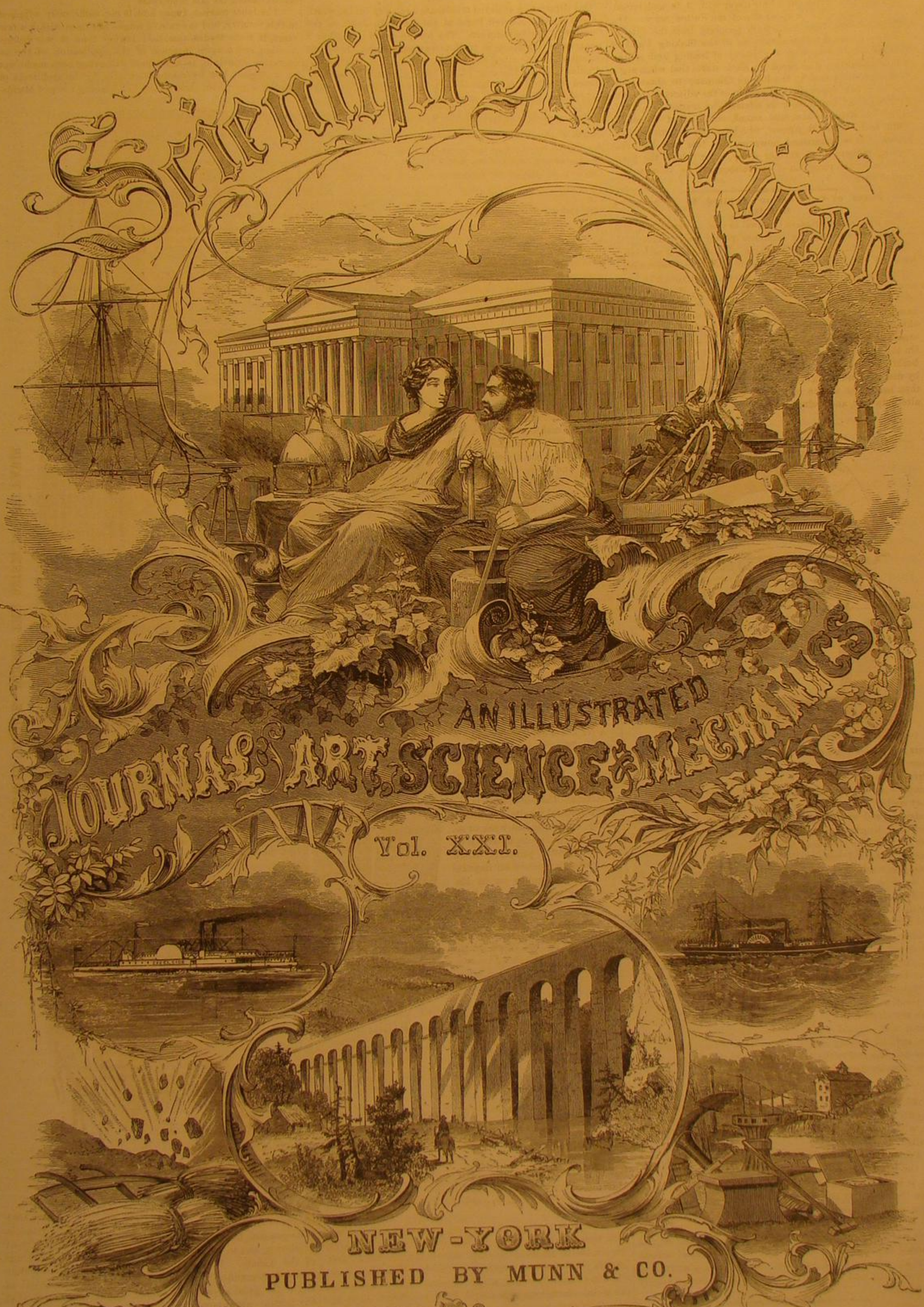
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A One-needle Family Knitter.

The exceedingly simple machine, illustrated below, will be examined with interest by all, and especially those accustomed to the complicated machines heretofore presented. Its prominent features are its fewness of parts and the superiority of its work, not without reason thought to be destined to revolutionize all previous methods for producing knitted goods. Most of our subscribers will remember our illustration of the original patent some twenty months since, which attracted considerable attention from its simplicity, and was copied from our pages into several European journals; but the company owning the patents, having been steadily improving their first machines, and having secured new patent, the machine differs essentially from the original device.

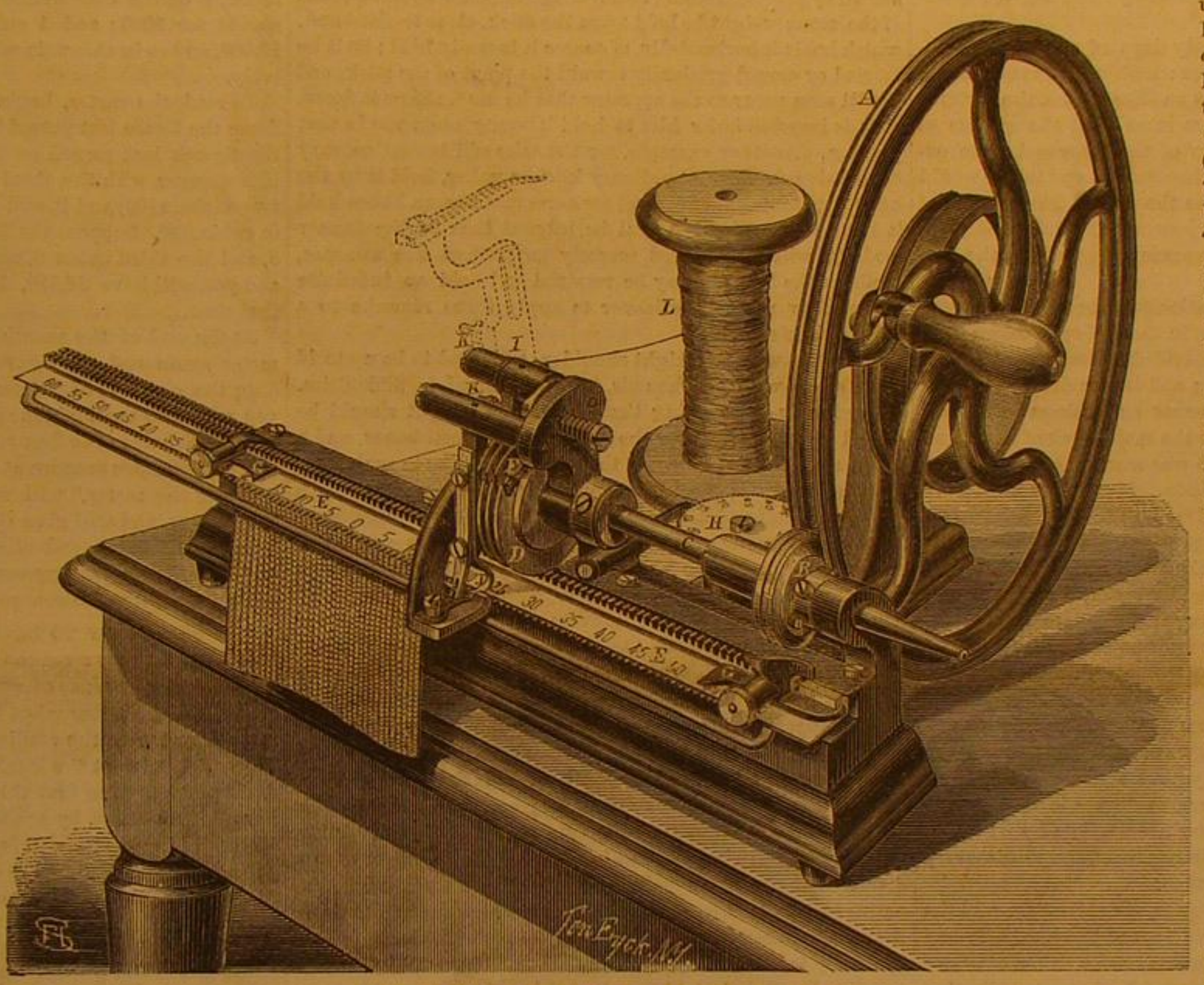
As a type of American ingenuity for American homes, a complete knitting machine, with but 27 pieces employed in its entire construction, will be, perhaps, as appropriate an illustration as could grace the first page of our new volume.

This simple, cheap, but substantial machine by means of a single eye-pointed needle, in connection with a looping hook, and work-supporting comb traversing (automatically, or at the design of the operator) in front of the needle, certainly produces the handsomest work we have ever seen from machinery or hand, in which opinion we are sustained by competent experts, as well as by the medals unanimously awarded it at the Paris Exposition, the last American Institute Fair in this city, and, indeed, wherever it has been in competition.

The driving wheel, A, adapted by its crank for hand, or by a band wheel and treadle, as in a sewing machine, for foot power, as desired, drives the friction pulley, B, on the shaft, C, and, by it, the grooved cam-disk, D. This latter ingenious device for operating the comb, E, backward and forward before the needle, consists of a small double grooved disk engaging in the toothed rack of the comb, and, as seen in the cut, has a section of its periphery movable and pivoted at one end. This arrangement causes the comb to advance one tooth each revolution of the disk, according as the section is swung to the right or left by the small dog, F, placed under the movable end of the swinging segment—and which dog is automatically operated by its striking against the indexes, G, as either arrive at the cam-disk, D—thus instantly reversing the direction of the rack. It will at once be seen that this short, movable portion of the periphery of the disk, causes, by its pitch, a comparatively quick advance of the comb—the complement of its grooved circumference holding the comb perfectly immovable the remainder of the revolution while the loop is being formed—thus rendering the stitch *certain*, without that liability of "dropped" stiches, which has, heretofore, prevented the general adoption of domestic knitting machines.

Another great advantage of this invention consists in supporting the work from the teeth of a steel comb, E, avoiding the complications and accidents to which knitting machines with from seventy-five to one hundred and twenty-five needles, are necessarily subject, although with these the generality produce but a straight circular tube, susceptible of no change or variation, save by stopping the machine and inserting or removing needles each time it is desired to vary the diameter even a single stitch.

The indexes, G, which are instantly moved any number of stitches desired, beside reversing the action of the comb, point to the number on the comb, give, at a glance, the stitches in width of the work in hand, while the counter, H, which is pushed forward one tooth each time the comb traverses across, presents the rows of stitches in length that the work has progressed—thus entirely saving the old drudgery of counting each stitch, necessitated in hand work or other knitting machines, and reducing the labor of knitting a stocking or other article, to the simple method of changing the indexes, whenever the counter, H, has enumerated a certain number of stitches in length. Centered immediately above the disk, D, is the needle bar, I, which carries the needle and receives its reciprocating motion from a crank pin on the disk working through it in a slot, and also the looping hook, J, operated by means of a cam-slot cut in the disk immediately about the crank pin, which slot receives a pin projecting from the looper shank, J. The needle bar is easily turned up, as shown by the dotted elevation of the same, for threading, etc., and when so reversed, as it can be, without breaking the yarn, the work in progress cannot be disturbed by the interference of a child, or others, during the absence of the operator. The tension screw, K, is seen on the side of the needle bar. With the needle disconnected from the work, and the grooves of the segment of the cam-disk, D, in line with the remainder of the grooves, preventing lateral motion of the comb, the machine is transformed into a "self-spooler" by setting the bobbin, L, on the spindle end of the shaft, C—projecting for that purpose—which rapidly winds its yarn from the swifts without interfering with the progress of the work on the comb, entirely obviating the use of a spooling machine and bobbin stand.



THE HINKLEY KNITTING MACHINE.

The above describes all of the various parts. The needle bar, I, receiving its motion from the crank pin in its slotted arm, advances with each revolution of the disk, D, and the needle, passing through the stitch immediately in front, under the tooth of the comb, removes that loop from its tooth, the revolution of the cam slot brings the looper-hook forward in season to take up a new loop from the eye of the needle, and, on its backward movement, deposits it on the tooth which held its predecessor. Now, the disk-cam, D, which has held the comb stationary while the new loop has been formed, reaches the gaining or cam part of its circumference, causing the comb to traverse one tooth for the repetition of the stitch forming. It is seen that upon the arrival of that part of the comb on which is stationed either index, that they strike the dog, F, instantly reversing the direction of the comb. The work hangs from the teeth of the comb in front of the machine in the plain view of the operator, and, unlike all other knitting machines, uses no weights to drag down the work, the use of the small wire rod, under the comb teeth, obviating their necessity.

It is easily apparent that by the use of a traversing comb of any length, straight, curved, or circular, that one needle can perform the work previously requiring as many needles as the comb has teeth, that the "widening" and "narrowing" is adjusted stitch by stitch, or as many as desirable, instantly, by sliding the indexes along the comb—that it "sets up" its own work, not requiring the loops to be "cast on" by hand—that the stitch is the same as that taken by hand from one needle to another—that each edge will be a "selvedge" like cloth, no matter how irregular in outline, and that the top of the work, as, for instance, a stocking, will not be a raw edge, but "finished," as it comes from the machine. Many other advantages over the most expensive "knitters," may be enumerated. For instance, it is evident that the work and all the machinery are in full view of the operator, and readily understood by a child—that the knitter can be run by hand or foot, like the sewing machine—that any size yarn or cord can be used—that, by reason of its small friction gear and the large driver, it is almost noiseless, while an extremely high speed can be reached, which, with the rapidity of "widening" and "narrowing," places this machine in the front rank of "fast" knitters, and that the tension governing the size of loop is altered in a second.

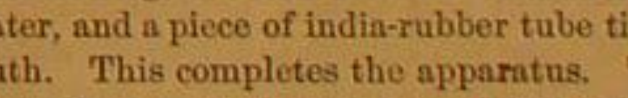
It also knits the buttonholes to use an Irishism), in a garment; knits in different colors or sizes of yarn without tying together; knits any fabric from an afghan to a pair of gloves; knits a stocking complete with a "hand heel" (which stockings do not require the toes and heels to be knit in by hand, but will knit them "double" if desired); and produces work equal to hand-knit in every respect, not liable to return to a uniform tubular shape after the first washing.

These machines are now being manufactured by the "Hinkley Knitting Machine Company," under the United States patents. The patents obtained in Great Britain, Belgium, France, New Brunswick, etc., are for sale.

Parties desiring agencies, territory, machines, or other information, will address the New York office of the "Hinkley Knitting Machine Company," No. 176 Broadway, New York city.

Determinations of Free Oxygen.

At a meeting of the Manchester Literary and Philosophical Society, Mr. Peter Hart described his method of making rapid determinations of free oxygen. The apparatus required consists, in addition to an ordinary pneumatic trough, of two tubes, each ½ inch in diameter and 16 inches long, closed at one end. One of the tubes is graduated into 50ths of a cubic inch, and the other is coated internally with phosphorus. This is effected by dropping into the tube a few pieces of phosphorus; it is then to be closed by a sound cork, and the phosphorus (melted by immersing the tube in hot water) may be spread in a thin coating over the interior by turning it round as it cools. On cooling, the cork is to be withdrawn, the tube filled with water, and a piece of india-rubber tube tied securely over the mouth. This completes the apparatus. The *modus operandi* is as follows: Both tubes are filled with water, and allowed to remain in the trough, a portion of the air to be examined is passed into the measuring tube, which is now allowed to remain for five minutes in the trough to allow it to attain the same temperature as the water. It is lifted until the water is at the same level within and without, and may then be closed by the finger, and withdrawn from the trough. The volume is easily noted. This done, it is connected by the india-rubber joint with the phosphorus tube; into which the air is allowed to flow. The whole may now be placed for half an hour in the trough, when the gas may be poured back into the measuring tube, the level once more taken, and the volume read off in the same way as before. The loss is oxygen. In the cut, *a* is the measuring tube, *b* the india-rubber junction, and *c* the phosphorus tube. No claim is made



for strict scientific accuracy in connection with this apparatus; its sole merit consists in its offering an easy and rapid means of approximately determining the free oxygen in an atmosphere. In the working of sulphuric acid chambers it has been found extremely valuable, and possibly may be found so for other technical inquiries.—*Mechanics' Magazine.*

AN exposition of textile fabrics is to be held at Cincinnati, commencing August 3d and closing on the 7th. It is to be under the auspices of the Woolen Manufacturers' Association of the Northwest.

Applied Mechanics in Relation to Natural Power.

The last of the course of "Cantor Lectures" on "Applied Mechanics" was delivered by John Anderson, Esq., C.E., Superintendent of Machinery to the War Department, before the Society of Arts on Monday evening. In the earlier ages of the world, said Mr. Anderson, when man as yet accomplished his ends by the exercise of his own physical powers, every fresh insight into the application of natural power must have appeared a wonderful discovery. Circular motions—those simple contrivances for receiving and distributing power, the revolving spindle and wheel, were wonderful discoveries, and they had exercised a far higher effect on our country than many with more sounding titles.

Passing on to consider the mode of reckoning power or force, the lecturer said all force was reckoned by units, one pound moving through a space of one foot being equal to a unit of work; or one pound lifted 100 feet to one hundred units. The convenience of this mode of measurement could not be over estimated. By it the force developed in a railway train, the wind or water lifted from a well, could all be measured and reduced to units of work. For practical measurement a larger unit was, however, necessary, and this was called horse power. A horse would pull 150 pounds through 220 feet in a minute, and this amount of work was equal to 33,000 units. A man's power, as reckoned in the government works, was only about one tenth of that of a horse, being about 15 pounds, or 3,300 units. Natural power could only be partially taken hold of and applied by man, and the quantity thus taken hold of varied.

It has been supposed in the early days of applied mechanics that man could increase power: nothing, however, could have been a greater mistake. As an illustration, the lecturer stated that when Mr. W. Fairbairn introduced the system of taking motion from the periphery of the fly wheel of an engine, men at once said he would lose power, and that it would be far better to have taken it from the axle. The success of Mr. Fairbairn's experiment had, however, been long demonstrated, and nobody would now question the truth of the system he adopted.

Man's first efforts in the application of natural power were lost in antiquity; they were made in Central or Western Asia ere yet the Aryan race had been divided and dispersed to people remoter regions of the world; and it was deeply interesting to note that names of implements and things belonging to peace and industry belonged to the main stock of the Aryan language, while those relating to war were introduced by the different branches after their division. Many ages must have lapsed before man had penetrated far into the secrets of natural power. It seemed a modern age which was adorned quite comparatively by the names of Euclid and Archimedes; yet it was long after this that we found so simple a contrivance introduced as a machine for raising water. Great, however, as was the contrast between the condition of applied mechanics in their days and ours, the contrast might be still greater between that of the present and succeeding ages.

All natural power is derived from the sun, the only exception being that of the great tidal wave that rolls round the world. Heat and force are synonymous terms. The heat required to raise one pound of water one degree is equal to 772 units of work. This fact gave engineers a data by which to measure the achievements of their machines, and its discovery had caused them great dissatisfaction.

Passing on to consider water power, Mr. Anderson said the circulation of water was due to the heat of the sun. It had been calculated that thirteen thousand cubic miles of water were evaporated every year and carried back again. Part of this, man was able to arrest and apply in its downward course, but all the power yielded was derived from the water, and not from any contrivance which man used in connection with it; and although the subject of water power had been comparatively exhausted he could not as yet utilize more than 75 per cent of the power of the water. This, however, was a great result as compared with that afforded by the steam engine, from which only about 10 per cent was obtained. It was very important that this should be remembered, for of late years it had become the custom to disparage water power to the advantage of the steam engine. The great discovery of modern times in connection with water power was a method adopted in Switzerland of using, so to speak, the ghost of the water—carrying to a distance of 4, 5, and 6 miles the power of the water without taking the water itself. This was effected by a most ingenious contrivance. At the water and by its power a large pulley was whisked round at the rate of sixty miles per hour. A small steel wire cord, not thicker than a pencil, was carried from this to wherever the mill was erected, over valleys, and sometimes miles from the water, and along it the power passed to the place where it was wanted.

A great improvement in connection with this invention had been the application to the pulley of a gutta-percha groove, which prevented the steel cord from slipping. Describing the power developed by steam or heated air engines, the lecturer showed that the nature of the power was precisely the same as that of the water. Both were derived from that great source of power, the sun. With wind and water power it was the present power of the sun, but with coal it was different. That was developed long ages ago and carefully stored up in the bowels of the earth, a rich patrimony of the present age. The supply of wind and water power was unbounded, and would last while "the sun and moon endured;" that of coal was limited, and it was the special province of the engineer to husband and preserve it.

Having considered at some length the progress made in the employment of natural power by the use of steam and air engines, the lecturer concluded by asking his hearers not to be discouraged in their attempts at further improvement because so much might appear to have been done, but still to persevere, and to believe that every fresh invention only cleared the ground for further discovery.—*London Building News.*

How to Select a Saddle Horse.

R. H. Dyer, a well-known English veterinary surgeon—gives the following directions about saddle horses:

"It has been asserted that an oblique shoulder is indispensable in a riding horse, and anything approaching to straightness is considered objectionable. These remarks may be well received, but they do not convey all that is necessary to know. It may be asked how or in what manner, speaking mechanically of course, an oblique shoulder is superior to a straight one. In order to explain this fully and satisfactorily, the reader's attention must be directed for a moment to a steelyard—a contrivance made of iron, which is capable of testing the weight of hay, straw, and other commodities. The small weight, used as a balancing power, is placed at some given point, so as to indicate the value of that which is weighed. If placed at the extreme point of the "yard" it will exert as much influence, although weighing but four ounces, as 56 pounds of hay or other matter would at the other end. This weight becomes less and less as it approaches the opposite end of the steelyard, so that when placed at one end it, as it were, weighs nothing, and when placed at the opposite end it will be found equal to 56 pounds in weight. The same may be shown by placing a stone (14-lb.) weight upon a walking stick. If the stone weight be held upon the stick, close to the hand, which holds it horizontally, of course it is easily held; let it be carried or moved gradually toward the point of the stick, and it will soon occur to the operator that he must throw it down, as it is impossible for him to hold it many moments in that position. Another example, for the sake of illustration, may be mentioned. Take an ordinary kitchen poker, hold it by the knob (horizontally, of course) for some minutes, and then hold it in the center, and it will be learned that in the former mode it will be retained scarcely more than five minutes, while in the latter it may be retained and held an indefinite time. Now we will endeavor to apply these remarks to a horse and his rider.

"A horse with a straight shoulder, supposed to be up to 14 or 15 stone with fox hounds, is often placed in difficulties. For example—presuming that the rider's weight should be placed immediately over the hindermost dorsal bones, and a portion of the lumbar bones, that weight will be in such a position as to admit of all his movements to be carried on with ease to himself and his rider; but if the rider is compelled to sit close to the neck, as he would have to do upon a straight shouldered horse, then his weight would materially interfere with the motion of the front limbs. There would be a corresponding influence upon his movements that we found in the position of the weight of the steelyard. Doubtless, 14 stone placed near to the neck will have as much influence as 18 or 20 stone has when placed in the center of the back, and this will be apparent in ordinary motion. How much more then, will it be apparent in leaping? If we take this for granted, we may readily believe how difficult it is for an animal to carry a fourteen-stone man over a large fence. Unless his hind quarters are proportionably strong, he is likely to fail in carrying him safely over the jump. Again, if a horse with a defective or straight shoulder is ridden down a steep hill, the entire weight is thrown upon the front limbs and neck, which must, of necessity, impede their action, in addition to which the rider is rendered uncomfortable and occasionally subject to falls. Further, in taking a deep drop, if the animal is over-weighted at the shoulders, he generally drops upon his knees, or falls altogether in coming to the ground, unless the rider has the power of keeping himself well back, which he cannot possibly do in the same manner he would if he were sitting in a proper position, with sufficient obliquity of shoulder. It is generally believed if a horse possesses strong hind quarters it is a compensation for a defective forehand. This is an error. A horse has propelling power, so to speak, in the front as well as in the hindmost limbs. I do not say that a powerful hind quarter will not, in some measure, make up for deficiency before, but not to the extent imagined by some persons. It may be accepted as truth that every quarter of an inch nearer to the cervical vertebra a rider is obliged to sit is an insuperable objection. The only way to get over this difficulty as regards the position of the rider is to have recourse to the obsolete crupper. Although it is old-fashioned, it tends to prove that our forefathers had good and sufficient reasons for using it. Many other illustrations might be adduced to prove the truth of these observations were it necessary. This reminds me of a conversation which took place sometime since with an eminent horse painter. He showed me his portfolios of celebrated horses, and in speaking of a straight-shouldered animal, he employed the hackneyed phrase, "the scapula has not room to play." I interrogated him as to his meaning, but he could afford no explanation. After explaining to him my views pretty much in the same language as I have used here, he acknowledged it was novel to him, and, looking at it mechanically, it must be correct.

Whatever may be of service in preventing the ravages committed by the *Dermestes lardarius* on preserved specimens in entomological or other collections of natural history is deserving of attention. A correspondent who has had considerable experience of the destructive powers of that beetle, says that camphor and corrosive sublimate are only partial detergents, and that carbolic acid acts perfectly. He advises the application of the carbolic as follows: "Place the crystals of carbolic acid throughout the cabinets, and the evaporation of the crystals will keep them thoroughly saturated with carbolic acid gas and kill all living insects therein."

FACTS ABOUT GAS FOR THE PEOPLE.

HOW TO READ THE METER.

There is no valid reason why consumers of gas should not be able to read the meter for themselves, and know exactly the amount of gas that is consumed. The meter is placed in every dwelling, giving equal privilege to the consumer as well as the gas company, to learn by its self-registering index the amount of gas consumed. If this knowledge was general, it would remove silly prejudice, that great "bone of contention" between those who pay for the gas and those who receive the pay, for it is a faithful arbiter and gives no favor to one more than another.

The meters (both wet and dry) in ordinary use will be found to have three indexes, the hand on the first or right hand index moves to the right as the figures read, and each index begins at a cipher (0) at the top and reads, 1 to 2 to 3 and so to the cipher again, which is 10. When the hand on the right index has moved to 1 it indicates that 100 cubic feet of gas have been used or passed the meter; when it points to 5 it means 500 feet, and after completing the circuit at (0) it is 1000 feet. Each of the indexes are ten-fold multipliers of the one preceding. Single figures are used for want of room, but the multiplier is generally placed above the index; thus the right hand is "one thousand," the next to the left or middle index is "ten thousand," and the last or left hand index is "one hundred thousand." Therefore on the first or right hand index, 1 on the dial stands for 100; in the middle index 1 stands for 1000; and 1 on the left hand index stands for 10,000, and so in this ratio with the succeeding figures respectively.

To read the meter, begin with the left index and write down the figure last passed by the pointer; then write down the figures last passed on the second index, and proceed in like manner with the third or right hand index. Now add two ciphers (00) and it will give the amount of gas registered in cubic feet. Suppose the first index was 2, the second index 5, and the third index 6, making 256, now add two ciphers and you will have 25,600, being the amount of gas used at that time.

At the end of the month (or at any other time) read the meter again and the figures will read—say 26,500 after adding the ciphers; now deduct the first sum from the last and you will have the difference 900, which indicates the number of feet used since the first reading.

A few minutes practice at reading meters, generally called "taking the meter," will make any one quite familiar with the matter, and will give the gas consumer a wonderful degree of satisfaction, and often bring about a much better feeling toward the gas company who supply the gas. Among other things it will show you

HOW TO DETECT ESCAPING GAS.

If your gas bills seem too high, or you have the evidence of escaping gas by sense of smell, but not positively so; take a reading of the meter when no burners are in use, and after an hour or so repeat the reading, and if gas is escaping it will be shown. To detect the locality of the leak is often a more difficult matter. The first thing is to see that no burners have been left turned on by accident, which is often the case where the cock has no *stop*, and is caused by the cock being turned partially round again so as to open the vent. Imperfect stop cocks are for this reason dangerous, and should be at once removed.

The next thing to do in order to detect a leak is to try the joints of the gas fittings. The sense of smell will frequently be sufficient by bringing the face near the suspected joint; a lighted taper or match held near the joint is a more certain plan. If gas is escaping it will take fire at the leak, or if too little to burn steadily it will momentarily catch and extinguish in little puffs.

Sometimes the gas escapes from the joints or imperfect piping between the ceiling and floor, or behind the walls or casings.

If beneath the floor the sense of smell will generally detect the section of the floor under which the leak is; as it escapes owing to its levity upwards through the crevices of the floor, and penetrates the carpet if there be one. If bracket or side burners are used, and the escaping gas is behind the walls or casings, the crevices in the casings, or the opening where the pipe enters the room, will let the escaping gas enter the room sufficiently at these points to indicate somewhat nearly the location of the leak.

In such cases the proper way is *never* to apply a light to the crevices or casings, but to turn off the gas at the meter and send for a gasfitter, otherwise an explosion may occur involving serious consequences. In ordinary leaks of gas fixtures and pipes, whether at the joints or at the attachment of the burner, the fitting or burner should be unscrewed and white lead or common bar soap rubbed in the threads, and then screwed home again. This can often be done without any aid from a gas fitter.—*American Gas Light Journal.*

Simple Method of Ascertaining Death.—Dr. Carrière, of St. Jean du Gard, in reply to the offer of the Marquis d'Orches, of a premium of twenty thousand francs, for a practical method of determining death, furnished the following, which he says he has practiced for forty years: Place the hand with the fingers closely pressed one against the other, close to a lighted lamp or candle; if alive, the tissues will be observed to be of a transparent, of a rosy hue, and the capillary circulation of life in full play; if, on the contrary, the hand of a dead person be placed in the same relation to light, none of the phenomena are observed—we see but a hand as of marble, without circulation, without life.—*Jour. de Méd. et de Chirurg.*

SKILL, INVENTION, AND PROPERTY IN PATENTS AND BOOKS.

By Horace Greeley.

Capital is the unconsumed and unwasted remainder of the fruits or proceeds of industry. He who spends as fast as he earns accumulates no capital: the first man who ever produced or fashioned any substance for use beyond his instant need was the first capitalist.

The material wealth which has been amassed by mankind throughout thousands of years is of incalculable amount and value. Apart from that held by individuals, the churches and other public edifices, canals, roads, railways, bridges, literature, paintings, sculpture, etc., though their cost was enormous, are worth far more than that. Immense is our indebtedness to the genius, industry, and thrift, of past ages for the wealth they have bequeathed us, and signal our obligation to transmit these blessings, not merely unimpaired but enhanced, to those who will come after us.

And, however great our obligation to the departed for the palpable, material wealth they bequeathed us, they have laid us under still greater obligation by their magnificent legacy of experience and skill. Having this, we might in time, were they all swept away, recreate most of our worldly possessions; deprived of it, we could scarcely, and with great difficulty, preserve our bare lives. The teeming millions of China are constantly near the brink of starvation, which many of them daily overpass; less, I apprehend, because of the density of their population than of the rudeness and inefficiency of their labor-saving devices. On the other hand, so prodigious has been the progress of invention in Europe that the steam engines of Great Britain alone have been estimated as equivalent in force, if not in productive capacity, to six hundred millions of men. Cheap beyond comparison as is the labor of Eastern Asia, the machinery of Great Britain competes with it in its own markets, rivals it, undersells its products at the very doors of the producers, divests them of employment, and dooms them to die of famine. In my early boyhood, Chinese cotton fabrics known as nankins, etc., were extensively worn, even by the poor, in New England; but that trade was destroyed by British and American power-looms nearly half a century ago; and now the peasanty of China and India are largely clad in the products of those looms. Cotton grown in India is extensively shipped to England, there spun and woven, returned in the shape of fabrics to India, and there worn all but exclusively by those among whom it was grown, who would gladly have spun and woven it for sixpence sterling per day's work, yet who paid the cost of two journeys around the Cape of Good Hope, that of the British manufacture, the interest on its value during its long absence, and the profits of several mercantile transfers, and yet were supplied with it in the market of India at lower cash prices than her own looms could afford.

Those countries only which cherish and delight in labor-saving devices have added aught of moment to the world's inestimable aggregate thereof. Europe could not now afford for a billion of dollars to lose the inventions and improvements in machinery for which she is indebted to America, and the great mass of which, in all human probability, would never have been, had the policy of buying from Europe every article of manufacture, which marked and fitted the era of our colonial dependence, been persevered in to this day.

Our oldest manufactures are naturally our cheapest and best. Europe cannot rival our axes, adzes, and other edge tools; nor can she surpass, either in quality or cheapness, the spades and shovels extensively made by one Massachusetts family throughout the last fifty years. Cut nails are an American idea; and no other nation yet makes them so cheaply or half so abundantly. We have begun, after many years trying, to make wrought nails also by machinery, and will naturally keep the lead in this department also. I have heard that the screw auger, whereby the cost of boring holes in timbers was reduced more than half, is a Connecticut invention, and never patented, though its value to mechanics defies computation. The planing machine, the innumerable reapers and mowers, the sewing machine, and ever so many kindred trophies of Yankee genius for invention, have enriched not our country only but the civilized world. And as the cotton gin would surely not have been invented had not the cotton culture preceded and required it, so the arts, in the prosecution of which other American inventions were called into being, had to be previously known and practiced among us, or the world must have waited indefinitely for the triumphs they incited. We are, I rejoice to learn, on the eve of a similar stride in the production of all forms of wrought or malleable iron, through a Pennsylvania invention whereby the expensive process known as puddling is to be superseded or immensely reduced in cost: and a thousand other beneficent applications of inventive genius to the cheapening of processes, the increase of products, are on the point of practical realization. No man can truthfully suggest an article which, having formerly been wholly imported, has since, through protection, been so naturalized on our soil that it is now produced here nearly to the extent of satisfying our own wants, yet which now costs our people more than it did when we procured it from abroad. And the area whereon such achievements are possible is by no means fully occupied. We shall yet make our own crockery and finer kinds of pottery, which we still mainly import, and shall grow as well as manufacture the silks for which we are still mainly indebted to the insects of China and the looms of France, we having in California a more genial climate for the silk-worm than Europe or Asia can boast; while we are already reeling and spinning, on American machinery invented for the purpose, vast quantities of raw silk imported in an imperfect or damaged condition (answering to the "swingle-tow" of flax) which all the ingenuity and patient industry of "the Flowery Land" had given up as hopelessly intractable and worthless. So shall we continue, under a beneficent policy of encouragement and support, to develop new and larger possibilities of industrial achievement, and, in expanding and diversifying our own national industry, benignantly stimulate, and ultimately renovate, that of all mankind.

The rights of thofe who create intellectual property are less clearly defined—perhaps less capable of unerring definition—than those of the producers or transformers of material substances; yet they seem to me not less real, beneficent, and defensible. Let us suppose that four brothers commence responsible life with equal patrimonies, equal capacity, and like habits of industry, temperance, and frugality. Twenty years afterward, one of them, who has devoted his energies to farming, has a fine estate, a commodious dwelling, a handsome herd of cattle, a good collection of implements, a library, and all the material elements of independence and comfort. A second has addresed himself to the construction of locomotives, and has done as well thereby as his farming brother. A third has given himself up to the study of mechanics and engineering, and has, after many disappointments, perfected a new steam engine, whereby the power required to move a train or boat of so many tuns at a given rate per hour is reduced at least twenty-five per cent. The fourth has addicted himself to literature, art, and poetry, and has produced a book which one hundred thousand of our people annually read, deriving pleasure and instruction therefrom which they would rather pay him for than forego. I ask why this inventor, and this author, have not as fairly earned, and are not as justly entitled to the price that others prefer to give rather than forego the advantage or pleasure derived from their products, as are their brethren, the farmer and the locomotive-builder, to a like remuneration for the use of *their* products? If, as Thiers forcibly says, "The indestructible foundation of the right of property is labor," then, surely, the right of property in Elias Howe to that combination of the needle with the shuttle which gave practical existence and value to the sewing machine, of Alfred Tennyson to "The Princess," "Maud," "In Memoriam," and "The Lotus Eaters," is as perfect as any right of property can be. For the craftsman merely fashions, adapts, or r ecasts materials coexistent with the earth, and which may be regarded as in some sense once the common property of mankind; while the inventor, the poet, builds into the void space, makes chaos luminous, and adds potentially, and, as it were, by original creation, to the enduring wealth of mankind. I cannot perceive how or why his right of property in his product is not at least as perfect and pervading as that of the maker of a locomotive, the grower of grain.

I have considered what has been urged in favor of a restriction of this right of property to the material thing wrought upon—to the particular locomotive built by the inventor, the author's manuscript copy of his poem—and it seems to me palpably absurd. For what the inventor has labored twenty years to perfect is not the single, particular locomotive on which he expended his handiwork, but *all* locomotives to be thereafter built—his efforts were incited and upheld by a desire to make *all* locomotives henceforth less costly or more efficient. This he has achieved, or nothing; herein he has succeeded, or not at all. Once completed, the machine whereon he labored so long may accidentally take fire and burn to ashes, yet no one, surely, would thence infer that his labor had been in vain.

I do not regret that foreign authors are extensively read here; I do not deny that some of them are eminently deserving of their American popularity; but I protest against the legislation, or lack of legislation, on the part of our rulers, whereby foreign works are habitually—nay, necessarily—proffered cheaper to our people than those of our own authors. This is unjust to both alike—to those whom it deprives of readers, and those whom it gives more than their fair proportion of readers, but denies compensation for their work. Walter Scott barely escaped dying a bankrupt, when one cent per volume from his American readers would have saved him from pecuniary embarrassment, smoothed his downhill of life, and perhaps enabled him to live longer and write more and better. I wish we had rendered him naked justice.

As to the abolition of the Patent system, which has of late been influentially advocated, I shall be more easily reconciled to it when I learn that it is to be swiftly followed by a repudiation of *all* rights of property whatever—or, more strictly, of all legal guaranties and defenses of such rights. Whenever the laws of my country shall refuse to protect the inventor, they should, in simple consistency, bid the land-owner, the bond-holder, the merchant, "Take care of yourself, and of all that you call your own." Assuredly, no man's right to the wild lands conceded to his ancestor by a European monarch who never saw, and knew not how, even to bound them accurately, can be better than that of Eli Whitney was to his cotton gin, or that of Daguerre to photography. When these shall be successfully denied, be sure that *no* rights of property can be secure.

"Then, why not make patents and copyright absolute and perpetual?" is often asked. I answer, there are *no* absolute rights of property. The land you bought of the Government yesterday may be taken from you for the bed of some highway or railroad to-morrow, and you have no redress. *All* rights of property are held subordinate to the dictates of National well-being; and the Government will batter down or burn to ashes your house, if it shall have become (through no fault on your part) a harbor or defense of public enemies, and make you no compensation therefor. I only insist that intellectual property shall be recognized by law as standing on a common foundation with other property and equally accorded the protection of the State and the respect of all who hold property no robbery, but justly entitled to deference and support from the wise and the good.

Rules for Bathing.

1. Baths should not be taken within at least one hour before eating, nor within two hours after; and not within two hours before, and three hours after, is still better.

The reason for this is, that in bathing, the blood is brought to the surface in large quantities and circulates freely in the capillaries of the skin, being drawn away from internal organs and generally diffused through the whole body, and the more freely this external circulation and warmth is kept up, the more refreshing and invigorating the bath becomes, and the greater the benefit derived from it; whereas, when the stomach has recently been supplied with food, the blood is diverted from the external circulation to the digestive organs to supply the secretions and juices necessary to carry on the digestive process.

From these facts, it will be evident that if food be taken into the stomach too soon after a bath the blood is directed to the stomach before a full reaction has taken place, thus interfering with its beneficial effects; while on the other hand, if the bath be taken too soon after a meal, the blood is diverted from the digestive organs before digestion is completed, and thus a very important function of the body is interfered with.

In cases of active congestion or inflammation, in fevers, or in severe pain and distress, it may be necessary to make water applications irrespective of this rule.

2. The head and face should be thoroughly bathed at the commencement of every bath. This will prevent the rushing of blood to the head and ward off unpleasant sensations.

3. A bath should never be taken when the body is exhausted, or too greatly fatigued by exercise, as a person in such a condition would not be likely to secure the proper reaction and warmth. Moderate exercise before a bath is usually beneficial, as it accelerates the circulation and secures a comfortable degree of warmth, which is always desirable before taking a bath. There is no danger from taking a general bath while in a perspiration, providing no fatigue accompanies it; for the sitz and foot baths, however, it is better that the body be warm, but not perspiring.

4. All general baths should be taken briskly, and the bather himself, if able, should rub vigorously that he may quicken his circulation and respiration, and thus secure the warmth and glowing reaction that is so essential after every bath; this should be observed not only while in the bath but in rubbing dry after it.

5. For drying the body after a general bath, a strong linen or cotton sheet is much better than towels; this should be for an adult at least two yards square, so as to envelop the whole body like a cloak, and with it he should be rubbed or rub himself till thoroughly dry—by using the sheet for wiping, the body is protected from the air, the escape of heat is prevented, and there is much less liability to feel chilly afterward—towels will suffice, however, for all local applications.

6. At the completion of the bath, the bather should immediately dress, and, if able, exercise in the open air, or engage in some active employment. If not able to exercise, it is well to cover up warm in bed for an hour or so, and sleep, if possible.

7. Very nervous persons or those whose digestion is much impaired, or circulation is imperfect and feeble, or temperature is below the normal standard, should be careful not to use cold water to any great extent in bathing; it may have a temporary beneficial effect, but in the end their sufferings will be likely to be increased.

8. Feeble invalids, consumptives, persons subject to hemorrhage of the lungs or the stomach, those who have just passed the crisis in fevers or other acute diseases, those suffering from profuse discharges, such as suppurations, diarrhea, cholera, etc., and also females during the menstrual period should avoid the use of cold water, as well as the excessive use of it in any form.

9. Always use a thermometer to determine the temperature of baths for invalids.

10. An invalid should nct bathe in a room with the temperature below 70°, and for most persons 80° or 85° would be better, provided there is good ventilation.—*E. P. Miller, M. D.*

Substitute for Copper in the Daniells Battery.

Few persons, in experimenting upon voltaic combinations, ever consider economy in their construction, and experiments which tend to cheapen their first cost should be made public.

An expensive part of the Daniells battery is the copper plate, the cost of which can be reduced two thirds, in the following manner:

Procure sheets of the ordinary sheet tin of commerce, brighten and plunge into a very weak copper plating solution, in connection with a voltaic battery of very low quantity. In fifteen to eighteen hours a tenacious film of copper will have been deposited upon the tin, and the plate can then be bent in shape suitable for a Daniells battery.—*Telegraph.*

Copal Varnish, according to Professor Böttger's prescription, should be made by first dissolving one part, by weight, of camphor, in twelve parts of ether; when the camphor is dissolved, four parts of the best copal resin, previously reduced to an impalpable powder, are added to the ethereal camphor solution, placed in a well-stoppered bottle. As soon as the copal appears to be partly dissolved, and has become swollen, four parts of strong alcohol, or methylated spirits, and ¼ part of oil of turpentine is added, and, after shaking the mixture, and letting it stand for a few hours longer, a thoroughly good copal varnish is obtained.

ROCKWELL'S OVERDRAW AND COMPRESSION BIT.

