER COMBINED.—Jonathan Lewis, Washington county, D. C.
109,433.—MACHINE FOR THREADING BOLTS.—M. Love, Corry, Pa.
109,434.—CHUCK.—Milton Love, Corry, Pa.
109,435.—COMBINED MUFF AND PORTE-MONNAIE.—Henry Manneck and Charles Strohmenger, New York city. Antedated Nov. 5, 1870.
109,436.—SAWING MACHINE.—C. H. Mayo, Bath, Me.
109,437.—HAND CORN PLANTER.—Peter McCollum, Fayette, Mo. Antedated Nov. 17, 1870.
109,438.—METHOD OF CONSTRUCTING BOOTS AND SHOES.—Joel McComber, Rockford, Ill.
109,439.—HORSE HAY RAKE.—O. T. Nanny, Amity, assignor to himself and J. M. Hanford, Middletown, N. Y.
109,440.—ROAD SCRAPER.—W. T. Nichols (assignor to himself and H. H. Lawrence), Chicago, Ill.
109,441.—HARVESTER RAKE.—George Oerllein, Utica, Minn.
109,442.—GRAFTING AWL.—Daniel Betts Oliver, Cambria, N. Y.
109,443.—SEWING MACHINE.—Charles Parham, Philadelphia, Pa.
109,444.—FLY TRAP.—John Parker, Dubuque, Iowa.
109,445.—SPRING BED BOTTOM.—J. F. Peck, Springfield, Mass.
109,446.—WOVEN WIRE MATTRESS.—G. C. Perkins, Hartford, Conn.
109,447.—WHEEL FOR VEHICLES.—C. V. Pettibone, Fond du Lac, Wis.
109,448.—ATMOSPHERIC LEAF TURNER.—C. Phelps, Clayton, and A. K. Tuttle, Cape Vincent, N. Y.
109,449.—HARVESTER RAKE.—William Pimlott, Brockport, N. Y.
109,450.—CLUTCH FOR MACHINERY.—John E. Plummer and J. N. Noyes, Binghampton, N. Y.
109,451.—SKATE FASTENING.—F. C. Poole and Harry Howe, Boston, Mass.
109,452.—DRIFT-RECEIVING GRATE.—W. N. Reed, Arlington, Va.
109,453.—SEDIMENT AGITATOR FOR STEAM BOILERS.—B. W. Reynolds, Evanville, Ind.
109,454.—APPLE-PARING MACHINE. — William Robb, 2d, South Stoddard, N. H.
109,455.—LIGHTNING ROD.—George Row, Indiana, Pa.
109,456.—FLUTING MACHINE.—Henry Sauerbier, Newark, N. J.
109,457.—COMBINATION LOCK.—Seymour K. Seelye, Hudson, Mich.
109,458.—PROPELLING MECHANISM. — Christian Sharps, Philadelphia, Pa.
109,459.—FURNITURE KNOB.—John H. Shelton (assignor to Benedict & Burnham Manufacturing Co.), Waterbury, Conn.
109,460.—GENERATING GAS FROM HYDROCARBONS.—J. R. Smedburg, San Francisco, Cal.
109,461.—INSULATOR FOR TELEGRAPH WIRES. — Ashbel Grattan Smith and William Pettingell assignors to themselves and William H. Fowler), Painesville, Ohio. Antedated November 11, 1870.
109,462.—TUBE DRAWER FOR DEEP WELLS.—J. P. Smith, Pioneer, Pa.
109,463.—TUBE DRAWER FOR DEEP WELLS.—J. P. Smith, Pioneeer, Pa.
109,464.—SUCKER ROD DRAWER FOR DEEP WELLS.—J. P. Smith, Pioneer, Pa.
109,465.—WHEEL FOR VEHICLES.—T. J. Smith, Connersville, Miss.
109,466.—STUMP EXTRACTOR.—William Smith, Tomah, assignor to himself and Herman Greve, Sparta, Wis.
109,467.—FILTER FOR WINES, SIRUPS, ETC.—Julius Strauss, New York city.
109,468.—HARVESTER RAKE.—Hugh A. Stringer and A. F. Ward, Chatham, Canada.
109,469.—HARVESTER RAKE.—Warren Sutliff, Burns, Wis.
109,470.—SEED SOWER.—Justin G. Thompson and Frederick M. Briggs, Stockton, N. Y.; said Briggs assigns his right to said Thompson.
109,471.—SAD-IRON HEATER.—Jos. W. Thorp, Hillborough Bridge, assignors to himself, David F. Brown, and Albert Webster, Concord, N. H.
109,472.—DEVICE FOR EXHIBITING PHOTOGRAPHIC PICTURES.—A. G. Walton, San Francisco, Cal.
109,473.—VENTILATOR FOR HATS.—William F. Warburton, Philadelphia, Pa.
109,474.—UNDERGROUND DRAIN.—S. H. Warner, Darbyville, Ohio.
109,475.—ELECTRO PLATING WITH NICKEL THE METALLIC PARTS OF COTTON GINS.—Leonard Watrous, Mystic River, Conn.
109,476.—VALVE.—John West, Bethlehem, Pa.
109,477.—BEEHIVE.—G. T. Wheeler, Mexico, N. Y.
109,478.—MOTIVE MECHANISM FOR SEWING MACHINES.—Amos Whittemore, Cambridgeport, Mass. Antedated November 14, 1870.
109,479.—HAIR-CLIPPING DEVICE.—John C. Wilson, New York city.
109,480.—DITCHING MACHINES. — Stephen Sidney Wood, Brooklyn, N. Y.
109,481.—MEANS FOR ADJUSTING THE GRAIN WHEELS OF HARVESTERS.—J. D. Wright, Columbia, Tenn.
109,482.—THRASHING MACHINE.—Joseph Allonas, Mansfield, Ohio.
109,483.—SAFETY VALVE.—A. C. Ancona, Evansville, Ind.
109,484.—THILL COUPLING.—W. W. Anderson, Camden, N. J.
109,485.—VARNISH.—R. A. Beattie, Philadelphia, Pa.
109,486.—COATING AND ORNAMENTING THE SURFACE OF PAPER, CLOTH, ETC.—Frederick Beck, New York city.
109,487.—DEVICE FOR CUTTING SLATS FOR WINDOW SHADES.—F. A. Bixler, Nashville, Tenn.
109,488.—CREAM STRAINER.—Harry Blake, Panama, N. Y.
109,489.—PREPARATION OF GARANCINE.—Spencer Borden, Fall River, Mass.
109,490.—CIGAR MOLD.—N. H. Borgfeldt, New York city.
109,491.—COTTON SWEEP.—T. E. C. Brinly, Louisville, Ky.
109,492.—FASTENING FOR BLOCKS OF LASTS.—Josiah Bullivant (assignor to S. W. Jamison and W. J. Dudley), Newark, N. J.
109,493.—WRENCH.—Peter Burress and Conrad Cline, Braidwood, Ill.
109,494.—GLUING HOPPER.—J. W. Campbell, New York city.
109,495.—NUT CRACKER.—Paul Ceredo, Dusseldorf, Prussia.
109,496.—WINDMILL.—J. P. Clement, Grinnell, Iowa.
109,497.—BREAD PAN.—W. A. Daggett, South Vineland, N. J.
109,498.—COMBINED PRUNING IMPLEMENT.—C. W. Dawson, Paynesville, Mo.
109,499.—COTTON PLANTER.—J. S. Dickason, Sulphur Well, Tenn.
109,500.—MACHINE FOR MOLDING, ROUNDING, AND CHANNELING BOOT AND SHOE SOLES.—William Duchemin (assignor to G. B. Bigelow), Boston, Mass.