Anything that tends to render the horse more docile, or what is still more important, tends to instruct the public in common sense and humane treatment of that noble animal is worthy the consideration of all intelligent men. The inventor

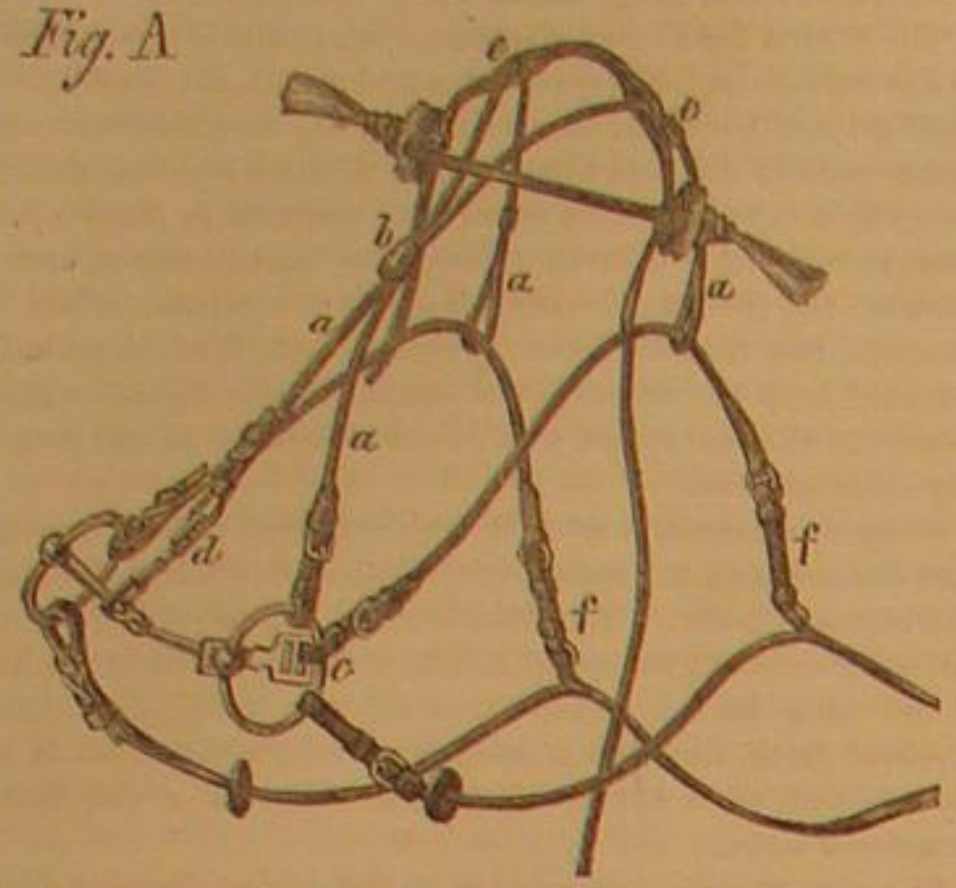


Fig. A

of the improvement we are about to describe, A. H. Rockwell, Harpersville, Broome Co., N. Y., is well known to the public through his work on horse training and personal skill in instructing the horse. The improvement is designed to take

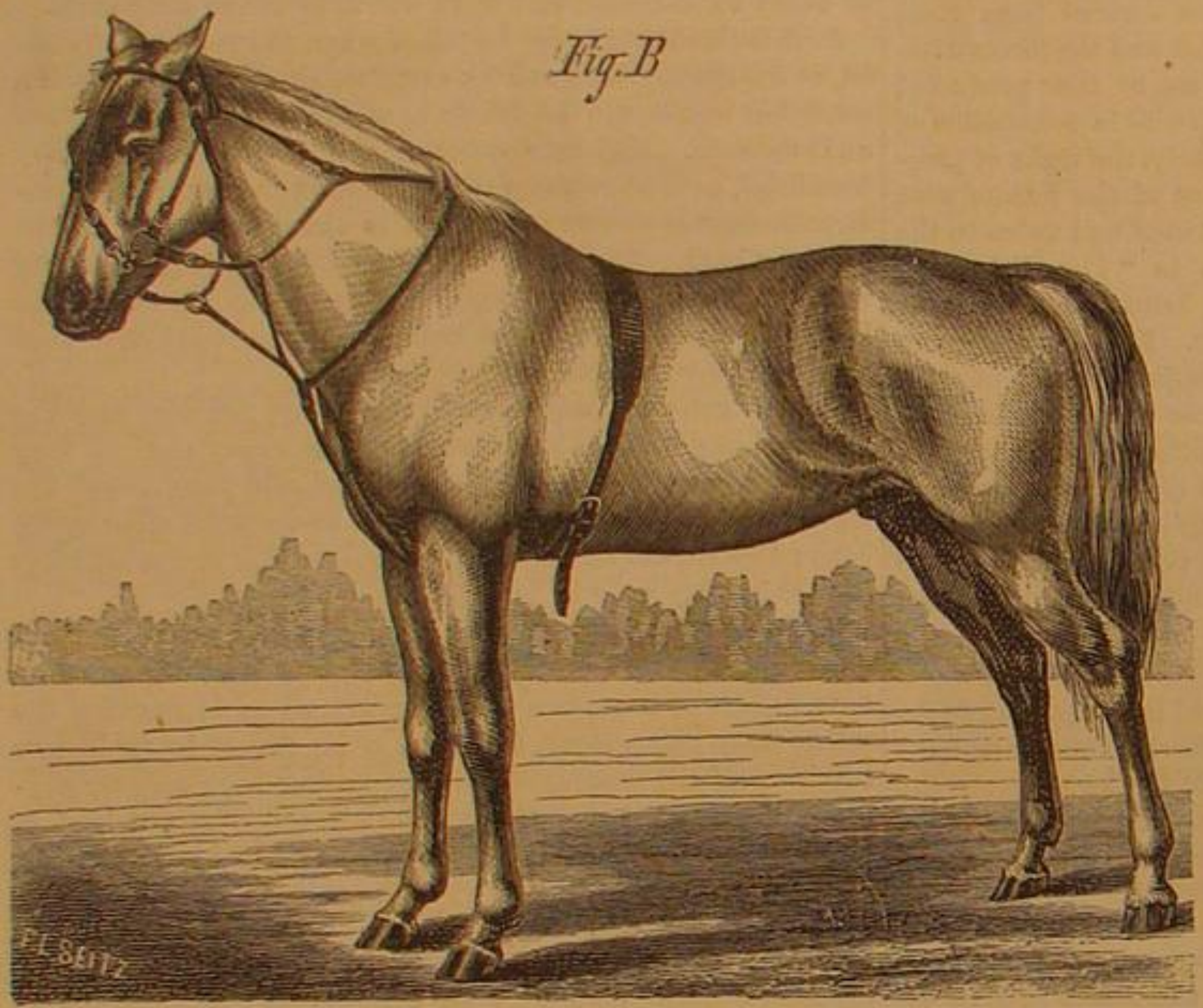


Fig. B

the place of the Yankee bridle with its double ring bit, patented by the same inventor December 4, 1866; the double ring bit was patented November 12, 1867, and the further improvements described in this sketch are now pending.

It is considered by the inventor to be a greater advance on the Yankee bridle than that was over the ordinary bridle in breaking and instructing the horse.

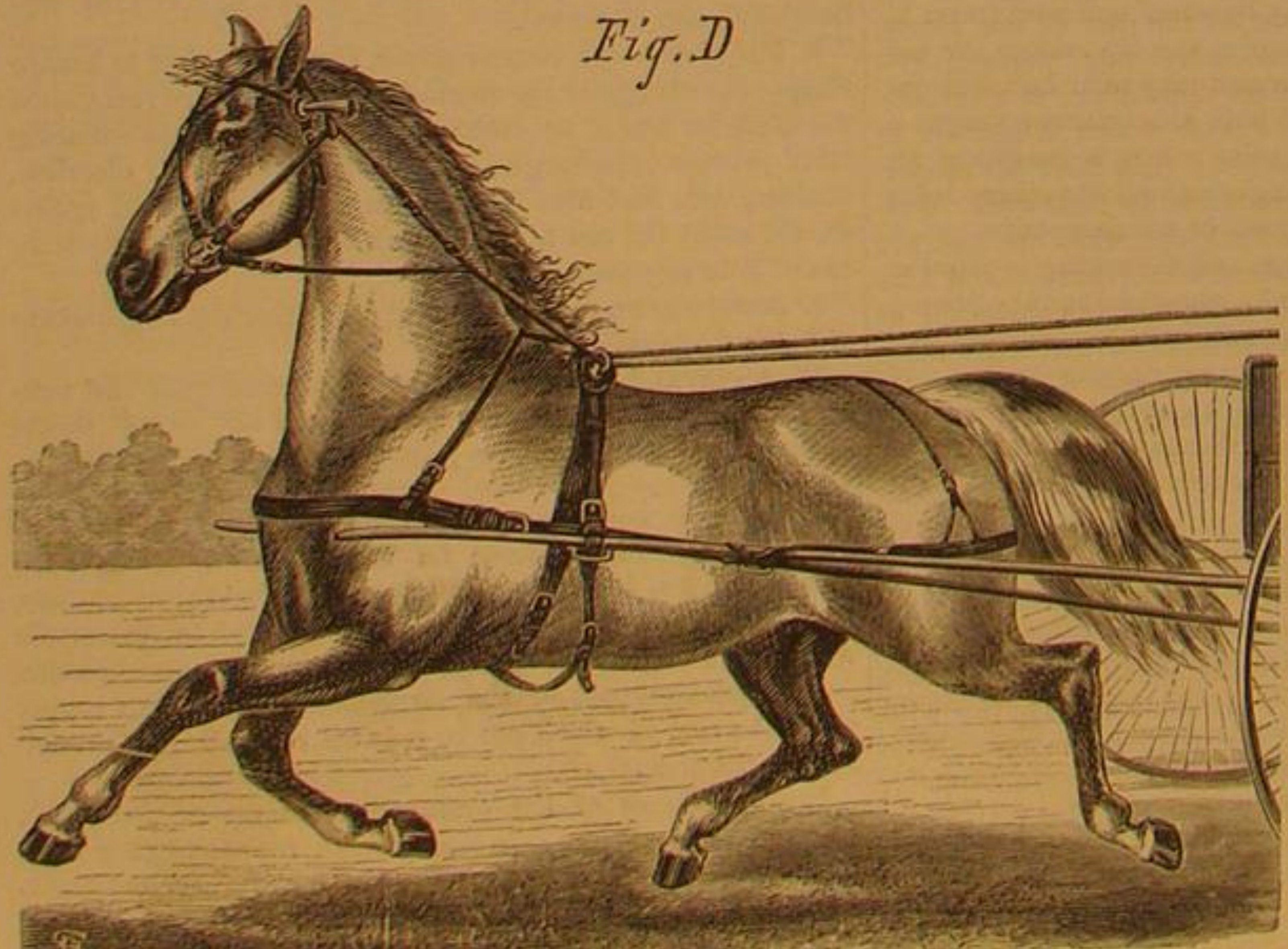


Fig. D

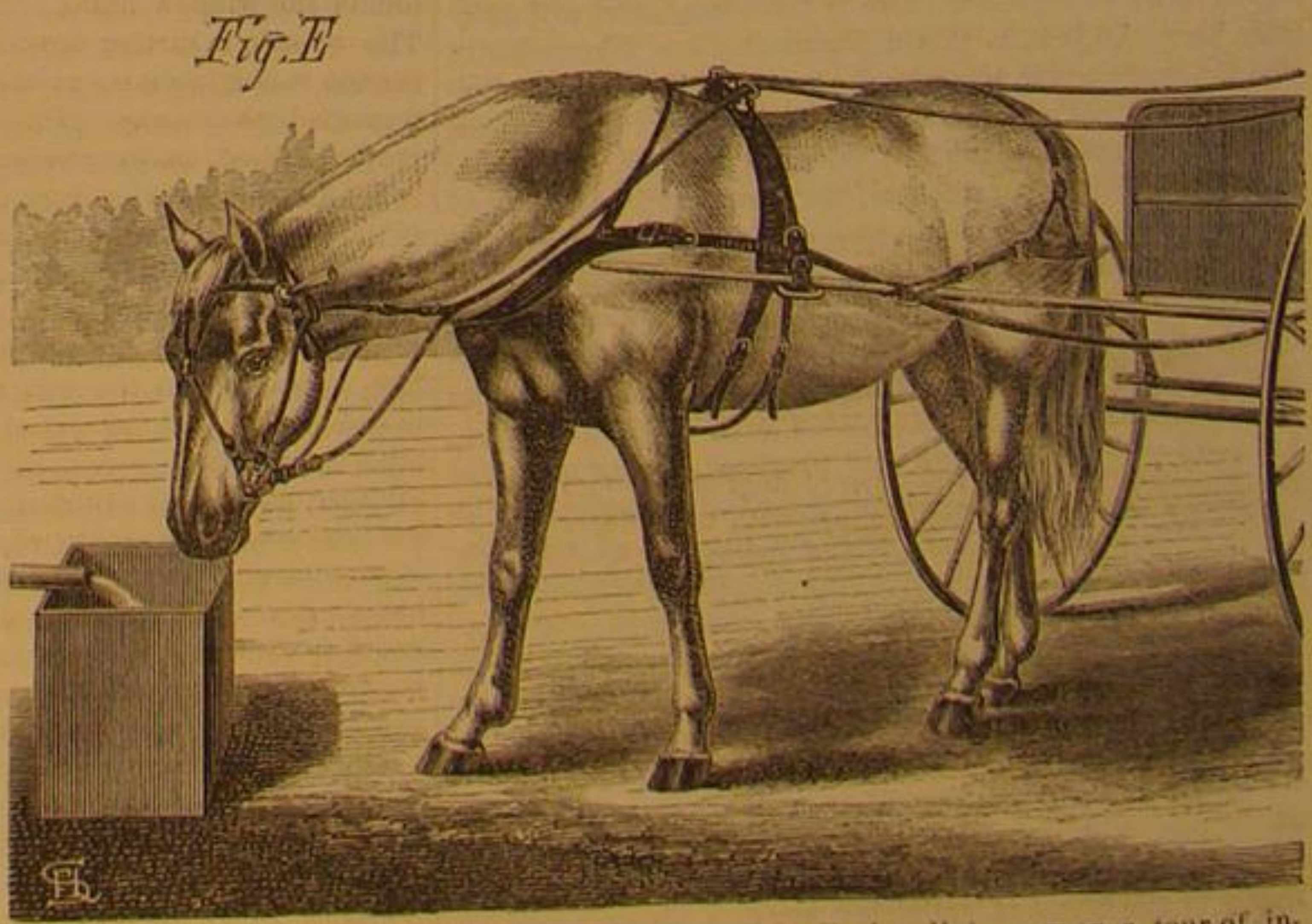


Fig. E

The principle of this improvement will be understood by reference to Fig. A. The mode of applying the bridle and bit to the training of horses will be understood by referring to the other engravings and their explanations.

Fig. A represents a skeleton bridle, with the improvements attached. The chief advantage which this bridle has over other bridles known is owing to the remarkable results which follow the application of the overdraw and compression bit in their various uses.

The overdraw is formed of two round straps, with a buckle and billet as represented by *a a* at the left of the figure, terminating in the two loops at the other ends, *a a*, at the right of the figure. Each of the straps, when buckled, to be two feet and two inches in length. A tight sliding loop, *b*, connects the straps. This loop should be stitched between the two straps so as to work snugly. A sliding knob is snugly attached to each strap, above the loop. The compression bit is a joint bit in the usual form, except that it is double jointed, with the two sliding bars, *c* and *d*. The figure represents two modes of attaching these sliding bars, which are hereafter explained.

The bridle is formed of a crown piece and throat latch of one piece of leather, lined over the head with patent leather. Two loops are placed on top of the crown piece, three inches apart, *e e*; the fore piece to be of the usual length; rosettes may be added to suit fancy; throat latch of usual length; the loops of the overdraw and the knobs are put through the loops on the crown piece, from front to back, the rest of the overdraw coming down over the face and being attached to the bit. It is attached in various ways, according to the end desired to be attained; but for the ordinary purposes of a riding or driving bridle, it is buckled to the ring of the bit. The remainder of the bridle consists of an ordinary driving line buckled to the ring of the bit, and an ordinary check rein, buckled to the ring of the bit and the sliding bar jointly (see *c*), passing through the loop of the overdraw, *a*, as through a gag runner; on the driving line, two inches farther back than the length of the check-rein, there is fastened a strap about four inches in length when doubled (*f f*) arranged the same as the flat part of a check-rein, capable of being adjusted, which strap is connected with a ring on the end of the check-rein.

For a Saddle Horse.—This is put on as just described, with the addition of a martingale when the horse carries his head too high and his nose out too much. The illustration, figure B, exhibits a horse bridled ready for mounting, and figure C shows the horse mounted and lines drawn up. These two illustrations have the overdraw buckled to the sliding bars, as shown by the letter *d*, Fig. A. This is proper where the horse pulls too hard or refuses to rein; but ordinarily it should be attached as shownby Figs. D and E.


Fig. C.

For a Driving Horse.—There is no change from the bridle as applied to a saddle horse (when an open bridle is desired), except in the mode of attaching the check-rein to the driving line, as the adjustable knobs on the overdraw hold the bit in the mouth and avoid the necessity for a check piece.

The driving line being usually rounded, a strap is made to lap around—drawn so tightly that it cannot slip—at the place where the check-rein is attached to the main driving line, as heretofore described. The overdraw may be attached to a common driving bridle if desired. In this case, the knobs will not be necessary, as the cheek piece answers the purpose for which they are intended. The advantages are manifold. While sitting in a carriage, the driver may, by drawing up the lines, have all the benefits of a check in adding style (see Fig. D) without any of its cruelty, as he can, by letting up on the lines while the animal is traveling, entirely relieve him from its pressure. He can also water the horse at a trough (see Fig. E) without removing from his seat. The horse's back is not galled, he travels freer, rests better when not in motion, mounts a hill much easier, and is held up descending a hill with more security; his head is kept up while standing, if desired, by fastening the lines to the whip, dashboard, or a hook in the buggy-top. Horses driven with this overdraw and bit will travel more miles in a day and last longer than by the use of any other contrivance known. If the horse is a hard puller, the overdraw is attached to the sliding bars independent of the bit rings, as in Figs. B and C. This creates a pressure upon the cheek which soon causes him to be more pliable. If he is a side-reiner, attach the end of the overdraw on the side toward which he turns his head to the detached sliding bar, leaving the other attached to the ring, exactly as shown in Fig. A. By sliding the front loop on the overdraw, up or down, the effectiveness of these appliances, is increased or lessened when operating upon the sliding bar detached from the check-rein and bit ring. If a horse carries his head lower than his mate, and it is wished to cause him to raise it, the overdraw is applied to the common bridle, in lieu of the usual gag runner; if a trotting horse throws his head down while speeding, use the overdraw, and check high. If the driver wishes to drive without a check-rein, and wants the advantage of the compression bit, he makes what is called a half-overdraw, by fastening a short overdraw to the head piece, instead of passing it through the loops; then, by sliding the front loop up or down, he can regulate its force. Governing the mouth is the main thing. This attachment will do it by the use of a reasonable degree of judgment. We have room to explain here only a small portion of the benefits to be derived from the use of these improvements. A careful study of their applications will, by a fair exercise of patience and common sense, prove invaluable to those interested in the improvement and instruction of the horse.

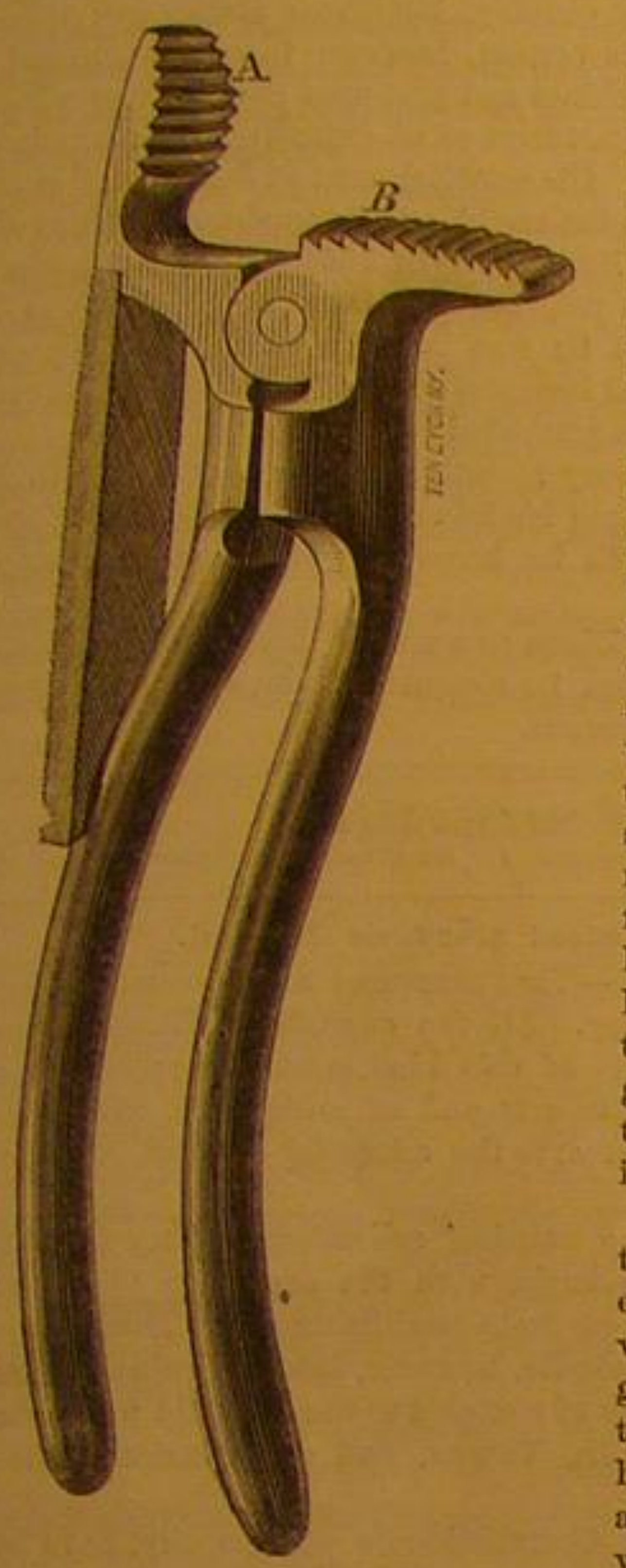
Patents for additional improvements are now pending through this office. Mr. Rockwell is now on a tour of instruction in the New England States, but orders addressed to him, at Harpersville, N. Y., as above, will receive attention.

We learn that a considerable quantity of land near Fond du Lac, Wisconsin, has been devoted this year to the cultivation of the sugar beet, and that a company is in process of formation to engage in the manufacture of beet sugar in that town.

An enterprising Chinese firm has established a publishing house and type foundery at Shanghai.

IMPROVED HORSESHOE CLINCHER.

In clinching the nails in ordinary horse shoeing four tools are commonly used; viz., a pair of nippers to cut the nail to the proper length for a good clinch, a rasp, an iron to hold the nail from being driven back, and a hammer by which the nail is bent over and clinched. Most horses will endure the hammering upon the bottom of the foot in inserting the nail, but are uneasy and at times fractious from the greater or less pain suffered when the side of the hoof is struck in clinching.



A method which should obviate this trouble particularly in shoeing unquiet horses, mules, and colts, has long been desired by blacksmiths and others, who have come to the rational conclusion, that any unnecessary pain inflicted upon the horse is to cause in him fear and mistrust, and foster any germs of mischief that naturally exist in his disposition.

The inventor of the horseshoe clincher, of which we this week give an engraving, is confident that the instrument he has devised exactly meets the want, we have alluded to. It is a combined nippers, rasp and clincher, all of which parts are shown in the engraving, and the use of which will be obvious without description, except the jaws, A and B, used for clinching. In use, after the nail has been driven by a hammer in the ordinary way, the jaw, A, is placed upon the head of the nail, and the other jaw is brought up to engage with the end of the nail remote from the head, when a few motions of the handle which works the jaw, B, quietly and securely clinches the nail without any pain to the horse or inconvenience to the smith.

This tool will be likely to not only attract the attention of farmers, but those who in traveling across our western plains and other out of the way places, frequently find it necessary to have at hand the means of fastening a shoe or replacing a lost one.

Patented through the Scientific American Patent Agency, June 8, 1869, by Nicholas Repp, whom address for information at Waterloo, Iowa.

ADJUSTABLE SPIRIT LEVEL PLUMB AND INCLINOMETER.

This instrument, invented by L. L. Davis, takes the place of the old-fashioned spirit level and plumb, which has been used by all classes of mechanics for many years. The advantage of this level and plumb is in the accuracy and simplicity by which it works, having a graduated scale showing the different angles, being conveniently and neatly arranged for getting elevation of any hight, the graduated scale show-

ing the exact elevation or number of degrees per foot, simply by turning the center or bubble case with the pointer attached, the bubble glass being well and substantially protected, not liable to breakage or derangement as is the case with the ordinary levels; and in case the bubble glass should become out of true or out of line with the base of the level it can be accurately adjusted again by the screw at either end of the bubble case, which screws, in connection with beveled studs, also act as stops. If the bubble case should accidentally be broken, the bubble case and ring can be readily removed by taking off the graduated dial; first, turn out the three small screws which hold it in place, the ring can then be detached from the bubble case by removing the screw which holds the two together, and the bubble case will then be exposed.

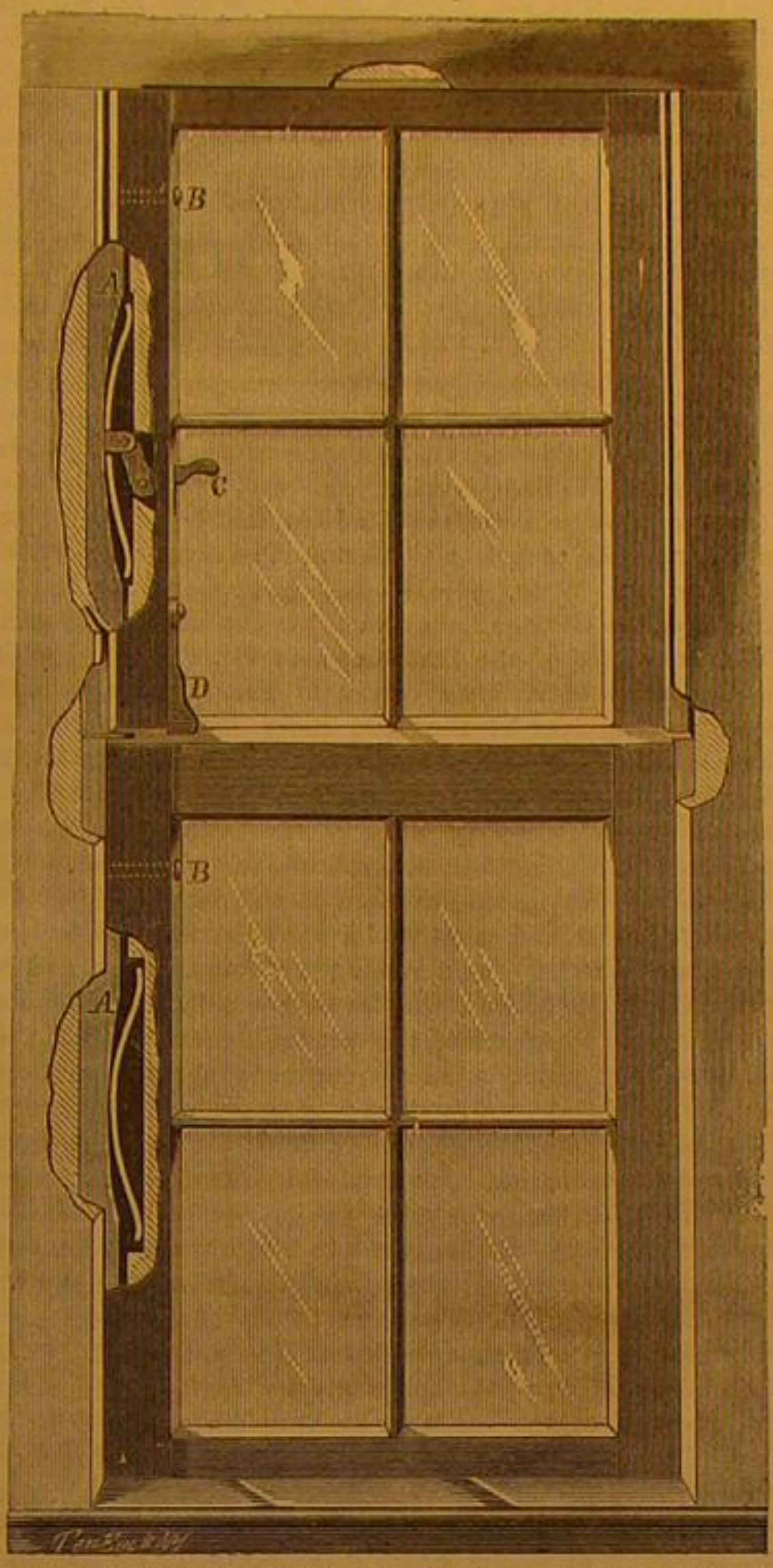
These levels are of the best material and workmanship, and are thoroughly adjusted and tested in every respect. They have been pronounced to be perfectly accurate, and are offered to the public with the assurance that they meet the wants of all classes of mechanics.

Address all orders to J. W. Storrs & Co., 252 Broadway, New York city.

IMPROVEMENT IN WINDOW SASHES.

Our engraving illustrates a very simple device designed to take the place of weights, cords, and pulleys, for window sashes.

The right side of the sash is tongued to fit into a rebate in the frame. On the left hand side a rebate is cut into both the frame and sash in which plays an adjustable tongue, A. This adjustable tongue, also plays on a horizontal pin, B, inserted in the sash so that it slides up and down with the sash.



The adjustable tongue is pressed outward by an elliptical spring as shown in the engraving where a portion of the sash is broken away to afford a view of this portion of the device. The lateral thrust of the adjustable tongue caused by the action at the spring generates sufficient friction to hold the sash in any position. The adjustable tongue is slightly concave at the point where it comes in contact with the spring to give the latter free action, and the sash has a recess which keeps the spring in its proper relative position to the other parts.

When the sash is to be removed, the pin, B, is withdrawn when the adjustable tongue may be seized and withdrawn by sliding the bottom sash to the top, or the top sash to the bottom of the window frame. The sash may then be taken out. The top sash is further provided with a permanent tongue at the top which is shown at the point where a portion of the frame is broken away. This tongue and all the others being properly fitted, answer the purposes of weather strips.

When the sashes are very large and the spring is required to be more than ordinarily strong, an angular thumb-piece, C, is pivoted to the sash, which when depressed takes off a portion of the power of the spring, and thus lessening the friction to any extent required, leaves only the weight of the sash to be overcome in raising it. On small windows this attachment is needless.

There are several advantages which this method possesses over those hitherto employed for raising and lowering sashes. It is not liable to the annoyances frequently caused by the breaking of cords where weights are used. No additional strips are used to exclude currents of cold air; and much less trouble is experienced in removing a sash for cleaning or other purposes. The sash cannot drop suddenly, remaining firmly suspended at any hight to which it is elevated. A sash lock, D, of the simple button form shown in the engraving, or nearly any other form applicable to sashes in general may be used.

Patented May 25, 1868. For further information address Gross, Yingling, & Co., Tiffin, Ohio.

Bridging the Connecticut.

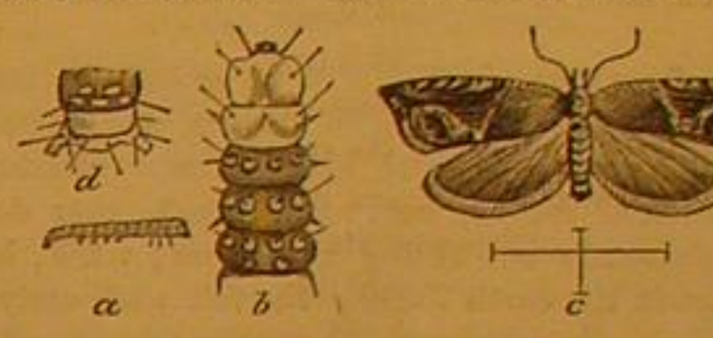
The Board of Engineers, consisting of General C. B. Stuart General George B. McClellan, and General Q. A. Gillmore, appointed to select a plan for a bridge across the Connecticut River at Middletown, for the "Air-line" railroad between New York and Boston, and to designate the point at which it shall be built, recently met at the office of the Chief Engineer of the Air Line, No. 64 Broadway. The session was not a public one. The Board occupied the entire day in examining and discussing plans for the proposed bridge, and adjourned without taking final action, in order to visit the workshops where structures of the kind are made, and to examine some of the large iron draws now in use.

The bridge is to be of wrought iron, and will be 1,248 feet long, with a draw of two openings of 160 feet each. The whole draw is to be 303 feet long, and is to open and shut in one minute and thirty seconds. The track is to be about 42 feet above ordinary water mark. The hight of the truss is to be 20 feet. The bridge is to have a strength equal to two tuns to the running foot, beside its own weight, and is to be capable of sustaining a train of locomotives passing over it at the rate of sixty miles an hour. It will be the strongest bridge on the continent. The name of the new railroad of which this bridge is a part, is the New Haven, Middletown, and Willimantic Railroad, which together with the New York and New Haven Railroad, and the Boston, Hartford, and Erie Railroad which it connects, will constitute what is known as the "Air-line" Railroad, running in a pretty straight line from this city to Boston. By this route a distance of nearly thirty miles will be saved and the time of transit will be shortened by an hour and a quarter. The road will be opened within a year; the bridge is to be completed in eight or nine months.

About forty different plans for the proposed bridge have been submitted to the board of Engineers, and of these eight or nine have been found to be worthy of serious consideration. The result of the deliberations of the Board will soon be made public.

Strawberry Worms.

For nearly two years, we have been acquainted with a little



greenish leaf-roller, shown above,—the strawberry leaf-roller (*Anchylopera fragariæ*, N. Sp.)—measuring about one third of an inch, which in certain parts of North Illinois and Indiana, has been ruining the strawberry fields in a most wholesale manner; and which also occurs in Canada. It crumples and folds the leaves, feeding on their pulpy substance, and causing them to appear dry and seared, and most usually lines the inside of the fold with silk. There are two broods of this leaf-roller during the year, and the worms of the first brood, which appear during the month of June, change to the pupa state within the rolled-up leaf, and become minute reddish brown moths during the fore part of July. After pairing in the usual manner, the females deposit their eggs on the plants, from which eggs in due time, hatches a second brood of worms. These last come to their growth toward the end of September, and, changing to pupæ, pass the winter in that state.

Mr. W. E. Lukens, of Sterling, Whiteside Co., Ill., remarks: "Where these insects are thick I would never think of raising strawberries. It is strange I have not noticed any of them work upon this side the river; while on the south side for a mile up and down they are ruining the crops of berries. Removing the plants does not take with them the moth or the eggs, so far as has been observed. A gentleman by the name of Kimball, at Prophetstown, had his crop a few years ago entirely destroyed by this insect, though it amounted in all to two or three acres. I hear of a great many men in other places having their crops burnt up with the sun, and have no doubt that it was this leaf roller, and not the sun, that was the real author of the damage. As for myself, I have on this account entirely quit the business of growing strawberries."

The only modes of fighting this new and very destructive foe of the strawberry—which however seems to be confined to northerly regions—are; 1st, to plough up either in the spring or in the fall, such patches as are badly infested by it, by which means the pupæ will probably be destroyed; and 2d, not to procure any plants from an infested region, so as to run the risk of introducing the plague upon your own farm

The strawberry false worm (*Emphytus maculatus*, Norton) is a worm quite different in appearance and belonging to the order of four-winged flies (*Hymenoptera*), and not to that of the scaly-winged moths and butterflies (*Lepidoptera*), as does the preceding species. It is a soft, dirty-yellow 22-footed worm, that feeds externally on the leaf of the strawberry, and is illustrated in all its stages in the above figure.

The parent flies may be seen hanging to and flying around strawberry vines about the beginning of May. They are dull and inactive in the cool of the morning and evening, and at these hours are seldom noticed. They are of a pitchy black color with two rows of large transverse, dull whitish spots upon the abdomen. The female, with the saw-like instrument peculiar to the insects of the great family (*Tenthred* *inidæ*), to which she belongs, deposits her eggs, by a most curious and interesting process, in the stems of the plant, clinging the while to the hairy substance with which these stems are covered. The eggs are white, opaque, and 0·03 of an inch long, and may be readily perceived upon splitting the stalk, though the outside orifice at which they were introduced is scarcely visible. They soon increase somewhat in bulk, causing a swelling of the stalk, and hatch in two weeks—more or less according to the temperature—and from the middle of May to the beginning of June the worms attract attention by the innumerable small holes which they make in the leaves. The colors of these worms are dirty yellow and gray green, and when not feeding, they rest on the under side of the leaf, curled up in a spiral manner, the tail occupying the center, and fall to the ground at the slightest disturbance. After changing their skin four times they become full grown, when they measure about ¾ of an inch.

At this season they descend into the ground, and form a very weak cocoon of earth, the inside being made smooth by a sort of gum. In this they soon change to pupæ, from which are produced a second brood of flies by the end of June and beginning of July. Under the influence of July weather, the whole progress of egg-depositing, etc., is rapidly repeated, and the second brood of worms descend into the earth, during the fore part of August, and form their cocoons, in which they remain in the caterpillar state, through the fall, winter, and early spring months, until the middle of April following, when they become pupæ and flies again as related. This fly has received the name of *Emphytus maculatus* by Norton, in allusion, doubtless, to the whitish transverse lines on the abdomen.

With the facts here given, it will be no difficult matter for any one interested to make war in his own way. The worm's habit of falling to the ground enables us to destroy them with a solution of cresylic acid soap, or any other decoction, without necessarily sprinkling the vines; while, knowing that they are in the earth during the fall and early spring, when there is no fruit, the ground may be stirred and poultry turned in to good advantage.—*Entomologist.*

Association for the Advancement of Science and Art—The Bathometer.

The regular meeting of the Association for the Advancement of Science and Art was held at room No. 18, Cooper Institute, New York.

Dr. S. I. Prime, the chairman, said that the Association had been in existence now several years, and had a membership of 200 or 300 members. It had done much toward increasing the general knowledge on scientific subjects, and to quicken the pursuit of scientific truth. The lectures of Dr. Lemercier and Agassiz had been delivered under the auspices of the Society. He earnestly invited all strangers who were present to join the Association. Dr. Prime spoke in terms of eulogy of the successful efforts of American inventors, and introduced Mr. Sidney E. Morse, formerly editor of the New York *Observer*, and his son, G. Livingston Morse. The latter exhibited and explained their bathometer, or apparatus for measuring the greatest depths of the ocean without the use of a line, and, it is claimed, in less than a tenth part of the time required when a line is used. The instrument admits of a combination in one sounding of three or more distinct methods of ascertaining and measuring these depths. The discovery of the Messrs. Morse was that of the means of making a buoy which will retain its buoyancy under the enormous pressure of the deep sea. They took a hollow glass sphere between three and four inches in diameter, the glass only a tenth of an inch thick, and the sphere so light that it floated in water with half its bulk above the surface, and subjecting this fragile body in the cistern of an hydraulic press to a pressure of seven tuns on the square inch, which is the pressure at the depth of about 30,000 feet in the ocean, they found that the sphere was neither chrushed or permeated by the liquid. A tin or wooden tube, four inches or more in diameter and of any required length, is filled with these glass spheres and ballasted so that it will float upright in the water. An elongated sinker also of any required length and weight, is then suspended from the bottom of the tube, and so attached there that it becomes detached when the weight touches, or if desired, when it is 100 feet, or any required distance from the bottom, leaving the tube with its spheres to ascend to the surface. As this instrument moves with uniform velocity both in its descent and ascent, the time of its disappearence from the surface indicates the depth to which it has descended. But the inventors do not confine themselves to this mode of determining the depth. They inclose in their tube, and send down and bring back with it their proper bathometer, which is simply a bottle of water with a bag of mercury and water suspended from its neck, the water in the bottle being connected with the mercury in the bag by a glass tube, of very fine bore, passing from the bottom of the bag through an India-rubber stopper in the neck of the bottle into its interior. When this bottle and bag are placed at the bottom of the sea, the pressure of the external water, communicated through the bag and through the mercury in the bag and glass tube to the water in the bottle, compresses that water, and mercury is forced from the bag into the bottle to supply the void caused by the compression. The amount of the mercury; forced into the bottle is the measure of the compression of the water, and the compression of the water is the measure of the hight of the compressing column, *i. e.*, of the depth of the sea. To facilitate the measuring of the mercury, there is inserted in the bottle opposite the neck, a graduated tube of even bore closed at its outer end, so that on inverting the bottle the mercury falls into this meter-tube, and the hight of the mercury indicates the depth to which the bottle has descended.

All attempts to measure the deep sea with a line and sinker attached as in ordinary soundings, have proved failures, and scientific men of the highest reputation, who have devoted much time to the investigation of the problem, have pronounced it impossible ever to send and recover a line with a sinker from the greatest depths of the ocean. Even in moderate depths the measurement by a line is very uncertain and unreliable in consequence of the effect of currents, and of the drifting of the boat from which the soundings are made. The bathometer of the Messrs. Morse, it is asserted, will descend to, and return from, the greatest depths with certainty, and with a rapidity which hardly admits of a limit. In a recent experiment the instrument rose from the bottom at the rate of twenty feet in a second, or of a mile in less than four minutes and a half. They believe that a sounding in 2,000 fathoms water will ultimately be made easily in less than fifteen minutes. The time occupied in a sounding of this depth by those employed by the United States Government in sounding between Ireland and Newfoundland, preparatory to lying the Atlantic cable, was ordinarily six or seven hours.

American Society of Civil Engineers.

This society held its annual meeting on the 10th ult., at its rooms, No. 63 William street.

Among those present were Mr. John B. Jervis, the oldest engineer in the country; Colonel J. W. Adams, engineer of the Brooklyn Water Works; Mr. E. S. Chesbrough, constructor of the Chicago Lake and River Tunnels; Mr. Thomas Fuller, architect of the State Capitol; Mr. Thomas Prosser, representative of Krupp's Works in Prussia; Mr. John A. Roebling, engineer of the East River Bridge; Mr. R. N. Browne, chief engineer of the Lake Shore Railroad; Mr. S. Whipple, the well-known constructor of iron bridges; General G. S. Greene, chief engineer of the Croton Department, and Israel Smith, engineer of the New Jersey Railroad.

Hon. J. W. McAlpine, President of the Society, called the meeting to order, and said that he was glad to be able to report that the Society is increasing both in numbers and respectability. He spoke of the importance of an exchange of ideas between members of the profession, and hoped that hereafter more papers would be presented for the consideration of the Society. A fund was being formed for the publication of such papers as might be deemed worthy of preservation and dissemination. He then introduced to the Society Mr. John B. Jervis, who gave an outline of the course of studies requisite for the engineer, in which the importance of a knowledge of mathematics and mechanical philosophy was especially dwelt upon. The careful study of structures erected by eminent engineers and of the special purposes they were intended to serve was inculcated. Mr. Jervis also spoke of the necessity of the engineer making his structure stable, especially when exposed to such deteriorative influences as surf and running water. Whether iron, stone, or wood must be used, would be determined by the relative cost of these articles and the facility with which they could be obtained. Railways now offered the largest amount of work for engineers; but as the country increased in population, structures of greater and still greater extent and difficulty of construction would be required. There appeared to be no stopping place for the engineer. He referred to the present defective condition of our railways, which he attributed to engineers being employed simply to lay out the line of the road, and to the details being supplied by mechanics. A great deal had been said about steel rails. There are, however, other and more important improvements to be considered. How is it that the great New York Central, that makes sufficient profit to pay dividends of eighty per cent, does not raise its road bed above the flood? It was disgraceful that this road should be compelled to stop its traffic occasionally because its road bed was under water.

Mr. Thomas C. Clark then read a paper on "The Strength of Iron Bridges and the Minimum Weight they should be required to support," and suggested that a committee should be appointed to investigate and report on the matter.

Mr. Martin Cor read an interesting paper on "The Construction of Bridge Foundations."

Mr. J. M. Clarke followed in a paper on laying out railway turnouts by the simple inspection of tables prepared for the purpose.

Mr. Arthur Beckwith read a paper on the composition of ancient cements.

The meeting soon afterward adjourned.

Death of a well-known Inventor.

We regret to notice the death of Joseph Dixon, of Jersey City, one of the most ingenious men of our time. Mr. Dixon was born in Marblehead, Mass., January 19, 1799. He made a machine to cut files before he attained his majority, learned the printer's trade, afterward that of wood engraving, then lithography, and afterward studied medicine, and in that connection became interested in chemistry, becoming finally one of the most accomplished and comprehensive chemists in the country. He was a thorough optician, and had no equal in his knowledge of photography. He took up the experiments of Daguerre in 1839, and was probably the first person to take a portrait by the camera. He showed Prof. Morse how to take portraits by means of a reflector, so that the subjects should not appear reversed. Morse tried to get the plan patented in Europe. Mr. Dixon built the first locomotive, with wooden wheels, but with the same double crank now used. He originated the process of photo-lithography, and published it years before it was believed to be useful. By his process of transferring, the old bank notes were easily counterfeited, and it was to guard against the abuse of his own process that he brought out the system of printing in colors on the bills, and had the method patented, but never received any benefit from the patent, all the banks having used it without pay. He perfected the system of making collodion for the photographers, and assisted Mr. Harrison in getting a true system for grinding the lenses for camera tubes.

He is said to have originated the well-known Babbitt antifriction metal, and to have been the father of the steel melting business in this country, but these claims rest upon a doubtful basis. It is certain, however, that he originated a vast number of machines and processes; but he was widely known among manufacturers as an extensive manufacturer of plumbago crucibles. His establishment at Jersey City is the largest of its kind in the world, and its productions received a medal at the Paris Exposition in 1867. He was singularly self-reliant, and was untiring in all that he undertook to do. For many years past he was intently engaged in the construction of a musical instrument that he called the "orchestrion," which he was permitted to see perfected.

Mr. Dixon had a very retentive memory, and during his leisure hours had stored his mind with a vast amount of practical knowledge which he knew how to impart in an attractive manner.

We recognise Mr. Dixon as a steady friend of the Scientific American from its commencement, and an occasional contributor to its columns.

Correspondence.

The Editors are no responsible for the Opinions expressed by their Correspondents.

Botanical Gardens Needed.

Messrs. Editors:—That museums are successful institutions no one will deny. All the capitals of Europe possess public establishments of this kind, containing collections of natural history, of fine arts, and of antiquities, which are of great value and interest to the scientific student, the artist, and the architect.

In this country the existing collections belong to private societies or to individuals, with the exception of some few attached to colleges or State establishments. The most considerable of these dwindle, however, into insignificance when compared in richness of contents to the splendid museums of London, Paris, Berlin, Vienna, and other cities of the old world.

The Central Park Commissioners of this city, have lately determined to erect a museum at the Park complementary to the nucleus of a menagerie which exists there already. I approve of the plan, although I doubt if the amount of money to be expended will enable them to make many acquisitions of really intrinsic value, beyond the purchase of a class of objects (such as attracted the curiosity of the gaping multitude at Barnum's), which will really teach them nothing.