109,501.—WASHING MACHINE.—J. H. Dustan, Spartansburg, Pa. Antedated November 19, 1870.
109,502.—WINDING MACHINE.—Samuel Eccles, Philadelphia, Pa.
109,503.—SEEDING MACHINE.—S. M. Firey, Clear Spring, Md.
109,504.—METALLIC SLEEPER FOR RAILWAYS.—Cyrus Fisher, Canton, Mass., assignor to himself and A. G. Fisher, Brooklyn, N. Y.
109,505.—DUMB WAITER FOR CAISSONS.—Henry Flad, St. Louis, Mo.
109,506.—DIE FOR MAKING CHORD BARS.—William Forshaw, Chicago, Ill.
109,507.—SECURING THE TOPS OF FRUIT JARS.—William Galloway, Philadelphia, Pa.
109,508.—PROTECTING IRON AGAINST CORROSION.—Cornelius Godfrey and Reuben Lighthall, New York city.
109,509.—HORSE HAY RAKE.—H. N. Green, Fort Wayne, Ind.
109,510.—APPARATUS FOR THE MANUFACTURE OF ILLUMINATING GAS.—A. W. Hall (assignor to himself and E. R. Warren), New York city. Antedated November 11, 1870.
109,511.—CLOD FENDER.—Reuben Harpster, West Cairo, Ohio.
109,512.—GATE AND DOOR SPRING.—Melvin Harrington, Waupun, Wis.
109,513.—SAFETY GUARD FOR PISTOLS.—R. D. Hay, Crooked Creek, N. C.
109,514.—GUN LOCK.—R. D. Hay, Crooked Creek, N. C.
109,515.—BALING PRESS.—Elias Hill, Hamilton, Ill.
109,516.—SASH LOCK.—John Hughes, New Berne, N. C.
109,517.—WASHING MACHINE.—G. W. Hungerford, Chicago, Ill.
109,518.—SCHOOL DESK AND SEAT.—Nathaniel Johnson, New York city.
109,519.—STOCKING LAST AND YARN AND NEEDLE HOLDERS COMBINED.—D. B. Keith, East Boston, Mass.
109,520.—BRIDGE GATE.—Michel Kirsch, Chicago, Ill.
109,521.—APPARATUS FOR DETACHING POLES AND SHAFTS FROM VEHICLES.—L. O. Kunze, Harrisonville, Mo.
109,522.—GRAIN REGISTER.—Charles Lamb, Binghamton, N. Y.
109,523.—ELEVATOR FOR RAISING AND STACKING STRAW.—Stephen Lewin, Poole, England.
109,524.—CONCRETE COMPOSITION FOR WALKS, FLOORING, ETC.—R. S. Lewis, Rockville, Conn., assignor to J. H. Lewis.
109,525.—CAR-AXLE LUBRICATOR.—Joseph Lichenstein (assignor to himself, C. F. Smith, and W. H. Pierce), Baltimore, Md.
109,526.— WATER PRESSURE REGULATOR. — N. C. Lock, Salem, Mass.
109,527.—CIDER MILL.—James Lytch, Laurinburg, N. C.
109,528.—SHIFTING CARRIAGE TOP.—O. E. Mallory, Batavia, N. Y.
109,529.—MACHINE FOR MAKING CORN CAKE.—William Manning, Chelmsford, Mass.
109,530.—ANIMAL TRAP.—T. E. Marable (assignor to himself and S. A. Plummer), Petersburg, Va.
109,531.—SLEIGH.—James Martin, Morenci, Mich.
109,532.—AWNING FOR HORSES.—William McCormick, Philadelphia, Pa.
109,533.—APPARATUS FOR COLLECTING PRECIOUS METALS.—J. T. McDougall, San Francisco, Cal.
109,534.—PUMP.—J. H. McGowan, Cincinnati, Ohio.
109,535.—FLUTING MACHINE.—W. P. McKee, Cincinnati, Ohio.
109,536.—GRAIN DRYER.—Helem Merrill, Brooklyn, N. Y.
109,537.—LAMP FOR RAILROAD CARS.—R. S. Merrill (assignor to himself, Joshua Merrill, and W. B. Merrill), Boston, Mass.
109,538.—BEDSTEAD FASTENING.—Elisha Mets and Wm. B. Geddes, Rochester, N. Y.
109,539.—CURTAIN FIXTURE.—M. H. Mosman, Waterbury, Conn.
109,540.—CENTER-SEAL FOR GAS WORKS.—Peter Munzinger, Philadelphia, Pa.
109,541.—CHEESE VAT.—Wm. H. Obitts, Elyria, Ohio.
109,542.—MILLSTONE DRESS.—George O'Connor and Haines O'Connor, Mishawaka, Ind.
109,543.—CORN PLANTER.—George H. Peck, East Hamburg, N. Y.
109,544.—CARRIAGE SPRING.—T. H. Prushaw (assignor to Taylor, Day & Co.), Fredonia, N. Y.
109,545.—WINDMILL.—A. R. Randal, Avola, Mo.
109,546.—MANUFACTURE OF SALT.—Dexter Reynolds, Albany, and J. W. Paige, Rochester, N. Y.
109,547.—HYDRANT. — Alexander Richmond, Jr., Dayton, Ohio.
109,548.—APPARATUS FOR STIRRING AND COOLING LARD.—E. F. Ring, St. Louis, Mo.
109,549.—ELECTRO-MAGNETIC SIGNALING APPARATUS FOR RAILROAD CROSSINGS, ETC.—William Robinson, Brooklyn, N. Y.
109,550.—FIREPLACE GRATE.—John S. Runyan, Columbus, Ohio.
109,551.—MODE OF PRODUCING LITHOGRAPHIC COPIES FROM PHOTOGRAPHIC NEGATIVES.—Emil Rye, Copenhagen, Denmark.
109,552.—PAPER MACHINE.—Patrick Scanlan, Indianapolis, Ind.
109,553.—EJECTOR.—Thomas H. Schriber, Evansville, Ind.
109,554.—CULTIVATOR.—J. B. Sexton, Pella, Iowa.
109,555.—EVAPORATING SALT BRINE.—Calvin A. Shepard, Pomeroy, assignor to himself and Roman Menager, Gallipolis, Ohio.
109,556.—CHURN.—Benedict J. Smith, Osage Mission, Kansas.
109,557.—BEE-HIVE.—Uriah J. Springer, Pontiac, Ill.
199,558.—COTTON CULTIVATOR AND PLOW.—J. R. Thomas, Mifflin, Pa.
109,559.—FURNACE FOR DESULPHURIZING ORES. — J. G. Trotter, Newark, N. J.
109,560.—LINK FOR OPERATING THE ANNULAR SERIES OF GATES FOR TURBINE WATER WHEELS.—Fuller Trump (assignor to James Leffel & Co.), Springfield, Ohio.
109,561.—AIR-CARBURETTING WHEEL.—J. H. Van Houten, Newark, N. J.
109,562.—APPARATUS FOR CARBURETTING AIR.—J. H. Van Houten, Newark, N. J.
109,563.—SHOE FASTENING FOR SHOE BOXES.—William W. Walton, Roanoke, Ind.
109,564.—LIQUID METER.—Albert Werckmeister, Berlin, Prussia.
109,565.—MILL-BUSH AND OTHER SPINDLES.—C. T. Weston, Scranton, Pa.
109,566.—PAPER CAP.—Philo S. White, Providence, R. I.
109,567.—CARRIAGE ATTACHMENT FOR PLOWS.—John Zoeberlein, Baltimore, Md.
109,568.—GAS MACHINE.—James H. Van Houten, Newark, N. J.