Now, Messrs. Editors, I take the liberty of making a suggestion: Would it not be better that the money to be expended for a museum in this city, which may be the laughing stock of foreigners, should be employed in the construction of a model botanical garden, with accessory green and hot houses, and an aquarium large enough for the cultivation of the giant water lilly, the *Victoria Regina*?

Scarcely a city in Europe of five thousand inhabitants, is without a botanical garden which is the pride of its inhabitants. In such a garden the young physician learns to know the living plants which produce the roots, barks, seeds, and flowers which he prescribes in various shapes to his patients; the druggist studies how to recognize the genuine from the counterfeit among the vegetable substances in which he deals; the horticulturist and the gardener are taught how to graft, how to bud, and how to produce variation and hybridation among the choicer varieties of plants; the agriculturist chooses for himself among many varieties of produce, such as are really the most prolific, without having to depend upon buncombe advertisements.

The student also here finds recreation of the healthiest sort in the study of botany, which is one of the most attractive branches of natural science, and the ladies can stroll and loiter with delight amid parterres of highly-scented plants, and may teach their children not to handle or to trifle with such vegetable species as are labeled "dangerous," "acrid," "poisonous," "stinging," "fœtid," etc.

A botanical garden is the grand *rendezvous* of innocence and taste, and it is more agreeable to gaze on beds of pretty flowers nodding their heads to every passing breeze, than to watch the evolutions of lascivious apes, to see boa constrictors devouring their innocent living prey, to learn how to eat from hungry lions, tigers, or hyenas, or to breathe the effluvia always attendant on captive animals.

The suggestion I here make is not simply destined for New York, but ought to be acted on in every city throughout the land. America ought to rank foremost as regards her horticultural, pomological, and agricultural productions.

Competition and rivalry between cities at the public shows would soon bring about the desired result, and lead to a taste for pursuits conducive to health of mind and of body.

With a good scientific gardener as a manager, such an establishment would soon be not only self-supporting, but ought to realize a large income by sales, which would allow of further extensions and of new acquisitions. Seeds and plants of all kinds can be obtained from botanical gardens in Europe for kindred establishments at a nominal cost, and exchanges are always freely and liberally made by them.

Should you think, Messrs. Editors, the subject of sufficient interest for further elucidation, I should be very happy to furnish the Scientific American with a sketch of the best plan of laying out and organizing a botanical garden, as has been done in some of the European cities. Botanicus.

New York city.

[We concur with our correspondent in the importance of establishing at the Central Park a first-class botanical garden, and we have no doubt that in the progress of time such will be the result, but we cannot concur in the suggestion that a zoological garden should not also be established. All the chief European cities have both, and we expect that New York will some day be favored with something like the *Jardin des Plantes*, of Paris, which not only combines horticulture and zoology, but has also valuable museums of botany, geology, and anatomy, and a school where the natural sciences are taught with a high degree of perfection. With regard to a plan for a garden our correspondent had better see the Central Park Commissioners.

Information Wanted.

MESSRS. EDITORS:—An immense number of intelligent persons in our country are now directing their attention to the production of valuable inventions; some for fame, but, it is reasonably to be supposed, the large majority for profit. Now what is wanted to know, especially by the latter class, is, What is needed? Inventors often waste much valuable time at churns and washing machines, who might produce a much-needed, valuable improvement.

Will you, Messrs. Editors, say what is called for urgently, and will your many readers, professional men, mechanics, or "any other man," do the same through the SCIENTIFIC AMERICAN? E. G. B.

Washington, D. C.

[This subject opens up a very broad field of inquiry, and affects almost every branch of our growing industries. We cannot specify any one article that is especially needed, but it is safe to say that more economical machines and processes are wanted in almost every department of manufacturing. The high price of labor at the present time renders it necessary that this labor should be supplemented by improved machines and processes to enable our manufacturers to produce articles more cheaply than is possible at the present time. The field for improvement is usually more general than specific, but with a view to meet the inquiry of our correspondent, we invite suggestions from others. Our columns are always open to make known the wants of manufacturers in the direction indicated.—EDS.

The Poppy in Texas.

MESSRS. EDITORS:—The frequent mention of the poppy in the recent numbers of your paper, and of the possibility of its successful cultivation in America, reminds me of the acres of this flower that I have seen growing wild in Texas. In portions of Texas, at this season of the year, you will see whole acres covered with the white poppy in bloom, standing as thick as you ever saw wheat growing in a wheat field. About West Liberty, Columbus, and other towns, it grows spontaneously on every uncultivated spot. I was informed that very good opium had been made from this wild white poppy in Texas. If any one wishes to cultivate the poppy for opium, or the *Palma Christi* for castor oil, Western Texas is the country for him to go to find the proper soil and to buy land cheap. JAMES BYARS.

Covington, Tenn.

CORNISH PUMPING ENGINES.

BY H. P. M. BIRKINBINE, ENGINEER.

The American character for independent thinking and acting is illustrated in the variety of pumping engines used in the water works throughout the country; their being no particular form or style that may be said to have precedence or that may be considered as the best, so far as any peculiar form of apparatus would indicate.

In England the Cornish engine is the one almost universally adopted where any considerable amount of water is to be raised, either for supplying towns or draining mines.

In this country there are but five cities where they are used exclusively; namely, Erie and Easton, Pa.; Louisville, Ky.; Cleveland, O.; and Jersey City, N. J.; there are also a few used in draining mines. We have several large pumping engines in use, which may be considered as modifications of the Cornish engine.

The Philadelphia Water Works have four Cornish engines (two overhead beam and two Bull engines) in use, and a side-lever Cornish engine is now in course of construction. The city has also in operation six engines of other form, and has contracted for two more (not Cornish).

Chicago has just completed two large pumping engines of another form.

St. Louis is having four new engines constructed, for the low lift two Bull Cornish, but for the high lift, where the most work is to be done, two engines of different construction.

Buffalo, N. Y., has two Bull Cornish engines, but the last engine placed in the works was of a different form, and it is now proposed to materially alter the Cornish engine.

From the above it is evident that in this country the Cornish engine is not a favorite; many of those constructed being failures. The Union Canal Company have one in use in connection with several high-pressure fly-wheel engines, in pumping water to supply the Summit level of their canal, which has been found to work so unsatisfactorily that it is never used when the work can possibly be done with the other engines.

At the zinc mines, near Bethlehem, Pa., there is one Cornish and several other engines used in draining the mines, and this company, whose engineer has had a large and successful experience in constructing Cornish engines, is now having a powerful engine built, which is not of this class.

This is in direct opposition to the usage of England; therefore, either English engineers adhere to the Cornish engine from prejudice—it being old, and they know of no better—while we have progressed and found other and improved forms, or the construction and management of Cornish engines is not generally understood by the mechanics and engineers of this country.

The exhaustive works of Wickstead and Pole fully describe the construction and operation of these engines, and demonstrate theoretically, and by the actual working of engines in operation, that there is no other form which gives as high duty; that is, raises as much water with a given amount of coal.

The records of the running of a large number of these engines in Great Britain, extending through a long period of time, show that they work with surprising economy. Those running in this country, which are properly constructed and placed where their management is understood, give very favorable results.

Some of the patented pumps have duties claimed for them greater than the Cornish engine accomplishes, but as this claim is made by those pecuniarly interested in their success, and as it cannot be sustained, either by a theoretical examination of the patented peculiarities or by the actual working of the machines, we may be excused from entering into a discussion of their merits.

Engineers acquainted with pumping machinery generally accord to the Cornish engine superiority of duty, and theory and practice both demonstrate that no other form of engine can be worked so economically.

The question then occurs, "Why are they not more generally recommended and used in this country, and why do those who are experienced often adopt other forms when new engines are required?"

It is impossible to give the reasons which have led to the difference in practice between American and English engineers. In some instances (which we believe are but few) the royalties which patentees of pumps receive have undoubtedly influenced those having the selection of engines. Ignorance and want of experience is probably another cause, as is also the difficulty in finding machinists skilled in designing and constructing Cornish engines. Another reason may arise from the impatience which is characteristic of Americans, who are sometimes unwilling to wait until a substantial pumping engine can be built and set up—considering time as the most important element, and frequently neglecting efficiency and durability.

The first cost may also be used as an objection to these engines. We have so much to do in developing the immense resources of the country and comparatively so little capital to do it with, and labor is so high and dear, that this difficulty meets engineers at every undertaking. The above may be some of the reasons why Cornish engines are not more generally used.

In the water works of Philadelphia, there is a number of different forms of pumping engines in use, which may be considered as fair specimens, the following comparisons of the average work for the past five years may form a basis of the relative merits of the different forms of engines. These accounts have been kept uniformly and represent the total amount of coal and other supplies purchased as well as all amounts paid for labor, repairs, etc.

Philadelphia receives its supply of water from six different pumping stations.

1st. FAIRMOUNT. The pumps at this station are driven by water power.

2d, SCHUYLKILL WORKS have four pumping engines. One overhead beam Cornish engine; one bell-crank condensing engine with fly wheel, steam cylinder vertical, pump double acting, nearly horizontal. One overhead beam condensing engine with fly-weeel, steam cylinder vertical, double-acting pump (vertical) placed directly under steam cylinder connected to piston through lower cylinder head. An engine similar to this has been removed and a side lever Cornish engine is being erected to take its place.

3d, DELAWARE WORKS have two pumping engines one overhead beam condensing engine with fly wheel, steam cylinder vertical, pump double-acting, horizontal, connected to piston, (which is connected through lower cylinder head) by bell crank and connecting rods, and one high pressure engine, steam cylinder horizontal, connected to horizontal pump (double-acting) by vertical beam.

4th, TWENTY-FOURTH WARD WORKS have two Cornish Bull engines. New works are being constructed for the district now supplied by these engines, where pumping engines of a different kind are to be used.

5th, GERMANTOWN WORKS.—These have two high pressure engines, steam cylinder and double-acting pumps, horizontal, connected through fly wheel shaft by cranks placed at dead points.

6th, ROXBOROUGH WORKS.—These are just completed and contain a large overhead beam Cornish engine.

There is quite a variety of forms of boilers in use at the different works, in one of them four kinds; they may all be considered as of fair average efficiency.

The works are generally in good repair, except the Twenty-fourth Ward Works, there being no reservoir for this district and the engines are driven much beyond their safe-working speed, and, as a consequence, are rarely if ever in good condition.

The average duty for the past five years in foot-pounds (that is pounds of water raised one foot high with a pound of anthracite coal), is Schuylkill Works, 396,961 foot-pounds; Delaware Works, 210,570 foot-pounds; Twenty-fourth Ward Works, 470,092 foot-pounds; Germantown Works, 214,728 foot-pounds.

At the Schuylkill Works more than one half of the work is done by the Cornish engine. When the Twenty-fourth Ward Works are in good condition; the average monthly duty has frequently been over 550,000 foot-pounds. The average cost of raising one million gallons one foot high, for the past five years, is at Schuylkill Works, 15·21 cents; Delaware Works, 24·80 cents; Twenty-fourth Ward Works, 9·72 cents; Germantown Works, 21·50 cents.

This includes salaries of engineers and firemen, coal, oil, tallow, gas or oil for lighting, packing, small stores, repairs, etc.

By making a calculation from this basis of the cost of raising an average of five million gallons per day, one hundred and fifty feet high, the relative value of the different forms of pumping engines will be made more apparent, thus: Schuylkill Works, $41,637·37 per annum; Delaware Works, $67,-890·00 per annum; Twenty-fourth Ward Works, $26,608·50 per annum; Germantown Works, $58,856·25 per annum.

If all the water raised at the Schuylkill Works was pumped by the Cornish engine, it would show economy even greater than the Twenty-fourth Ward Works, and were it not for the large amount of repairs required by the Cornish engines at the Twenty-fourth Ward Works, they would exhibit more comparative economy than they do.

From the above it is evident that the Cornish engine is the most economical. An experience of nearly seven years as chief engineer of the Philadelphia Water Works, and an extensive connection with other water works, has satisfied the writer that where any considerable amount of water is to be raised the Cornish engine is not only the most economical in all items of running expenses, but also the most reliable, and that no other form of engine should be recommended.

Fossil Gums or Copals.

Professor W. H. Gunning contributes to the *Philadelphia Coachmaker's Journal* an article on the above subject. He says: "Amber and copal are so entirely of the past that Nature, it would seem, has forgotten how to make them. They come down to us from out of the by-gone ages, although no place has been found for them on the page of the geologist. Commerce has made them known to the world; and science has at last interpreted their origin.

"Every one has seen gum bleeding from a cherry-tree. This gum is a hydro-carbon, inodorous and soluble in water. Imagine the gum, hard as the wood that bleeds it, soluble only in alcohol, and that only when oxidized, and you have amber or copal. In some olden time, trees long extinct—the *Pinus succinifer*—were standing on the shores of the Baltic. Another species, with a more formidable name—the *Elæocarpus copalifer*—was growing over the desert of Africa and in South America. If now we approach the Baltic, and dig down to the old tree-bearing soil, we find clumps of amber gum bled from the *succinifer*. Specimens are found now and then on our continent, at Cape Sable and Gay Head. Gum from the *copalifer* is called copal. Copal does not differ essentially from amber. It is more abundant and more accessible. The beginning was far back in the golden age of Africa, before the wind and the sand had made a desolation of her great plain. How impenetrable the gloom and mystery which veil this land of the sun! Here is a desert, parched and blasted, the same to-day as when the caravans tracked it, with the stars for chart and compass, in the days of the Pharaohs. Men have thought of it as a primal blight, a brand of some great curse on the new-created world. And yet that plain, so desolate now, was covered once with a majestic forest. The trees have perished, and their sap alone remains to tell that they were. Under a burning sun these trees were bleeding gum: insects came to sip it, lit, mired; the nectar flowed around them and entombed them; the trees perished, but time has wrought their blood into gems, and here are the insects to-day embalmed in their crystal tombs forever. A hundred thousand deaths could not disturb even the dust upon their wings.

"Our fathers used to puzzle over these insects in amber. The amber itself was a mystery, and then the insect—how did it ever get there. We no longer wonder how the insect got there, but how long it has been there. Negroes find the copal down even eighty feet in the desert sand. We infer that in places the soil from which the copal tree grew was buried under eighty feet of sand and clay. We have no data by which we can fix the time demanded for such a change, but we know enough to assure us that it must be reckoned in thousands of years. The revolutions of nature, from forest to desert, are never achieved in a day.

"In general the greatness of a change is a measure of the time. In general, we say. Where man comes in as a disturbing force, desolation or abundance follows quickly in his path. The plains of Babylonia, so fertile in the days of the great Babylon, the borders of Lake Galilee, so beautiful when the Saviour was wont to seek them, are now desolate.

"The crimes of men "have dried up realms to deserts." Nature has done the same, but she is never a swift architect of ruin. To have wrought the extinction of a race of trees from Africa, and buried the soil which bore them under eighty feet of sand, must have required many ages. The fly or moth, which looks as if it had just lit in its crystal coffin, may have been there a hundred thousand years. We are very sure it was there, just as you see it to-day, long before there was any man upon the earth.

"A race of trees perished from the earth, and left no wood or bark to tell that they lived, no seed or scion to perpetuate their kind, but their sap, their spirit—a mere aroma which exhaled from their wounds—this remains, a thing of beauty, while everything that was earthly has crumbled to dust."

GOOD WHOLESOME BREAD.—Professor Stohmann advises to mix to $\frac{3}{4}$ parts of rye meal, $\frac{1}{4}$ part of bean, or pea meal, and 2 per cent, by weight, of the mixture, of ordinary common salt. It appears that bread thus made is of excellent quality, taking its constituents into consideration, and easily digestible

Improvement in Hoisting Apparatus.

This invention is an improvement on the common hoisting machine by which it is rendered self-sustaining, beside having the advantages over contrivances of this nature heretofore made of being free from extra friction while hoisting, and still under control of the check line when lowering. This is accomplished in the following manner reference being made to the drawings, Figs. 1 and 2.

A, represents a suitable frame of wood to which the other parts of the machine are fastened. B represents fixed bearings in which are pivoted the levers, C, carrying the hoisting drum, D, and pinion shaft, E; these levers being so placed in the fixed bearings, B, that a portion of the load sustained by the drum, D, shall act upon the brake, I. F is the large gear attached to the drum. G is a pinion meshing into F. H is the rope wheel on the periphery of which is the brake flange as usual. I is an iron brake shoe bolted to the frame, A, which is extended for the purpose.

This shoe is provided with a good friction surface, by being faced with rawhide or leather. J is an L-shaped lever pivoted at K, to the suspending lever, C, and carrying at its longer end a rope pulley, L. M is the endless rope passing from the wheel, H, at an angle over the pulley, L; N is the check line leading from the lever, J, over a small pulley at O; P is the fulcrum to the lever, J; Q is the draft rope.

In operation a load being suspended from Q, the act of hoisting by the rope, M, will cause a lateral motion of the same toward the lever, J, which, bearing upon the fulcrum, O, will raise the wheel, H, from contact with the brake surface on I, allowing the load to be lifted until the pull ceases, when it is instantly held in place. To lower, the check line is pulled so as to free the brake flange wholly, or in part as desired.

This machine is now tested in practice and found to answer the ends sought. It is a valuable improvement, since it furnishes a more safe and convenient arrangement in the laborious process of hoisting, permits the use of a platform when required, loading or unloading at any floor, and for power hoists, provides at once for the slipping off, stretching or breaking of belt.

For State rights to manufacture (except N. E.), or for further particulars, address F. P. Canfield, 71 Sudbury street, Boston, Mass.

Fig. 1.

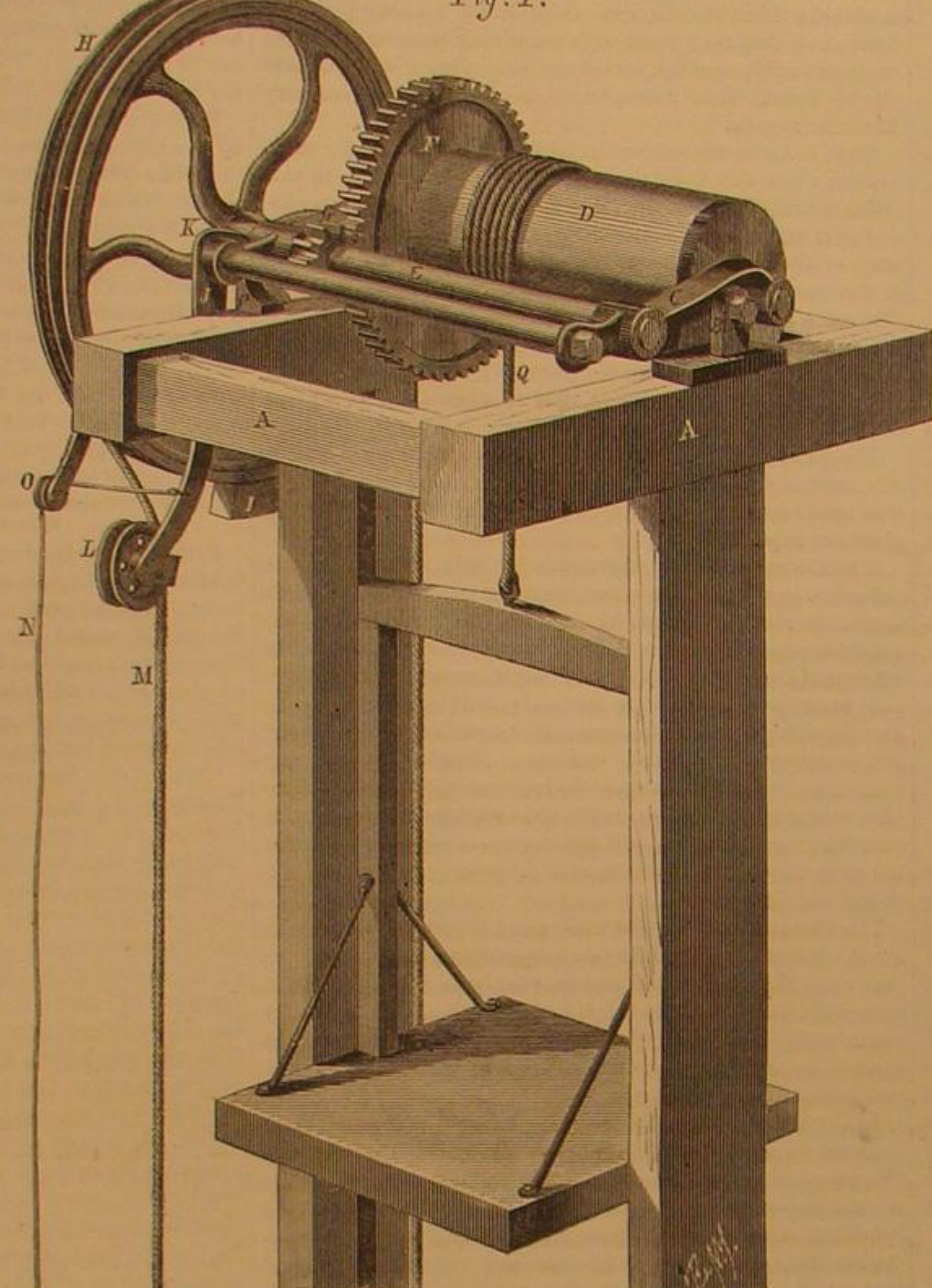
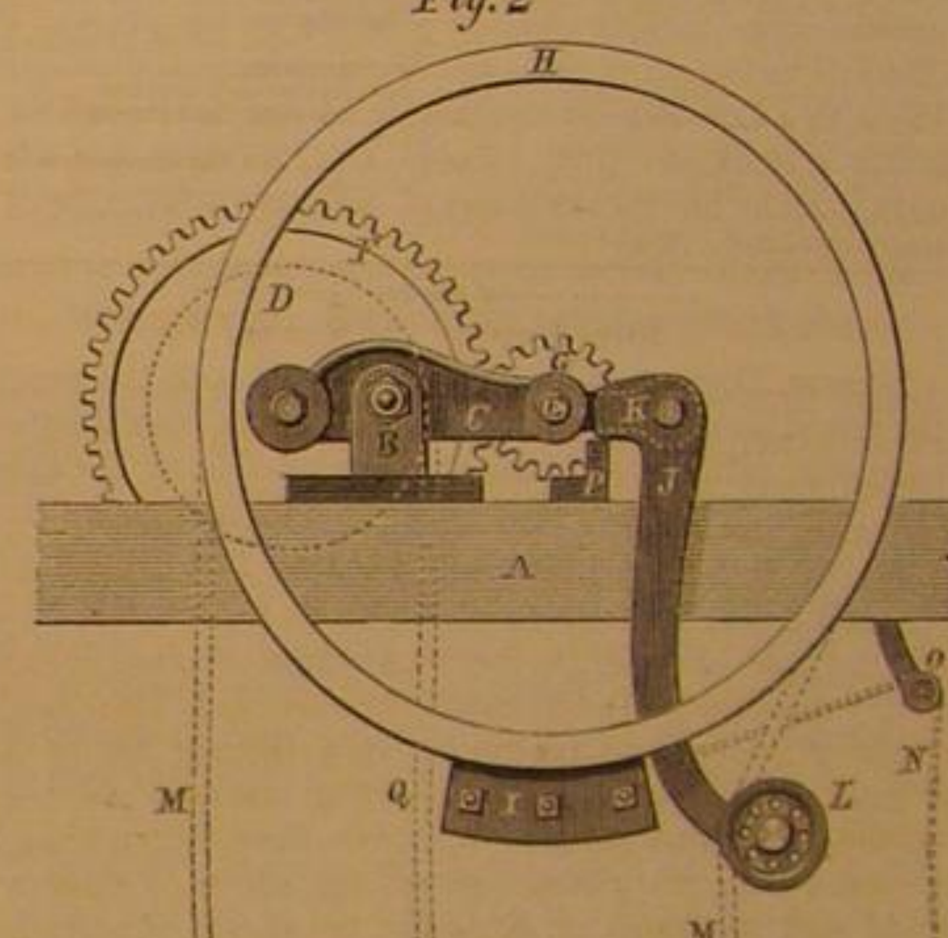


Fig. 2



CANFIELDS. IMPROVED PATENT ELEVATOR.

Beet-root Sugar in California.

The *Mining and Scientific Press* says, the question of producing beet-root sugar in this State is gradually increasing in interest, and we are pleased to note that an important experiment has been made by Mr Justus Beplar, of San Mateo county, to ascertain definitely the capacities of the soil and climate of California for this valuable product. Mr. Beplar has produced a sample of sugar pronounced to be equal to the best brands of imported cane sugar. It is well granulated, pure, and presents a thoroughly marketable appearance. This experiment is considered one of much importance and significance. Some idea of the value to which this interest may attain on this coast may be inferred from the fact that the sales of sugar by our local refineries for the quarter ending March 31, amounted to an aggregate value of $748,598; or within a fraction of three millions a year. It is now pretty well settled that the Sacramento beet-root sugar factory will go into operation during the current year, and the company will be prepared to purchase all the beets which may be produced in the present season. There can be little doubt that within a few years beet-root sugar will form an important item in the already long list of California productions.

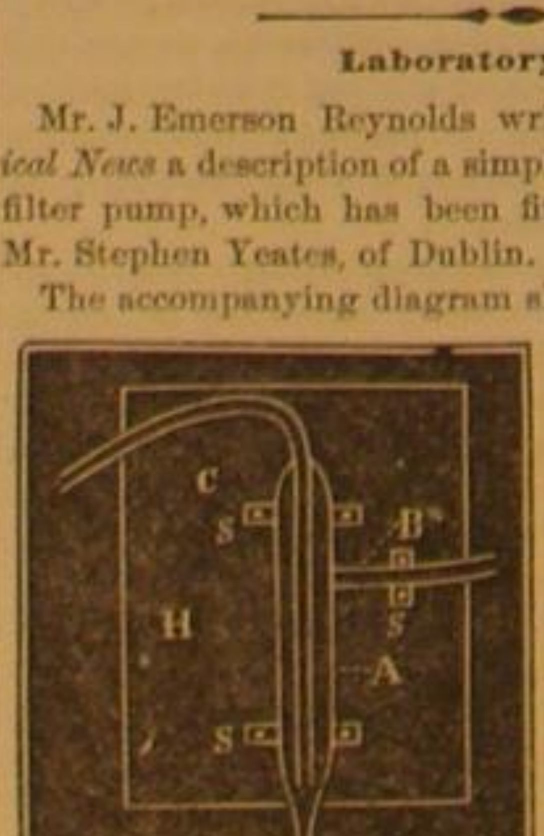
Signal Drill--Field Telegraphs.

At the recent examination of the West Point graduating class, one of the most interesting features of the occasion was, what is called a signal and telegraph drill—signaling by means of flags, and building a field telegraph. Although very few persons, but those immediately concerned in the drill, were able to comprehend much about the thing, it attracted considerable attention, and was looked upon with a great deal of interest by the officers of the post. The signaling was probably the most attractive feature of the whole affair. A certain number of the second class were detailed with the flags, which were of the ordinary size, nailed to poles about four leet long. Several of the signalers went up to the hights of Fort Putnam, and across the river, and signaled to others on the parade ground, with the flags, and for several minutes orders were communicated from point to point, and conversations held by the aid of the simple movements made by the moving of the flags. The orders were communicated and repeated with a rapidity which was actually astonishing. The building of the field telegraph, which was done by the first class, was also a great feature of the drill. Lines were run from Fort Putnam down in the direction of Cozzens' West Hotel and back to the post, and messages were sent over the wires without the slightest hindrance, although on the plains the lines were laid at the rate of three miles an hour. The batteries that were used in the drill differ very much from the ordinary batteries common to most telegraph companies, one of their principal advantages over the ordinary kind being the impunity with which they can be thrown into and carried in the wagons. Everybody who knows anything about telegraphing is aware that ordinary batteries, after being tossed about over a rough road for a short time, refuse to work; but all the rough usage which the batteries received during the drill that day, appeared in nowise to impair their efficiency. They consist simply of a peculiar apparatus to be attached to the wires, and contain sulphate of copper in crystals, a piece of zinc, and a sponge. When they are used, the copper, zinc, and sponge are wetted, and, it is said, after once being put in readiness for action, that they will work steadily for at least a month. During the drill, hard-rubber was used about the poles as insulators, instead of glass.

Laboratory Pump.

Mr. J. Emerson Reynolds writes to the editor of the *Chemical News* a description of a simple form of a Bunsen's valuable filter pump, which has been fitted up in his laboratory by Mr. Stephen Yeates, of Dublin.

The accompanying diagram shows the essential parts of the pump.



A is a tube of tin, about eight inches long, and of nearly one inch internal diameter; within three inches of one end, the tube, B, is soldered. The diameter of this tube should be about three eighths of an inch. The end of the wide tube most distant from B is now contracted so as to form a portion of a cone, and D then soldered in. A small tube, C, is now selected, one extremity of which enters, but must not at all close, the cone formed by the junction of A and D; and at this point its orifice is contracted so as not not to exceed one eighth of an inch in diameter. It is then soldered, as shown, into the upper end of A. The whole arrangement is fitted to a board by the straps, S S.

The tube, C, is connected with the vessel to be exhausted of air. B is the delivery pipe for water, obtained from a cistern or from the street main; the supply should admit of regulation by means of a stop-cock placed in the course of B. In order to obtain the maximum exhaustion with the pump, the length of D should be about thirty-three feet, but a fall of twenty feet I find to be more than sufficient for ordinary water. As this form of Bunsen's pump can be constructed by any intelligent plumber for a few shillings, no chemist need be deterred, either on account of expense or trouble, from fitting his laboratory with the new apparatus.

I have had the pump in operation in my laboratory for about two months, and gladly bear testimony to the great practical value of Professor Bunsen's admirable arrangement.

The First Iron Founders in St. Louis.

The proximity of St. Louis to the vast ore-yielding fields of Missouri so closely identifies it with the iron interest as to make anything connected with the subject of special importance to the city; and it is not a matter at all surprising that the citizens watch with the deepest interest any enterprise looking to the development of the great wealth garnered up by nature in those immense storehouses of iron ore, the Iron Mountain and Pilot Knob. With this idea we propose, says the St. Louis *Republican*, to give some few notes on the history of iron founding in St. Louis.

The history of founding iron in St. Louis dates back far as as 1824, though it was then done in a rude way. In the year 1817 a man named Louis Newell landed in St. Louis, then, as many know, a small village compared with its present proportions. Newell commenced the business of blacksmithing, giving special attention to the making of edge tools. His fame soon spread abroad as a great ax-maker. At this time St. Louis was an important center of the fur trade of the West; the demand for wolf traps, beaver traps, and squaw axes was very considerable, and Newell soon made a specialty of the manufacture of these implements, the production of a good quality of which brought him at once wealth and a wider fame. About that time, too, the old French cart began to be superseded by the Yankee wagon, all the cast-iron hub boxes for which had to be brought from Pittsburgh, as indeed all other iron castings.

Then it was that the idea of founding first entered the brain of the first St. Louis founder. Newell saw that if he could make the hub boxes he could make a wagon out and-out, thus saving a heavy expense in their manufacture and adding greater facility to their production; a desideratum much to be desired by the farmers and settlers around St. Louis. So Newell went to racking his brain for a plan to overcome the inconvenience of having to import wagon boxes.

He was not a practical iron founder; but his genius and indomitable courage made up for the want. Having completed a pattern, he went to work with a common blacksmith's forge to make wagon boxes; he melted his iron and molded them with the most perfect success. This was the first melting of iron west of the Mississippi river. For four years Newell proceeded with this slow process to turn out boxes for the wagons he made.

In 1828, Mr. Samuel Gaty—then a mere boy—left his home in Kentucky, and pitched his tent in St. Louis. In connection with two other men, named Richards and Martin, he rented a piece of ground from Colonel Martin Thomas, and put up a small foundery on what is now the corner of Second and Cherry streets, and the trio went to work. Young Gaty had all the capital ($250), and acted as molder and financier; Richards was furnace man and Martin pattern maker. Under this arrangement matters progressed satisfactorily, and they made money. Colonel Thomas, looking upon Richards as *the* man of the concern, and seeing the profit in the business, made overtures to buy out Gaty's interest; and the latter looking a little deeper into matters than the Colonel could see, sold out to him. The sequel proved the sagacity of Gaty, for the two men, Richards and Martin, without business management, and being given to dissipation, soon let the concern run down. Colonel Thomas then declared he had bought out the wrong man. Gaty went back to Louisville.

Ether Spray is used successfully in Lyons, France, to render painless the operation of uprooting hair, when necessary, in cases of cutaneous disease.

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PROPERTY IN PATENTS AND COPYRIGHTS.

Horace Greeley, the veteran editor of the *Tribune*, is publishing in that journal a series of interesting articles upon Political Economy, which are designed to set forth the value of protection to American industry. The third article of the series is devoted to the discussion of Capital, Skill, Invention, and Intellectual Property, some extracts from which we reprint in this number of the SCIENTIFIC AMERICAN. Mr. Greeley discusses, with his usual clearness and force, the influence of labor-saving machinery upon the civilization and progress of the world, and shows the immense value and benefits which have resulted from inventions, contributing, at the same time, his protest against the efforts of those who would seek to abolish, or disparage, the system of protecting the property right of inventors and authors to their discoveries and works. The discussion of this subject by Mr. Greeley is timely, especially when viewed in connection with the recent effort in the British Commons, to secure the abolishment of the Patent System of Great Britain.

In reference to the rights of authors, we have never had but one opinion. We have, as we think, very justly arraigned the Canadian Government for its persistent refusal to allow patents to American inventors, and we consider it no less unjust, on the part of our Government, to deny to foreign authors the right to copyright their books, and we trust that this illiberal policy, which serves only to enrich a few large publishers at the expense of the brain-workers of Europe will soon give way to a sense of justice too long withheld.

CHEAP IRON FENCES.

Among the numberless uses to which iron is put, the manufacture of railings and fences for courtyards has attained very large proportions. Such fences are rapidly superseding all others for inclosing public parks and courtyards of first-class buildings in large cities.

There remains, however, a want for an iron fence of a much cheaper character, suitable for farms. The rate at which we are cutting and exporting timber in this country and the consequent increase in the price of lumber, render the supply of fencing material, very expensive to farmers in many parts of the country.

Where fencing timber is scarce and farms are stony, farmers manage to "kill two birds with one stone," by removing the stones which cumber their lands, and building with them a wall about their fields; but there are many large tracts of fertile land, without either stone or timber. Such is the character of our western prairie land. The time is coming when these lands must be cut up into small farms, and the cultivation of grain must be replaced in great measure by stock raising. When this time arrives, fences will be needed. It is safe to say that even now a large market would be found for a cheap and efficient iron fence, which could be built for about the same cost that a board fence now entails, while its durability would be greater, and its need for repair less.

Upon lands where neither stone nor timber can be obtained hedges have been tried, but there are many objections to them. It is a matter of difficulty to get them started into vigorous growth; they require more attention and labor when grown, to prevent spreading and unsightliness, than will keep either a stone or board fence in good repair; they are likely to be winter-killed, and they exhaust and occupy a considerable proportion of land.

An attempt was made a few years since to meet the want by wire fences, but unless the wires were woven into mutually supporting meshes, making the fence too expensive, they could not relied upon to restrain anything but the larger cattle of the farm; and even these soon learned that the wires could be easily broken. Wire fence for farms has for the most part gone the way of plank-roads to return no more, unless some inventor shall make the phœnix rise from its ashes in a form much better adapted for real service than it existed before its demise.

Another class of inventions which have had better although not complete success is that of portable wooden fences. Some of these were really meritorious, as they required a much less quantity of lumber than the old style of fence, while the labor consumed in their construction was scarcely more. They were, however, though lighter and more graceful, not so strong as the fences they were designed to supersede, and thus they failed to fully meet the requirements of the case.

Now it seems to us, that it would require no great amount of genius to adapt the principle of corrugation of sheet metals, in combination with the angle iron now regularly manufactured and sold, to the production of a fence so light that it should be sufficiently cheap for farm use, and yet so strong and durable as to outlast any timber fence of equal cost.

Fences of this kind, painted with coal tar, would resist oxidation for a long time, and there is no doubt that they could be made sufficiently rigid and inelastic to restrain sheep, pigs, etc., which the old wire fence was incompetent to do.

ARCHITECTURAL ENGINEERING.

The sister arts of engineering and architecture are commonly considered as being distinct, and in one sense they are distinct; but there is a class of building which, while it gives scope to all skill in design which the finished architect possesses, also involves considerable knowledge of civil and mechanical engineering.

We allude to the designing of buildings, and works for manufacturing purposes. In many kinds of manufacturing, long established and systematized, there exists a regular method of building so far as interior arrangement is concerned, never modified except in unimportant details. The exteriors of such buildings vary greatly in the degree of beauty and appropriateness of their designs; but a large number are totally destitute of either, being simply stiff and ungraceful masses of masonry, which if not without form, are certainly destitute of comeliness. Others would be good designs were it not for their inappropriateness.

But it is not of exterior designs that we were about to speak. There is a field in which the highest success can only be reached by uniting the special requisites of skill in mechanical and civil engineering with the skill of the architect. In many industrial establishments strict adherence to one type of building is neither requisite nor desirable. Circumstances connected with the location, the materials available for the erection of buildings, the character of the site, and other particulars not necessary to be enumerated, must, in some cases, and may, in any case, render more or less change necessary.

As an illustration of this fact, we have in mind a case, where a large industrial building, requiring very heavy walls to support the machinery, was erected on the side of a clay hill. The work was about two thirds completed when it was found that the building and its foundations were gradually but surely sliding down hill. Of course, nothing was left but to tear down, and either begin over again upon a better foundation, or change the site of the building. Here was a grave error committed by an architect, of no mean reputation, simply by not taking into proper account the effect likely to be produced upon the clay basis by such a great weight as was necessary.

Our readers will doubtless recall some instances of terrible disasters arising from want of proper strength in manufacturing buildings, of which the fall of the Pemberton Mill, at Lawrence, Mass., was a most notable and lamentable example. We have, in our observations of different industrial works, often wondered that more such disasters did not befall, rather than so few. It is common to meet with errors in building arising from obvious ignorance of the practical working of machines, and their effects upon buildings in which they are placed, together with a total disregard of the effect likely to be produced by rhythmic movements and their attendant vibrations. We have seen power printing presses placed in positions, on top floors, where the ultimate destruction of a building, by their effects, would only be a work of time; and drop presses placed upon foundations so weak that they could not, by any possibility, be expected, by an expert, to remain *in situ* more than a week at the outside.

We believe that there is now, and has been for some time, a requirement for a special profession of architectural engineering.

Because a man can build handsome churches, design a splendid front for a bank building, or erect an elegant villa, it does not follow that he is competent to build or superintend the building of a grist mill, or even a saw mill.

To properly design and complete works of the latter character requires a knowledge of the machinery to be used, the nature of the work they are designed to perform, the points of the structure likely to be subjected to strain, and knowledge of the resources whereby such points may be adequately strengthened.

We are aware that there there are some architects who have devoted themselves to this speciality, and have acquired skill in it, but they are too few to meet the requirements of the public, and, consequently, much of the work, which only such experts can properly perform, goes into the hands of men who, however skillful in other departments, are certainly incompetent to win enviable fame in this.

DEATH OF A DISTINGUISHED EDITOR

Henry J. Raymond, the editor of the New York *Times*, died suddenly at his residence, in this city, on the morning of June 18th, in his 50th year. Mr. Raymond began life a poor boy, and, by his indefatigable purpose to achieve success, he secured a liberal education at the University of Vermont, graduating with honor in 1840. Upon quitting college he at once came to this city, and began the study of law, and maintained himself by teaching. Mr. Raymond early evinced a strong tendency to journalism, and attracted the attention of Horace Greeley, who invited him to a position on the *Tribune*, then in its infancy. Of the value of Mr. Raymond's services, Mr. Greeley thus speaks in his recently published work entitled the "Recollections of a Busy Life:"

I had not much for him to do till the *Tribune* was started; then I had enough; and I never found another person, barely of age and just from his studies, who evinced so signal and such versatile ability in journalism as he did. Abler and stronger men I may have met; a cleverer, readier, more generally efficient journalist, I never saw. He remained with me nearly eight years, if my memory serves me, and is the only assistant with whom I ever felt required to remonstrate for doing more work than any human brain and frame could be expected to endure. His salary was, of course, gradually increased from time to time; but his services were more valuable in proportion to their cost than those of any one else who ever aided me on the *Tribune*.

Mr. Raymond became well known as a public man, having held several prominent positions, but his abilities were best known as a journalist. In company with Mr. George Jones as publisher, he started the New York *Times* in 1851, and has since displayed great tact and ability as the editor-in-chief of that able journal. Mr. Raymond was seized with an apoplectic fit, and died a victim to his untiring industry. He was a generous-hearted man, and will be mourned sincerely by a host of chosen and intimate friends and associates, who were best able to appreciate his many excellent qualities.

THE CLAIMS OF GENIUS.

There is a peculiar cant current among artists and the crowd of hangers-on which are always to be found frequenting the haunts of artists, about the claims of genius upon the public. Artists, they say, are not and cannot be men of business. They live on a higher plane than butchers, and grocers, and haberdashers. Artists' pursuits are ennobling in their nature. They call off the mind from the groveling details of business. The true artist lives for his art, and ought not to look upon it as a mere means of obtaining a livelihood. That would immediately degrade art to a mere catchpenny business.

The obvious deduction from all this is, that the baker and butcher who refuse to trust the artist, with his last week's bill unpaid, are cruel in their heartless unrecognition of genius. The world owes such men a living because their mere existence in it is a boon to mankind whether they work like other men or not. Now, so far as we are able to discover, the higher plane which sustains this sort of cant is out of sight. Though artists may live upon this plane, we are able to say from knowledge, that they eat the same food and drink sometimes a great deal of the same drink as other people, and so far as the plane of elevation is concerned, as long as plain people fail to see it, it must go for little in the work-a-day world.

The idea of genius which originates all this cant, is that of spontaneous inspiration, coming unsought, after long intervals of idleness. It once prevailed in regard to literary work. The old ideal of literary genius, was that of a man lazy in his work, loose in his habits, yet living above ordinary mortals in a realm of thought, always clear, but at times inspired. The modern newspaper has pretty much done away with these absurd notions of literary genius. It demands and gets the work it needs done on time, and it must be confessed gets it done sufficiently well. Inventive genius has claimed far less of inspiration than art or literature, though it might as reasonably have done so as either of them. In this field, however, the lesson was early learned, that he who demands anything of the world, must not only be recognized as being able at some moment of ecstasy to give something in return, but must at all times actually give *quid pro quo*. It has thus been thoroughly taught that genius in this department means ability to work, evidenced by work done, and it has come to be recognized as not only being ability but *will* to do work.

The old idea of lazy or desultory genius is fast becoming obsolete. That it still clings to the fine arts is a great misfortune. The true genius is always a steady, plodding, ardent worker, for the most part finishing what he begins according to a definite plan conceived before the beginning. Such a genius is always successful, unless some great calamity of sickness, or blindness, or other physical or mental incapacity overtakes him. His success is to be attributed to his industry more than to any other quality, and will, in general, be found proportional to it.

It may be argued that many eminent men, whose names will be long remembered as benefactors to their race, were desultory in their habits and in many cases even dissipated. There may have been exceptional cases of this kind, but that they can be justly adduced as examples of the highest and broadest success we deny. Success is something more than the securing a name which will descend to posterity; something more, even, than conferring large benefits upon humanity at large. He who confers these benefits should be himself benefited, and the rule has been in the past, and is more than ever now, that he who works persistently at any useful occupation, whether it be high art or low art, literature, or whatever else it may be, will himself be rewarded by something far more substantial than posthumous fame.

A man must not only show himself capable of doing, he must do and keep doing, to be successful. The world is getting too narrow for lazy races or lazy individuals. This continent was once peopled by indolent and barbarous tribes which refused to help in the grand work of civilization. The result is they are crushed beneath its wheels. Their fate will ultimately be the fate of all races who place themselves across the path of advancing improvement.

This world is yet to see the day when idleness will be esteemed a crime, when work will be equally distributed and remunerated, when false distinctions which have prevailed in regard to kinds of work shall be annihilated, and the best shoemaker shall take honors with the best painter or the best physician. In that day, we shall hear no more cant about "higher planes;" man will have attained his level.

TESTING STEAM ENGINES.

Our able cotemporary, *Engineering*, whose editor is himself a Yankee, in an article on "Testing Steam Engines," published in its issue of May 21, makes a statement which will strike the minds of Yankee engineers at large as being rather funny. It says: "Although the ordinary method of expressing the performance of a steam engine by stating the number of pounds of coal per horse power per hour consumed in working it, no doubt possesses some points of practical convenience, yet as a means of comparing accurately the performances of different engines it is absolutely valueless."

We assure our English cotemporary that we have in this country got somewhat further than this. That the above-named method is with us not *an ordinary* method, and that we feel surprised to find that missionary ground still remains in a land that has done so much with steam; that, so to speak, exists on steam.

We in America have got so far that we do not commit the fault of considering "the boiler and engine as one instead of two entirely independent parts," which *Engineering* asserts to be the ordinary method.