REISSUES.

4,181.—COMPOUND FOR COLORING AND ORNAMENTING PAPER AND OTHER FABRICS AND MATERIALS.—Frederick Beck, New York city.—Patent No. 107,997, dated October 4, 1870.
4,182.—LAMP CHIMNEY.—Edward Dithridge and Edward D. Dithridge, Pittsburgh, Pa.—Patent No. 33,428, dated October 8, 1861.
4,183.—STOVE-PIPE DAMPER.—G. B. Halsted, Brooklyn, N. Y.—Patent No. 70,836, dated November 12, 1867.
4,184.—TREADLE FOR SEWING AND OTHER MACHINES.—Benjamin C. Poole, Washington, D. C.—Patent 107,717, dated September 27, 1870.

DESIGNS.

4,480 to 4,482.—CARPET PATTERN.—Alexander Beck, Philadelphia, Pa. Three patents.
4,483.—WELL CASING.—Erastus S. Cummins, Clarence, Iowa.
4,484 to 4,486.—FLOOR OIL-CLOTH PATTERN.—C. T. Meyer, Newark, N. J., assignor to E. C. Sampson, New York city. Three patents.
4,487.—GROUP OF STATUARY.—John Rogers, New York city.
4,488.—SCHOOL DESK.—Nelson O. Tiffany, Buffalo, N. Y.
4,489.—SCHOOL-SEAT HINGE.—Nelson O. Tiffany, Buffalo, N. Y.
4,490.—STATUARY.—Ames Van Wart, New York city.
4,491.—STATUETTE.—Ames Van Wart, New York city.
4,492.—CHURCH-WINDOW GLASS. — Samuel West, Boston, Mass.

TRADE-MARKS.

66.— BLACK ALPACA DRESS-GOODS. — Bowen, Hunt and Winslow, Chicago, Ill.
67.— NON-EXPLOSIVE BURNING-FLUID. — R. F. Danforth, Cleveland, Ohio.
68.—HUNTOON STEAM GOVERNOR.—John A. Lynch & Co., Boston, Mass.
69.—YERBA SANTA.—A. McDermott, Oroville, and Redington, Hostetter & Co., San Francisco, Cal.
70.—DETERGENT POWDER.—Jesse S. Smith, Waverly, N. Y.
71.—WHITE LEAD.—The Atlantic White Lead Company, New York city.
72.—REFINED BOILED LINSEED OIL.—The Atlantic White Lead Company, New York city.
73.—METAL.—The Patent Metal Company, Philadelphia, Pa.
74.—MEDICAL COMPOUND.—United States Proprietary Medicine Company, Cincinnati, Ohio.
75.—FERTILIZER.—Walton, Whann, & Co., Wilmington, Del.
76.—MEDICINE.—Wm. N. Wells, Boston, Mass.
77.—WHISKEY.—White and Alexander, Paris, Ky.

EXTENSIONS.

CLOTHES DRYERS. — Samuel Morrill, of Andover, N. H.—Letters Patent No. 16,065, dated November 11, 1856; reissue No. 830, dated September 27, 1859.
MELODEON.—El Dora Louis, of New York city, administratrix of La Fayette Louis, deceased.—Letters Patent No. 16,094, dated Nov. 18, 1856; reissue No. 2,498, dated February 26, 1867; reissue No. 2,944 dated May 26, 1868.

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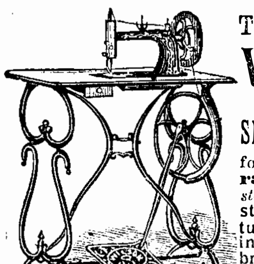

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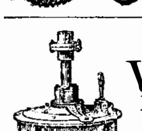

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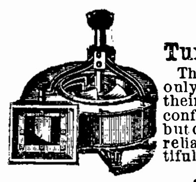

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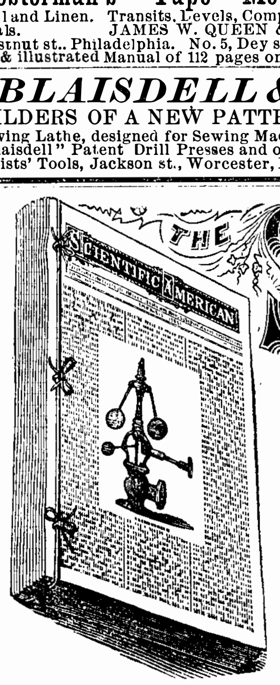

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