It is true we understand that when we use more than the proper amount of fuel to do a given amount of work, and find that the fault is not in the inferior quality of the fuel, we assume there is something wrong, and that the fault lies somewhere between the fuel and the work. Now we have have learned some time since, that there are two distinct vital organs which constitute the animal we are dealing with, and that the disease may be in one of these organs while the other is perfectly sound. But we see outward evidence of organic derangement in the prominent symptoms of morbid appetite. It eats too much, and with engines we do not believe it "better to pay two butchers than one doctor," however well the maxim may apply to the human engine. So we make it put out its tongue, feel its pulse, sound its lungs, and so forth, till a correct diagnosis has been made, and then apply the proper remedy if the disease is in its nature curable.

The remarks in the article to which we have made allusion, serve as an introduction to a description of a method for testing steam engines, based upon the amount of heat which remains utilized in the exhaust steam. It is stated to be the invention of Messrs. Farey and Donkin, well-known English engineers.

This method has for its object the ascertaining of the comparative efficiencies of steam engines, and is worthy of attention, not so much in our opinion for its asserted superiority, but because anything that can add to our present stock of tests serves as a check upon errors in the methods in vogue, and as a new standpoint for investigation.

"The principles upon which the system is founded," says our cotemporary, "may be very simply stated. A steam engine is but a form of heat engine, receiving its supply of heat from the boiler, and converting a greater or less portion of this heat into useful work. The more efficient the engine the greater will be the proportionate amount of heat thus transformed into work, and the less, consequently, will be the proportionate quantity carried off by the exhaust steam. We thus see that we measure the quantity of heat carried off by the waste steam of any engine, during, say, a minute, and divide this quantity by the number of horse power developed by the engine during that minute, we get a certain number or constant which will enable the performance of that engine to be compared accurately with that of any other engine tested in a similar way. The more efficient the engine, the lower, of course, its 'constant' will be, and *vice versâ*.

"We must next consider the means by which the quantity of heat carried off by the exhaust steam can be measured, and we may here remark that nothing could be more simple, and at the same time more accurate, than the apparatus which Messrs. Farey and B. Donkin, Jr., have devised and employed for this purpose. In its simplest and most generally useful form, it consists merely of a wooden trough or box, into which the whole of the water from the hot well is led, this trough having several partitions across it, over and under which the water flows, so as to obtain at last a steady current, which, at one end of the trough, falls over a weir or a "tumbling bay." The hight or head of water above the weir can be readily determined by the ordinary hook gage, and this and the breadth of the weir being known, the quantity of water discharged in a given time can be readily and accurately calculated by the use of Beardmore's Tables, or equivalent formulæ. In practice it would be unnecessary to make these calculations more than once for any given apparatus, it being, of course, more convenient to mark on the gage the discharge per minute corresponding to each given amount of head. To ascertain the temperature at which the condensing water enters the condenser and finally escapes, a good thermometer is, of course, all that is required. The number of degrees that the water is raised in temperature during its passage through the condenser, and the number of pounds of water thus heated during a given time, being known, we can, by merely multiplying these two quantities together, determine the number of pound-degrees of heat or thermal units carried off from the engine during that time by the exhaust steam. Dividing this number of pound-degrees by the number of horse power developed by the engine during the trial, we get the 'constant' already mentioned.

"All, then, that is necessary to test an engine on Messrs. Farey and Donkin's system, is a wooden box with a tumbling bay, a good thermometer, and indicators for determining the power developed. It is by no means necessary that the trial should be a lengthened one, for it will be found that as long as a constant pressure of steam is maintained, and the engine is employed to do a uniform amount of work, the amount of heat carried off by the condensing water will also remain constant from hour to hour, and there is, therefore, no reason why the experiment should be extended for an inconvenient time. This is a very important point in favor of the system of testing of which we are speaking, as in all mills or factories an engine can be kept doing tolerably uniform work for a couple of hours or so without inconvenience, whereas, if the trial had to be extended over a lengthened period (as would be essential if the quantity of water evaporated by the boilers and the amount of coal consumed were obtained in the ordinary way) much inconvenience and expense would be in most cases incurred.

"We must now speak of another important point connected with this system of testing engines. Mr. Farey and Mr. B. Donkin, Jr., have found, from experiments, that the 'constant' of any given engine does not vary to any practical extent with moderate variations of power; and thus when the 'constant' has once been obtained, the power developed at any given time by an engine fitted with the apparatus we have described, can be ascertained very closely without the use of the indicator. For instance, let us suppose that it has been ascertained that the 'constant' of any given engine is 480, or in other words, that the exhaust steam of that engine carries off 480 pound-degrees of heat per minute for every indicated horse power. Then if, on observing the apparatus, it was found that 14,400 units of heat were passing away per minute, the engine would then be developing $\frac{14400}{480} = 30$ horse power, or if 16,800 units were being given off per minute, $\frac{16800}{480} = 35$ horse-power would be developed, and so on. We thus see that the apparatus affords a very ready means of estimating the power requisite to drive various machines, shafting, etc., and we are inclined to believe that if it was generally applied to these purposes some curious revelations would be the result.

"In cases where it is desired to maintain a continuous registration of the work done by an engine, Messrs. Farey and Donkin employ the simple arrangement of photographic apparatus described and illustrated in the letter from Mr. Farey to which we have already referred. According to this plan, two rays of light from a gas burner—the one passing through a hole in a screen carried by a float, and the other through a break in the mercurial column of a thermometer—are, after traversing lenses, made to fall upon a sheet of sensitized paper carried by a slowly revolving drum, which derives its motion from the engine. Each ray of course traces a line upon the sensitized paper, and by the distance of these lines above or below a fixed datum line traced by a third ray of light, the quantity and temperature of the water passing over the weir at any given time are registered. Applied in this way, the apparatus is calculated to do good service to large mill owners and water-works companies who desire to obtain a continuous record of the performances of their engines.

"We have spoken of this system of testing as applied to stationary condensing engines only; but it is also applicable to high-pressure engines, and, under certain circumstances, to marine engines."

Improved Photographic Paper.

The *British Journal of Photography* publishes the following by W. H. Davis: "My method for preparing the surface—for I believe it will do for many other surfaces than paper—is the following for direct printing: Take from four to six grains of gelatine, soak it in an ounce of water for an hour, then melt it gently over a fire, hot plate, or water bath, using a clean earthen pipkin. When fully dissolved, add to it, while yet warm, and stirring it gently during the mixing, from four to six drachms of a solution of white lac in methylated spirit, if for white or pale surfaces; but orange lac will do if the surface be of a darker color. This is made in the proportion of six ounces of spirit to one ounce of lac, and digesting it till fully dissolved. The mixture of the gelatine and gum lac in spirits produces a creamy-looking emulsion, to which is added four grains of chloride of sodium, or a like equivalent of chlorides of ammonium or barium, and, when fully dissolved, filter through fine muslin into a clean pipkin, and it is ready for use.

"I generally apply the solution warm with a flat camel's hair brush, crossing it till it lies evenly. When the paper is dry it is ready for sensitizing, which may be either done by flotation on the ordinary printing bath, or by brushing on the silver solution. I prefer to use the ammonia-nitrate solution brushed on; but there are specimens by both methods before you. I use forty grains of silver to the ounce of water. Some of the ammonia-nitrate prints contain also a large proportion of citrate of silver in addition to the usual ammonia-nitrate.

"As you will see, the tones of many of the untoned prints are quite as fine in color as are those toned with gold, and I attribute this entirely to the variations in the salting and in the strength of the size and lac solution, and to the minute variation of the silver bath by the addition of various salts in the course of sensitizing.

"The question will probably be asked—Will this method allow of printing by development? I can only say that I believe it will. There is nothing in the materials to prevent it; but I have not had time to go into that branch of the matter."

Misadventure in Experiment---Professor Silliman.

The true nobility of character and calm heroism evinced by Professor Bunsen, while suffering from the effects of the late distressing accident—an account of which we recently published—must have excited feelings of admiration for the *man*, apart from the high respect justly due to him as an eminent scientist. Many similar instances could be given of other men distinguished in the walks of science, one of which, happily unattended by serious damage, is thus related of Professor Silliman by the Worcester *Spy*: "In one of his lectures, Mr. Silliman was explaining the properties of hydrogen, and was proceeding to illustrate its combustible properties by an experiment. After stating that, on a lighted candle being applied to it, it would burn quietly with a bluish flame, he raised by its knob a glass receiver which he supposed was filled with the gas and applied the candle. There was a violent explosion; the glass flew in splinters about the lecture room; the ladies present screamed with terror, and the students rose from their seats, startled by the shock, and uncertain whether some of the other powerful agents in the laboratory might not be called into destructive activity in a moment. The cool bearing of the venerable professor as he stood in an easy attitude, still holding the knob of the jar in his hand, quieted the apprehensions of the audience, and, as soon as the commotion began to subside, the clear, even tones of his voice were heard saying: 'This illustrates something that I was going to speak of by-and-by. A little oxygen was accidentally mixed with the hydrogen, and caused the explosion. It has burned my hand a little; but that is no matter. We will now try another jar, which I presume we shall find pure.'"

Practical Application of Sensitive Flames.

An apparatus has been invented by Barrett for making practical use of sensitive flames. It consists of two perpendicular copper rods, one of which, on its upper end, holds a metallic ribbon, which is composed of thin leaves of gold, silver, or platinum, welded together. Such a ribbon expands unequally under the influence of heat; it bends toward one side, and, in doing so, comes in contact with a fine platinum wire attached to a galvanic battery. As soon as the poles of the battery are closed, a bell begins to ring. The working of the apparatus is as follows:

"A sensitive flame is lighted, about ten inches from the metallic ribbon. This burns quietly so long as there is no noise, but a shrill whistle, or any unusual disturbance, will cause it to diminish one half in length, and to spread out wide in the middle, like the wings of a bird. It thus heats the metallic ribbon, which expands unequally, and occasions the contact of the poles of the battery, which rings a bell."

Such a light as this in a banking house would betray to the watchman the noise of robbery, and the inventor proposes to use it as a species of burglar alarm. As sound can be transmitted in water four times as rapidly as in the air, it is also suggested to employ this method on shipboard to make known the approach of a vessel in time of a fog.

There is probably the germ of curious applications of sensitive flames in Barrett's invention, and it would not be surprising to hear of its use in war, to warn a sentinel of the approach of the enemy, or of its application to a new species of telegraphy.

A New Decorative Material.

The slowness of painting operations in buildings, the obstruction caused by workmen, and the disagreeable smell from fresh paint, are great inconveniences inherent to the present mode of painting and decorating. To remedy this, M. Jean Marie Lasché, of No. 23, Boulevard de Strasbourg, Paris, has just patented an invention, the object of which is chiefly to dispense with painting operations in the house or room to be decorated and to prepare the painting at a factory or shop, so that it can be applied to walls or other surfaces by ordinary hangers or layers, without giving rise to disagreeable smells. The invention consists in producing the painting upon tin foil. M. Lasché takes thin tin foil, which possesses great flexibility, and spreads it upon glass, taking care to damp the glass in order to facilitate the spreading and retention of the foil. The foil thus spread constitutes a very smooth surface, on which the inventor paints or colors in oil, either plain or ornamental, as on walls or wainscots. It is allowed to dry, and is then varnished. This portable painting, when removed from the glass with its lining of tin, is ready to be applied in a house or otherwise. This new covering or hanging is wound on rollers like paper hangings, but it differs from them, inasmuch as the coloring or painting is on tin and in oil; the back or tin lining constitutes a waterproof surfrce, and the tin, owing to its great flexibility, can be adapted to the configuration of all moldings or irregularities. Before applying the tin hanging or covering, a waterproof mixture is spread on the wall or surface to be decorated, and the hanging is then cut and applied, being made to follow the irregularities of the moldings and ornaments. This tin covering may also replace gilding, the gold being applied on the tin foil with the ordinary preparation. It is dried and cut, and after having had a waterproof mixture spread on the ornaments or surface to be decorated, the pieces of tin gilding are applied to them. The advantage of this tin gilding over ordinary gilding on metals is that it does not oxidize, while ordinary gilding on metals soon becomes spotted or tarnished. This invention thus constitutes, as it were, a new process of decorative painting, which dispenses with all labor at the place of application, except simple hanging or laying. We have by us some samples of this new material, which are exceedingly appropriate and effective.—*Mechanics' Magazine.*

THE PRESENT STATUS OF MEDICAL SCIENCE.

The present status of medical science presents some singular aspects. While the majority of the people, perhaps, retain their faith in drugs, the doctors—at least, those of the allopathic school—are daily losing faith in them, and relying more upon good nursing, proper dietetic regimen, and rest, for the cure of disease.

Homeopathy, with its infinitesimal doses, has greater faith in its drugs; but, whether this faith arises from the really greater success in the use of the remedies than is attained by the allopathic system, or whether that success is falsely attributed to the effect of drugs, given in so small quantities that their influence upon disease is imperceptible, and therefore, harmless, is a question, we believe, not fully decided. And it cannot be decided so long as many professed homeopathists do not conform to the practice they profess, and persist in substituting the allopathic dose for the homeopathic one.

There are quacks in all kinds of medical practice, quacks admitted into full communion, and of good standing. In the allopathic practice, the strictly honest physicians, who always give the remedies they pretend to give, who eschew bread pills, and give the real old-fashioned "kill or cure" dose, are the men of inferior talent and small reputation; secretly laughed at by the knowing ones, and publicly praised in consultations. "The treatment has been perfectly correct ma'am," says the wisehead, whom the weaker brother has called in to reassure the anxious mother, who has had some misgivings as to whether her old family doctor was not possibly treating her sick child erroneously. "The treatment has been perfectly correct. The constitution of your child has been admirably prepared to receive the benefit of a course of tonics which I shall now recommend." "What tonics?" timidly asks the weaker brother of the man of great repute. "A little wine and plenty of beef tea are the best for children, with perhaps a little, a very little, of any other simple tonic remedy," says that oracle as he steps into his carriage, endeavoring to save, at once, the child and his own standing as a "regular."

"Talk about the inefficiency of homeopathic remedies," says the practitioner of that school. "See, ma'am, I will place one of these little pellets of stibium upon the tongue of your Spanish greyhound, and presently he shall be literally as sick as a dog." Now, stibium, worthy reader, is antimony, and this metal and its salts are deadly poisons. The stomach revolts against a very small quantity of it, and it is never used in the allopathic practice except in minute doses. This experiment, often performed to convince people of the power of homeopathic remedies, is convincing to people who know nothing of the nature of the drug.

We believe homeopathy is doing a good work, and that it will ultimately teach the world the utter powerlessness of drugs to cure diseases, but its practice is not free from quacks, who are,so to speak, "neither fish nor fowl," neither allopathists nor homeopathists, but simply eclectics, doctoring as they think best for the good of the patient; that is, in nine cases out of ten, not doctoring at all, but humbugging patients into the belief that they are doctored. This class of eclectics are the most successful physicians in all kinds of practice.

What is disease is a question never yet satisfactorily answered. The allopathists affirm that the homeopathists treat only symptoms. But what do the former know of disease except symptoms? Can they point out the subtle cause of smallpox? show how it operates in the blood, and taints the entire system? Can they give you the origin of Bright's disease, or throw a single obstacle in the way of its progress? Can they show the primary cause of tubercular deposit, or explain the mysterious nature of the scrofulous diathesis? Yet these are the men who claim, *par excellence*, to treat causes and not symptoms.

The following statement in the *Radical*, for June, is not exaggerated. "No branch of science is in a more unstable and chaotic state than the science of medicine. Earnest young men graduate from the medical schools, and then throw up the profession with the frank avowal that they do not understand how an honest man can be a physician. Grave professors close their learned lectures with the *naive* confession, that, although these are the accepted theories of to-day, a few years will undoubtedly sweep them all into the waste-basket of posterity. Undoubtedly they will; and with them will go what Egyptian pyramids of pills and powders! what rivers and seas of wine bitters and cherry pectorals, of pain killers and panaceas of every conceivable sort, that have brought wealth to their venders, and woe to humanity! Every day marks the birth of some new, and the burial of some old, nostrum—more worthless, even, than ephemeral—while temperance, cleanliness, and exercise—the world-old healers of humanity—lose not one jot nor tittle of their ancient virtues, though the world comes to a knowledge of, and adherence to them by slow and painful steps. It certainly has not learned that temperance means the intelligent use of all that is good, and the rejection of all that is evil; that cleanliness includes purity of person, purity of surroundings, purity of soul; and that exercise, in its true sense, means a full and perfect development of the body in harmony with all the laws thereof."

Says the *London Quarterly Review*: "The acknowledgment seems to become daily wider spread, that 'the man is greater than his maladies;' that his general condition is of more importance than his local ailments; that disease is a change in him, rather than in some part of him; and that no treatment can be of real service which sacrifices the greater to the lesser."

This is what Dr. Wisehead reasoned to himself, when he spoke to Weaker Brother, M.D., about the wine and beef tea, shrewdly covering up his wisdom by the "little tonic remedy," lest he should risk his standing with the "County Medical Society," and thus deprive himself of the opportunity of another consultation.

The *London Quarterly* further remarks: "It may be easily seen that a prime moving spur to a great deal of the practice, from which our medical guides are now drawing back, was a certain awful 'idol of the market place,' called Inflammation. With fiery limbs spread aloft, wielding weapons labeled Tumor, Rubor, Calor, Dolor, Effusion, Suppuration, Fibrinous Exudation, Phlegmon, Fever, etc., it has made all fall down before it: and the more it has been sacrificed to the fiercer it has seemed. It has been a veritable Kalee. Of late,men of science have been picking at the skin of this hideous object of faith, and have seen reason to pronounce some of its weapons of offense mere wind-bags and tinsel. Though they cannot say but that there is a sort of life in it, yet its destructiveness consists mainly in the pitfalls encountered by those running away from the Bogy. Laying aside metaphor, it would seem that inflammation consists in the phenomena of a lower degree of life. The process of nutritive growth in the various tissues of the body is arrested at an incomplete stage. For example, what should have been the intricate meshes of skin, elastic sensitive muscle, or mysterious gland, gets no further than being a thickish liquid, which can assume no comely form, can only multiply itself, and appear in the shape of mucus or pus. This is suppuration. Again, the swelling (*tumor*) of inflamed parts is a loss of one of the vital properties of the small blood vessels, elasticity. Spur them up to more life, and the swelling vanishes. And so on.

"What is now principally feared by the shrewder class is, not so much inflammation, as the panic which it causes. They almost prefer that those who have to deal with it should shut their eyes than open them and act upon their fright. A fashionable physician, who is also a learned physiologist and acute observer, was summoned to a case of rheumatic fever of some days' duration. In the consultation, he pointed out that there was extensive inflammation of the heart, to the extreme terror of the family doctor. 'Oh dear, dear! what will you think of me? How can I forgive myself for so neglecting my poor friend's case?' 'Pray do not be distressed,' was the comforting answer, 'it is just as well you did not find out the pericarditis; you might, perhaps, have treated it.'"

On the whole, we do not think the prospects of the drug trade, for a brisk business, during the latter half of the twentieth century, are altogether flattering. Before the expiration of that period, man will, perhaps, not have practically learned that diseases may be warded off by a clean, temperate life; but he will, at least, have learned that diseases, once acquired, cannot be cured by cathartics, emetics, or any of the other "ics," and, throwing himself upon nature, will give her the best chance to work he can, and thus secure the only possible chance he has for recovery.

We would not, in these remarks, be understood to reflect anything upon the noble art of surgery, whose influence upon the sister science of medicine has been most salutary. It is the use of nauseous, poisonous,and powerful drugs,not tonic in their action, that we deprecate, believing that not one patient in a hundred needs them, while many a life has been lost through their administration.

HELL GATE.—We perceive with pleasure that our townsman, Mr. Samuel Lewis, monopolizes a considerable portion of the current number of the SCIENTIFIC AMERICAN by a two-page illustration of his admirable submarine drilling apparatus. The pictures and descriptive text are very fine, and reflect great credit upon the conductors of the SCIENTIFIC AMERICAN. Foreign patents for this truly splendid invention have been procured by Munn & Co., patent solicitors, and the inventor is now prepared to clear Hell Gate, or either side of it, or any other important obstructed channel, with the least possible delay. As we have before said in these columns, if the rocks lying between the Sound and East river are ever removed it will be by this magnificent mechanism, the speedy use of which nothing but the most disreputable coalitions can prevent.—*The Brooklyn Argus.*

THE Portland *Argus* says, Walter Brown has brought home a new paper boat, of the Waters' patent, from a model of his own. This boat is 31½ feet long, 12 inches wide, and weighs but 22 pounds. The lightest wooden boat ever built of similar dimensions weighed 41 pounds. The most singular part of the matter is that the boat is more than four times stronger than one of wood. All of it, save where the sculler sits, is gas-tight, so that in the event of a race sufficient gas may be taken into it to reduce its weight to 8 pounds. The displacement of water by such a craft will be very much less than that of a wooden boat, and the same exertion will propel it proportionately faster. Its strength is also a great advantage.

AN IMPROVED BATTERY.—We have recorded so many improvements (as they are all called) in galvanic batteries, that the number and variety becomes bewildering. The last we meet with is that suggested by Böttger, who proposes to substitute metallic antimony for carbon. An amalgamated zinc plate is immersed in a strong solution of common salt and sulphate of magnesia. The antimony, like the carbon, is placed in a porous pot, but the liquid used is dilute sulphuric acid. A combination of this arrangement is said to give a stronger and more lasting current than a cell of Daniel's battery.—*Mechanic's Magazine.*

NEW PUBLICATIONS.

A PRACTICAL TREATISE ON THE MANUFACTURE OF PORTLAND CEMENT. By Henry Reid, C. E., to which is added a Translation of M. A. Lipowitz's Work, describing a New Method adopted in Germany, of Manufacturing that Cement. By W. F. Reid. Philadelphia: Henry Carey Baird, 406 Walnut street. 8vo. Price, by mail, free of postage, $7·00.

The large and increasing use of Portland cement not only renders a work of this kind necessary to manufacturers and dealers, but to architects, engineers, builders, contractors on public works, and whoever desires a valuable work of reference upon this important article of trade, its composition, different modes of manufacture, its uses, methods of application etc., etc. A prejudice which has existed in certain quarters against the use of this cement is gradually giving way before the light of experience, and, as a consequence, its manufacture and use are likely to assume in the future much larger proportions than has hitherto been the case. The work begins with the A, B, C of the subject. The selection of a site for a manufactory, giving proportions of the materials required, and full details and descriptions, with plates illustrating the apparatus, distribution of help, processes, etc. These subjects occupy eleven chapters. The author then treats of the importance of rigid testing, and gives the different methods in vogue, with the advantages and disadvantages pertaining to each. This chapter is an excellent and valuable portion of the work for architects and engineers, but is followed by one upon experiments determining the constructive value of Portland cement and its uses, which alone contains information worth the price of the work. Several other chapters follow upon the mode of using the cement, its application to marine architecture and its suitability for concrete building; and then Mr. H. Reid closes his part of the work by an interesting and well-prepared essay on the improvement of roads, streets, etc., by the agency of this material. Then follows the translation of Lipowitz's work, by W. F. Reid, which completes the volume. We have nothing but commendation for this book, except that it lacks an index. Publishers should recollect that a large class of readers use their works not as text-books for study, but as books of reference for casual information, and that to such a table of contents, however copious, can never take the place of a well-prepared index.

A TREATISE ON THE TEETH OF WHEELS, Demonstrating the Best Forms which can be given to them for the purposes of Machinery, such as Mill Work and Clock Work. Translated from the French of M. Camus, by John Isaac Hawkins. Third Edition. Philadelphia: Henry Carey Baird, 406 Walnut street.

While finished mechanical engineers are perhaps fully aware of the great importance of proper shape in the teeth of wheels, their practice in this regard is, in many cases, but little better than that of less accomplished men. This is evidenced by the imperfections met with in toothed wheels almost universally. If gears will only run together with tolerable smoothness, and without too much noise, the average perfection is reached, and further considerations are too often neglected. But poorly formed gears may, although they cost less in the first instance, soon absorb an amount of power in friction which would more than purchase good ones at double the price of inferior ones. We would not be understood as saying that so wide a departure from good practice as we have described is the rule, but it is certain that more or less departure from accurate proportions is looked upon with toleration, even by those who are capable of judging correctly, would they take the trouble, of the evil effects of such a departure. There are few manufacturing establishments where such errors of form cannot be detected in the wear and clashing of badly-constructed toothed wheels. The work before us is that of a man celebrated for his learning and a recipient of the highest academic honors, both in his own and other countries. A rigid reasoner, he assumes nothing, but leads his reader on step by step to each conclusion through an admirable course of mathematical demonstration. To read the book will require some acquaintance with mathematics and patience on the part of the reader, not accustomed to following readily a train of mathematical reasoning; but the importance of the conclusions finally reached will repay such readers for the trouble taken. To those well versed in mathematical methods and language, the work presents no difficulties, and is recommended as being probably the most complete and exhaustive treatise upon the subject extant.

ON MECHANICAL SAWS. By S. W. Worssam, Jr. Illustrated with eighteen large folding Plates. Philadelphia: Henry Carey Baird, 406 Walnut street.

This is an essay on saws actuated by steam power, reprinted from the "Transactions of the Society of Engineers for 1867." Three divisions are made of the subject, namely: Reciprocating, or mill saws; rotary, or circular saws; endless ribbon, or band saws. The treatise embraces the origin of mill saws and their introduction into this country; various forms of saw teeth; sharpening and setting mill saws and cross cuts, mill saw vise, gages, files, saw sets, etc., statistics of mill saws, saw-sharpening machines, attachment of saws to swing frames, with various addenda. The treatise is eminently practical, and offers no difficulties to any mechanic. It will prove useful to all who are connected with the manufacture or the use of saws.

HOW TO BATHE. A Family Guide for the Use of Water in Preserving Health and Treating Disease. By E. P. Miller, M. D., author of "Vital Force; How Wasted and How Preserved," etc. Published for the author. New York: American News Company. Boston: Lee & Shepard.

We have found this little work entertaining and instructive. It contains descriptions of some forty or more kinds of general and local bathing, with other information of a popular character in regard to properties of water, its solvent power, how to purify it, and many other matters respecting this wonderful fluid. As a specimen of the general character of the book, we have reproduced in another column rules for ordinary bathing, extracted from the book, which will be found interesting and useful. The world has begun to learn that cleanliness is only another name for health, and that disease and dirt always keep company.

INVESTIGATIONS OF FORMULÆ FOR THE STRENGTH OF THE IRON PARTS OF STEAM MACHINERY. By J. D. Van Buren, Jr., C. E., late of the Engineers, U. S. Navy. New York: D. Van Nostrand, 23 Murray street and 27 Warren street.

This book has lain upon our table for some days, but as yet we have not found time to give that attention which would enable us to speak of it as it properly deserves. It is written in the abstruse style of mathematical investigations, and was probably designed for those well posted in the mathematical treatment of such subjects. The formulæ seem chiefly founded upon the experiments of Fairbairn, Rankine, Mosely, Mahan, and other engineers of note, great care being taken in securing accuracy of the data, from which the formulæ are deduced.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

1,535.—DEVICE FOR SECURING CORKS IN BOTTLES.—W. M. Littell, Newark, N. J. May 18, 1869.

1,549.—SHOES FOR HORSES AND OTHER ANIMALS.—David Roberge, New York city. May 19, 1869.

1,558.—CORD TIGHTENERS FOR CURTAIN FIXTURES.—C. C. Parker, Brooklyn, N. Y. May 19, 1869.

1,568.—DISTILLATION OF SPIRITUOUS LIQUORS, AND IN APPARATUS TO BE EMPLOYED THEREFOR.—George Johnson, San Francisco, Cal. May 20, 1869.

1,559.—PROCESS FOR OBTAINING GELATINE, ETC., FROM ANIMAL SUBSTANCES.—D. K. Tuttle, Orazio Lugo, W. J. Hooper, and Theodore Hooper, Baltimore, Md. May 19, 1869.

1,567.—BOAT-DETACHING APPARATUS.—Jas. Foster, Jr., Noah Hand, and Charles Sloan, Camden, N. J. May 20, 1869.

1,577.—MACHINE FOR WORKING METALS.—Charles Bower, Sherbrooke, Canada. May 21, 1869.

1,585.—Horseshoe Nails and Nail Machinery.—John S. Griffing, New Haven, Conn. May 22, 1869.

1,586.—Machinery for Casting Iron.—J. A. Burden, Troy, N. Y. May 22, 1869.

1,593.—Ice Houses and Refrigerators.—E. D. Brainard, Albany, N. Y. May 24, 1869.

1,595.—Machinery for the Manufacture of Brushes.—A. M. White, Thompsonville, Conn. May 22, 1869.

1,603.—Imitation, Wood, Ivory, Stone, etc.—David Blake, Albany, N.Y. May 25, 1869.

1,612.—Tools for Cutting Glass, etc. [Joseph Beales, W. T. Davis, and A. De Wolf, Greenfield, Mass. May 26, 1869.

1,647.—Machinery for Manufacturing Bolts and Nuts.—O. C. Burdict, Providence, R. I. May 28, 1869.

1,682.—Mechanism for Propelling by Muscular Power.—W. S. Hall, Quincy, Mass. May 31, 1869.

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; beside, 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 advertisemets at $1·00 a line, under the head of "Business and Personal."

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

W. B., of Ky.—We do not think the process you suggest of transferring pencil drawings can be accomplished. There is no solvent that will dissolve wood without decomposing it. A pulp may be made of woody tissue by mechanical means, which is used in the manufacture of paper. The idea of making moldings of saw dust by pressure and combination with some cementing material is not new. If in the distillation of water,the weight of the condensed distillate and the residue of saline and organic matter left in the still do not equal the weight of the water experimented with, the fact argues only your inexperience, or the imperfection of the apparatus employed. The substance which you describe as resembling graphite, is the product of attrition between the two metallic surfaces. It is not graphite. Graphite is one of the forms in which carbon exists. As generally found, however, it contains more or less carbonate of iron. Bone or horn is easily dissolved by steam under high pressure. In the ordinary manufacture of handles, etc., such as you describe, these materials are only softened by hot water or steam, and shaped while hot by pressure in molds. When cold they harden again and retain the form of the mold.

J. H. T., of Ill.—To find the loss in the delivery of a water pipe caused by friction, the following rule is given: Multiply the weight of fluid discharged in a given time, by the product of the length of the pipe, the circumference of the cross section of the bore, and the square of the velocity of the flow, all expressed in similar units of measurement divide this product by 32·1808 times the area of the cross section of the bore, and multiply the quotient by 0·0035. This will give an expression, in pounds of water prevented from flowing by friction during the time of the experiment. We have not the data for answering your second query, and doubt if it has ever been made the subject of experiment.

C. C., of N. Y.—Steel springs can be either tinned or zinced. Zincing a steel spring by immersing it in melted zinc, you will draw the temper of the spring, but the melting point of tin being considerably lower, tinning by the usual method will not be likely to injure the temper unless you heat the tin beyond the melting point. The temperature of zinc at the melting point is too high to give a proper spring temper. By the use of a battery we think you might coat springs with zinc without injuring the temper. You could not restore the temper of a spring if lost after zincing by any process known to us.

A. B., of Mass.—The liquid blacking used by manufacturers for rubber goods is applied before the goods are vulcanized, and passes through the process with the rubber. We learn that it can not be made available for common use. We are, however, informed that black japan varnish tempered with a little boiled linseed oil may be used for restoring the surface on manufactured goods when it has become dimmed or abraded and that the varnish is perfectly harmless in its effects upon the material.

H. P., of N. Y.—You may make quite an effective filter by binding several thicknesses of flannel over the nozzle of your water faucet; but for a permanent filter, we would advise you to purchase some one of the numerous filters kept for sale. You must either do this or clean out the tank. The latter is best, as the accumulation of organic matter you describe must eventually prove detrimentul to health.

H. B., of N. Y.—You can temper small springs in large quantities, by first hardening them in water in the usual manner of hardening steel, then placing as many as convenient in a vessel containing oil. Heat the oil containing the springs until it takes fire from the top, then set off the vessel and let it cool. The springs when cooled will be found to have the proper temper.

E. R., of Vt.—The strain of iron in a mold depends primarily upon the principles which govern the pressure of liquids, and partly from the fact that,at the time the metal is about to assume the crystalline form, an expansion takes place analogous to that which takes place in water in cooling from 39° Fah. to 32° Fah.

C. B., of Iowa.—The assignee of an original patent has no right, under an extended term of the patent, in the absence of a specific agreement to that effect. It is the intention of the law to allow the extention of a patent, only for the benefit of the patentee or his heirs.

R. G. W., of———The temperature for incubation is 104° Fah.

Recent American and Foreign Patents.

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

Chromo-Lithographic Power Press.—August Hoen, Baltimore, Md.—This invention comprises several valuable improvements in the chromo press, among which are a new method of applying the pressure, a new device for inking and damping, and a new apparatus for registering.

Paper Envelopes.—G. P. Hachenberg, Hudson, N. Y.—This invention relates to a new and improved method of forming envelopes for letters and for official and professional inclosures as well as for paper packages or parcels; and it consists in a fold formed on one or more of the edges of the envelope in such a manner that the fold so made may be readily torn off, and the envelope thereby be opened.

Milking Stool.—E. W. Hopkins, Oneonta, N. Y.—This invention relates to improvements in milking stools, designed to provide a simple and efficient means for securing the cow's tail while milking; also an improved arrangement of pail-holding attachment.

Flour Cooler.—Abraham Staffer and Peter Staffer, Salt Creek, Ind.—This invention relates to an improvement in machines for cooling flour in the process of manufacturing the same, whereby the operation is more thoroughly and speedily performed than by the old method.

Wheel Hubs.—H. V. Belding, Oppenheim, N. Y.—The object of this invention is to provide certain improvements in the construction of hubs for wagon wheels, calculated to reduce the friction, facilitate oiling, and to economize in the cost of construction.

Conveyor "Flight."—John M. Lemon, Polk City, Iowa.—This invention relates to a new and useful improvement in machinery for moving or conveying flour or grain in a horizontal direction in mills or warehouses.

Bolt and Nut-Threading Machines.—John Killefer, West Richfield, Ohio.—This invention consists in an improved arrangement of the bolt-threading dies and die holders to facilitate the changing of the dies for bolts of different sizes. Also, an improved arrangement of the vise for holding the bolts or rods to be threaded. Also, an improved arrangement of means for throwing the dies out of action when the bolts have been threaded the right length, and for throwing them into action again when a fresh blank has been supplied. Also, an improved arrangement for operating the nut-threading device from the bolt-threading operating mechanism; and, also, an improved arrangement for gearing and ungearing the nut-threading spindle.

Spittoon Footstool.—Charles Marcher, New York city.—This invention relates to new and useful improvements in foot-stools, whereby they are made to inclose and secure a spittoon.

Ovens.—D. A. Kennedy, Beloit, Wis.—This invention relates to improvements in ovens, designed to provide an improved arrangement of the means for operating rotary tables within the said oven. Also, an arrangement of means for maintaining a supply of aqueous vapor in the oven while baking; and also a means for imparting aromatic flavors to the bread while baking.

Earth Closets and Commodes.—Henry Moule, Fordington, England, and Henry John Girdlestone, London, England.—This invention relates to improvements in apparatus to be used in closets and commodes, in which dry and powdered earths (consisting of clay in a dry, unburned, or burnt state or loam) lime, peat, and other dry vegetable matters in powder, but more especially dry earths are employed for deodorizing the fresh excrementitious matters by covering or dusting them over with such powders and dry earths.

Steam Boilers.—James Eaton, Bridgeport, Ill.—This invention consists in providing a steam chamber within the shell of the boiler, in a manner to be completely enveloped by the water, and an elevated water chamber communicating with the water space, to be so arranged that the boiler may be kept full of water at all times, the water being maintained at such a hight in the said elevated chamber that no change of position, such as is likely to occur to the boiler, will cause any part of the fire surface or steam chamber to become increased, and provided with means for conveying the steam to the said chamber.

Punches.—John Wright, Middleport, Ohio.—This invention consists in an arrangement of right-and-left threaded operating screw for effecting a quick movement of the punch. It consists in an improved arrangement of ratchet mechanism for operating the screw in either direction. It also consists in certain improvements in the method of connecting the punch to the sliding nut by which motion is imparted to the punch.

Self-Feeding and Self-Rotating Drill.—Samuel Lewis, Williamsburgh, N. Y.—This invention has for its especial object the lifting, rotating, and freeing a drill by as nearly one motion and device as is practicable, but which, having in view the large variety of work in the quarry, under water, for coal oil wells, stamp mill movements, etc., shall be applicable to a wider range of uses by a simpler series of means, than anything heretofore produced for such purposes.

Plows.—S. T. Godfrey, Scaville, N. J.—This invention has for its object to improve the construction of plows so as to make them better adapted for plowing sedge, sea-weed, and other similar substances.

Table Leaf Support.—C. P. Wing, Lyonsville, Ill.—This invention has for its object to furnish a simple, convenient and secure support for table leaves which shall be so constructed that it may be operated to secure or release the leaves, without its being necessary to stoop and reach under the leaves to operate the support.

Washing Machine.—F. L. Wickham, Pavilion, Ill.—This invention has for its object to furnish an improved washing machine which shall be simple in construction, effective in operation, and easily operted, doing its work quickly and well.

Backs for Brushes, Hand Mirrors, etc.—W. U. Dudley, Port Richmond, N. Y.—This invention has for its object to improve the construction of brushes, so that the brush may be wet without injuring the veneering or cover of its back, and so that the body of the brush may be removed when worn out and replaced with a new one.

Animal Trap.—Henry Pattison, Duck Creek, Ill.—This invention has for its object to furnish an improved animal trap, simple in construction and effective in operation; catching and caging the animals in such a way as not to alarm the animals still uncaught, and which shall also be self-setting.

Corn Planter.—Geo. H. Wood, Cambridge City, Ind.—This invention has for its object to furnish a simple, convenient, and accurate corn planter which shall be so constructed and arranged as to plant the corn at uniform distances apart, without the gaining or losing of space, which is unavoidable when the planter is operated by wheels rolling upon the ground.

Plow.—Josiah Long, Leavenworth, Ind.—This invention has for its object to furnish an improved plow which shall be so constructed as to more thoroughly turn and pulverize the soil than plows constructed in the ordinary manner, while at the same time it may be adjusted to turn a narrow or wide furrow according to the character of the soil to be plowed.

Hay Loader.—F. W. Harlow, Hannibal, Mo.—This invention consists in a rake of curved teeth of steel wire, suspended from the axle of a two-wheel carriage, to be attached to and drawn by the side of the wagon to be loaded; also of a broad elevator supported on the same carriage and operated thereby, which takes the hay from the said rake, carrying it up and delivering it into a trough wherein a transverse carrier works also, supported on and operated by the said wheels, and which conveys the hay over the rack to be loaded.

Animal Trap.—A. C. Flanders, Owatonna, Minn.—This invention relates to that class of animal traps provided with a slip noose and operated by a spring arm. The present improvement consists in the peculiar construction and arrangement of the spring arm, noose, catch, and bait hook, whereby the parts operate in a peculiar manner and with several important advantages over traps of this class heretofore brought into public use.

Hay and Manure Fork.—L. D. Pitcher, Pitcherville, Ill.—This invention relates to a new manner of connecting the tines to the handle of a manure and hay fork, for the purpose of producing a substantial fastening, so that the fork will be adapted for loading and transporting loose hay and straw as securely as if the same was in bundles. The invention consists chiefly in the application of a cross bar with dovetail mortises adapted to receive the inverted V-shaped sheet metal tines, and also in a new manner of attaching the crosshead to the flattened back ends of the tines by means of screws and by the ends of the bow.

Bag Fastener.—Samuel P. Parmly, New Orleans, La.—This invention relates to a novel and convenient device for closing bags of all kinds, and consists in the combination with a knotted string of a novel star-shaped plate for fastening the same to the bag, and of a peculiarly bent wire, which is held to the bag by the said star-shaped plate, and which is to secure the outer end of the knotted string.

Filling for the Walls of Safes, etc.—Geo. H. Ireland, Somerville, Mass.—This invention relates to a new filling for walls of safes or other burglar-proof structures, and consists of a novel combination of tubes, plates and spring bars, all arranged so as to make the same almost absolutely burglar-proof. The tubes are set close together, so that they will turn, when an attempt to perforate them should be made, and the rods or bars in them are made so that their fractured ends will close together when they shall have been successfully drilled.

Coffee and Tea Pot.—Gregor Heiss and Martin Schmidt, Houston, Texas. —This invention relates to a new apparatus for producing extracts from coffee, tea,and other substances, and for straining the same, and it consists of a novel construction of the interior devices by which the substance to be treated is at first thoroughly stirred in the boiling water, and then properly strained, so that a pure and wholesome extract may be produced.

Adjustable-center Square.—M. J. Trowbridge, Cazenovia, N. Y.—This invention relates to a new center square which is to be used for laying out patterns for toothed wheels, or for other purposes, and which is so arranged that the squaring pins will be held steady in any desired position. The vention consists in the peculiar arrangement of the braces for holding the reversible tongue and the squaring pins.

Water Elevator.—G. W. Dickerson, Prairieton, Ind.—This invention has for its object to furnish an improved water elevator, which shall be so constructed and arranged that the bucket may be at all times completely under the control of the crank, which shall be simple in construction, not liable to get out of order, and conveniently operated.

Velocipede.—Fisher A. Spofford and Matthew G. Raffington, Columbus Ohio.—This invention relates to a new driving mechanism for velocipedes, and has for its object to provide greater leverage, and,consequently,greater power than could heretofore be obtained. The invention consists in the application of toothed segments, which are connected with one single lever in such manner that they will simultaneously be oscillated in opposite directions, so that the one swinging backward will impart motion by means of pinion and ratchet pawl to the driving axle.

Milk Cooler.—J. C. Sherwood, West Cornwall, Conn.—This invention lates to a new apparatus for cooling the milk as it comes from the cow, preparatory to filling the same into cans. The present invention has for its object to spread the liquid in a thin layer, while it passes over the cooling surface, so as to obtain quick and reliable action; and it consists in the application of an inclined cooling plate provided with a series of perforated transversely-projecting plates, by which the milk, as it passes through their apertures, during its downward passage on the cooling plate, is spread, so as to move in a thin sheet over the said plate, and will, consequently, have each particle thoroughly cooled.

Steam Generator.—H. Whittingham, New York city.—This invention relates to a new sectional steam generator,which is so constructed that it will provide a very large heating surface, so as to produce steam with great rapidity, and with a considerable saving of fuel. The invention consists in forming a boiler of sections of horizontal tubes connected by vertical tubes, the horizontal tubes containing smoke flues, so that the water in them will be heated from the outer as well as inner side. The invention consists, also, in forming narrow projecting strips on the sides of the vertical tubes of each section, whereby, when a number of sections are put side by side, transverse partitions are formed, to confine the products of combustion in certain desired channels.

Velocipede.—John C. Wirtz, New York city.—This invention relates to a new three-wheeled velocipede, which is especially adapted for ladies' use, and which is so constructed that the motion of the feet, by which the vehicle is propelled, cannot be perceived, and so that the driving mechanism is all concealed and protected from dust and rain. The invention consists in the general combination of a protecting shield which has the appearance of a wagon body, with the driving mechanism, which is set in motion by an oscillating footboard, said footboard being concealed by the protecting shield, so that the motion of the feet cannot be perceived. The invention also consists in arranging a convenient steering apparatus, on the front end of the reach, and in covering the same by means of a hood, so that it will be protected from the inclemencies of the weather.

Mason's Sand Screen.—Charles Lockwood, Haverstraw, N. Y.—This invention has for its object to furnish an improved mason's screen, which shall be stronger, more durable, simpler in construction, more effective in use, and which can, at the same time, be manufactured at less cost than the screens constructed in the ordinary manner.

Head-rest Attachment for Church Pews.—John H. Weeden, Water bury, Conn.—This invention has for its object to furnish an improved device for attachment to church pews, to support the head of the worshipper when inclined, and which shall be so constructed and arranged that it may be conveniently detached from the pew when no longer required for use.

Combined Child's Chair and Carriage.—James Lee, New York city.—This invention has for its object to furnish a combined chair and carriage, designed especially for use in the nursery as a toy, but which may be made larger for street use if desired, and which from the various transformations of which it is capable, will prove an unfailing source of amusement to its possessor.

Revolving Dough Mixer.—Thomas Holmes, Williamsburgh, N. Y.—This invention has for its object to furnish an improved machine for wetting the flour, or mixing or forming the dough, which shall be simple in construction and effective in operation, and at the same time easily operated.

Saw Gummer.—Abraham Staffer and Peter Staffer, Salt Creek, Ind.—This invention relates to a new and useful improvement in machines for gumming saws, whereby the saw may be gummed without removing the same from the frame.

Cultivator.—I. A. Benedict, West Springfield, Pa.—This invention relates to improvements in cultivating implements for working between the rows of corn, or other plants; and has for its object to provide a cultivator that will work the ground as much as possible between the rows without throwing it on to the plants, especially when small. It consists of a common shovel plow with broad low wings or side plates attached to each side.

Vise.—Otis Dean, Richmond, Va.—The object of this invention is to provide certain improvements in bench vises, calculated to facilitate adjusting them to any required position, and also to adapt the pins and feeding screw to be employed as a part of a drilling press.

Horse Power.—Wm. Lauver, Peru Mills, Pa.—The object of this invention is to obtain, at the same time, the maximum of compactness and speed.

Guano Distributor.—J. D. Coxwell, Gibson, Ga.—The object of this invention is to provide for public use, a light, simple, and convenient hand machine for sowing or distributing guano, or other pulverized fertilizers.

Grain Sieve.—Lorin D. Carpenter, Buffalo Grove, Iowa.—This invention consists in an arrangement of perforated angle plates of thin sheet metal and plain strips, traversing the said plates, and also in an improved arrangement for operating the sieves.

Extension Table.—Floyd Hamblin, Madrid Springs, N.Y.—This invention consists in the application to an ordinary table having a permanent top and leaves hinged to each side thereof, of other leaves hinged to legs arranged to slide in and out under the first-mentioned leaves, and to be supported in the same horizontal plane therewith by circular braces when all the leaves are spread.

Gun Carriage.—J. R. Kelso, Freedom, Mo.—This invention consists in a carriage swiveled at each end upon supports, arranged in ways or on tracks crossing each other at right angles, in such a manner that the said supports are moved forward or back in their separate ways, and that the gun may be turned to any required direction.

Brick Truck.—John M. Mayer, Rondout, N. Y.—The object of this invention is to provide a three-wheeled truck for moving the molded bricks while in a soft state, capable at all times of maintaining the load in a level condition to prevent the substance of the bricks from flowing and becoming thicker on the lower sides, as they will do when not kept in a level position.

Seeder.—Robert B. Tunstall, Norfolk, Va.—This invention consists in the arrangement upon a vehicle resembling a common wheelbarrow, without a box, of a seeding wheel having numerous seeding chambers, radiating from the center, and having adjustable openings at the periphery for discharging the seed, which is rotated by gearing with the axle of the supporting wheel, which is made heavy and forms the drill or groove for the seed A chain and roller are applied for covering and passing the seed.

Facts for the Ladies.

I have used my Wheeler & Wilson over fifteen years. It has done the sewing for two families, and numerous benevolent purposes, without one cent of repairs. I had no personal instructions, but simply followed the printed directions. MRS. R. E. HALE. Coldwater, Mich.

Business and Personal.

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

Scientific Books to order. Macdonald & Co.,37 Park Row,N.Y.

Engine and horizontal tubular boiler for sale—15 to 25-horse, now at work at 80 Greenwich st., New York.

Patents and patent articles sold, manufactured,and introduced. National Patent Exchange, Buffalo, N. Y.

Patentees, manufacturers, and venders of water wheels, mill furnishing goods,etc.,who wish their wares noticed in a forthcoming book, on Mills and Milling,will please communicate with Henry Carey Baird, Industrial Publisher, 406 Walnut st., Philadelphia. N. B.—No charge will be made for notice—none inserted unless approved by the editor. Baird's New Catalogue of Industrial Books, June 1, 1869, 72 pages, sent free to any address.

Rolling-mill blanks wanted—3-8, 7-16, 1-2, and 9-16-in. rounds, cut to 1-ft. lengths. Address Box 6,721 New York Postoffice.

See advertisement of Doty Manufacturing Co.'s Punching and Shearing machinery on last page.

Wanted—A pattern maker, with good reference. Address box 75, Ephrata, Lancaster county, Pa.

Wanted—A thorough practical machinist, familiar with the details of first-class work, and qualified to take general oversight of its execution. The right man will find a permanent situation in a well established concern,desirably located. Address with full particulars,Postoffice Box 4,499, New York city.

Wanted—Enterprising men, with large and small capital, to introduce and sell a money-making patented article. Sample and circular sent postpaid for 35c. Address Tusch & Co., 37 Park Row, Room 29, N. Y.

Steam engine, Harrison boiler, rotary pump, wrought iron steam and water pipes, much below cost, by G. Leverich, Mechanical Engineer, 80 Broadway, New York, room 46.

Superintendent wanted in a well-established machinery business, who can buy an interest. Liberal Salary to a thoroughly competent man. None other need apply. Address "Iron Works," Care Joy, Coe & Co., Tribune Buildings, New York.

Builders of bridges, railway cars, and other woodworkers will notice Steptoe, McFarlan & Co.'s advertisement, inside.

An engineer,about leaving for Europe (where he has first-class business friends), to negotiate a very valuable patent, is desirous of receiving one or two similar commissions. 1st-class firms only treated with References A 1. For particulars address H. M., Postoffice Box 6,New York.

A small,useful patent for sale. Address A.Storm,Matteawan,N.Y.

Leschot's Patent Diamond-pointed Steam Drills save, on the average, fifty per cent of the cost of rock drilling. Manufactured only by Severance & Holt, 16 Wall st., New York.

For Sale—A Patent valuable to manufacturers of farm machinery. Will sell low, or trade for lands. Send address to H. S., Box 651, Cincinnati Postoffice, Ohio.

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

New Machine for Grinding Tools,etc., great saving of files and labor by their use. Address American Twist Drill Co., Woonsocket, R. I.

Gear-cutting engines—new patterns—cut every number up to 127, and 26 in. diam., made by A. H. Saunders, Nashua, N. H.

Cider Mills for sale, and rights to manufacture. Address B. Sells, Vienna, Ont., or Shaw & Wells, Buffalo, N. Y.

Scientific American—Old and scarce volumes, numbers, and entire sets of the Scientific American for sale. Address Theo. Tusch, Box 448, or Room 29, No. 37, Park Row, New York city.

State Rights for sale of a new and valuable improvement on the velocipede, in successful operation. L. H. Soule, Binghamton, N. Y.

Glynn's Anti-incrustator for steam boilers—the only reliable preventive. Prevents foaming and does not attack the metals of the boiler Liberal terms to agents. M. A. Glynn & Co., 735 Broadway, New York.

For the best hammer and sledge handles, made of carefully-selected, well-seasoned, second-growth hickory, address Hoopes, Bro. & Darlington, West Chester Spoke Works, West Chester, Pa.

Tempered steel spiral springs made to order. John Chatillon, 91 and 93 Cliff st., New York.

A. A. Fesquet, practical and analytical chemist. Construction of chemical works, etc., 323 Walnut st., Philadelphia.

The Tanite Emery Wheel—see advertisement on inside page.

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

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

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

APPLICATIONS FOR EXTENSION OF PATENTS.

SEWING MACHINE CASES.—F. A. Ross, of New York city, for himself, and as assignee of William H. Marshall, of his interest in the extended term, has applied for an extension of the above patent. Day of hearing August 16, 1869.

GRASS HARVESTER.—James Haines, of Pekin, Ill., administrator of the estate of Jonathan Haines, deceased, has petitioned for the extension of the above patent. Day of hearing, August 16, 1869.

BANK LOCK.—Joshua H. Butterworth, Dover, N. J., has applied for an extension of the above patent. Day of hearing August 23, 1869.

MACHINERY FOR FOLDING AND MEASURING CLOTH.—J.D.Elliott,Leicester, Mass., has petitioned for an extension of the above patent. Day of hearing August 23, 1869.

METHOD OF OPERATING RECIPROCATING SAWS.—Ozias S. Woodcock, of Paris, Ill., has petitioned for the extension of the above patent. Day of hearing August 23, 1869.

KNITTING MACHINE.—Clark Tompkins, of Troy, N. Y., and John Johnson, of Boston, Mass., has petitioned for an extension of the above patent. Day of hearing, August 30, 1869.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING JUNE 15, 1869.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT OFFICE FEES:

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In addition to which there are some small revenue-stamp taxes. Residents of Canada and Nova Scotia pay $500 on application.

For copy of Claim of any Patent issued within 30 years ... $1

A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from ... $1 *upward, but usually at the price above-named.*

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Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.

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91,197.—NUT LOCK.—S. C. Adams, Buffalo, N. Y.
91,198.—CHECK-BOOK CLIP.—A. B. Auer, Chicago, Ill.
91,199.—VISE.—Noyes Baldwin, Buffalo, N. Y.
91,200.—SLIDE BLOCK FOR MULEY SAW MILLS.—A. P. Barlow, Kalamazoo, Mich.
91,201.—COMPOUND TOOL FOR REAMING AND SQUARING PIPES.—Wm. Barry, Chicago, Ill.
91,202.—GRAIN BINDER.—C. L. Beamer, Cambria, N. Y.
91,203.—BEEHIVE.—Henry Berix, Petersburgh, Ohio.
91,204.—WAGON WHEEL.—C. W. Bierbach, Milwaukee, Wis.
91,205.—INJECTOR.—A. J. Blakslee and G. C. Williams, Du Quoin, Ill.
91,206.—COTTON SEED PLANTER.—A. W. Brian, Ouachita county, Ark.
91,207.—LET-OFF MECHANISM FOR LOOMS.—L. C. Briggs and Albert Howard, Boston, Mass.
91,208.—LAMP BURNER.—A. W. Browne (assignor to Mary A. Van Alen), Brooklyn, N. Y.
91,209.—TINSMITHS' MACHINE.—Bradford Buckland (assignor to S. Stow Manufacturing Co.), Plantsville, Conn.
91,210.—CIDER MILL.—C. L. Carter, Union City, Ind.
91,211.—FEED PUMP FOR LOCOMOTIVE ENGINES.—Plumer Cheswell, Manchester, N. H.
91,212.—CULTIVATOR.—B. M. Close, West Camden, N. Y.
91,213.—CARBURETER.—W. H. Covel, New York city.
91,214.—KNITTING MACHINE.—Thomas Crane, Fort Atkinson, Wis.
91,215.—KNITTING MACHINE AND KNITTED FABRIC.—Thos. Crane, Fort Atkinson, Wis.
91,216.—COMPOSITION TO BE USED IN THE MANUFACTURE OF PAINTS, CEMENTS, HARD AND SOFT RUBBER, AND THE LIKE.—Ferdinand Dickenson, Jr. (assignor to himself and J. E. Coleman), Hartford, Conn. Antedated June 4, 1869.
91,217.—THEATER CHAIR.—Wm. Dixon, Boston, Mass.
91,218.—COMPOSITION TO DESTOY THE APPETITE FOR TOBACCO.—Edward Douglass, Gorham, Me.
91,219.—MACHINE FOR FINISHING LEATHER, PAPER, ETC.—Peter Farrell, Albany, N. Y.
91,220.—PAPER FOR THE MANUFACTURE OF PAPER BAGS.—W. E. Farrell, Philadelphia, Pa. Antedated June 4, 1869.
91,221.—PADDLE WHEEL.—A. C. Fletcher, New York city.
91,222.—DOOR SPRING.—O. V. Flora (assignor to A. Balding and J. C. Moore), Madison, Ind.
91,223.—COMPOSITION CEMENT FOR SETTING SLATES, MAKING GUTTERS, ETC.—John Fullager and Miles Byrne, New York city.
91,224.—STEAM ENGINE.—Wm. Fuzzard, Chelsea, Mass.
91,225.—BUNG CUTTER.—A. J. Gibson (assignor to W. C. Davis and J. W. Garrison), Cincinnati, Ohio. Antedated June 8, 1869.
91,226.—OAR.—R. E. Gleason (assignor to himself and E. W. Parkhurst), Libertyville, Ill.
91,227.—HOUSEHOLD IMPLEMENT.—Aaron Guinzburg, Boston, Mass.
91,228.—MODE OF ATTACHING HUBS TO AXLES.—John Gunn, Salem township, Ill.
91,229.—FEEDING DEVICE FOR MACHINES FOR COMBING COTTON, ETC.—C. F. Hadley, Chicopee, Mass., and Elisha Johnson, Wethersfield, Conn.
91,230.—WHIFFLETREE HOOK.—J. A. Hammon, Franconia, Minn.
91,231.—STOVE DRUM.—W. P. Hepburn and William Reiner, Clarinda, Iowa.
91,232.—SETTEE.—Sullivan Hill (assignor to himself and E. A. Hill), Spencer, Mass.
91,233.—CHECKER MEN.—J. W. Hyatt, Jr., Albany, N. Y.
91,234.—DOMINO.—J. W. Hyatt, Jr., Albany, N. Y.
91,235.—MANUFACTURE OF DOMINOS.—J. W. Hyatt, Jr., Albany, N. Y.
91,236.—MACHINE FOR LOADING LOCOMOTIVE TENDERS.—J. N. Jackson, Brookhaven, Miss.
91,237.—HORSESHOE CALKS.—Joseph Jorey, North Manchester, Conn.
91,238.—MACHINE FOR PEELING FRUIT.—Charles Lehman, Hartford, Conn.
91,239.—HOT-AIR ENGINE.—Wilhelm Lehmann, Nuremberg, Germany, assignor to himself and Stelin & Wulding, New York city.
91,240.—APPARATUS FOR PERFORATING PAPER FOR TELEGRAPHING.—George Little, Hudson City, N. J., assignor to himself and Marshall Lefferts, N. Y. city.
91,241.—APPARATUS FOR PERFORATING PAPER FOR AUTOMATIC TRANSMITTERS.—George Little, Hudson City, N. J., assignor to Marshall Lefferts, New York city, and Marshall Lefferts, assignor to himself and George Little.
91,242.—HAY LOADER.—A. W. Lozier, New York city.
91,243.—HAY RAKER AND LOADER.—A. W. Lozier, New York city.
91,244.—CABINET BEDSTEAD.—S. C. Maine, Boston, Mass.
91,245.—STOVE DAMPER.—H. Mallory, Milwaukee, Wis.
91,246.—HARVESTER.—J. P. Manny, Rockford, Ill.
91,247.—STEAM GENERATOR.—Carlile Mason, Chicago, Ill.
91,248.—MACHINE FOR MANUFACTURING METAL CANS.—John Mays and E. W. Bliss, Brooklyn, N. Y.
91,249.—CARTRIDGE BOX.—J. R. McGinnis, Washington, D.C. Antedated June 2, 1869.
91,250.—PISTON PACKING.—Andrew McMullin, Paterson, N. J.
91,251.—MECHANICAL MOVEMENT.—Henry Merriman, Bloomington, Ill.
91,252.—APPARATUS FOR BENDING TIRES.—John Metzgar, Rancho Gap, Pa.
91,253.—ICE VELOCIPEDE.—G. H. Miller and John Jageler, Binghamton, N. Y.
91,254.—STEAM GENERATOR.—R. B. Mitchell, Chicago, Ill.
91,255.—STEAM GENERATOR.—D. M. Nichols, New York city.
91,256.—FRUIT PICKER.—Thomas Nutting, Georgiaville, R. I.
91,257.—THRASHING MACHINE.—Geo. Oerlein, Utica, Minn.
91,258.—HAMES STRAP.—George Paddington and W. F. Crew, Waubeck, Iowa.
91,259.—BED BOTTOM.—Thomas Payne (assignor to Walter Wilkins and A. D. Plumb), Grand Rapids, Mich.
91,260.—MAGAZINE COOKING STOVE.—J. S. Perry, Albany, N. Y.
91,261.—SAFETY ATTACHMENT FOR BREASTPINS.—Charles F. Pierce, Providence, R. I.
91,262.—GRAIN SIEVE.—Peter Plamandon and N. A. Maher, Atchison, Kansas.
91,263.—LAMP.—George Pugh, Cleveland, Ohio.
91,264.—MACHINE FOR MEASURING AND WINDING CLOTH, ETC.—J. E. Race and Hiram Whitney, Chicago, Ill.
91,265.—UTERINE SUPPORTER.—J. S. Rankin, Pittsburgh, Pa.
91,266.—BEEHIVE.—E. B. Redfield, White's Corners, and E.C Hubbard, Water Valley, N. Y.
91,267.—MACHINE FOR MAKING LEAD SHAVINGS.—Joseph Repetti, Philadelphia, Pa.
91,268.—PAPER FILE.—A. S. Richards, Montgomery county Md.
91,269.—CUTTER HEAD.—Charles Richards and Willard Curtiss, Cleveland, Ohio.
91,270.—GRAIN SEPARATOR.—Henry Richmann, Cincinnati, Ohio.
91,271.—PROCESS FOR RECUTTING FILES.—Xiste Robert Worcester, Mass.
91,272.—SYRINGE FOR DESTROYING COTTON-PLANT WORMS.—Antonia Robira, Galveston, Texas.
91,273.—MEAT CHOPPER.—M. E. Russel, China, Me.
91,274.—COFFEE POT.—Silas T. Savage, Greenbush, N. Y., assignor to himself and J. S. Perry, executor and trustee.
91,275.—COOKING STOVE.—A. C. Schwanke, La Prairie,Ill.
91,276.—PERCUSSION CAP HOLDER.—F. J. Seymour,and O. N. Perkins, Meriden Conn.
91,277.—PAGING MACHINE.—C. L. Sholes, Milwaukee, Wis. Antedated June 4, 1869.
91,278.—METALLIC CARTRIDGE.—Dexter Smith, Springfield, Mass.
91,279.—PORTABLE FURNACE FOR SHRINKING ON AND REMOVING TIRES.—W. Bell Smith, Charleston, S. C.
91,280.—THILL COUPLING.—W. C. Spalding and C. P. Southwell, Watertown, Wis.
91,281.—MACHINE FOR ROUNDING UP BOOT AND SHOE SOLES.—E. M. Stevens, Chelsea, Mass.
91,282.—GRAIN BINDER.—Ole O. Storle, Norway, assignor to himself, J. G. Flint, Jr., and Mary M. Mason, Milwaukee, Wis.
91,283.—HOISTING APPARATUS.—Henry D. Stover, New York city. Antedated June 2, 1869.
91,284.—MILLSTONE PICK.—H. P. Straub, Cincinnati, Ohio.
91,285.—CORDER FOR SEWING MACHINES.—J. B. Sulgrove, Indianapolis, Ind.
91,286.—INSTRUMENT FOR PARING HORSES' HOOFS.—John Temple, Van Buren. Ohio.
91,287.—FIREPLACE HEATER.—J. M. Thatcher, Bergen, N. J.
91,288.—MACHINE FOR MAKING METALLIC NUTS.—A. S. Upson, Unionville, Conn.
91,289.—MODE OF CONSTRUCTING HOUSES.—Fred. Walton, Staines, England. Patented in England, Dec. 11, 1868.
91,290.—JAW FOR BOOMS.—Isaac Webster (assignor to Jas. F. Moses), Bucksport, Me.
91,291.—PIPE COUPLING.—F. R. Wegman (assignor to himself and F. C. Hydel) Hartford, Conn.
91,292.—GUIDE FOR SEWING MACHINE.—G. W. Wells, Washington, D. C.
91,293.—MACHINE FOR CUTTING RASPS.—J. B. West, Geneseo, N. Y.
91,294.—STEAM GENERATOR.—I. N. Wilfong, Philadelphia, Pa.
91,295.—HANGING MILLSTONES.—A. W. Winall, Cincinnati, Ohio.
91,296.—COMPOUND FOR CLEANING AND SCOURING WOOD, METAL, ETC.—F. M. Woodbury (assignor to himself and J. P. Bonnell), New York city. Antedated June 8, 1869.
91,297.—AUTOMATIC FAN.—David Aaron, San Francisco, Cal.
91,298.—MODE OF PREPARING RENNET FOR USE IN MAKING CHEESE.—L. B. Arnold, Lansing, N. Y.
91,299.—FIREPLACE.—Thomas F. Baker, Cincinnati, Ohio.
91,300.—SWIMMING APPARATUS.—Frederick Barnett, Paris, France.
91,301.—HEATING DRUM.—S. M. Bayard, Ionia, Mich.
91,302.—CARRIAGE HUB.—H. V. Belding, Oppenheim, N. Y.
91,303.—CULTIVATOR.—I. A. Benedict, West Springfield, Pa.
91,304.—APPARATUS FOR EXTINGUISHING FIRES.—J. F. Boynton, Syracuse, N. Y.
91,305.—LOOM FOR WEAVING HATS.—Peter Brooks (assignor to himself, and C. O. Crosby), New Haven, Conn.
91,306.—TIRE COOLER.—T. S. Brown, Boston, Mass., and Geo. W. Gou'd, Camden, Me. , Antedated June 9, 1869.
91,307.—GRAIN SIEVE.—Loren D. Carpenter, Buffalo Grove, Iowa.
91,308.—FASTENING FOR HAND-REIN.—L. C. Chase, Boston, Mass.
91,309.—VISE AND DRILL COMBINED.—Otis Dean, Richmond, Va.
91,310.—IRON FENCE.—D. I. DeGroat, Newburg, N. Y.
91,311.—WATER ELEVATOR.—G. W. Dickerson, Prairieton, Ind.
91,312.—TOOL FOR HOLDING DIAMONDS FOR DRESSING STONE.—John Dickinson, Bay Ridge, N. Y.
91,313.—MODE OF TREATING THE SPENT OXIDE OF IRON USED FOR PURIFYING GAS.—S. R. Divine, New York city.
91,314.—BACK FOR BRUSHES.—W. U. Dudley, Port Richmond, N. Y.
91,315.—HARVESTER RAKE.—J. C. Durborow, Ellicott's City, Md.
91,316.—STEAM GENERATOR.—Jas. Eaton, Bridgeport, Ill.
91,317.—HOE AND RAKE.—Augustin Ellis and Oliver Albertson, Salem, Ind.
91,318.—SEWING MACHINE.—M. J. Ferren (assignor to himself and W. J. Battles), Stoneham, Mass.
91,319.—PIPE COUPLING.—J. J. Fifield, East Boston, Mass.
91,320.—TEA AND COFFE POT.—J. H. Finch, Rochester, N. Y.
91,321.—BEEHIVE.—J. E. Finley, Enon, Ohio.
91,322.—VELOCIPEDE.—D. P. Flint, Nueces county, Texas.
91,323.—VELOCIPEDE.—D. P. Flint, Nueces county, Texas.
91,324.—MANUFACTURE OF IRON AND STEEL.—J. Lee Floyd, Philadelphia, Pa.
91,325.—LAMP.—Jim B. Fuller, Norwich, Conn.
91,326.—SASH-CORD FASTENIMG.—J. J. Gabel, Lebanon, Pa.
91,327.—MECHANISM FOR DRIVING SEWING MACHINES.—Caroline Garcin and U. Adam, Colmar, France.
91,328.—PLOW.—S. T. Godfrey, Seaville, N. J.
91,329.—ASH SIFTER.—B. J. Greely, Boston, Mass.
91,330.—FRUIT STAND.—Arthur Greenman, East Kendall, N. Y.
91,331.—ENVELOPE.—G. P. Hachenberg, Hudson, N. Y.
91,332.—EXTENSION TABLE.—Floyd Hamblin, Madrid Springs, N. Y.
91,333.—COFFEE AND TEA POT.—Gregor Heiss and Martin Schmidt, Houston, Texas.
91,334.—DIAPER.—J. C. Hempel, Baltimore, Md.
91,335.—REVOLVING DOUGH MIXER.—Thomas Holmes, Williamsburgh, N. Y.
91,336.—MILKING STOOL.—E. W. Hopkins, Oneota, N. Y.
91,337.—STEAM-ENGINE STOP-VALVE.—W. H. Howland, San Francisco, Cal.
91,338.—WATER WHEEL.—Rodney Hunt (assignor to himself J. B. Waite, and D. B. Flint), Orange, Mass.
91,339.—MANUFACTURE OF RAILWAY RAILS.—J. S. Hunter, Lowellville, Ohio.
91,340.—LINE HOLDER.—C. S. Hutchins, Canton, Conn.
91,341.—METHOD OF MAKING SOLID COLLODION.—J. W. Hyatt, Jr., Albany, N. Y., and I. S. Hyatt, Rockford, Ill.
91,342.—BURGLAR-PROOF SAFE.—George H. Ireland, Somerville, Mass.
91,343.—HOMINY-MILL BURR.—Andrew P. Jackson, Memphis, Ind.
91,344.—FIELD FENCE.—D. W. Keefer, Leechburg, Pa.
91,345.—GUN CARRIAGE.—J. R. Kelso (assignor to himself and Ernest Quast), Freedom, Mo.
91,346.—APPARATUS FOR DETACHING HORSES FROM CARRIAGES.—Solomon Kepner (assignor to J. E. Meister, and J. F. Evans), Pottstown, Pa.
91,347.—HARVESTER.—John Kershaw, Kent, Ohio.
91,348.—MACHINE FOR THREADING BOLTS AND NUTS.—John Killeier, West Richfield, Ohio.
91,349.—BOTTLE STOPPER.—F. Kutscher, New Haven, Conn.
91,350.—CHILD'S CHAIR AND CARRIAGE.—James Lee, New York city.
91,351.—CONVEYER-"FLIGHT."—John M. Lemon, Polk City, Iowa.
91,352.—ROCK DRILL.—Samuel Lewis, Williamsburgh, N. Y.
91,353.—SAND SCREEN.—Charles Lockwood, Haverstraw, N. Y.
91,354.—PLOW.—Josiah Long, Leavenworth, Ind

91,355.—Wool Table.—Jesse Mallette, Catharine, N. Y.
91,356.—Spittoon Footstool.—Charles Marcher, New York city.
91,357.—Cooking Stove.—Geo. Mayer, Cincinnati, Ohio.
91,358.—Brick Truck.—John Mayer, Rondout, N. Y.
91,359.—Permutation Lock.—John H. Morse (assignor to himself and Henry W. Wells), Peoria, Ill. Antedated May 28, 1869.
91,360.—Churn.—J. L. Nettleton (assignor to himself and F. Caffray), West Cheshire, Conn.
91,361.—Cotton-bale Tie.—T. Campbell Oakman, Paterson, N. J.
91,362.—Bag Fastener.—S. P. Parmly, New Orleans, La.
91,363.—Animal Trap.—Henry Pattison, Duck Creek, Ill.
91,364.—Mosaic Covering for Floors.—Shadrach H. Pearce, Boston, Mass.
91,365.—Apparatus for Destroying Worms on Cotton Plants.—M. Perl, Houston, Texas. Antedated June 9, 1869.
91,366.—Railroad Car Duster.—Lawrence M. Platt, Chicago, Ill.
91,367.—Fork Blank.—J. C. Richardson, Ilion, N. Y.
91,368.—Valve and Opening for Steam Engines.—F. Rochow, New York city.
91,369.—Cabinet Hook.—J. B. Sargent, New Haven, Conn.
91,370.—Machine for Rounding Whalebone for Corsets.—James A. Sevey, Boston, Mass.
91,371.—Fur Collar.—R. M. Seldis (assignor to Myer Stern), New York city.
91,372.—Milk Cooler.—J. C. Sherwood, West Cornwall, Conn.
91,373.—Mode of Purifying and Deodorizing Sewage, etc.—William Cameron Sillar, Matheran, Sydenham Hill, Robert George Sillar, 7 Cintra Park, Upper Norwood, and George William Wigner, Grove Lane, Camberwell, Great Britain.
91,374.—Liquid Meter.—J. Plumer Smith, Cleveland, Ohio.
91,375.—Fireproof Ceiling.—Samuel P. Snead, Louisville, Ky.
91,376.—Automatic Gas Regulator for Blow Pipes.—Joseph H. Snow, Providence, R. I.
91,377.—Compounds Containing Xyloidine.—Daniel Spill, Paradise Terrace, Hackney, England.
91,378.—Mode of Protecting Insulated Telegraph Wires.—Daniel Spill, Paradise Terrace, Hackney, England.
91,379.—Velocipede.—Fisher A. Spofford and Matthew G. Raffington, Columbus, Ohio.
91,380.—Saw Gummer.—Abraham Staffer and Peter Staffer, Salt Creek, Ind.
91,381.—Flour Cooler.—Abraham Staffer and Peter Staffer, Salt Creek, Ind.
91,382.—Muff.—Myer Stern and R. M. Seldis, New York city.
91,383.—Steam Plow.—Linus Stewart, San Francisco, Cal.
91,384.—Sawdust Feeder for Furnaces.—Samuel Sykes (assignor to himself and Michael Gorland), Chippeway Falls, Wis.
91,385.—Center Square.—M. J. Trowbridge, Cazenovia, N. Y.
91,386.—Seeder.—Robert B. Tunstall, Norfolk, Va.
91,387.—Post Auger.—A. Vaughan, Chicago, Ill.
91,388.—Attachment of Main Springs to Watch Barrels, etc.—Arthur Wadsworth, Newark, N. J. Antedated December 15, 1868.
91,389.—Head-rest for Church Pews.—John H. Weeden (assignor to himself and L. G. Arnold), Waterbury, Conn.
91,390.—Trace Buckle.—Jacob Welker, Attica, N. Y.
91,391.—Rolling Tobacco.—John Wettstein, Lynchburg, Va.
91,392.—Carpet Stretcher and Nailer.—Elonzo S. Wheeler, Westport, Conn.
91,393.—Mode of Protecting Insulated Telegraph Wires.—Edward Orange Wildman Whitehouse, Stoke, Newington, England.
91,394.—Knob Latch.—Andrew F. Whitting, Greenville, Conn.
91,395.—Steam Generator.—H. Whittingham, New York city.
91,396.—Washing Machine.—Flavius L. Wickham, Pavilion, Ill.
91,397.—Table-leaf Support.—Charlas P. Wing, Lyonsville, Ill.
91,498.—Velocipede.—John C. Wirtz, New York city.
91,399.—Corn Planter.—George H. Wood, Cambridge City, Ind.
91,400.—Punch.—John Wright (assignor to himself and J. W. Wells), Middleport, Ohio.
91,401.—Harvester Rake.—Abram Adams, Boston Station, Ky.
91,402.—Apparatus for Tanning Hides.—Henry W. Adams, Philadelphia, Pa.
91,403.—Device for Carrying Lumber from the Saw in Circular Saw Mills.—John H. Adams, Martinsville, Ind.
91,404.—Railway Car Brake.—Arthur M. Allen, New York city.
91,405.—Necktie.—John Bachelder, Norwich, Conn.
91,406.—Fastening for Necktie.—John Bachelder, Norwich, Conn.
91,407.—Process of Cleaning Cotton and Woolen Wastes from Oils, Grease, etc.—Haydn M. Baker, Washington, D. C.
91,408.—Process for Cleaning Plate Printers' Cloths, etc.—Haydn M. Baker, Washington, D. C.
91,409.—Cabinet for Dressing Bureau.—Wm. E. Beames, New York city.
91,410.—Machine for Carving and Ornamenting Woodwork.—Myron T. Boult, Battle Creek, Mich.
91,411.—Fire Extinguisher.—J. F. Boynton, Syracuse, N. Y.
91,412.—Grain Separator.—Abram Burkholder, Cornelius Burkholder, and Henry K. Burkholder, Clear Spring, Pa.
91,413.—Safety Valve.—Charles Burley, Cincinnati, Ohio.
91,414.—Gluing Hopper.—James W. Campbell and William J. Miller, New York city.
91,415.—Potato Digger.—Horace Carrier, Kirtland, Ohio.
91,416.—Telegraph Wire.—Alanson Cary (assignor to the American Compound Telegraph Wire Company), New York city.
91,417.—Machine for Making Compound Telegraph Wire.—Alanson Cary (assignor to the American Compound Telegraph Wire Company), New York city.
91,418.—Hoop Skirt.—John F. Chase, Augusta, Me.
91,419.—Cartridge Box.—Felix Chillingworth, Springfield, Mass.
91,420.—Corn-stalk Cutter.—Milton Clark, Oakley, Ill.
91,421.—Breech-loading Firearm.—Loughlin Conroy, New York city.
91,422.—Curtain Fixture.—Henry T. Cooper (assignor to himself and Wm. Pitman), New York city.
91,423.—Apparatus for Making Light from Hydrocarbon Liquids.—E. Hall Covell, New York city.
91,424.—Railway Car Axle.—Daniel M. Cummings, Enfield, N. H., assignor to himself, Francis H. Wells, and Salmon B. Godfrey.
91,425.—Harness Tug.—J. S. H. Dickinson, Jackson, Pa.
91,426.—Mold for Casting Solder.—John Fanning, Brooklyn, N. Y., assignor to Thomas Otis Le Roy and Co., New York city.
91,427.—Animal Trap.—A. C. Flanders, Owatonna, Minn.
91,428.—Saw Handle.—Joseph Flint, Rochester, N. Y.
91,429.—Match-boxing Machine.—Nelson B. Forest, Auburn, N. Y.
91,430.—Turbine Water Wheel.—Theodore M. Fuller, Hainesville, N. J.
91,431.—Harness-operating Mechanism for Looms.—John F. Gebhart, New Albany, Ind.
91,432.—Device for Raising and Kneading Bread.—A. G. Good, Reading, Pa.
91,433.—Laundry Heater.—Charles H. Goss, Troy, N. Y.
91,434.—Guano Distributor.—John D. Coxwell, Gibson, Ga.
91,435.—Mode of Attaching Rubber Tires to Wheels.—J. Ashton Greene, Brooklyn, N. Y.
91,436.—Hot-air Furnace.—Daniel Gusweiler (assignor to himself and Jacob Hoffner), Cincinnati, Ohio.
91,437.—Miniature Rink.—Cordelia C. Hall, Saratoga Springs, N. Y.
91,438.—Velocipede.—C. A. Harper, New York city.
91,439.—Skirt Board and Ironing Table.—L. M. Harvey, Albany, N. Y. Antedated June 4, 1869.
91,440.—Apparatus for Shoveling Grain.—T. D. Hawley, Detroit, Mich.
91,441.—Cornice for Curtains.—Charles Washington Hill, New York city.
91,442.—Cartridge Case Charger.—A. C. Hobbs, Bridgeport, Conn.
91,443.—Extension Slide for Gas Fixtures.—John Horton, New York city.
91,444.—Corn Harvester.—William B. Hubbard, Arrington Depot, Va.
91,445.—Plow.—Leavitt Hunt, Weathersfield, Vt.
91,446.—Oil for Curriers' Use.—J. B. Kendall, Boston, assignor, to himself and J. O. Safford, Salem, Mass.
91,447.—Apparatus for Distilling Hydrocarbons.—J. J. Johnston, Allegheny City, assignor to John T. Tyler, A. R. Hurst, Henry M. Myers, and David M. Armor, Pittsburgh, Pa. Antedated June 12, 1869.
91,448.—Apparatus for Distilling Hydrocarbon Oils.—J. J. Johnston, Allegheny City, assignor to John T. Tyler, A. R. Hurst, Henry M. Myers, and David M. Armor, Pittsburgh, Pa. Antedated June 10, 1869.
91,449.—Method of Making Carpenters' Squares.—H. K. Jones, Kensington, Conn.
91,450.—Sadiron Heater.—A. J. Kennedy, St. Louis, Mo.
91,451.—Oven.—D. A. Kennedy, Beloit, Wis., assignor to himself, Wm. Wadsworth, and E. D. Murray.
91,452.—Nail Extractor.—Wm. Knaus, Otterville, Mo.
91,453.—Combination of Rocker, Sled, and Swing.—Geo. Knell, Moorestown, N. J. Antedated June 8, 1869.
91,454.—Churn Dasher.—Gottleib Lange, East Saginaw, Mich.
91,455.—Roofing Paint.—C. W. Langworthy, Bergen, N. J.
91,456.—Horse-Power.—Wm. Lauver, Peru Mills, Pa.
91,457.—Wind Wheel.—T. S. Lines, Newcastle, Ind.
91,458.—Fabric from Fibrous Sheets and Hard Rubber.—R. O. Lowrey, Salem, N. Y.
91,459.—Fire Extinguisher.—S. C. Maine, Boston, Mass.
91,460.—Skate.—M. W. Marshall, Hudson, Mich.
91,461.—Sawing Machine.—Wm. Martin, Bay City, Mich., assignor to himself and H. B. Everett, Washington, D. C.
91,462.—Horse Fetter.—A. P. Mason (assignor to himself and Zalmon Hanford), Gowanda, N. Y.
91,463.—Bridle Bit.—A. P. Mason (assignor to himself and Zalmon Hanford), Gowanda, N. Y.
91,464.—Coulter Cle ner.—A. B. Mattoon, Auburn, N. Y.
91,465.—Sash Fastener.—W. W. Maughlin, Baltimore, Md.
91,466.—Manufacture of White Lead.—F. F. Mayer, New York city.
91,467.—Churn Power.—David McCurdy, Ottawa, Ohio.
91,468.—Rotary Steam Engine.—Thomas McEwen, Chicago, Ill.
91,469.—Rocking Chair.—A. K. McMurray, Utica, N. Y.
91,470.—Revolving Show Case.—O. H. Melendy, Delhi, Iowa.
91,471.—Corn Plow.—A. D. Michener and J. W. Steigmeyer, Attica, Ohio.
91,472.—Plow.—W. D. Miller, Enon, Ohio.
91,473.—Postal-currency Envelope.—Fisk Mills, Washington, D. C., assignor to himself, M. P. Norton, Troy, N. Y., and G. H. Penfield, Hartford, Conn.
91,474.—Deodorizing Apparatus for Water Closets.—Henry Moule, Fordington, and Henry John Girdlestone, London, England.
91,475.—Construction of Hot-water Boilers.—Anton Müller, Brooklyn, N. Y.
91,476.—Machine for Making Rubber Hose, etc.—John Murphy and A. H. Hook, New York city.
91,477.—Method of Coating Hinges with Tin.—H. M. Myers, Allegheny City, Pa.
91,478.—Machine for Refitting Conical Valves.—Isaiah Nutt, New York city.
91,479.—Combined Latch and Lock.—Anton Ochsner, New Haven, Conn.
91,480.—Manufacture of Paper.—John Pickles, Wigan, England.
91,481.—Milk Cooler.—M. F. Potter, Kaneville, Ill.
91,482.—Harvester.—Geo. Pye, Boston, Mass.
91,483.—Hopper Cock.—Peter Regitz, Chicago, Ill.
91,484.—Sewing Machine Work Plate.—George Rehfuss, (assignor to the American Buttonhole Over-seaming & Sewing Machine Co.), Philadelphia, Pa.
91,485.—Evaporating Apparatus.—Dexter Reynolds, Albany, N. Y.
91,486.—Method of Constructing Piles for Forming Axles, etc.—Percival Roberts, Philadelphia, Pa.
91,487.—Potato Digger.—James Roberts, White Pigeon, Mich.
91,488.—Boat Detaching Apparatus.—William S. Ryerson, (assignor to himself, Amos L. Tripp, and Charles Chambers), New York city.
91,489.—Corn Planter.—H. C. Shafer, Petersburg, Ind.
91,490.—Sash Holder.—Christian Sholl, Mount Joy, Pa.
91,491.—Ash Sifter.—De Witt Stevens, Newark, N. J.
91,492.—Beehive.—Solomon Stevens, Terre Coupee, Ind.
91,493.—Smelting Furnace.—Charles H. Swain, Brooklyn, N. Y.
91,494.—Potato and Corn Planter.—A. J. Taylor, Manchester, Ind.
91,495.—Baling Press.—H. H. Tift, Mystic, Conn.
91,496.—Gas Stove.—L. Trowbridge and W. H. Trowbridge, New York city.
91,497.—Reversible Cultivator.—Seth G. Tufts, Maineville, Ohio.
91,498.—Machine for Making Covered Cord.—John Turner, Norwich, Conn.
91,499.—Apparatus for Making Gas from Hydrocarbons.—John T. Tyler, Pittsburgh, and James J. Johnston, Allegheny City, assignors to J. T. Tyler, A. R. Hurst, H. M. Myers, and D. M. Armor, Pittsburgh, Pa. Antedated June 12, 1869.
91,500.—Whiffletree.—Alexander Vail, Henry, Ill.
91,501.—Harvester.—W. J. Wallis and W. E. Huttmann, Chicago, Ill.
91,502.—Wine and Cider Press.—Joseph Weizenecker, St. Louis, Mo.
91,503.—Process for Making Augers and Boring Bits.—Cornelius Whitehouse, Bridgetown, near Cannock, England.
91,504.—Process of Tanning Hides.—H. L. Wilcox, Percival, Iowa.
91,505.—Butchers' Steel.—J. R. Wood (assignor to C. G. Taft, Jr.), Providence, R. I.

REISSUES.

14,517.—Grain Separator.—Dated March 25, 1856; reissue 3,502.—C. Aultman, Mansfield, Ohio, assignee, by mesne assignments, of Cyrus Roberts and John Cox.
70,885.—Fanning Mill, Grain and Seed Separator.—Dated Nov. 12, 1867; reissue 3,503. Division A.—Harrison Ogborn, Richmond, Ind.
70,885.—Fanning Mill.—Dated Nov. 12, 1867; reissue 3,504. Division B.—Harrison Ogborn, Richmond, assignor to Ellis Michael, Laporte, Ind.
87,968.—Composition for Welding Iron and Steel.—Dated March 16, 1869; reissue 3,505.—J. B. Rand, Concord, N. H.
35,842.—Apparatus for Recovering Gold and Silver from Waste Solutions.—Dated July 8, 186 ; reissue No. 1,652, dated April 5, 1864; reissue No. 3,506.—The Shaw & Wilcox Co., Bridgeport, Conn., assignees, by mesne assignments, of Jehyleman Shaw.
72,697.—Gasoline Head Light.—Dated Dec. 24, 1867; reissue No. 3,507.—The American Railway Gas Light Co., New York city, assignees, by mesne assignments, of J. B. Terry.
38,001.—Lamp for Locomotive Head Lights.—Dated March 24, 1863; reissue No. 3,508.—James Radley, Alexander McAlister, and R. S. Aikman, New York city, assignees, by mesne assignments, of Peter Budenbach.

DESIGNS.

3,537.—Trade Mark.—P. M. Consuegra, New York city.
3,538.—Lantern.—G. H. Deuell, Brooklyn, N. Y.
3,539.—Trade Mark.—J. I. Livingston, Pittsburgh, Pa.
3,540 to 3,547.—Carpet Pattern.—E. J. Ney, Middlesex county, assignor to the Lowell Manufacturing Co., Lowell, Mass. Eight Patents.
3,548.—Fireplace Heater.—Philip Rollhaus, Port Chester, N. Y.
3,549.—Stove.—J. R. Rose and E. L. Calely (assignors to Cox, Whiteman & Cox), Philadelphia, Pa. Antedated May 25, 1869.
3,550 and 3,551.—Stove.—I. N. Ross, Holden, Mass., assignor to Earle Stove Co. Two Patents.
3,552 and 3,553.—Cook's Stove.—I. N. Ross, Holden, Mass., assignor to Earle Stove Co. Two Patents.
3,554.—Stove.—Garrettson Smith and Henry Brown (assignors to Sharp & Thomson), Philadelphia, Pa. Antedated May 25, 1869.

EXTENSIONS.

Miter Machine.—G. W. La Baw, Jersey City, N. J.—Letters Patent No. 12,956, dated May 29, 1855; reissue No. 3,445, dated May 18, 1869.
Machine for Punching Metal.—Geo. Fowler, Seymour, Conn., and Sophronia and Maltby Fowler, Wallingford, Conn., administrators of De Grasse Fowler, deceased.—Letters Patent No. 12,723, dated April 17, 1855. Act of Congress approved March 3, 1869.
Faucet.—E. A. Sterry, Norwich, Conn.—Letters Patent No. 13,047, dated June 12, 1855.

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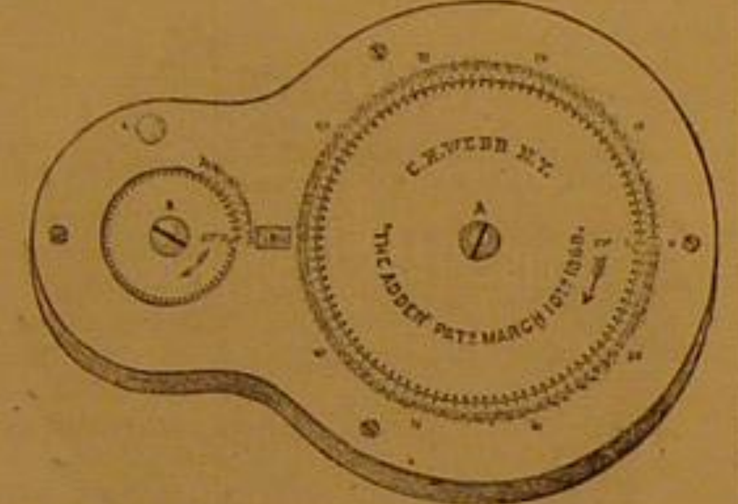

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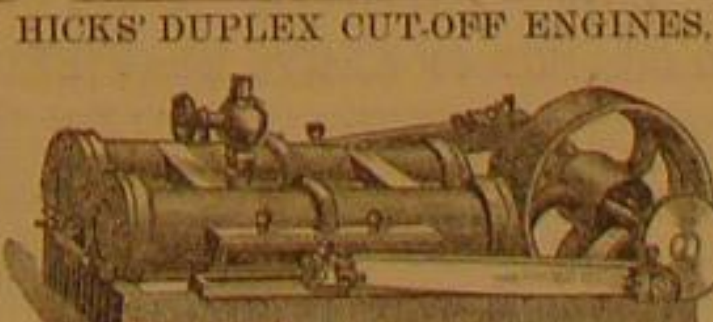

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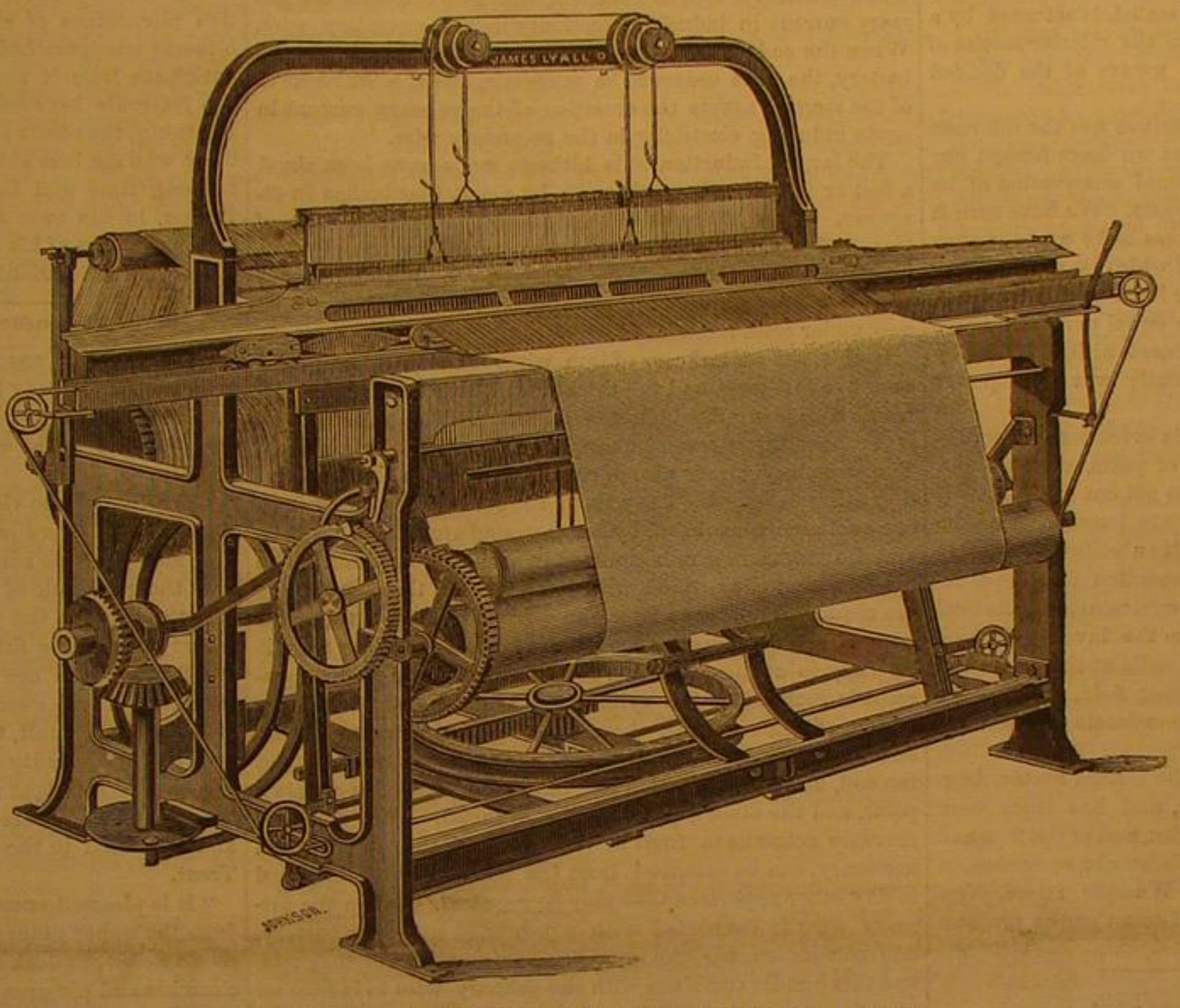
Improvement in Looms.

We are seldom called upon to illustrate and describe a more important invention than the one shown in the accompanying engravings. The precise date at which the shuttle in the form which it has held so long was first employed in weaving would be hard to fix. It is mentioned in Job vii., 6. "My days are swifter than the weaver's shuttle." In this passage evident allusion is made to the darting motion of the shuttle when thrown by hand, and it is a most beautiful poetic figure by which the brevity of life is illustrated.

It is certain that the throwing of the shuttle by hand was practiced many centuries ago, and the fact that this method is still retained in the manufacture of many kinds of fine fabrics shows how difficult has been the substitution of any application of power to this motion, which could adequately take the place of the hand, in all kinds of weaving.

The introduction of the picker staff and its adjuncts to actuate the shuttle was an immense stride in the art of weaving. It and the Jacquard attachment constitute perhaps the most remarkable improvements made in the art of weaving up to the date of the present invention.

Notwithstanding the persistence with which the ancient form and method of actuating the shuttle have held their ground, there have always existed serious difficulties, which it was desirable to obviate. Without entering too minutely into details which are perfectly familiar to those acquainted with the art of weaving in all its branches, we will specify a few important defects that the general reader may understand the important advantages the device under consideration is destined to accomplish.



LYALL'S PATENT POSITIVE MOTION LOOM.

First, the distance to which the shuttle can be thrown with certainty, either by the hand, or by the use of the picker staff, is limited, and the difficulty of weaving wide goods is consequently so much greater than that of medium or narrow textures of similar materials, that the cost of wide goods per square yard is considerably more than the narrow. This alone would render a shuttle motion, capable of weaving wide goods as cheaply as narrow, a great desideratum.

Second, the motion of the shuttle, having no positive relation to the other parts of the loom, the operator has no control over it during the time it is traversing the distance between the shuttle boxes; and the motions of the other parts, if by accident they should take place a little too soon, through the breaking of any of the working parts, or from any other cause, are liable to clash with that of the shuttle. To illustrate this, suppose the shuttle, impelled by too feeble a stroke, to pause in its passage between the sheds of the warp. In a power loom of the ordinary construction the lay would then make its beat, and either drive the shuttle through the warps, making an extensive breakage, or it would spring the dents of the reed. Or both these accidents may occur at the same moment.

In a piece of fine goods the bending of the dents is a disaster which cannot be wholly repaired. They cannot be again perfectly straightened without taking the piece out of the loom, and if the piece is woven to the end with such a defect in the reed, a slack woven streak will appear through the entire remainder of the tissue. In order that the shuttle may traverse with certainty, a regular speed must also be maintained, below which it is impossible to work a power loom with success.

Third, the shuttle reaches the shuttle box after its flight in either direction, and comes to rest before the lay makes its beat. An adjustment so perfect that, at this point, the thread of the weft shall be firmly drawn up against the exterior threads of the warp opposite the shuttle, is necessary to make a perfect selvedge. This perfect adjustment is difficult of attainment, so much so that the character of the selvedge on a piece of linen or silk goods is one of the criterions by which the quality of the article is determined.

To remedy these defects *in toto*, was a reform so radical in its nature, that a motion radically different was necessitated. It is evident from the nature of the case that no absolute connection between the shuttle and any appliance working exterior to the sheds of the warp, can be made capable of lateral motion without breaking the threads. The problem may therefore be enunciated as follows:

Required to produce absolute, positive, and uniform motion in a shuttle, by means of an external appliance moving exteriorly to the sheds of the warp *without absolute and positive connection between the shuttle and the motor through which it receives its motion.* A problem which the majority of mechanics would have pronounced impossible had not its possibility been demonstrated by this invention. But the problem is further complicated by another condition which is omitted in the general enunciation, namely, no lateral motion must be imparted to the threads of the warp.

Fig. 2.—Elevation of the Shuttle and Shuttle Carriage.

The ingenious method by which these conditions are fulfilled is shown by Fig. 2, which represents the shuttle resting in its carriage, *o*. Motion is imparted to the carriage and through it to the shuttle by means of a stout cylindrical band, *n*, in a manner to be hereafter described.

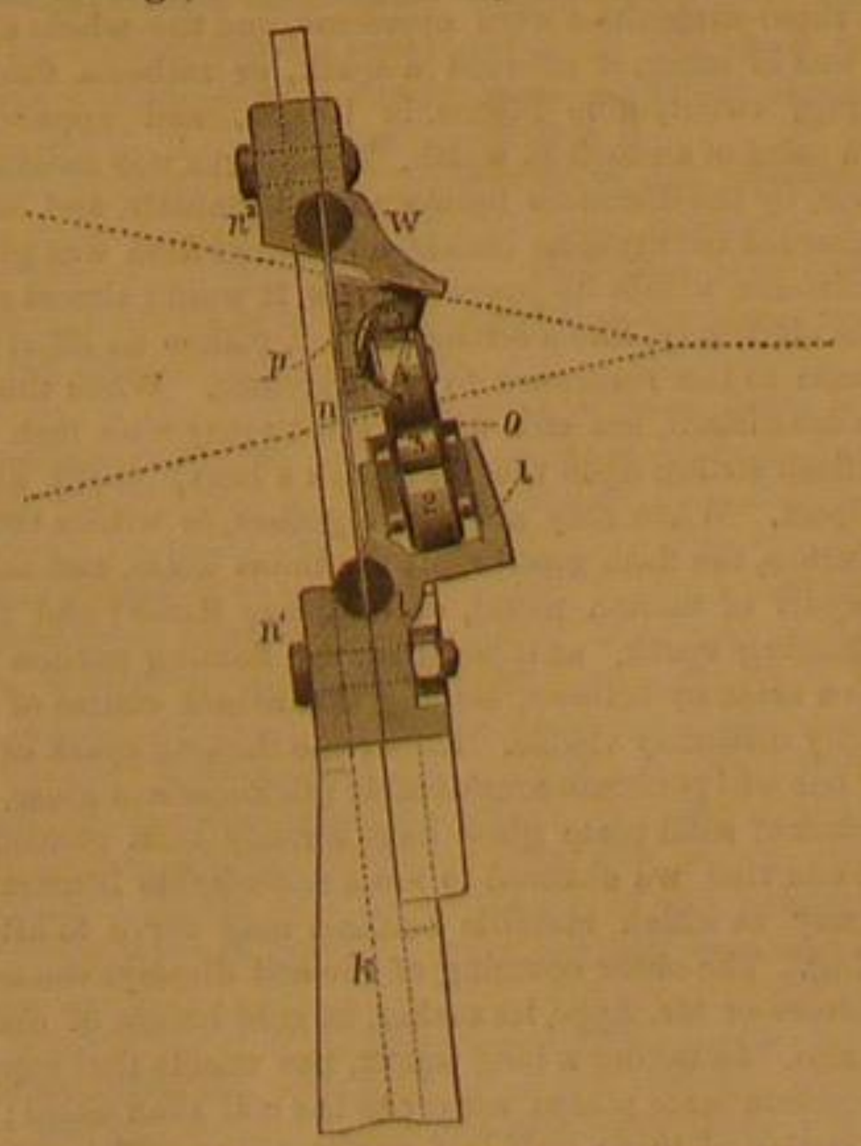


Fig. 3.—Section of Lay and Reed containing Shuttle and Shuttle Carriage.

Let the reader now imagine a sheet of parallel threads stretched between the shuttle, *p*, and its carriage, *o*, and bear in mind that *l* is the upper surface of a race-way running across the lay beneath the warp, upon which the wheels numbered 2 roll. Also notice that the pivots of the wheels, 2, play in slotted bearings, so that their upper surfaces roll on the lower surfaces of the wheels numbered 3. Now suppose the shuttle to be taken off the carriage or driver, *o*, and let this be drawn to the left in the direction of the arrow. It is now evident that the wheels, 2, will revolve in the direction of the arrows drawn upon them, and that their circumferential motion will always be exactly equal to the motion of the carriage, *o*, upon the race-way, *l*, of the lay. But as the slotted bearings of the wheels, 2, allow the weight of the carriage to rest on the pivots of the wheels, 3, and these wheels rest on the tops of the wheels, 2, the wheels, 3, must evidently receive a counter motion in the direction of the arrows marked on them, exactly equal to the motion of the wheels 2, which is likewise equal to the motion of the carriage along the race-way, *l*. If now the sheet of threads be brought into contact with the wheels, 3, it will be seen that while the wheels, 2, are rolling along the race-way, *l*, the wheels, 3, are rolling along the *under* side of the shed of *warp threads*, causing no more lateral motion in those threads than the wheels, 2, cause in the lay, *l*, which is nothing.

We have now seen that the carriage itself produces no tendency to lateral motion in the threads of the warp. Now let us lay on the shuttle, holding it to its place by a beveled rail, a section of which is shown at *w*, Fig. 3; and move the carriage in the same direction as before. The wheels, 2, revolve to the left, and cause wheels, 3, to revolve to the right, and roll along the bottom of the sheet of warp threads. Some of these threads will be successively engaging at each moment between wheels, 3 in the carriage, and wheels, 4, in the shuttle; and, as these threads may be moved in a vertical direction without conflicting with the object we wish to attain, wheels, 4, also commence rotating to the left and thus roll along the top of the sheet of warp threads, at exactly the same speed as wheels, 3, so that each thread of the warp in succession is passed between the lower surfaces of the wheels, 4, and the upper surfaces of the wheels, 3, without being pulled laterally, their only motion being a slight vertical one, owing to the relative positions of the wheels. The wheels, 5, do not engage with the wheels, 4, but roll along the under surface of the beveled rail, *w*, Fig. 3, holding the shuttle down to its work.

The formation of the race-way in which the shuttle carriage rolls, is shown in Fig. 3. The back is the reed, *n*. The beveled rail which holds the shuttle from falling off the carriage in front, is shown at *w*, and another rail, *l*, does the same for the carriage. When the shuttle and carriage are in place they can only be removed by drawing them out at the end of the lay, unless the bevel rail be taken off by unscrewing the bolts which hold it in place. The extreme lightness with which the parts move, is shown by the fact that, in our recent examination, we found we could easily actuate the loom weaving the six yards wide drugget, by a crank screwed on to the main shaft; the labor being scarcely more than that required to turn a grindstone.

Fig. 1 is a perspective view of a power loom with this shuttle movement attached. In this engraving the band, *n*, which draws the carriage, *o*, may be traced passing over grooved pulleys fixed to the ends of the lay, down over other grooved pulleys attached to the lower parts of the swords, and from thence around a horizontal pulley under and a little back of the cloth beam. Motion is imparted to the horizontal pulley, from the main shaft, by means of a pair of beveled gears, driving a short vertical shaft, with crank and pitman at its lower end, actuating a rack and a pinion attached to the shaft of the horizontal pulley.

A reversing motion being thus given to the horizontal pulley, the band, *n*, which draws the shuttle carriage, is alternately wound up on one side, and unwound on the other side, and a reciprocating movement imparted to the shuttle carriage and shuttle. It is obvious now that by putting different sized pinions upon the shaft of the horizontal pulley, or by speeding up from the rack, any amount of throw may be obtained for the shuttle, so that the width of the piece to be woven, is only limited by other considerations; so far as the shuttle is concerned there would be no difficulty in weaving a piece sixty yards wide, if such a width were required, at precisely the same rate that it travels in narrow goods, and producing a given number of square yards of cloth just as rapidly in one case as the other. It will be also obvious that any precise rate of speed is not essential, when it is understood that the lay is actuated by a cam motion, and that the cam groove is so cut that the lay must remain stationary until the shuttle has passed entirely through between the sheds, and drawn the shoot of the weft perfectly tight. If a loom were stopped with the shuttle midway between the sheds, and then started, the first thing it would do would be to draw the shuttle out of the way. In short, a breakage resulting from failure of any part of the loom to operate, is a contingency so remote, that it may be considered practically to be nothing.

The loom frame, yarn beam, cloth roller, let-off and take-up motions, together with the heddles, and the means for operating them, are of any usual or desired kind and do not require description here. The lay swings upon swords like those of other looms, but as we have stated, is actuated by a cam, instead of a crank motion. As to the relative merits of the two motions for actuating a lay, we are of the decided opinion the cam motion is the better.

We should neither do justice to ourselves nor the interests of our readers, if we failed to state that we have formed our opinions of this improvement, from actual observation of its operation, both on narrow and wide goods. We have seen it weave various textures, from fine dress silks up to woolen drugget six yards in width, in each of which its work was of the most satisfactory kind. No power loom ever before used can be relied upon to make a selvedge equal to it, and, if we mistake not, many lines of goods produced hitherto only by hand weaving will ere long be successfully woven by power on the positive motion loom.

Instead of complicating the loom, this invention has actually simplified it, reducing the number of parts, and introducing no motions or attachments liable to get out of repair. It is to the loom what the link motion is to locomotive engineering, or the compass to navigation. It substitutes certainty for uncertainty and thus lays the foundation for future development in the textile arts hitherto unattainable. Radical in its character, it may be compared to the invention which placed the eye of the sewing-machine needle at the point, and like that invention, it will, in its proper field, be likely to produce results impossible at present to estimate at their true value.

This improvement was patented in the United States, Aug. 11, 1868, by James Lyall, of this city, and has since been patented in the chief European countries, and is the first and only positive shuttle-motion loom. It is now in operation, in various kinds of work, at 35 and 37 Wooster street, New York, the office of the Positive Motion Loom Company, whom address for further information.

PLAYING WITH LIGHTNING.

From All the Year Round.

Although we had inspected electrical machines, and had looked as scientific as possible at the sparks we had seen elicited from them, the grand and heroic idea of lightning-making had never left us. Consequently, when we were told that lightning was made and exhibited at certain stated hours in the unromantic district of Regent street, we received the statement with some incredulity; and it was to test its truth that, after many years, we came to revisit the Polytechnic. Let us endeavor to give some account of what we learn from the lucid and interesting lecture, which explained to us the extraordinary performances of the great Induction Coil.

It was discovered by Faraday, many years ago, that a coil of wire, wound loosely round a magnet, became actively electric at the moment when the magnet was either placed within its folds or withdrawn from them, and also that a galvanic current, in passing round a conducting circuit, produces an "induced" current in another conductor that surrounds the first. A galvanic current is usually generated by what is called a galvanic battery, consisting of two dissimilar metals or other substances, technically named elements, not touching each other, but immersed in some acid fluid. Chemical action is excited, and electricity, in the form known as galvanism, is set free. If the elements are connected together outside the acid, by a piece of wire, or any other conductor, the electricity will proceed from one element, called the positive pole of the battery, and will pass along the wire to the other or negative pole, thus making what is called a circuit. If the wire be interrupted, the electricity, if present in sufficent quantity will leap across the gap in the form of a visible spark. If the gap be filled by any substance capable of being chemically decomposed by electricity, the decomposition will take place. In all this we have only the galvanic battery, and the primary current directly proceeding from it.

Now, Faraday's discovery was, that this galvanic or primary current, at the moment when it begins to flow, and again at the moment when it ceases to flow, produces a secondary, or induced, and perfectly independent current, in another conductor wound around the first, but not in contact with it. At the moment when the primary current begins to flow, the induced current passes in the same direction with it; but at the moment when the primary current ceases to flow, the induced current passes in the opposite direction. Instead of being, as in the primary current, continuous, the induced current is only momentary; and, in order to produce it at pleasure, it is necessary to have some contrivance by which to cut off and to restore the primary current as often as may be desired. As often as it is cut off, the reverse induced current passes; as often as it is restored, the direct induced current passes. The instrument used for this purpose is called a break, or contact breaker. It is placed in a gap in the primary or galvanic circuit, communicating with one extremity of the gap, and capable of being made to touch the other extremity also. When it touches, it is said to "make" contact, and when it ceases to touch, it "breaks" contact.

Not only does the magnet, like the primary current, induce electricity, but a piece of soft iron is rendered magnetic during the passage of a primary current through a coil of wire surrounding it. If the iron be massive, it retains its magnetic quality for a few moments after the galvanic current ceases; but, if it be of small bulk, it gives up its magnetism immediately.

In the manufacture of a "coil" for the display of induced electricity, all the foregoing facts are taken into account. The center, or core, of the coil is formed of a bundle of soft iron wire. Around this is wound the wire for the primary current, and around this again the wire for the secondary current. When the ends of the primary wire are connected with the two poles of a galvanic battery, the core of iron wires becomes a core of magnets, and hence assists the primary current in inducing electricity in the secondary wire. When the ends of the primary wire are disconnected from the battery, the core ceases to be magnetic, and the withdrawal of the magnet assists the cessation of the primary current in again inducing electricity in the secondary wire.

The largest induction coils hitherto made have been about a foot or fifteen inches in length, by about four inches in diameter. Seven miles have been about the extreme limit of length of the secondary wire; and nine inches the greatest length of spark that could be obtained. With these figures as standards of comparison, we approach the "monster coil" now under consideration.

In this, the central core of iron wires is composed of pieces each five feet long, and the thickness of knitting-needles, the whole core being five inches in diameter. The primary wire is of copper, thirty-seven hundred and seventy yards in length. The secondary wire is also of copper, and is one hundred and fifty miles in length. The rods of the core are separated from one another, or insulated, by being wound around with cotton, and the primary wire is covered in a similar manner. The secondary wire is covered with silk; and all these coverings are required in order to force the current to keep within each wire, or to pass along its length, instead of escaping from it laterally to contiguous turns of the spiral. The whole apparatus is inclosed within cylinders of vulcanite, and is mounted on strong supports, themselves similarly covered. The ends of the secondary wire issue one from each extremity of the coil, and are connected to "terminals," one of which is a point, and the other a polished disk of metal. They stand on movable columns in front of the coil; and the wires, when necessary, can be detached from the terminals, and attached to any other apparatus that may be required. When the primary wire is connected with a powerful galvanic battery, and contact is made, the core becomes a bundle of magnets, and this bundle combines with the primary wire to induce an electric current in the secondary wire. When contact is broken, the primary current ceases to flow, the core loses its magnetism, and an electric current is again induced in the secondary wire. If the terminals be not too far apart, this induced current leaps across the space between them in the form of a visible spark or flash.

There is yet another piece of subsidiary apparatus, called the condenser. This consists of a number of small sheets of insulated tinfoil, connected together, and with the primary wire, to which they form a sort of loop circuit. The condenser is supposed to afford a safety-valve, or reservoir of space for the primary current, and a security against any injury being done to the primary wire by the sudden rushing into it of a stream of electricity.

The first endeavors to work the new coil were frustrated by its own powers of destruction. It melted the platinum, and burnt up the brass of the original contact breaker. When used with a small amount of condenser surface, it burst the primary wire into fragments, and escaped from it laterally. When these difficulties were overcome, and the whole apparatus was in order, it afforded a spark, or rather a flash of lightning, twenty-nine inches in length, and apparently about a third of an inch in width. The length was measured, of course, by the distances between the terminals, and when this exceeded twenty-nine inches, no distinct flash was given. For a distance within its power to cross, it would almost seem that the electricity, like a strong leaper, makes an effort proportionate to the resistance to be overcome. When the terminals are distant, but still within the twenty-nine inch limit, the flash strikes upon the disk with a heavy shock and a loud report. When they are near together, or within two or three inches, the flash gushes forth without noise, and lazily, like a spurt of molten metal, or of dense flame; and from this "flaming spark," as it is called, the flaming portion can be blown aside by bellows, leaving the actual course of the electricity distinctly visible. Either the flaming spark or the longer one will perforate considerable thicknesses of glass, and five inches of solid plate glass have already been pierced by it. At one visit we chanced to see a remarkable illustration of the way in which metallic surfaces may serve to attract lightning. The outer covering of the coil displays the name and address of Mr. Apps, its maker, in gold letters of considerable size. In taking a long spark, the stands that support the terminals were placed nearer to the coil than usual; and the attraction of these gold-leaf surfaces was sufficient to divert the spark from its course, and visibly to break it up into portions.

In the darkened theater at the Polytechnic, the long flash lights up the room and the audience with the peculiar lurid glare so well known as an effect of brilliant lightning at night, and displays the features and action of every one present. But it is curious to note that, the flash being of instantaneous duration only, it allows no *motion* to be seen. We should think, if guided by our consciousness alone, that the flash lasted an appreciable time; but this would be an error, due to the persistence of the impression on the eye, after the flash itself had ceased. If the room be made perfectly dark, and if the spectators all raise their arms and wave their hands to and fro as quickly as they can, the flash will display the position of the arms, but not the movements of the hands. *While the flash lasts, the hand has no time to move*, and is consequently seen, as if motionless, in the position in which the flash finds it. It is in contemplation to exhibit the same effect in a more complete way by affixing a picture to a revolving disk. When the disk revolves so rapidly that no outlines of the picture can be distinguished by means of any ordinary light, they will be perfectly seen in a darkened room by the light of the flash. It lasts so short a time, that the revolving disk does not change its position in the brief period.

It is the smallest part of the advantage expected from the new coil, that it allows all the luminous and all the destructive phenomena of chamber electricity to be exhibited, in hitherto unapproached beauty and intensity. Men of science anticipate from it new discoveries of high importance. In the intervals between the public exhibitions of artificial lightning, the effects of the coil are being closely studied by those who are best able to appreciate them; and we believe no long time will be required in order to prove that Mr. Pepper, in his ever zealous catering for the entertainment and instruction of his especial public, has laid the foundation of real and solid scientific progress.

Manufacture of Malt Vinegar.

The following agreeable extract from the *Grocer*, gives a good idea of the way in which the manufacture of malt vinegar is conducted in England. It is extracted from a description of a visit to the works of Messrs. Hills and Underwood, at Norwich.

"The first of the visitor's pleasant surprises is the extreme cleanliness of every part of the building, the perfect ventilation, and the free admission of light; the second—if he follows the good rule of 'beginning at the beginning'—is the delicate odor of the malt lying on the two granary floors, where he sees the first process of the manufacture. These two floors, which are each some 50 feet square, will contain several thousand quarters of malt, and as vinegar, like beer, is the wine of malt, the difference being in the process of brewing, the quality of the grain is the first consideration. We could not forbear remarking on the resemblance between the fine, pale, delicate malt at the Norwich Vinegar Works, and that used in the great pale ale breweries of Burton-on-Trent.

"It is pleasant enough to walk into the hoist-house,leading from the upper granary, and there, amid the aroma from the rooms below, to look out over the ancient city with its forty churches and picturesque old buildings,and to trace the course of the Yare, the great highway for the produce of its modern factories; but if we are to learn how vinegar is made,we must follow the grain to a lower floor, where it is slowly ground into meal by great millstones cased in iron and moved by steam power; from these it is conveyed, in hot and odorous flakes, to a huge hopper, whence it finds its way by means of simple machinery along a trough to the mash tun immediately beneath. This great tun, in which the scientific process is added to the mechanical, is large enough to prepare about twenty-five quarters of grain at each mighty brew—a mass of meal which is rapidly converted into preliminary gruel by means of a series of rakes which are made to revolve inside the tun and mix the meal with water from an immense iron tank heated by steam pipes. As the revolving rakes mix and mix, more water is added, for the gruel, which grows thinner and thinner,must still be kept to boiling point,until the whole strength of the malt has been extracted; and during the operation,the odor arises from the seething, yeasty liquid in a pleasant steam. This operation having been completed, the liquor is run off into a cooler below the tun. This cooler is one of the most remarkable objects in the building, not only on account of its great size, which makes it look like a great plunge bath, and from the fact that its contents represent about 200 barrels of vinegar, but because, in looking down into it from the gallery above, where you have been witnessing the process of mashing, the whole area of that part of the building is reflected in its clear surface. The tall windows, fitted with louvre boards, cast the light on it in such a way as to convert it into a liquid mirror, wherein you see an inverted image of everything around, and begin to wonder how the fumes of the malt can take such an effect on a head, the strength of which had always been a subject of legitimate pride. The liquor into which we look is really intoxicating enough, however, for it is aromatic glutinous 'sweet-wort.' The sugar and the 'diastase,' which have been formed in malting,from the starch and the gluten of the grain,are dissolved; and the diastase, acting on that portion of the starch which has not been malted,changes it first into a sort of soluble gum and then into saccharine matter. From the cooler, this glutinous liquor passes through a Towlson's refrigerator, constantly cooled with water, the supply of which, though almost perpetually pumped from a well only twenty feet deep, has never yet failed in the driest season. On passing through the refrigerator, the wort loses some forty-five degrees of its temperature before it reaches the fermenting vats. There are eight of these enormous vats, each capable of holding about 10,000 gallons, and as large, therefore, as the space frequently made to 'accommodate' a small family. When the wort has been run into these, the process of fermentation commences, with the addition of the 'barm' the specific gravity rapidly decreasing if the operation is successfully conducted, and the final process of acetous fermentation, or 'acidification,' being alone required to convert the liquor into vinegar. The acidifying vats occupy a vast chamber beneath the granary floor, to which the fermented liquor is conveyed by means of pumps worked by steam power, and the top of each vat is occupied down to nearly one third of its depth, by large besoms or collections of birch twigs, upon which the wort is constantly pumped, that it may the more readily be exposed to the action of the atmosphere, the acidification being effected by means of the combination of the alcohol with the oxygen of the air. Before the use of this method of acidification, it was customary to expose the liquor in vats in large open fields or yards, which were, from that circumstance, called vinegar yards; but this was a slow process, and it also permitted the escape of the acetic ether, thus making the acidification less complete. This subtle and pungent essence escapes in such quantities, even here, that it is only possible to hold one's head over the vat for a few moments; but on the old system the piquancy of the vinegar must have been greatly deteriorated by the long process, which is rendered altogether unnecessary by the completeness of the system adopted by Messrs Hills and Underwood, and the careful selection of the grain from which their vinegar is manufactured. The acidification is by no means a rapid process, however, even under the most favorable circumstances; and a very delicate appreciation is required to determine the proper time for running off the liquor, which is now, indeed, vinegar, but 'unfined,' into a fresh series of vats, whence it is drawn out, bright and sparkling, and true vinegar. If the other vats were large, these refining vats are enormous; if the acidifying chambers were like drawing-rooms for size, these are capable of being converted into villa residences by the addition of a roof and a first floor. Some of them, we hear, will contain about 30,000 gallons, and, indeed, cost as much as a modern suburban residence. It is from these that the true vinegar is drawn into casks, and sent away to various parts of the world.

"It is necessary, however, to mention one other process, which, while it does not in the least affect the character of the vinegar, very essentially alters its appearance. In its natural state it is of a beautiful pale primrose color, resembling fine hock; but, for some reason or other, the British public insists on a dark hue, perhaps from some vague association with the 'old times,' when the dark color hid a great many deficiencies, and this prejudice is so strong that it is necessary for manufacturers to impart the color by means of burnt sugar. Curiously enough, our Scotch brethren have a prejudice the other way, and dislike any color at all, so that it becomes necessary to distil the vinegar to get rid of the natural tint. Neither process improves it; it is a question of fashion and popular prejudice, to which even science must sometimes bow if it involves commercial success."

THE LIGHT OF THE STARS.

Professor Robert Grant, F.R.S., Superintendent of Glasgow Observatory, recently lectured at the Royal Institution upon the light from the fixed stars. He said that the questions of the distances of the fixed stars, and of the amount of light reaching us from each star, are more intimately connected than is apparent at first sight. In early astronomical times it was not possible to discover the distances of the stars by parallax, so an attempt was ingeniously made to discover how far they are off by reasonings founded upon photometric measurements of the comparative amounts of light which they emit.

In a total eclipse the moon takes a long time to cover the sun, but if the sun were removed from us to the distance of the planet Neptune, the apparent diameter of the sun would be so reduced that the moon would eclipse it in ten minutes. Therefore, as the suns, which we call fixed stars, are eclipsed instantaneously by the moon, it follows that they are at enormous distances from the earth. As astronomers could not at one time measure this distance by parallax, they tried to find it out by comparing the intensity of the light of the stars with the light of the sun. This, however, was a difficult task, because when the stars were visible the sun was below the horizon, and when the sun was near the zenith the stars could not be seen.

This difficulty was surmounted by using the planets as intermediate bodies, and Saturn offering special facilities, was chosen for the purpose. The distance of Saturn being known, as well as the extent to which the sun's light was enfeebled by reflection from the planet, it was possible to compare the intensity of the light from the planet with the intensity of the light from the sun and with the light from the stars. Mitchell, and other astronomers, tried this method, and found that the sun must be removed to 220,000 times its actual distance to give us the same amount of light we receive from a bright star.

In these experiments it was necessary to assume that the stars were of the same magnitude and splendor as our sun. Now that the distance of some of the fixed stars is known by the unobjectionable method of parallax, it has been proved that the photometric measurements placed some of the stars nearer to us than their real distance. It follows, therefore, that those stars are either larger in size or more brilliant than our sun, and this is the way in which photometric measurements give some clue to the relative sizes of the stars, and show that some of them are larger and some smaller than our sun. In the present state of experimental astronomical science, it is impossible to learn the diameters of any of the stars by actual measurement, their distance is so enormous.

The following is the result of the measurements of the intensity of the light of some of the principal stars: Sirius, 416; Canopus, 204; Alpha Centauri, 100; Arcturus, 72; Rigel, 66; Capella, 51; Alpha Lyræ, 51; Procyon, 51; Alpha Orionis, 49; Aldebaran, 44; Antares, 39; Alpha Aquilæ, 35; Spica Virginis, 31; Fomalhaut, 26.

The excessive distances of the nearest of the fixed stars are very difficult to measure, and with more distant stars the difficulties of measurement are vastly increased. The only clue to the distance of faint stars depends upon the space-penetrating power of telescopes. It is assumed that the faintest stars are those which are most distant, and this is a very reasonable supposition, because, if stars were pretty evenly distributed in space, the fainter stars should greatly out-number the bright ones, and this is the case in reality.

Rosse's small reflector will bring into view stars 100 times less bright than the smallest visible to the naked eye. His forty-feet reflector penetrates into space 192 times further than the distance of the smallest star visible to the eye, so that the furthest stars revealed by his telescope, are so far away that the light from them takes about 8,064 years to reach the earth, traveling at the rate of nearly 190,000 miles per second. Yet through this telescope, beyond these distant stars, many a faint haze is revealed, which might be resolved into other galaxies of stars, could more powerful instruments be brought to bear.

In a previous lecture Professor Grant called attention to the peculiar light which benefits the inhabitants of the worlds which revolve round colored double stars. For instance: the inhabitants of a world which travels round a green and a red sun, must have red or green day, according to which sun chances to be above the horizon. Two or three months ago, Mr. James Buckingham, F.R.A.S., was kind enough to let me have two evenings with his great refracting telescope, which powerfully separated many of the double stars and resolved some of the colored star clusters into magnificent individual gems, the whole of them flashing more brilliantly than the finest jewels. Mr. Buckingham, by curiously-constructed steam machinery, and long years of labor, in which he was assisted by Mr. Wray, the optician, has overcome the enormous difficulties in grinding great telescopic object-glasses. The object glass of the telescope just mentioned is 21¼ inches in diameter, and perfect up to the edge, with a fine "black polish" over its whole surface. I believe it to be the largest object-glass in the world in practical daily use. Although many opticians have tried to make larger glasses, I think that none approaching this in size has proved successful.—*British Journal of Photography.*

The Rising of the Nile.

To the annual phenomena of the rising of the Nile, Egypt is entirely indebted for its fertility, and even for its existence as an inhabited and populous country. Without it the land would always have been a desert, incapable of affording the means of subcistence to man. Except occasionally near the shores of the Mediterranean, no rain falls throughout the land, and therefore its parched and sandy soil would be entirely unfruitful, were it not that regularly, at a certain season of the year, the river overflows the whole adjacent country.

Why it should do so was a mystery in ancient times, and many absurd theories and conjectures were raised to account for it. The Egyptians themselves believed the river was a god, who, in his beneficence, spread himself annually over the land, to supply the wants of his people. If the rising did not begin to make its appearance at the expected time—and it has hardly varied a single day throughout the course of ages—they hastily prepared a sacrifice to this deity, usually a beautiful girl, who was richly adorned and then thrown into the stream.

Some of the ancient philosophers lighted on the true reason of the rising of the waters, when they imagined it to be due to heavy rains falling in the interior of Africa, and swelling the sources of the river. What those sources were, it had baffled the investigation of thousands of years to ascertain, until recently our travelers, Speke, Grant, and Baker, discovered them in immense lakes situated near the equator, more than 3,000 miles, as the stream winds, from the mouth of the Nile on the Mediterranean coast. To these lakes the names of the Victoria Nyanza and the Albert Nyanza have been given by the successful explorers.

In the regions adjacent to these lakes, rain falls throughout the greater part of the year, and most heavily in March, at the time of the spring equinox. The lakes form huge reservoirs for the water which descends from the elevations known as the Mountains of the Moon; and as they become swollen, the size of the streams which emerge from them is proportionately increased. Several of these streams, uniting in their course, form the Upper or White Nile, and this river, flowing gradually on, until it meets the Blue or Lower Nile, bears irrigation to the thirsty lands below. Not only this, but as these rivers come down they bring with them a quantity of alluvial soil of the richest kind; and when the Nile at last spreads itself over the flat and sandy plains of Egypt, it enriches them year by year with this muddy but fertile deposit. The consequence is a gradually rising of the land, to the extent, it is calculated, of from five to six inches in a century. Owing to this fact, many of the remains of the proudest cities of ancient Egypt are now half buried in the soil.

Although in these days we know more about natural phenomena than the philosophers of old, and can satisfactorily explain the reason of the rising waters, there remains one wonder connected with it which is as great to us as to them, and that is its uniformity. As we have said, throughout the course of ages its commencement has scarcely varied by one day, and its extent is also comprised, as a rule, within a narrow limit. So equal, in the main, must be the quantity of water which falls annually at the equator, and so regular the commencement and decline of the rainy season.

The rising commences in Lower Egypt about the 25th of June, and steadily increases during the three months following. In this time the valley of the Nile becomes covered by its waters, and its villages stand out from them like little islands, as for the time they are. When the water has attained its maximum hight, it remains stationary for about ten days, and then declines as steadily as it arose. On its subsiding, the land has been thoroughly fertilized, and vegetation becomes luxuriant.

The hight to which the river rises is a matter of vital importance. A few feet more or less make the difference between starvation and abundance. The average hight varies according to the distance traversed by the river, from about forty feet where it enters Egypt, to four feet only near the Mediterranean. Taking as an intermediate hight that observed at Cario, if the rise is less than twenty feet, there is scarcity, or even famine; if it is three or four feet more, the crops will be short; three or four feet more again, and they will be abundant; but if the water goes still higher, it becomes an unhealthy flood.

Contrivances for measuring the exact rise of the Nile were in use in ancient times, and in two instances the remains of these "Nilometers" still exist. One, and the most ancient, supposed to have been erected in the time of the Roman dominion, is found in the island of Elephantine, in Upper Egypt; and on the walls of the building in which it is contained are inscriptions recording the hights of the inundation in various years. The other is situated in the island of Rhoda, near Cairo, and is believed to have been built in the time of the Arabian caliphs. It consists of a square well, into which the water is admitted as it rises, while in the center is a column of marble marked at frequent intervals with the distance from the lowest level. The Nilometers are supposed to have been of chief utility in adjusting the taxation of the country, as they would give indications as to whether the season would be plentiful or otherwise.—*World of Wonders.*

Revision of the Rules of the Patent Office in Regard to Drawings.

Commissioner Fisher has made the following important modifications of the Patent Office rules, which are now in full force:

United States Patent Office, June 15, 1869.

It is proposed, as soon as possible after the 1st of July, to photograph the drawings of the current issues, for the purpose of attaching one copy to the patent, of placing in the room of each Examiner a copy of those belonging to his class, of binding a copy of each drawing for the inspection of the public, and for furnishing certified copies at cheaper rates than heretofore. The adoption of this plan has made it necessary to make essential modifications in the rules relating to drawings, to which the careful attention of inventors and agents is invited. It is absolutely necessary to the success of the undertaking that the rules should be rigidly enforced, and drawings which do not comply with them will not be received.

The rules, which are as follows, go into effect immediately.

Drawings.—The applicant for a patent is required by law to furnish duplicate drawings when the nature of the case admits of them. One must be on thick drawing paper, sufficiently stiff to support itself in the portfolio of the Office for which it is intended. It must be neatly and artistically executed, with such detached sectional views as to clearly show what the invention is, its construction and operation. Each part must be distinguished by the same number or letter whenever it appears in the several drawings. The name of the inventor should be written at the top, the shortest side being considered as such.

This drawing must be signed by the applicant or his attorney and attested by two witnesses, and must be sent with the specification.

Tracings upon cloth pasted upon thick paper will not be admitted.

Thick drawings should never be folded for transmission, but should be rolled.

The duplicate drawing to be attached to the patent will be furnished by the Office at the expense of the applicant, and will be a photographic copy of the thick drawing. A fee of fifty cents per sheet of 10 by 15 inches will be charged, which must be transmitted with the final fee.

If the applicant does not choose to pay this fee he must furnish the duplicate drawing, as heretofore. This must be on tracing muslin, which will bear folding and transportation, and not on paper. It need not be forwarded until the patent to which it is to be attached is ordered to issue. It must have, for the purpose of attaching it, a margin of one inch on the right hand.

Copies of drawings of patents issued after July 1, 1869, will be furnished to any one at the uniform rate of fifty cents per sheet of standard size.

The following rules must be observed in the preparation of the drawings in order that they may be photographed. They must be executed in deep black lines, to give distinctness to the print. In shading, small lines of black ink should be used. Pale, ashy tints should be dispensed with. All colors except black should be avoided, even in lettering; but light blue, pink, and brown, are entirely inadmissible, and deep blue, yellow, and carmine take black.

The sheet must not be larger than 10 by 15 inches, that being the size of the patent. If more illustrations are needed, several sheets must be used.

Applicants are advised to employ competent artists to make the drawings, which will be returned if not executed in strict conformity with these rules, or if injured by folding.

S. S. Fisher, Commissioner of Patents.

To take Oil out of Leather.—A correspondent, Mr. A. D. Fisk, of Newark, N. J., answers a recent inquiry on the subject as follows: "In the factory where I am employed we use 4 *F. aqua ammoniæ*, which will take oil out without injury to the leather. It must be used two or three times in order to get it all out. First use it and let the leather stand until more comes out, and apply again. This is the only thing that will take it out and not hurt the leather.

Improved Automatic Apparatus for working Ships' Pumps.

Various make-shifts have been employed by the crews of leaking vessels, to relieve them from the excessive labor of the pumps often required to keep a vessel afloat. Not unfrequently this labor is so prolonged in the struggle between life and death, that exhaustion has incapacitated a crew from making even such provision as lay in their power for their scant comfort, when they have been finally driven to their boats. One can scarcely imagine a more terrible condition than that of a crew when all hands are ordered to the pumps. Then begins an unremitting and exhausting toil, monotonous and nearly hopeless, a toil the end of which, is known only to Him who holds the destinies of the shipwrecked mariners in His hands.

In steam vessels this labor is performed in most cases by steam power, and is so effectually performed, that instances are on record where such ships have sailed for days, and finally made their destined port safely, with a leak that would without such aid, have sunk them in a few hours.

In view of these facts, all will agree that an apparatus which shall successfully take the place of steam power on board sailing vessels, is a boon which should secure fame and fortune to its inventor, as well as the gratitude of the civilized world.

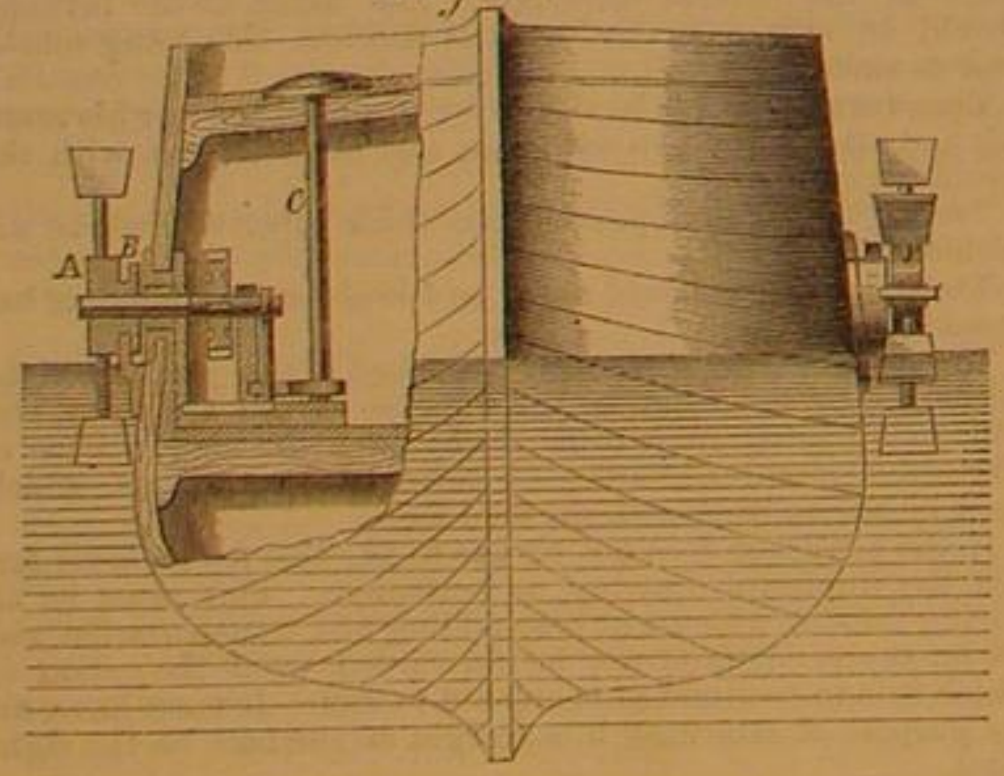
The inventor—an old mechanic—of the apparatus shown in the accompanying engravings, claims to have done this, and his device certainly seems to be tolerably free from any impracticability.

In the sides of a vessel are pierced holes through which shafts may be thrust out when wanted, or drawn in when not in use, and the ports closed. Paddle wheels are lowered over the sides of the vessel and attached to these shafts when required, which, when the vessel is under motion by the force of the wind, revolve, and thus generate power to work the pumps. The appearance of these wheels when in operation is shown in Fig. 1.

The method of attaching the paddle wheels is shown in Fig. 2. The arms of the paddles are inserted into a central disk, A, having a flanged bearing which, when the paddle wheel is lowered prevents its slipping off the shaft. The shaft upon which the wheel revolves, and through which it imparts motion to the other working parts of the apparatus, is square, and fits into a square hole in the central disk, A. This together with the flanged bearing which fits into a suitable step, permanently attached to the side of a vessel, obviates all necessity of keys or set screws.

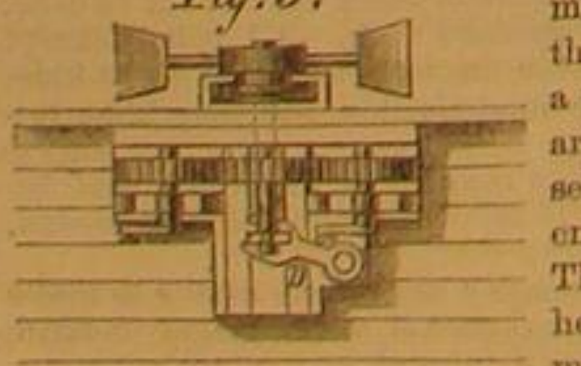
A vertical shaft, C, Fig. 2, operates a slotted arm, D, Fig. 3, by means of which the square driving shaft is thrust out or drawn in, while it at the same time slides the central spur wheel, Fig. 3, attached to the driving shaft, into gear with two other gears, which, through their crank shafts operate the pumps. When the shaft, C, is not employed, it is covered by a circular cap, fitting tightly into the deck.

Fig. 2.



The square driving shaft, when thrust out, slides through a square hole in the center of a cylindrical collar which serves as a bearing for it and revolves with it, at the same time closing the port against the ingress of the water.

Fig. 3.



Thus the hungry waves are made to defeat themselves in their struggles for the lives of a ship's crew, while the men are at liberty to work the vessel and to provide for any emergency that may arise. The inventor will have the heartiest wishes of all humanitarians for the success of his attempts to introduce his apparatus into general use; and we consider his device as being well worthy the attention of ship owners and underwriters.

This invention was patented June 8, 1869, through the Scientific American Patent Agency, by Almon Roff, of Southport, Conn., who has also secured patents in various foreign countries through this office.

One of the "shoe kings" of Portland, Me., who is very wealthy, began business five years ago with but $150.

The Locomotive of the Future.

It would be difficult for the most enthusiastic engineering futurist, if at all practical, to point out the direction in which any radical improvement in the locomotive engine is to be sought. As long as the resistances opposed to the motion of trains are what they are, and as long as the present rates of speed are maintained, the amount of locomotive power to be provided cannot be lessened. There is not the slightest chance that any other agent than steam will be employed, in our generation at least, to produce this power. Compressed air locomotives, hot air locomotives, vapor of alcohol locomotives, and electro-magnetic locomotives have all been tried, and they have failed for perfectly obvious reasons—reasons which should have been foreseen by any one possessing the least knowledge of the motive agencies thus called into play.

ROFF'S AUTOMATIC PUMPING APPARATUS.

Steam, then, being our only resource, it can be generated only by the combustion of fuel, and this fuel must obviously be the cheapest available. With us, the cheapest fuel is coal. We can none of us see the way to anything cheaper. Petroleum may be burnt easily enough—its use is entirely practicable, but it is too dear. Even were it cheaper than coal, its use would involve no important constructive modifications of the locomotive boiler, and none whatever in the working machinery.

And what can be simpler than the locomotive boiler as it is? A large amount of heating surface *must* be provided, and how could it be better provided? There are few who would not desire to welcome improvements were they possible, but it will prove no easy task to improve upon the principles, or the general construction, of Neville's multitubular boiler of 1826, as successively improved in detail by so many locomotive engineers since George Stephenson first brought it into practical work. The locomotive boiler has been made in almost every possible form. There have been twin barrels, double fireboxes, round fireboxes, combustion chambers, mid-feathers, return tubes, water tubes, water grates—indeed, every imaginable modification of the original structure to which all successful practice has again returned.

We have no doubt that steel will yet take an important place in locomotive boiler construction, as it has already done in that of fixed boilers. The Bolton Steel and Iron Company appear at last to have produced Bessemer steel boiler plates which can be thoroughly depended upon in large quantities, and there are fireboxes of a somewhat kindred material—Howell's homogeneous metal—which have perfectly withstood nine years' use on the Scottish Central Railway. In all this, however, there is no new principle, and the most that can be hoped from steel is somewhat greater economy in repairs, and the possibility of working higher pressures of steam, should it prove desirable to do so.

In the motive machinery of the locomotive, beginning with the regulator and ending with the driving wheels, no improvements beyond those of mechanical detail appear to be possible. No possible application of the principle of the rotary engine holds out the least hope.

As for the rest, the locomotive engine is a carriage merely. So much total weight, divided by so much permissible weight per wheel, and we have the necessary number of wheels, to be coupled or not, according to the requisite adhesion.

It is only as a carriage that we see much room for improving the locomotive. It does appear anomalous that with from one hundred to two hundred wheels beneath a train none of them loaded beyond 3 or 3½ tuns, a permanent way of twice the strength otherwise necessary should be required to carry 7 tuns each on a pair of driving wheels. It is equally inconsistent that with wheel bases of from 8 to 10 feet under the wagons and carriages from 15 to 18 feet should be necessary for the engine. Were the maximum weight per wheel not more than 4 tuns, and the maximum wheel base in any one unalterable rectangle no more than 10 feet, it is almost beyond dispute that a very considerable economy would be effected in the maintenance of the permanent way.—*Engineering.*

NEW AND IMPROVED FORM OF SIMPLE MICROSCOPE.

The chief peculiarities of this microscope are, its being made almost entirely of wood, the general arrangement, and, particularly, the mode in which the focal adjustment is effected.

The instrument (Fig. 1), consists of a circular base, A, from which rises a standard, B, having a mirror, C, attached to its lower part. The mirror is turned by the head, D, so as to reflect the light coming in front of the observer. Through the center of the standard runs a square groove into which a bar, E, of similar shape fits. An iron screw firmly secured to the lower end of this bar, fits into the head or nut, F, and by turning this the bar is raised or depressed. The head, F, fits accurately into the cut made for its reception in the standard, which has two opposite sides flattened at this part in order to allow a slight projection of the head, thus giving the thumb and middle finger a good hold on it. A lens holder, G, is attached to the upper part of the bar, E. Several disks of wood having spherules or globules of glass mounted in them, are made to fit into this holder. When a change of powers is desired, nothing is necessary but to take out one disk, drop another in its place, and then make the proper focal adjustment. A full size section of part of the lens holder, showing the manner of mounting the globule and fitting the disk, is given at Fig. 2. At I, is the stage with an aperture at J for admitting the light from the mirror. To the stage are attached two spring clips, K K, for holding the glass slide containing the object firmly in its place. Beneath these clips two transverse bars are fixed to the stage, and the slide resting on these is slightly elevated, thus giving the fingers a better hold in moving it about. A portion of the under side of the lens holder, G, is cut away, as shown in the engraving, in order that the spring clip passing underneath, may not prevent the lens from being brought very near the object, as is necessary when high powers are used. That part of the stage through which the bar, E, passes, is lined with leather moistened with a little oil. By this means the lens holder is kept free from any lateral movement while the focal adjustment is being made. The stage is 4½ × 1½ inches, and is designed to allow the use of a full sized slide 3 × 1 inch. The groove in the standard is planed in a piece of wood, another piece is glued over this, and the block afterwards turned to the proper form in a lathe.

Metal and rubber, or suitable combinations of these and wood, may be used in the construction of the microscope, but it answers equally well if made of wood. Hard and dark colored woods, such as black walnut, rosewood, mahogany, etc., are the best. The microscope from which the engraving was made, was made of black walnut oiled. None of the parts were of metal except the screw and spring clips.

Fig. 1

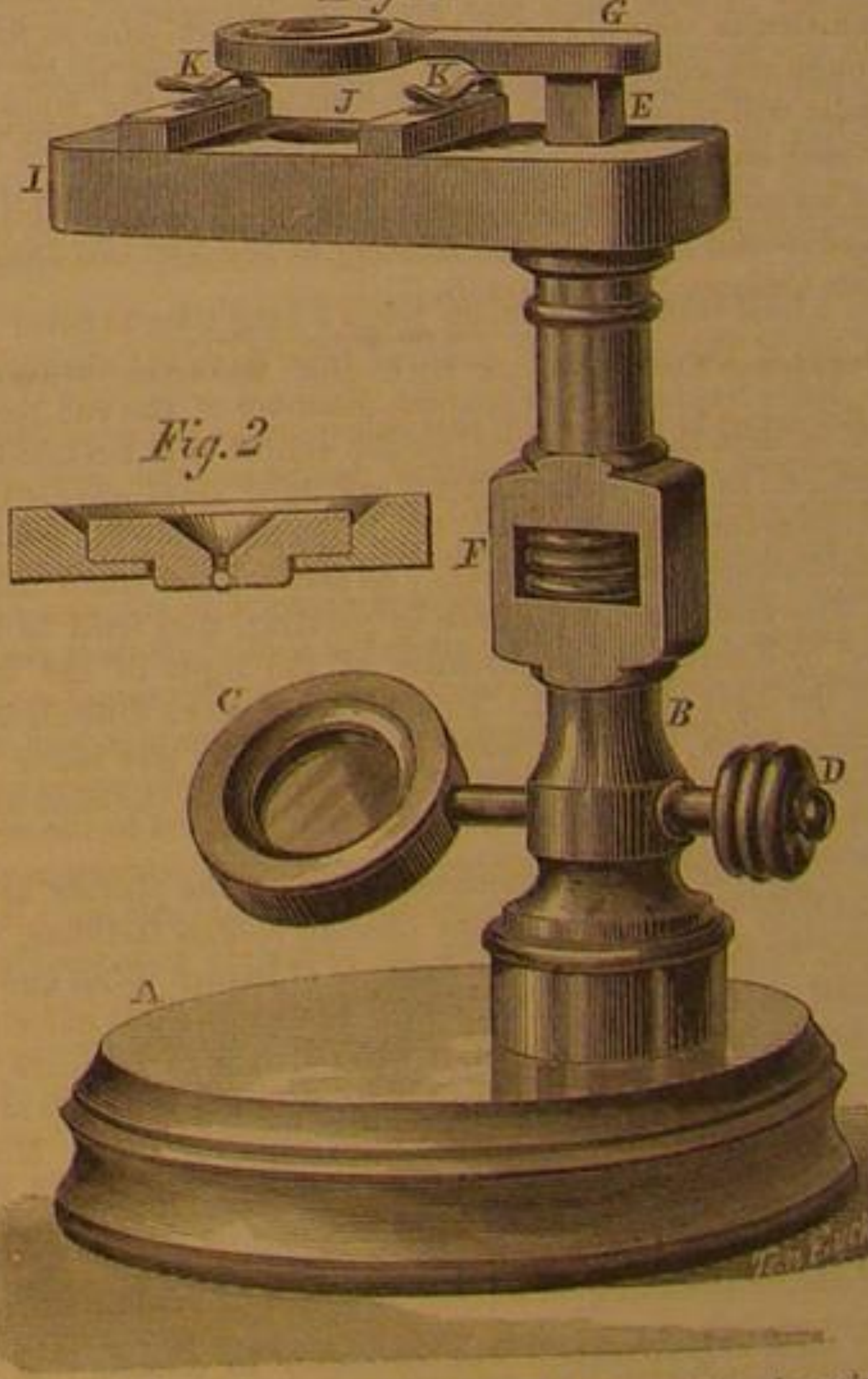


Fig. 2

In using the microscope the head for turning the mirror must be at the right or left hand, as may be most convenient, and the light must come in front of the observer. No advantage is derived from having the mirror fixed so as to reflect light from the left or right, because the arms, while moving the slide, will always cut off the light so reflected. The nearer the lens is to the object the greater is the care necessary in making the focal adjustment. In examining infusoria, or other objects found in water, a drop or two of the fluid may be placed on the middle of an ordinary slide and covered with a square of very thin mica or glass. Most objects, whether dry or in fluid, will need this precaution, which is often necessary to prevent the globule lenses from getting soiled by coming in contact with the object under examination. Care must also be taken that the mica or glass cover does not approach too near the spring clips, otherwise the fluid may be drawn under the clips and wet the stage. Should the globules get soiled, and rubbing them with tissue paper does not clean them, they must be punched out and replaced by new ones.

The microscope was designed with special reference to the most convenient and efficient use of these globules as magnifiers. Globules of high power were first made and used by Robert Hooke, an English microscopist of the seventeenth century. These when well made show objects remarkably well. They may be made to give enormous powers, and that, too, at a cost of only a few cents. It is not a very difficult matter to obtain with these a power of 1,000 diameters, or even more. The field of view is rather small and its extent is the same for all powers. This is because it is limited by the pupil of the eye, as may be readily proved by a simple experiment. Looking through a globule lens, arrange the mirror so that just sufficient light is given to make the field visible. Then suddenly turn the mirror so as to illuminate the field with a strong light when it will be seen to contract. With the larger globules the light given by the flat mirror is sufficient, but when globules having a focus less than $\frac{1}{40}$ or $\frac{1}{50}$ of an inch are used a concave mirror will be necessary. Any person may, after a little practice, be able to make and mount his own globules.

The globules should be made of French plate or other very pure and clear glass. The glass must be cut into a narrow strip, carefully cleaned, and then drawn out into threads in the flame of a spirit lamp. The threads should be made of different thicknesses and carefully kept on a clean plate. The wick of the lamp should then be pushed down until the flame is not more than half an inch long. One end of a thread is now to be held in the flame when it will melt and run up into a globule. When the globule is seen to be perfectly spherical it must be withdrawn, held a little while to cool, broken from the thread,and put aside until wanted for mounting. The larger globules are the most difficult to make, the fine threads melt and run up into perfect globules almost as soon as thrust in the flame. The hole in the disk for the globules must be burnt in and then cleaned by rubbing it with a piece of wood. Care must be taken that the inside of the hole is made dark in order to prevent all reflection of light. A needle will be convenient for burning in the smaller holes. The globule is then to be carefully placed in a hole with the broken end of the thread to one side, and may then be fastened securely by pressing it in a little. If desired, other forms of magnifiers, such as ordinary double convex lenses, Wollaston doublets, triplets, and Coddington lenses may be used.

For the examination of infusoria, animal and vegetable tissues, and such other objects as are, or can be made transparent, these globules have been found to answer very well indeed. It is for the use of globules in such examinations that the microscope here described was devised. It was not intended for, and cannot conveniently be used as a dissecting microscope. By means of a globule magnifying over 500 diameters the writer has been able to perceive clearly the hexagonal markings on the most common diatoms found in the "Richmond earth." He has examined live diatoms and animalcules whose movements he has been able to follow, though not without difficulty when they were rapid. The reader will thus get some idea of what may be accomplished by such simple things as globules of glass.

This invention was designed by James H. Logan, who may be addressed for further information, at the National Deaf and Mute College, Washingon, D. C.

Picrates---Their use as Gun and Blasting Powders.

Referring to a notice on this subject in our issue of May 15, we propose to give some further details on this new and interesting compound. In 1867, Designolle, of Paris, made powder for firearms and for blasting purposes by means of picrates. Both kinds consist of a mixture of picrate and nitrate of potassa; the only difference being that the former contains in addition an admixture of charcoal. Their manufacture, as may be inferred from the accident which recently took place in Paris, appears to be carried on to a considerable extent, and the well-known chemist, Payen, in a report to the *Société d' Encouragement*, ascribes to them several advantages over the ordinary powder. He points out that various kinds of powder may be manufactured by means of them, the relative effects of which may be varied between the limits 1 : 10; viz., that, on one hand, a powder may be made, which will possess ten times the effect of common gunpowder of equal weight; while on the other hand,it,is just as easy to prepare an explosive of the same projectile force, but of a less bursting tendency compared with odrinary powder It is said that between these limits all desirable kinds can be made. If so, the long sought for problem is solved; that is, an explosive can be prepared in a charge of a certain weight, which will impart a definite velocity to a projectile from a firearm of stated dimensions.

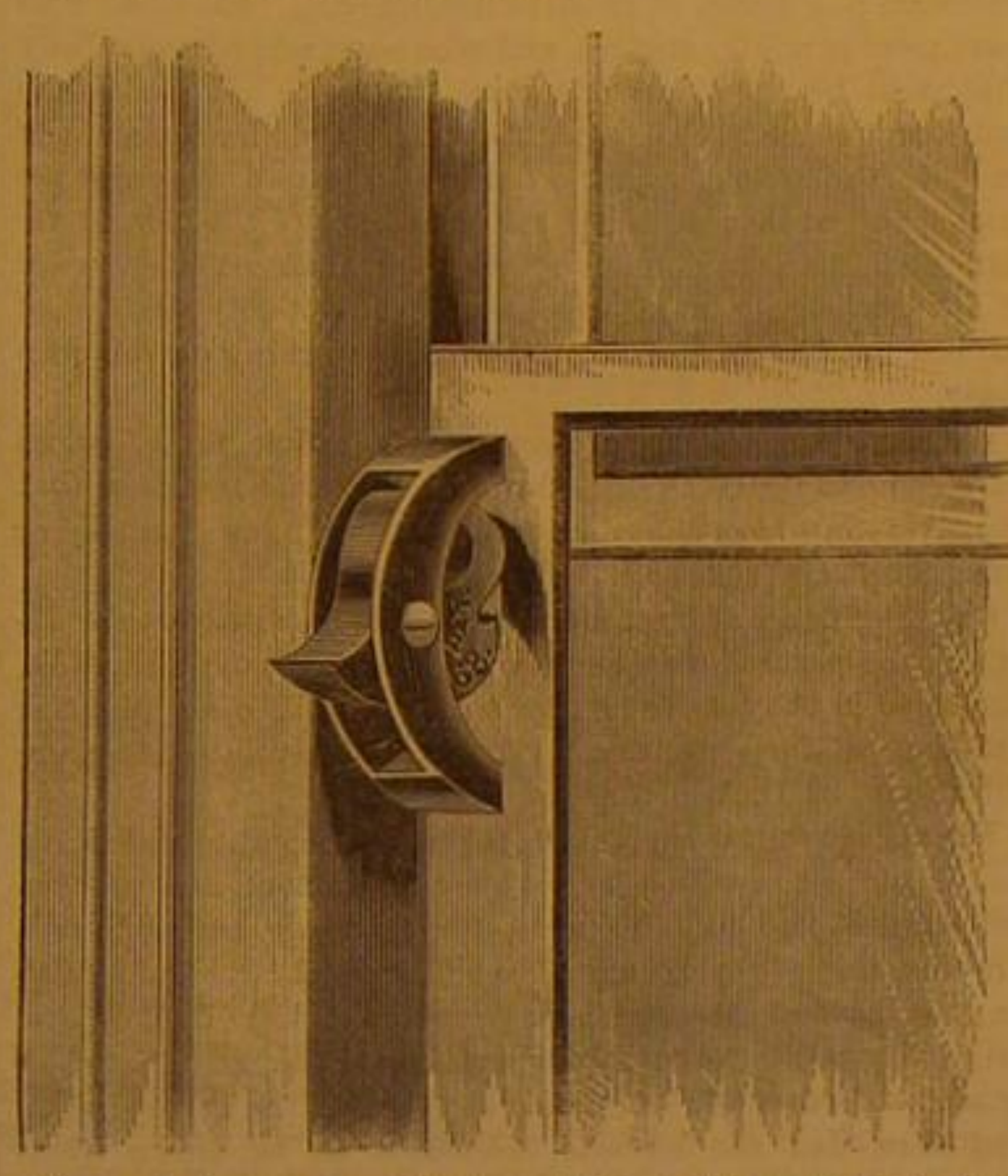
Other advantages of the picric acid compound are that its projectile force can be increased without enhancing its blasting force, or changing its manner of manufacture; the velocity of combustion may be regulated at will; and its ignition is not attended with the generation of disagreeable gases, as they consist simply of steam.

The manufacture of the powder from picrates proceeds as follows: The various ingredients are powdered in a stamping mill for at least three or at most six hours, under addition of six to fourteen per cent of water, according to their composition. The mass is now subjected to a pressure of from 600 to 1,000 hundred weight per square inch, according to the velocity of combustion to be imparted to the powder. The cake obtained is then granulated, polished and dried in the ordinary manner. The process remains the same for all kinds.

Gunpowder cannot well bear over twenty per cent of picrate of potassa, while for cannon powder, it should not exceed fifteen per cent. For the latter from eight to fifteen per cent are taken according to the desired velocity of combustion. Designolle prepares also colored fire-work compositions by means of picrates, of which the following are recipes: Gold rain—50 parts of picrate of ammonia, and 50 parts of picrate of iron; Green fire—48 parts of picrate of ammonia, and 52 parts of nitrate of baryta; Red fire—54 parts of picrate of ammonia, and 46 parts of nitrate of strontia. Until recently, the picrate of potassa has been very expensive, but improvements made in its mode of preparation enable the manufacturer to sell it at a price sufficiently low to ensure its application for all practical purposes.

WALKER'S PATENT SASH FASTENER.

Deliverance from the inconvenience and expense of cords, pulleys, and weights, attached to window sashes, seems to be an attainment much desired, and inventors are racking their brains to meet the demands of the public in this respect. Among the best devices produced are those which employ an eccentric, which by engaging with the sash at the moment it tends to fall, forces it against the side of the frame thus generating friction and holding more and more firmly, the greater the force which tends to move it.



The sash fastener we illustrate this week is not attached to the sash, but the semi-circular frame which holds the eccentric, is screwed on the window frame, close to but not touching the sash. The eccentric or cam is cut so as to give two supporting surfaces—upper and lower—one of which holds the window from being raised, and the other prevents it from falling. To raise the sash the eccentric is thrown up; to lower, it is thrown down.

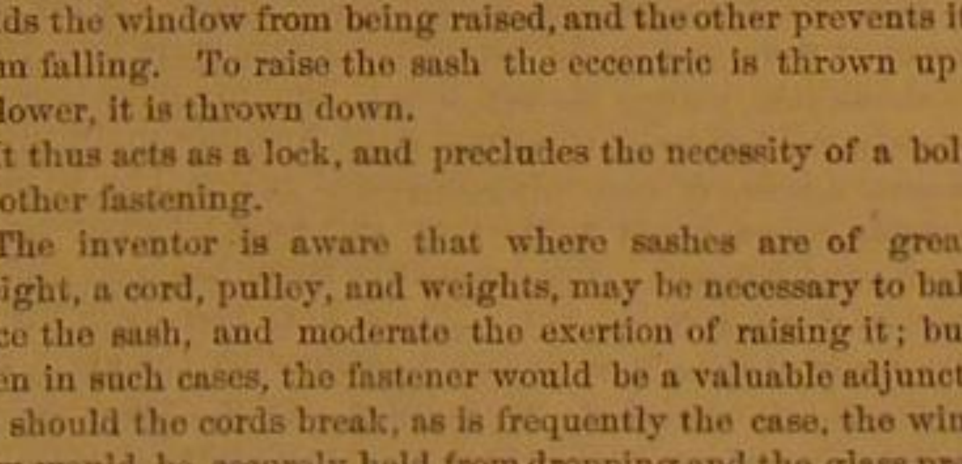
It thus acts as a lock, and precludes the necessity of a bolt or other fastening.

The inventor is aware that where sashes are of great weight, a cord, pulley, and weights, may be necessary to balance the sash, and moderate the exertion of raising it; but even in such cases, the fastener would be a valuable adjunct, as, should the cords break, as is frequently the case, the window would be securely held from dropping and the glass preserved from breakage.

This improvement was patented September 1, 1868, by Felix Walker, and is sold by Felix Walker & Co., at the Whitlock Exposition Building, Nos. 35 and 37 Park Place, New York city.

The Joint-worm.--"Isosoma hordei."

In certain years and in particular States the crops of wheat, of barley, or of rye, are observed to be greatly injured by a minute maggot, popularly known as the "Joint-worm."



This maggot is but little more than one eighth of an inch long, and of a pale yellow color with the exception of the jaws which are dark brown. It inhabits a little cell, which is situated in the internal substance of the stem of the affected plant, usually a short distance above the first or second knot from the root, the outer surface of the stem being elevated in a corresponding elongate blister-like swelling; and when, as is generally the case, from three to ten of these cells lie close together in the same spot, the whole forms a woody enlargement honey-combed by cells, and is in reality a many-celled gall. In the figure, *a*, will be seen a sketch of one of these galls, the little holes being the orifices through which the flies produced from the joint-worms have escaped. At first sight, these knotty swellings of the stem are apt to elude observation, because, being almost always situated just above the joint or knot on that stem—whence comes the popular name "Joint-worms"—they are enwrapped and hidden by the sheath of the blade; but on stripping off the sheath, as is supposed to have been done in the engraving, they become at once very conspicuous objects. We have observed that the "internodes," as botanists call them, or the spaces between the knots, in infected straws, are always much contracted in length; none out of a lot of over fifty specimens examined by us, exceeding six inches in length, and many being reduced to only one and a half inches. A similar phenomenon occurs in two "polythalamous" galls formed by certain gall-gnats (*Cecidomyia*) upon the tips of the twigs of certain species of willow.

DAMAGE DONE BY THE JOINT-WORM.—The damage occasioned by the joint-worm is, in certain seasons and in certain localities, ruinously great. In the year 1851, throughout a large part of Virginia, many crops of wheat were hardly worth cutting on account of its attacks, and all that we have seen or heard of, except one, were badly hurt by it. According to Prof. Cabell, of the University of Virginia, the loss occasioned by this insect often amounts to one third of the average crop, and is sometimes much greater; and in 1851 "some farmers did not reap as much as they sowed." In 1860 the rye crop was considerably injured by this little pest in Lycoming Co., Pennsylvania; and according to Mr. Norton, the species is very common upon rye "in Connecticut and probably the other New England States." As long ago as 1829, it had been noticed in various parts of the New England States to attack the barley, causing it in some places "to yield only a very small crop, and on some farms not much than the seed sown;" although since that date it does not appear to have been materially troublesome in that region. But in central New York, formerly the great barley-growing district of America, it has been ruinously destructive to the barley since about 1850. In the words of Mr. George Geddes, "Formerly we expected forty bushels of barley to the acre; now we cannot rely on more than twenty." And he goes on to state that this falling off is principally due to the depredations of the joint-worm; and that, unless some relief from it is found, the farmers of Central New York will have to discontinue raising this crop. Lastly, in Canada West, in the neighborhood of Grimsby, it was very abundant upon barley in the years 1866 and '67.

NATURAL HISTORY OF THE JOINT-WORM.—The mode in which the joint-worm produces its destructive effects upon small grain, may be readily explained. Not only is the sap of the plant abstracted on its road to the ear, in order to form the abnormal woody enlargement or gall, in which the larvæ are embedded, each in his own private and peculiar cell, but a very large supply of sap must be wasted in feeding the larvæ themselves.

The joint-worm fly, b, makes its appearance in the North in the fore part and middle of June, and in southern latitudes in the middle of May. After coupling in the usual manner, the female joint-worm fly proceeds to lay her eggs in the stems of the growing grain.

Before commencing operations they walk leisurely up one side of the plant as far as the last leaf, and then down the other, apparently to make sure that it has not already been oviposited in. Head downward, they then begin by bending the abdomen downward, and placing the tip of the ovipositor on the straw at right angles with the body, when the abdomen resumes its natural position, and the ovipositor is gradually worked into the plant to its full extent. Very shortly after this the egg must hatch out.

By the beginning of September, the infested grain having ripened long before this period, the galls are already dry and hard, and the larvæ contained in them full grown, measuring now about 0·13 inch in length. The great majority of these larvæ are destined to remain in that state, inclosed in their little cells, until the succeeding spring; but—as happens with many different insects—a small percentage of them seem to pass into the pupa, and thence into the perfect state, the same summer that the eggs are deposited.

REMEDY.—Whenever you discover the stems of your small grain to be badly affected near the root, in the manner shown in the figure a, then you ought to burn off your stubble ground any time before the following summer, and burn up all the tailings and refuse straw after thrashing. If you do this and can persuade your neighbors to do the same, you will soon kill out out the joint-worm; if you neglect it, the parasites sent by a kind Providence may perhaps do the work for yon; and again it may be possible that, in spite of the parasites, the joint-worm may increase upon you year after year.—*The American Entomologist.*

THE library of Congress has recently acquired a valuable addition of books in the Spanish language, largely relating to America, many of which formed a portion of what is known as the Maximilian library, recently sold at Leipsic The library now contains 180,000 volumes, about 2,000 of which have been added within the past sixty days.

MENDING PLASTER MODELS.—Wax and resin, or shellac varnish, is recommended in the last number of the *Dental Cosmos* for the above purpose. Dr. Chaim suggests the use of liquid silex. Wet the two surfaces with it, and allow a few moments for it to dry. It will be found very useful in cases of accident to a cast.

Correspondence.

The Editors are no responsible for the Opinions expressed by their Correspondents.

Spectacles or No Spectacles.

MESSRS. EDITORS.—In No. 23, last volume (June 5), Dr. J. V. C. Smith advises the public to begin with the firm resolution never to wear glasses of any kind for reading or writing, but to attempt persistently to read without them, by which the eye will regain its former power. To strengthen his suggestion he brings names of celebrated persons who have done without them, still having the perfect use of their eyes to a good old age. Such an admonition is hardly necessary in this age of vanity, for it is usual now, that persons arriving at a period where the failing organs proclaim advancing age, strenuously resist the use of glasses, because they advertise the unwelcome fact.

The truth of the doctor's assertion consists in the fact that the eyes of some are probably susceptible to such a change; but it is only the empiric whose confidence is absolute and final, while the thinking professional makes experiments and watches the results of a trial.

It is easy to collect a small volume of telling examples to prove preposterous opinions, but that is no evidence. Experience must be our guide. Much depends on the individual case, much on the condition of the organism. What will help one won't help others; the great difficulty, beside, consists in deciding whether the beneficial effects attributed to any particular cause really has reference to its action or to some concurrent cause.

As it comes under our daily notice, the method recommended by the doctor has a directly opposite effect on the eyesight, we cannot withhold the suspicion that the recommendation put forth is a fallacy. Let the doctor make experiments, collect precise data; let him give us the maximum time during which we must grope in the dark in order to see light again.

Studious habits, overwork, the taxing of the eye to perform most severe duty for a considerable period of time, are the universal causes of the early failing of its functions, but the idea of relying upon time for its restoration, is utterly inadmissible, for if time is invoked at all, it must be invoked as the cause of the very evil which we thus propose to leave to its cure.

The progress of civilization, the art of printing, does a great deal toward the increase of weak sight, and as Gutenberg put forth his invention only in 1438, the ancients could not suffer from that source; but even before that date, in 1292, Roger Bacon mentions the benefit derived from the use of a plano-convex glass, by old men and those with weak eyes. This shows conclusively that although Cicero never complained of imperfect vision, even at the age of sixty-three (perhaps he had his, so-called, "second sight," an occurence not very uncommon among aged people), there must have been many others who have suffered from that defect.

The Bible mentions that Isaac, the patriarch, had dim eyes from old age.

Experience proves daily that the judicious use of glasses is mostly accompanied by beneficial results; therefore we should think, with due deference to Dr. Smith's opinion, that it is best to submit with good grace to an affliction which cannot be averted. LOUIS BLACK.

Detroit, Mich.

A Lunar Rainbow.

MESSRS. EDITORS:—I think the following may be of interest to some of your readers:

In latitude 25° 35′ south, and longitude 47° 12′ west, at a place called the Situo Americano (belonging to the Parana Manufacturing Co.) one and a half miles from the village of Morretes, in the Province of Parana and Empire of Brazil, on the evening of Feb. 9th, 1868, at the hour of 8·15 P. M., we saw a most beautiful and distinct lunar rainbow, with all the colors clearly and plainly defined. It formed a complete arch with the apex at an elevation of about 45°, and lasted nearly half an hour. The moon was about twenty minutes above the horizon when we first observed the rainbow and was nearly full though on the wane. Thermometer 77° Fah.; weather damp or humid but not rainy; light fleecy clouds passing between us and the moon. The bank of clouds that almost continually hang around the Mirumbi Mountains, formed, as it were, a back ground for the beautiful sight. The base of the mountains was about six miles off and the summit about thirteen miles. The mountains here are about 6,000 feet above the Situo Americano. I have but lately returned from there, after an absence of nearly two years, in erecting the works of the Parana Manufacturing Company, and expect to return again at an early day.

JAMES K. MILLER, Supt. of Parana Man'f'g Co.

Litchfield, Ill.

THE senior class of the Michigan University have placed underneath the class tree a boulder which has long been known as "calico rock," on account of the curious arrangement of the smaller fragments on the surface. It is a rare and curious specimen of conglomerate, from the fact that so many different kinds of rock are found cemented together. It is thought that as many as twenty can be named, some of which are granite, gneiss, quartz, mica, schist, chlorite scihst, dolerite, hyperite, etc. The boulder belongs to the azoic period of the world's history, and was probably brought from the Lake Superior region by the great glacier which Agassiz says once passed over this part of the continent. Its size is about a square yard, and its estimated weight two and a half tuns.

AN IMPORTANT QUESTION IN SOCIOLOGY—THE INTERMARRIAGE OF RELATIONS.

The researches of Darwin and others of his school, together with the results of in-and-in breeding in the perfection of stock, have attracted the attention of social philosophers and have, so to speak, reopened the question as to what extent the intermarriage of blood relations is allowable, and whether it could not be made, setting aside the moral and religious bearings of the subject, a means of improving the physical constitution of the human race.

In the discussion which has arisen upon the subject science has taken a stand as something distinct from theology, and asserted its right to ask and to answer the question whether there exists in nature a law inimicable to the intermarriage of blood relations, and if so, to what limit of consanguinity does that law extend. The conclusions arrived at, so far as we have been able to follow the discussion, demonstrate clearly to our mind, a fundamental truth applicable to all scientific investigations, which is, that the more theological views and considerations are kept apart from any investigation pursued by modern scientific methods, the more probable is the attainment of truth by these methods, and the less likely are the results obtained to conflict with those great and sublime truths, which underlie all religious belief. It was once thought by many that geology was atheistical in its tendencies and subversive of all religious faith. Who believes this now? It is at present thought by some that Darwin's views of natural selection and the origin of species must lead its followers to a denial of creative intelligence. But those who have most carefully studied, and who comprehend most fully that most beautiful law of nature, for we do not hesitate to consider it as such, only recognize in it the development of one of the many ways in which creative intelligence works, and while perceiving the simplicity of the law of variation and its perpetuation by selection, also see the necessity of acknowledging an all-wise Deity, who not only established the law but has made direct use of it in working out his purposes.

So in regard to the subject of this article, investigators have come to the conclusion, by pure scientific methods, that the divine law is in accordance with nature's laws, and by so doing admit their oneness.

Our attention has been more immediately called to this subject by the perusal of an essay written by Nathan Allen, M.D., published in the *Quarterly Journal of Psychological Medicine and Medical Jurisprudence*, for April, and reprinted in pamphlet form, by D. Appleton and Company.

We cannot follow the author through the entire line of his able argument in which he reviews the ancient and modern ecclesiastical and civil law upon intermarriage, and adduces a large number of psychological and biological facts and statistics, to show that intermarriage beyond a certain limit of consanguinity tends to disastrous results upon the race; but shall content ourselves with a glance at some of the more important facts, and the obvious inferences to be drawn therefrom, in connection with what appears to us to be a well-stated and overwhelming argument against close intermarriage.

"In an elaborate article upon 'Ancient Marriages of Consanguinity,' found in the *Medical Journal* of Nashville, Tenn., for 1859, Dr. J. Casselberry, in an examination of the early history of Syria and Egypt, brings out some remarkable facts. He shows that, among the rulers, generals, and leading characters in the history of these two great nations, there was an unusual amount of such intermarrying, and that almost invariably it turned out badly. In the history of the royal founders of different nations there has been at times a great number of such intermarriages, and it is well known that very many of these have proved decidedly unfavorable as far as offspring is concerned. So marked was the effect that a peculiar disease, called the 'king's evil,' was said to originate from this source, and to become very common and troublesome. The power and influence which these families had endeavored in this way to perpetuate had come to naught, and their names in history almost extinct. In the history of certain orders, such as the patricians of Rome, the nobility of France, the peerage of England, and other aristocratic classes, where, for the sake of position, wealth, or some other consideration, intermarriages among members of the same families have frequently taken place, and this practice continued through several generations, the hereditary effects have generally proved unfavorable. Both the mental character and the physical organization have suffered by such alliances. It has been found that such classes or orders would, in time, actually run out in offspring, if their ranks were not replenished occasionally by those moving in lower or humbler spheres of life.

"Again: in some small islands or places remote from the thoroughfares of public travel and business, and where there is but little change in society from immigration, the practice of the intermarrying of relatives becomes quite common. The effects of such unions, when continued through several generations, are marked by a loss of mental power and strength, of boldness and energy of character, with an increase of scrofulous and consumptive complaints, of defects in one or more of the senses, and not unfrequently of deformities of the body. With such a people there is not only little real improvement or progress in securing the most important objects of life, but, after remaining awhile in a kind of stationary state, they gradually decline both in numbers and character. This change may not be very perceptible in one generation, but, when continued through several generations, it becomes most marked both in reference to the body and the mind. Probably nowhere in the world can there be found more striking illustrations of this truth than in some of the valleys of Switzerland, where, from the barriers formed by almost impassable mountains, the same seclusion of communities and frequency of family alliances have been found to exist for hundreds of years. Here we find goitre, cretinism, scrofula, albinism, mutism, and idiocy, in all their most aggravated forms. A writer in the *American Journal of Insanity* gives the following sketch of this people: 'Marriage between blood-relations is nowhere of such frequent occurrence as in the localities where are born the greatest number of deaf and dumb. I have before described certain valleys in the Canton of Berne, the inhabitants of which, collected in masses, and living almost without any means of communication with neighboring countries, offer all the conditions favorable to these unions between relatives. There the men marry very young, in order to avoid the troubles and cares of celibacy without compensation. They marry their cousins, and all the families have been allied for a long time. The children of two brothers, of a brother and of a sister, marry as a matter of expediency, and thus preserve the inheritance intact; consequently the new family is founded in physical conditions than which nothing could be more injurious. It is in the midst of these isolated populations that we find in all its hideousness the degradation of the species, the coruption of the race. There reign cretinism, idiocy, and congenital deafness to such a degree, that the demonstration of the fact I have advanced blazes forth in all its brilliancy.'

"According to a great mass of facts collected on this subject, the functions of the brain seem to be affected far more than those of any other organ. Hence, a great number of weak or feeble-minded persons, together with every grade of idiocy, has been reported as originating in such unions. It is through the brain also that certain peculiarities or idiosyncrasies of character, as well as a great predominance of the animal propensities, are thus transmitted. The organs of the senses are so immediately connected with the brain, that their functions would generally become more readily impaired. Riliet considered that epilepsy was the most frequent disease thus transmitted, which has its seat in the nervous system.

"Dr. Barlow states that the tuberculous diathesis shows itself in the greatest intensity in the offspring of marriage between relations in whose family the taint has already existed. Hence we have a large number of cases of phthisis—consumption—from this source, as well as scrofula in all its diversified phases. There is also the disease known as rickets, with curvatures of the spine, and deformities of the body in an endless variety of forms. It should be borne in mind that all these abnormal states increase most rapidly with every generation thus intermarrying, becoming thereby intensified more and more. These morbid forces resemble somewhat the falling of heavy bodies where the power of gravitation is constantly accumulating. A small force will hold these bodies in check at the start, but, when far advanced, no power can well resist them.

"Dr. S. M. Bemiss, of Louisville, Ky., published a large collection of facts bearing on this subject, in the *North American Medico-Chirurgical Review* for 1857. Says he: 'By much labor I have obtained statistical accounts of 34 marriages of consanguinity; of this number, 28 were between first cousins, and 6 between second cousins. Of the total number of marriages, 27 were fruitful and 7 sterile. The 27 fruitful unions produced 191 children. Of the 28 marriages of cousins, 23 were fruitful and 5 sterile; of the 6 marriages of second cousins, 4 were fruitful and 2 sterile. In both these latter instances of sterility the female was the product of a marriage of consanguinity.

"'Of the 192 children resulting from these marriages, 58 perished in early life. In 24 of the 58 deaths the causes were stated as follows: Of consumption, 15: of spasmodic affections, 8; of hydrocephalus, 1. Of the 134 who arrived at maturity, 46 are reported as healthy; 32 are set down as deteriorated, but without absolute indications of disease; and 9 are returned without any statement as to health or condition. The remaining 47 all possess such abnormities as to render them the subjects of particular observation. These are classed as follows: 23 are scrofulous; 4 are epileptics; 2 are insane; 2 are mutes; 4 are idiots; 2 are blind; 2 are deformed; 5 are albinos; 1 has chorea, and 6 have defective vision.' While these statistics present a goodly number of children, there was an unusual number tuberculous (15 dying of consumption) or scrofulous (23), making 38 in this class. Nearly one half inherited, probably an imperfect organization.'

"In the Transactions of the American Medical Association for 1858 is an extended paper by Dr. Bemiss on this subject, made up mostly of tables, reporting 833 such marriages, giving the time of marriage, the occupation, the temperament, the health, habits, etc., of the parents, with the number of children, their defects, peculiarities, etc., etc. The whole number of children was 3,942, of which 1,134 were defective; 145 deaf and dumb, 85 blind, 308 idiotic, 38 insane, 60 epileptic, 300 scrofulus, 98 deformed, and 883 died early. The proportion reported deaf and dumb, blind, idiotic, scrofulous, and deformed, is altogether larger than what would be found among the children of families in the community, taking them indiscriminately. The degree of relationship in these cases is thus given: 10 marriages between brother and sister, or parent and child; 12 between uncle and niece, or aunt and nephew; 61 between blood relations, who were themselves the descendants of blood relations; 27 between double first cousins; 600 between first cousins; 120 between second cousins, and 13 between third cousins. In a careful examination of the several degrees of consanguinity here given, the hereditary effects are found to be the worst in the first and second degrees, in the third not so bad; but when we come to the fourth, fifth, and sixth, the digerence is not so perceptible."

The significance of these facts cannot be denied, and we might gather from Dr. Allen's pamphlet, a much larger mass of facts bearing upon the subject, all going to prove that intermarriage has universally proved disastrous to the human race wherever it has prevailed to any considerable extent.

But it has been stated, and it must be admitted that there is force in the argument, that in all these cases, intermarriage has not been according to psychological laws; and that had these laws been observed as rigidly as stockbreeders observe them in producing the improved animals for which "In-and-in" breeding has become so celebrated, improvement, and not deterioration, would have been the result.

This is dealt with by Dr. Allen, in the most candid spirit, but at the same time his argument seems to us entirely incontrovertible. It is much too long for us to transcribe, but its gist may be summed up very briefly, as follows: Granted that the statement that intermarriage if conducted in rigid accordance with psychological laws, would improve progeny, it is simply impossible so to conduct it. Even the stockbreeder who is dealing with a coarser and far less complex organism than the human constitution, and who has power to control the coupling of the sexes at will, makes at times the most grievous blunders. The effect of such blunders may be corrected by killing a deformed or diseased animal, or preventing it from perpetuating its defects in future progeny, but these resources are not available in the case of the deformed, deaf, or diseased of the human race, and if they were, they would afford no remedy for the evils of intermarriage, which depend upon such complex and indeterminate physical characteristics that their effects upon the offspring of two nearly related individuals cannot be predicted with even approximate certainty.

From the doctor's essay we infer that the proper limit of consanguinity excludes first cousins from intermarriage, in which we agree with him. We believe that psychological laws have been altogether too much disregarded in the marriage of those not related by blood, and that much of the disease now prevalent in the world may be traced directly to this cause, and when we consider the largely increased tendency to impress upon offspring any peculiarity of consanguineous parents, we are convinced that such marriages are injurious in their effects upon society at large; and also that the Levitical law upon intermarriage was based upon sound psychological science as well as being an expression of the divine will, through the prophet Moses, to the Israelitish Nation.

NATURAL SELECTION.

The following, from the *London Quarterly Review*, is so terse and clear an exposition of Darwin's theory of natural selection, and presents such interesting facts bearing upon a subject now attracting universal attention in the scientific world, that we give it a place in our columns.

"Mr. Darwin's theory is based on a very few groups of observed facts, and on one demonstrable principle. The first group of facts is the *variability* of all organisms descended from the same parents; a variability not confined to external form or color, but extending to every part of the structure, and even to constitutional and mental characteristics. This variability is found to be one of the most universal facts in nature. It is not common or general only, but absolutely universal. Every one knows from his own experience that no two individuals of a family, whether human or animal, are absolutely alike, but no one knows the large amount, or the infinite phases of this variability, but the naturalist or the breeder.

"The fact of universal and all-pervading variability being proved, it is next shown that every kind of variation can be accumulated, by the simple process of choosing from a great number of individuals those which possess any given variation in a marked degree, and breeding from these. It is found that in the next generation, the offspring do not, as might perhaps have been supposed, cease to vary further in the same direction, but generally vary from their parents as a center in every direction, and if a large number of individuals are produced, a considerable increase of the first variation may be obtained. For example the wild jungle cock (*Gallus bankiva*) has an average size about equal to that of our smaller kinds of domestic poultry, and out of thousands or millions of individuals none are ever so large as the 'Shanghai,' or so small as the 'Bantam' breeds. Yet these are descended from the same race, made permanently larger or smaller by the process above described. In pigeons, the bill, the feet, the wings, and the tail have been altered in size and form to an extent nowhere seen in the original wild stock, and Mr. Darwin has shown that the bones and internal organs are capable of modification to an equal extent. The power of accumulating every kind of variation is therefore proved, and this is the very corner-stone of the theory, and that which best distinguishes it from all hypotheses of transmutation of development that have preceded it.

Another fact of importance is, that all living things have the capacity of increasing in a geometrical ratio. If a pair produce ten young ones once during their lives, and these breed at a year old, there will be nearly 20,000,000 produced in ten years. Many animals, and most plants, have far greater powers of increase than this, and even the slowest breeding of all, the elephant, would, in five hundred years, increase from a single pair to 15,000,000. But we know that in any country once stocked with animals and plants, the number of individuals may fluctuate slightly, but never regularly increases.

Taking an average of all the species, it certainly remains nearly stationary. It follows, therefore, that the deaths every year are almost exactly equal to the births. If the number of sparrows in England is on the average half a million, and if a million young ones are hatched every year, then before the next year a million sparrows must die. So in a forest of oaks, the number of trees cannot increase on the same space of ground, yet millions of acorns are dropped annually, and would all become oak trees under favorable conditions, but all must die before maturity till an oak falls and leaves room for some of them. Now when, according to our supposition, a million sparrows die every year, what is it that determines which individuals die and which survive? We know that wild animals die of diseases, of hunger, of cold, by the attacks of enemies, and perhaps from other causes. Will it be the healthy or the sickly that will die of disease—the strong or the weak that will die of hunger—the well-feathered or the poorly-feathered that will die of cold—the active and wary or the slow and careless that will be killed by enemies? We can only answer these questions one way. We are as sure of the average result, as we are that an insurance company, which charged the ordinary rates to all people with consumption and heart disease would soon be bankrupt; and we may well express it by the term—'survival of the fittest' (this term was first used by Mr. Herbert Spencer in his remarkable work, 'The Principles of Biology,' and its more general adoption would alone answer some of the popular objections to Mr. Darwin's theory), a term which states the absolute fact, that those best adapted to survive do survive, and those least adapted die. This is Mr. Darwin's celebrated theory of 'Natural Selection,' but which is more properly a self-evident principle or axiom. Having been led to it by the analogy of the choosing or selecting by man of certain varieties to continue the breed, while others were neglected or destroyed, he personified the various natural causes which led to the preservation of the half million, and the death of the million, and termed them 'natural selection.' But people are continually forgetting that the term is an analogical one, and object over and over again that 'selection' implies a selecter; whereas if they would take pains to understand the thing, instead of puzzling over the mere term, they would see that the preservation of those best fitted to live, was as much the secondary result of the powers of nature as is the arrangement of sand and pebbles by water, or the selecting of leaves to be drifted into heaps by the wind, while the stones and sticks are left behind.

"Fully bearing in mind these great and demonstrable facts—the universal variability of all organisms and of all their parts—the possibility of accumulating these variations in definite directions—the enormous reproductive powers of all living things; and the mortality equal to the births—and lastly the necessary survival of the fittest—we shall be able to see, that the changes in external nature, animate and inanimate, continually going on, must produce indirect effects vastly greater and more important than any which, as Lamarck supposed, they can produce by their direct action on individuals or species.

"Let us take first the differences of color in animals. These are absolutely inexplicable on Lamarck's theory, for we do not find that any change of conditions produces definite changes of color, still less does it produce the varied spots, lines, bands, and patches of color that occur in animals. Neither have the motions of animals, their desires, or their food been proved to produce any definite effects on their colors. But we know that color is the most variable of all an animal's characters, and yet in a state of nature, color, as a rule, is very constant in each species.

"Mr. Darwin has shown, however, that color is often intimately associated with other constitutional peculiarities. In Virginia the paint root (*Lachnanthes tinctoria*) is eaten by pigs, and makes their hoofs drop off. But black pigs are uninjured by it. Consequently, in places where this plant is abundant the farmers never keep any but black pigs, as no others can be raised except in confinement. Here we have a beautiful illustration of the mode of action of 'natural selection.' The pigs of Virginia are not all born black any more than in other countries, but those of all other colors soon die, and therefore in a state of nature a black race would be produced; and from the powerful action of the law of hereditary descent there can be little doubt that in time the litters would consist almost entirely of black pigs. If after this had happened it were first discovered that white or brown pigs could not live in the district, we should have a striking example of adaptation; but the adaptation would evidently be an adjustment brought about by the simple law of 'natural selection' or 'survival of the fittest,' and the rigid extermination of all individuals not adapted to the surrounding conditions. It can be easily seen that in this case 'natural selection' does not imply a personal selecter, since exactly the same result must happen whether the farmer kills off the white pigs himself and turns the black ones loose, or turns out all together.

"This case, although curious, is by no means isolated. White terriers suffer most from distemper, and white chickens from the gapes. In Sicily the *Hypericum crispum* is poisonous to white sheep alone. White horses suffer severely from eating honey-dewed vetches, while chestnuts and bays are uninjured. Purple plums in North America are subject to a disease from which green and yellow plumbs are free. Again, the white pigeons of a flock are the first to fall victims to the kite. White rabbits of a very hardy kind have been turned loose but failed to maintain themselves, and black fowls on the west coast of Ireland are picked off by sea eagles. Here we have the explanation of the otherwise puzzling fact, that white quadrupeds and birds are so rare in nature, al though abundant in all domestic animals; and the explanation is all the more satisfactory because it accounts for the exception to the rule, in the case of many arctic birds and quadrupeds as well as of sea birds, for to these the white color is a protection instead of a danger. Now this same principle will apply to structural and constitutional peculiarities and to habits.

"Man can accumulate variations either in the root, the leaf, the flower, or the fruit of plants, their color, odor, or taste; in the size, swiftness, or scent of dogs; he can alter the bill, the feet, the tail, or the habits of pigeons; can increase the milk of the cow or the fat of the pig; can alter the length of ear in the rabbit and of horns in the bull, or can attend to two or even more of these points at once. In like manner the law of 'survival of the fittest,' by simply determining which out of the immense surplus annually born shall be the parents of the next generation, must lead to the modification of every part of an animal's organization that affects its welfare—that is to say, sooner or later of its whole organization. So long as the changes of land and sea of which geology assures us, and their concomitant changes of climate, of soil, and of vegetation, and of the distribution of animal forms, are going on, each species in turn must be exposed to new conditions and new dangers, must have to live upon new food, or to struggle with new enemies. Those whose organization is sufficiently flexible to furnish in each generation favorable variations, will become adapted to the new conditions, and will appear as the new or representative species of the naturalist; such as could not vary quickly enough would die out, and furnish the extinct species whose remains the palæontologist disentombs.

"Here we have at all events a real and a powerful cause in action, and one which is accurately defined, and has been copiously illustrated by observation and experiment. No occult powers are postulated, but instead of them demonstrable groups of facts; and Mr. Darwin has developed his theory so fully, and has shown it to be in accordance with such a vast mass and variety of phenomena which on any other hypothesis are unintelligible, that it has commanded very general acceptance, especially among geologists with whose general doctrine it so well harmonizes."

Cultivation of the Truffle.

The truffle is a species of tubercular mushroom which grows and lives below the surface of the ground. Since the days of Pythagoras and of the ancient Greeks, a reputation for delicacy of flavor and perfume has been attached to it, which has made it a favorite with all true epicures, and has given it a high market value.

In France, which has at present almost an exclusive monopoly of the trade in this vegetable, more than 18,000,000 francs worth of truffles are consumed annually.

The region from whence these truffles are procured is south of the river Loire, and more especially those portions of France popularly known as Lorraine, Perigord, Saintonge, Gascony, Rouergue, Languedoc, Provence, and Dauphine.

A careful study of localities and a chemical examination of soils by Mr. Chatin, has proved that truffles will only grow in a calcareous soil, and that they are never found in silicious, schistose, or granitic soil. The ground must be perfectly free from permanent moisture. The climate needed must be temperate as both extremes of heat or cold are prejudicial to the truffle. In the Pyrenees truffles are found at a hight of 2,500 feet above the sea, but on the Alps they do not thrive at half this hight.

Singularly enough truffles are only found growing at the foot of a certain limited number of trees or shrubs (27 in all), but the various species of oak seem to be preferred above all others.

Truffles are hunted by means of small dogs trained for the purpose, who smell from the surface the whereabouts of the subterranean tubers, and by scratching the ground indicate to their master the spot where he has to introduce his spade in order to dig up the precious tuber. In the absence of dogs, the hog, whose sense of smelling is much more delicate than most persons believe, is often employed for the same purpose, a boy driving the animal slowly along through the woods, while he holds on by means of a string attached to the porker's hind leg. Wherever the hog stops to "root," the probability is that a truffle is to be found.

Attempts to cultivate the truffle have at various periods been made by enthusiasts but always without success.

It seems, however, that a M. Rousseau, of Carpentras, in France, has at last succeeded in this new branch of gastronomic horticulture, but no report of his system has yet been published.

Gas vs. Gunpowder.

The *Advertiser and Times*, Oswego, N. Y., says: "We saw, yesterday, a novel experiment involving the explosive power of gas. In the new tank excavation, now in a forward state, at the gas works in this city, an old well had been pumped out and then filled up after leaving an aperture beneath. Into this space a limited quantity of gas was introduced from the gas pipe, sufficient to form an explosive compound with the air in the covered well. A match trigger touched off the mine, when a general upheaving of the surrounding earth took place, loosening up the soil and making easier digging."

CEMENT FOR FASTENING INSTRUMENTS IN HANDLES.—A material for fastening knives or forks into their handles, when they have become loosened by use, is a much-needed article. The best cement for this purpose consists of one pound of colophony (purchasable at the druggists'), and eight ounces of sulphur, which are to be melted together, and either kept in bars or reduced to powder. One part of the powder is to be mixed with half a part of iron filings, fine sand or brick-dust, and the cavity of the handle is then to be filled with this mixture. The stem of the knife or fork is then to be heated and inserted into the cavity; and when cold it will be found fixed in its place with great tenacity.

Improved Plow.

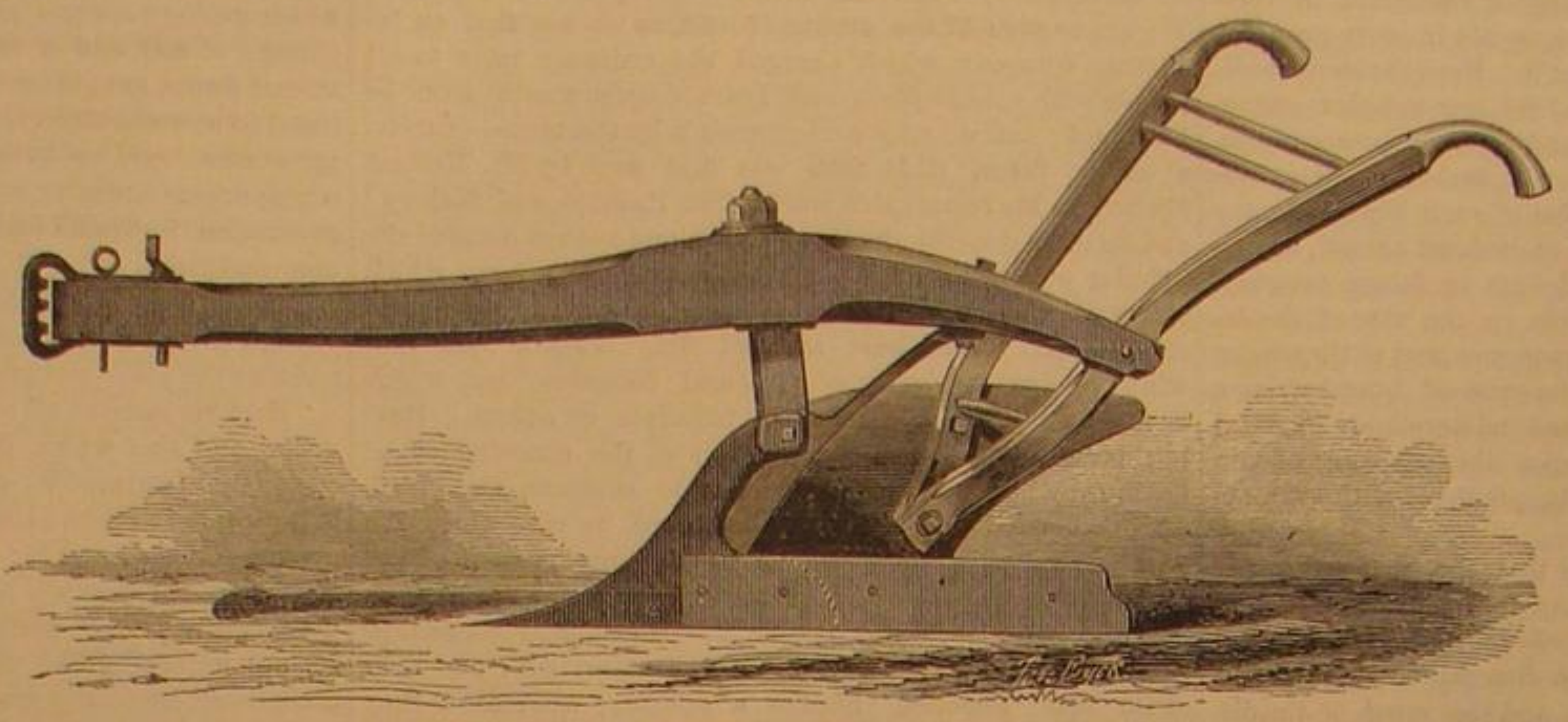
The improvement here noticed is one of those simple in character, but on account of practicability and obvious utility, worthy of the earnest attention of those interested in the manufacture and perfection of agricultural implements.

Its object is to firmly brace and stay the beam and other parts of a plow, and, at the same time, to obviate the clogging which takes place from attaching one of the handles to the landside bar or to an arm projecting from the rear of the standard.

The method of attachment adopted in this device leaves a clear space behind the standard, and between the beam and the landside bar; thus permitting stones, weeds, clods, or anything likely to fall into and clog an ordinary plow to escape readily.

The improvement consists in bringing the landside handle by a proper bend directly across to the mold board and attaching it at, or very nearly at, the same point that the opposite handle is attached. In the engraving they are shown as being attached by a single bolt passing through the lower ends of both handles; but separate bolts may be used if thought best.

The beam is thoroughly braced to the shank, and the landside bar is also strongly braced laterally.



MANN'S PATENT IMPROVED PLOW.

It will be at once seen that the friction upon the landside bar must be very much less when made in the form shown in the engraving, than when it is increased in width to cover and shield the handle as in the old form; and that the draft must be correspondingly lessened. The plow never becomes loaded with stones, weeds, and earth, but constantly clears itself, which also greatly lessens the draft.

The inventor has in his possession certificates from those who have tested the draft of this plow, stating that it is twenty-five per cent lighter than plows of the former construction. Let any farmer figure out for himself what a saving would here be made by the use of this plow. Work implies food for the animals which perform it. A given amount of work represents a given amount of oats, hay, or other forage consumed. Let a farmer estimate the value of one fourth the feed required for a team required to do a spring's plowing on an ordinary farm, and set the value of it against the cost of one of these plows, and he will at once see that if the tests above alluded to are to be relied upon, a large saving has been accomplished by this improvement.

This plow was patented, April 16th, 1861, by Henry F. Mann, at that time of La Porte, Ind., but now of Pittsburgh, Pa., who may be addressed for exclusive rights or licenses at the latter place.

Improvement in Tea-kettle Breasts

That simple, useful, and universal kitchen utensil, the tea-kettle, it would seem has in its ordinary construction some important defects. When it has got "to the boil" it makes steam faster than the meager avenues around the cover can permit it to escape; pressure is thus generated, and the water is forced up the spout and ejected, producing the catastrophe known to housewives and kitchen maids as "boiling over." If it be sought to prevent this by taking off the cover, the fingers are in danger of scalding, and are not unfrequently badly burned.

When the article in question is made of tin, it is liable to rust around the cover and thus enlarge the aperture rendering the cover loose and liable to drop into the tea-kettle, or off during the pouring, when a scald is almost certain. The rust also, not unfrequently extends back as far as the ears, weakening the attachment, which finally breaks out, necessitating a patch.

DIXON'S TEA-KETTLE BREAST.

The engraving shows an improved tea-kettle, which has not the defects we have described. It has a perforated dome for the escape of steam when generated, so that it cannot boil over; and the apertures in the dome are placed on the opposite side from the handle, which directs the steam away from the hand when the handle is grasped. The aperture into which the cover fits is bound with sheet metal, of any suitable kind not acted upon by water; as copper, block-tin, or other suitable material, which also as a collateral advantage, strengthens the breast.

The old method of punching of a hole through the cover gives vent to the steam, but directs it against the hand precisely where it is not wanted; this improvement on the contrary obviates all necessity for any such clumsy make shift. A tube bent to the proper form may be substituted for the perforated dome, and can be applied to copper or iron kettles which may dispense with the binding.

The whole forms a simple, perfectly practicable, improvement, on a very useful article of kitchen furniture.

A patent was obtained on this improvement, April 6, 1869, by Z Dixon, Bristol, Ill., who now offers for sale the right for the New England States, and who may be addressed as above for further information.

LEGHORN STRAW HATS.

The Leghorn, or Italian straw bonnets and hats are celebrated the world over on account of their beautiful texture, pliability, artistic make, and high cost.

This modern branch of industry, which is limited to Tuscany, was begun in Florence in the year 1825, and has gradually acquired an importance of from three to five millions of dollars for crude straw for export.

The material used is a special variety of wheat cultivated for this express purpose, the seed of which sells at a much higher price than that of ordinary wheat.

The straw is harvested in the mountainous regions of Prato, Empoli, etc., where the vegetation is poor and stunted, the soil being light and sandy.

The fields are weeded by hand and worked with as much care as a garden plot. Fourteen bushels of seed are usually sown to the acre; two bushels being "broadcast" at each time, and each sowing made at a different angle to the first. The effect of this is to produce a very close, compact growth, and only one elongated stem rises from each seed sown.

The straw is harvested while green and before the ear is fully developed. It is gathered into small sheaves weighing about half a pound each, which are at first placed upright in the field to dry, one acre bearing about three thousand of them. Next day these bundles of straw are spread out over rocks and pebbles in the dry bed of water-courses, where they are submitted to the action of sun and dew. At night they are covered up, great care being taken to protect them from rain. The straw is now bleached by means of sulphuric acid gas.

The next operation consists in taking off the ear below the first joint, in separating the lower useless portion, and in cutting the straw into lengths of four inches. Each blade of straw usually furnishes three such lengths. It is then bleached for the second time by fumes of sulphur.

At this point the straws are sorted according to their various sizes—an operation performed by women who acquire, through long habit, a most remarkable tact in distinguishing the smallest variation in diameters, as may be inferred from the fact, that in front of each operator are placed goblets numbered from 30 to 180, each of which is the receptacle for a special size of straw.

The braids are plaited with from eleven to thirteen straws each. Their length is from 300 to 320 feet, their width and the quantity of straw entering into them varying according to quality. With No. 30 straw the braid is coarse and wide, and weighs two pounds and a half. It takes, however, a whole month to plait a single bonnet from such straw. With Nos. 120 to 180 it takes about one pound and a half of straw to a braid. With extra straw—No. 180—the braids are not more than 0·039 of an inch in width, and it takes six months' labor to make a sufficiency for a single bonnet for a lady.

The braids are cleaned, exposed to the sun for a short time, and then sent to the manufacturer to be sewn into shape. This last operation is performed with the very greatest care, the stitches being nearly invisible and yet strong, and not liable to unravel during the pressure to which the hats are often subjected after being sized.

The hats are "ungreased," and any bumps or protuberances on their surface are effaced by rubbing one portion of the tissue against another, or by means of friction with a dog skin.

If an accidental tear be made, a piece is immediately inserted into the slit, and so adroitly is this done that the most practiced eye can hardly discern the imperfection. The hats or bonnets are then immersed into a warm-water bath containing a certain amount of acetate of lead, and are finally bleached for the last time by means of sulphureous fumes. The pliability of these hats is very remarkable when compared with the common straw fabrics made in other parts of the world.

Imitation Leghorns have of late years been largely made, and with considerable success, in the Canton of Aargau, in Switzerland. The trade from this latter region amounts already to a value of several millions of francs per annum. These hats are neither as fine nor as strong as the genuine, but they sell at much lower prices.

The manufacture of "fancy" straw goods is a remunerative branch of agricultural technology, which might profitably be introduced into the United States. Such work is well paid for, and is of a nature suited to our country women and girls, who could earn a living at home, without being obliged to leave their families.

The seed of Tuscany wheat would probably have to be imported annually from Italy, as it has been proved by careful experiments in various portions of Europe, that it rapidly degenerates in quality whenever grown, for several successive years, in regions far removed from its original place of production.

Cheap Method for Grapes.

Mr. William J. Flagg, a practical vine-grower in Ohio, has recently spent three summers among the vineyards of Europe, most of the time in France, but Italy, Austria, and Switzerland were also visited. The modes of vine culture were carefully examined, with a practical eye, and although the excellence of various foreign practices were readily acknowledged, we do not find any desire to recommend or adopt any particular mode of cultivation merely because it is foreign. Mr. Flagg believes the souche (or stock) mode of training vines more suitable for this country at present than those now in vogue "We can and will," says the author, "grow wine cheaper than the Europeans, and for the same reason that we can grow wheat cheaper than they, namely, that we have cheaper land and more of it. In raising grapes on our present system, however, we abandon the only vantage ground we possess and enter into competition with them in a field where they are stronger than we." The appearance of vines trained after the *souche* method is thus described in an earlier portion of the work. "'What is that?' I exclaimed, with no little astonishment, as, turning away from the trellises where vines were so tenderly upheld, we entered a field where there was never a bit of trellis nor stake at all, nor peg to tie to, nor tree to hang upon, but where each individual plant, alone and self-sustaining, scorning all support—its arms embracing nothing—its tendrils twining around nothing—stood on its own bottom, and held up its own top, like a strong-minded woman planted on her rights! It was a field of the variety known as *la folle blanche* (the crazy vine), growing *en souche basse*, which may be translated by stump, or stool, *souche* meaning, literally, stock. * * * As a workman drew apart the branches of one of the *souches*, a profusion of full-sized, white grapes was revealed, all hanging close about the head, and easily sustained by the rugged old stock, which was about ten inches high and five inches thick. 'It is a perfect fountain of wine,' said the man." It is this mode of training that Mr. Flagg would have introduced in America, and apparently with good reason.—*Albion.*

We notice in one of our exchanges the death of Professor Dussauce, a native of France, who at the time of his death filled the position of chemist to the establishment of Messrs. Tilden & Co., of New Lebanon, N. Y.—The deceased was evidently an indefatigable worker, having written and compiled several scientific works. Respecting Professor Dussauce's early history and education we have no mportant facts.

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WANTED A SUBSTITUTE FOR EARTH AND PLASTER WALLS.

In the matter of external construction, the architecture of the civilized and semi-civilized races shows a very marked contrast to the rude habitations of savages; but so far as inside walls are concerned we are but little removed from them. We daub the insides of our dwellings with what if not exactly mud is but little removed from it. In this respect our civilization is but little above that of the beaver, the mason bee, or the mud wasp. It seems strange that in this age of improvement, the public is content with the rude plastering, the earliest date of which would be about as hard to fix as the date at which building began.

Mortar is ill adapted to the purpose in several respects. First, it is uncomely, unless covered with hard finish or paper, or frescoed in a much more artistic manner than most modern fresco painters seem capable of. Second, it is friable and inelastic. A slight inequality in the settling of buildings fills it with unsightly cracks, the repair of which fills a dwelling with dirt, ruining furniture and irritating temper. Third, a certain temperature must be maintained after it is applied until it is dry, to obtain a successful result. Fourth, it is liable to fall from the ceiling upon the heads of people quietly and unsuspiciously sitting beneath it, from the effects of jar or an undetected leak in the roof. Fifth, it is a porous and absorbent material, and forms, unless covered with hard finish, painted, or otherwise covered, a reservoir for the accumulation of noisome odors and pestilential effluvia, etc.

Standing opposite these objections it has the advantages of cheapness and easy application, which do not in our opinion balance the account.

It would seem that with all the resources now at command something much better than mortar may be found out of which to construct inside walls; something not so expensive as wooden wainscoting and ceiling, while at the same time it might be susceptible of a high degree of adornment, and free from the objections we have enumerated.

We believe an excellent, warm, and durable wall might be made of straw board, sized with glue, or some other permanent stiffening, and painted on the inside. This material has considerable strength and elasticity. It is a bad conductor of heat, and would not condense moisture from the air in cold weather, as is frequently the case with plastered walls, in churches and assembly rooms, when an audience assembles in them.

Nothing can be more unsightly than the streaks formed by condensed moisture on a frescoed wall, unless perhaps it may be the streaks of color sometimes seen on the cheeks of ladies in overheated assembly rooms.

It is even possible that a preparation of straw pulp could be made that might be applied in a plastic form; a sort of straw *papier mache*, capable of being molded into forms of beauty in cornices, center pieces, etc. Such a wall would seem to be inexpensive and easily put on, it would not be attended, in repairs, by the disagreeable and destructive lime dust. If varnished over the paint, it could be easily kept clean by washing, and any colors desirable might be used in its decoration.

There are other materials which will suggest themselves to inventors as being likely to prove available for the purpose, and there can scarcely be a question that the public would eagerly embrace any improvement that would secure immuniw from the objectionable features of plastered walls. 3ut perhaps the material which will soonest be thought of in this connection is sheet metal. We are informed that ceilings of corrugated metal have been manufactured, but we do not know the parties who make them, nor have we learned the success which has attended their use. It must be remembered however, that metallic bodies conduct and radiate heat with greater facility than other substances, and are therefore perhaps open to some objections on the score of economy in cold climates where a saving in fuel is a desirable attainment.

To find a substitute for mortar, every way answering the requirements of the case, will undoubtedly necessitate some experiment, but we believe the value of such an improvement would warrant the devotion of considerable effort toward its attainment.

WANTED—LIGHT IN DARK PLACES.

While the means of creating artificial light have received much attention, and have been greatly extended within a few years, we find city corporations still clinging to common illuminating gas for lighting streets, railroad companies using kerosene for lighting stations and tunnels, and the United States Government holding on to the lard oil lamps for lighthouses. We have seen only one indication that anything better than gas is sought by city governments in this country for street lighting. This indication is found in the annual message of Mayor Hall to the Common Council of New York, which contains a suggestion that the magnesium, or, more properly, magnesia light—for this must not be confounded with the light produced by the combustion of the metal magnesium—might prove cheaper and better than the gas now used. The light in question is produced by the combustion of two small jets of gas, one of ordinary illuminating gas and the other of oxygen, in contact with a pencil of magnesia. It is precisely similar in principle to the well-known lime light; the substitution of magnesia for lime on account of its superior durability, and common illuminating gas for pure hydrogen on account of its cheapness, being all the modifications made, if we except the improved burners intended for general use. The process of Du Motay has so cheapened the cost of obtaining oxygen that the light thus obtained is rendered cheap enough for general use.

The want of diffusiveness complained of in the lights of this kind, placed at the corners of Trafalgar Square, in London, does not appear to us an essential defect of this light, and we are of the opinion that proper adjustment would entirely obviate any such objection.

We are assured by Dr. Doremus that the city streets could be illuminated far more cheaply and efficiently by the magnesia light than is possible by the old method.

It is also demonstrable that the safety of life and property is enhanced by thoroughly lighted streets, while the comfort of the populace is greatly increased.

But while it needs no argument to show the superiority of the magnesia light over the ordinary gas, we think a suggestion in regard to the placing of lights, of whatever character they may be, is worthy of consideration.

In approaching one of the ordinary gas lamps the eyes are so dazzled by the direct rays from the burner, slightly elevated above the heads of foot passengers, that a person, although his face may be perfectly recognized by another coming from the light toward him, cannot recognize distinctly any one a few feet in advance.

A remedy for this occurred to us one evening during the past winter, when upon the occasion of a *fete*, held in the Academy of Music, on Fourteenth street, in this city, the street for several blocks was illuminated with the magnesia light. The light being placed at quite an elevation, there was considerable diffusion of the light through the atmosphere approximating the effect of daylight. The faces of people coming from the light were as readily recognizable, as—when we had passed it—were those of people approaching it. The light, although very dazzling to look at from a short distance, was above the line of ordinary vision, except at a considerable distance, which so tempered it that its dazzling effects were not felt. Our observations at the time convinced us that the elevation of street lights would not only add to their general illuminating power but would render their effect much more agreeable.

The adaptation of the magnesium light to the illumination of dark tunnels on railways, seems not only obvious, but, it appears to us, demands the attention of railroad managers, from its economy, efficiency, and the increased safety which would be secured by its adoption.

For example, the Bergen Tunnel, on the Erie Railroad, a short distance from the ferry in Jersey City, has trains passing and repassing nearly every half hour of the day. It is three quarters of a mile in length. It is the custom to light the lamps in the cars when a train is about to enter this tunnel and extinguish them after the tunnel has been passed. The rushing into this darkness from broad daylight, produces a very uncomfortable sensation. This annoyance to passengers might be obviated, and the trouble of lighting lamps be done away with, by a suitable disposal of a few magnesia lights, which would light up the entire tunnel. We are certain that the adoption of this suggestion would be hailed with satisfaction by the crowds of people who daily pass through the Bergen Tunnel.

What reasonable excuse can be given by the Government for neglecting the advantages of this light for lighthouses along the coast, we cannot conjecture. In power it is as much superior to the lard oil lamps as they are superior to total darkness. When it is reflected that the loss of a single loaded vessel would supply the lighthouses along the entire coast with the new light for a long time, it is hard to conceive why our Government should not at once gladly avail itself of a means whereby immensely greater efficiency could be at once secured.

Many of our city readers will remember the humorous and sarcastic manner in which Prof. Doremus spoke of some of the officials who have this matter in charge, at his lecture on the Photometer, before the American Institute last winter, and the hearty laugh which burst from the audience on that occasion, when after the hall had been flooded with the magnesia light, he made the simple announcement that the government officials above alluded to, thought on the whole, lard oil was the best thing for the lighthouses. We heartily wish Professor Henry, of the Smithsonian Institute, whose intensely old-fogy letter upon the subject was read by Dr. Doremus, could have been present on that occasion. He would have found the lard-oil party decidedly in the minority at the moment.

But we have said enough for our purpose at this time. The whole matter may be summed up by the plain assertion that the public want, and will have, better light than is at present provided by tardy officials.

SPONTANEOUS GENERATION.

Discussion upon this topic seems to have been revived in some quarters. Most of our readers will understand what is meant by spontaneous generation, but lest there should be any misapprehension in the minds of any we will state what we understand by the term.

It certainly does not mean the springing into existence of living beings without any cause or causes for such an event; but, as we understand it, it signifies the production of a living thing from the elements which enter into the composition of its tissues, without the previous existence of parents and the formation of a germ through the action of vital energy, which, in general, is the commencement of reproduction.

It is not to be denied that the tendency of modern science is to the belief that spontaneous generation is possible, though if so, rare, and occurring only in the lower forms of life, under circumstances very difficult to separate from those which tend to obscure, and defeat demonstration. Notwithstanding all attempts at positive demonstration have hitherto failed, there remain some stubborn facts very difficult to reconcile with the belief that spontaneous generation can never occur.

Our readers will recollect reading of the appearance of certain insects of the *acarus* tribe in a highly caustic solution upon which the celebrated English electrician, Andrew Crosse, was experimenting in 1836. A considerable sensation was caused by the discovery, and a sharp discussion followed as to whether the appearance of the *acari* was an example of spontaneous generation or otherwise. The wife of Mr. Crosse has testified since his death that he never so regarded the occurrence, although surprised and nonplussed by it. Professor Faraday and Mr. Weeks confirmed the experiment of Mr. Crosse, but it has since been repeated by Professor Schulze, of Germany, without the appearance of the *acari* or anything resembling a living germ.

Others, among whom the most prominent is perhaps M. Pouchet, have endeavored to demonstrate the possibility of spontaneous generation by actual experiment, but though they have performed their experiments with much care and have succeeded in finding in their solutions many new infusoria, they have not generally convinced the scientific world of the satisfactory nature of their experiments.

The views of Professor Fick are that every organ of living beings is formed of congeries of cells, that each of these cells has a separate and distinct existence, and that, could proper conditions be attained, these cells would preserve their individuality of existence, and continue to live though the body of which they form a part were dead.

Professor Clarke, in his investigations upon the origin of *vibrios* from decaying muscle, says that he was impressed with the thought "that the *vibrios* were neither more nor less than the fibrillæ of the muscle set free from the fibers," a suspicion which he says was eventually verified by actually witnessing the fibrillæ disentangling themselves. He concludes, however, that the *vibrios* are nothing but dead muscle, notwithstanding their active motions.

A writer in *Scientific Opinion* now takes the ground that these are or may be living organisms; and accounts for the organisms found in the infusions of M. Pouchet and others, by the assumption, that they are simply the re-arrangements, and re-combinations, of the liberated cells of the substances infused; basing his views on those of Professor Fick above alluded to.

Now it is certain that every germ is a living entity, and that it is composed of matters found in the inorganic world. These matters have been combined by some means, and the compounds blended in the tissues are of a chemical character, yet possess a certain undefined something which merely chemical compounds, so far as present knowledge extends, do not possess, but which has received the name of vital force.

This force is synthetic in its nature; it builds up tissue, or it enables tissue to build up other tissue like itself. Hence we have growth, and when the vital energy decreases, or ceases, we have decay of parts, or general death and decay. While it is not proved that vital energy is not identical with chemical affinity, there are many reasons for believing it to be a distinct property belonging only to living things, and capable of being imparted only by living things to combinations of dead matter which thus becomes quickened. There are, at present, too few data for determining the question at issue, and while the subject is one of intense interest, and presents a most captivating field for study and speculation, it is one upon which it is absurd to hazard an opinion at present.

However deep we enter the penetralia of nature, there yet remains something between us and the ultimate; and all analogy teaches us that this must ever be the case. Every new discovery only leads us one step nearer the great controlling intelligence, who infinitely removed from mortal ken, yet permits us to approach gradually, through the ages of eternity to the secret of omnipotence. How vain, therefore, to assume from the few facts which biological science has already attained and classified, that we have even caught one glimpse of the profound mystery of life.

HAIL AND HAILSTORMS.

Our exchanges give accounts of several hailstorms which have occurred in various parts of the United States, and we are in receipt of several communications concerning the principles which govern the formation of hail, and containing some inquiries in regard to them.

Among these, a fair correspondent from Otsego Co., N. Y., has asked us whether a genuine hailstorm was ever known to occur in the night. Several others write us in a way that shows a confusion in their minds as to what is to be considered a hail storm, and what is not.

We will answer several of these together by saying that the sleet which falls in cold weather, and, in some regards, resembles hail, is not genuine hail. If a granule or globule of sleet be examined, it will be found to be generally of uniform texture throughout, being simply an ice globule. A hailstone, on the contrary, is formed, generally, of alternate layers of ice and snow, arranged somewhat like the layers of an onion, around a white nucleus of snow.

It is stated in the books that hail rarely occurs in the night. In our own experience, a hailstorm has *never*, to our knowledge, occurred at night. Our numerous correspondents, who reside in regions liable to the occurrence of hailstorms, will confer a favor by informing us if they have seen genuine hail between sunset and sunrise.

These storms usually occur during the hottest weather, and in the daytime, generally, if not universally, accompanied by electrical displays of great activity. It is quite certain, therefore, that electricity is, either as a cause, or effect, or concomitant, connected intimately with the production of hail.

During the occurrence of two hailstorms, which occurred at this point this season, we examined some of the stones which fell, and, whether owing to the warmth of the pavement, acting to speedily melt them, or to some other cause, the form of the stones did not present the usual pear-shaped form very distinctly.

The Transactions of the American Institute, for 1864, contain an account of a hail storm which occurred in Paris on the 29th of March, of that year, in which the stones had an absolute conical form. The base of the cone was slightly concave, and the sides were roughened by minute, six-sided, transparent pyramids, inclined toward the base. Some pyramids, also, emerged from the base. The weight of these cones varied from 180 to 250 milligrammes—about from 28 to 38 gr., —and the diameters of the bases varied from 8 to 10 millimeters, or from about 3-10 to 4-10 of an inch; while the hight was from 10 to 13 millimeters, or from 4-10 to 5-10 of an inch. The hail, was, therefore, remarkable in nothing except the form of the stones.

The combination of causes which produce hail are very imperfectly understood. There must, however, be contact of cold air with warm, moist air, but how the intense degree of cold necessary to change the condensed watery vapor into ice, so rapidly, is produced, is yet a mystery. All the theories yet put forth are based upon hypothesis, and it is difficult to see how facts can be obtained which will give a reasonable solution of the phenomenon.

The freezing takes place at points inaccessible to man and the lumps of ice are precipitated upon the earth, frequently in such a manner, and of such a size, as to show that they must have fallen from high altitudes.

The theories alluded to are so familiar to most of our readers, that we will not dwell upon them, but will say in conclusion, that the most plausible of them appears to us to be that of Redfield, which supposes the hot and cold airs to be mingled and carried to high and intensely cold regions by the action of a vortex or whirlwind, from whence the congealed moisture is precipitated in the form of hail.

THE PRACTICAL APPLICATION OF THE SLIDE VALVE AND LINK MOTION TO STATIONARY, PORTABLE, LOCOMOTIVE, AND MARINE ENGINES.

The above is the title of a new book from the pen of William S. Auchincloss, C. E., which is a work of too great importance not to receive at our hands more than the brief notice usually accorded to new publications.

The author tells us in his preface that

> the main object of his treatise is to place in the hands of the mechanical engineer and draftsman, a simple method for determining the proportions suitable to any link motion, without the assistance of an expensive and cumbrous model or the delays incident to its manipulation. Secondarily to supply the student of steam engineering with a comprehensive view of those causes which regulate both the form and dimension of the cylinder, slide valve, and eccentric. This portion of the work has grown incidentally out of the first; for as the link merely combines the action of two eccentrics, it was obviously necessary that the functions of one of these should be clearly understood before an attempt was made to develop the laws of their joint action.

The author modestly expresses the hope that these Parts I. and II. will not prove entirely devoid of interest to the skilled designer, but that they will at least receive a hasty survey, for the sake of the light they throw on the general subject through the medium of Part III. The author may dismiss all fear that any part of his able work will fail to interest either skilled or unskilled readers. We have seldom had the pleasure of reading a work, in which the author has been able to express himself with greater clearness, or has reached the real difficulties of his subject by such well-selected methods of approach. There is in the body of the work no shadow of an attempt to sacrifice perfect plainness of speech to a desire to display the learning of the author. He has, from the outset, conscientiously kept but one purpose in view; namely, to choose only those methods of demonstration which would best enable his mind to come in contact with the minds of his readers. To this end he has never let style or pompousness of expression take precedence of perspicuity, and has been willing to adopt any method of illustration, however simple, provided it would best subserve the purpose. In this way he has stamped his personality so strongly upon his work that one feels, after perusing his work, as though he had held a conversation with the author, instead of reading a book.

He is fully aware, at the outset, that

> engineers, accustomed to consider the model as absolutely indispensable to the proper adjustment of a link motion, will be wont to look with skepticism upon all efforts made to solve the problem by other means,

and admits that

> so far as these feelings are entertained against an algebraic or trigonometric solution they are well based; the number of variables entering into the problem, being too great for the powers of algebraic expression.

He has, therefore, adopted geometric construction as the basis of his system, and has shown great skill in its development. But while in his treatment of the subject the author has judiciously avoided all abstruse modes of expression, he has added, in the appendix, a mathematical investigation of the subject of the crank and piston motion.

The results of the investigations and discussion enable the author to construct a travel scale, by which all problems connected with the slide valve can be directly solved by simple measurement, and without any complicated construction or calculation.

The author commences his work by a brief but sufficiently comprehensive discussion of what is to be correctly understood by the term work, and the methods of estimating it. He then takes up the subject of mean effective pressure, and shows that

> the character of the connections between the boiler and steam cylinder, their length, degree of protection, number of bends, shape of valves, etc., must all be considered in forming the initial pressure in the cylinder, while the mean effective pressure will depend upon the point of cut-off of the steam, and the freedom with which it exhausts.

He does not attempt the discussion of the proper point at which steam should be cut off, that being foreign to the purpose of the work; but considers it throughout the treatise as predetermined, with the exception of certain limitations prescribed by certain valve motions.

This is followed by a mean pressure, volume, and temperature table, in which the stroke, being taken as a unit, and the initial pressure in lbs., with the temperature in degrees, Fah., and the corresponding relative volume being given, the mean pressure for various points of cut-off may be at once taken off.

> If from the mean pressure we subtract the mean value of the back pressure, or that which may arise from imperfections in the exhaust usually taken for low-pressure engines, at from one to two lbs. per square inch, the resulting pressure will be the mean effective pressure in pounds exerted on each square inch of the piston.

This, in connection with a large number of experiments made by Mr. Gooch, in 1851, with the locomotive *Great Britain*, forms the basis for another table of mean effective pressures. The author here, as well as in all other parts of the work, illustrates by an actual example performed in accordance with the principles laid down, the proper application of the principles to the solution of problems.

The next subjects considered are the speed of piston, diameter of piston, and its stroke. Here it is plainly shown that the diameter of the piston to drive a given horse-power depends upon the mean available pressure and its speed, the latter, of course, left to be decided by the judgment of the designer, as formed upon a due consideration of each individual case. The author, therefore, contents himself with giving the quantities most frequently found in ordinary practice. Of course the stroke of the piston is derivable directly from the speed of the piston, but the circumstances which should limit the stroke are referred to in this connection, accompanied by tables of the revolutions made by driving wheels of a locomotive at given speeds, for various diameters, and the number of revolutions of cranks of marine and stationary engines, for given stroke and (approximate) piston speed.

As all work performed depends primarily upon the mean effective pressure in the cylinder, and as this mean effective pressure so far as the engine proper is concerned, depends chiefly upon the point of cut-off and the freedom with which the exhaust takes place, the author justly remarks, that

> the area of the steam port ranks next to cut-off in its controlling influence upon the proportions of the valve seat and face. It may, therefore, be considered as a *base* from which all the other dimensions are derived in conformity with certain laws. Its value depends greatly upon the manner in which the port is employed, whether simply for admitting the steam to the cylinder, or for purposes both of admission and exit. In cases of admission it is evident that the pressure will be sustained at substantially a constant quantity by the flow of steam from the boiler. But in cases of exit or exhaust, a limited quantity of steam, impelled by a constantly diminishing pressure, forces its way into the atmosphere with less and less velocity. If, then, the engine is supplied with two steam and two exhaust passages, the ports will be correctly proportioned when the areas of the latter exceed those of the former, by an amount indicated by careful experiment. When, however, one passage performs both duties, it should have an area suitable for the exhaust, and be opened only a limited amount for the admission of steam. Very excellent results have been found to attend the employment of an area equal to 0·04 of that of the piston, and a steam pipe area of 0·025 of the same, when the speed of the piston does not exceed 200 feet per minute, but widely different factors are demanded by higher speeds, like those peculiar to locomotives.

The experiments of Gouin, Le Chatelier, Clark, Gooch, and Bertera, are then considered, and a table constructed for the relative proportions of port area and steam pipe area, expressed in decimal fractions of the area of the piston for various speeds of the piston.

> Having determined the area of the steam port, the next step is to resolve it into its factors, length and breadth. When a small travel of the valve is essential, the length should be made as nearly equal to the diameter of the cylinder as possible: then the port area, divided by the length, furnishes, of course, the value of the breadth. *The extent to which the valve should open this port for the admission of the steam will equal from 0·6 to 0·9 of the breadth*, and the *minimum* travel, that which, with a given cut-off, just opens the steam port the amount of this limit. The *maximum* travel is governed by expediency, the general tendency of an excess over the minimum is to render the events of the stroke *more* decisive, the cut-off takes place with greater brevity, avoiding unnecessary wire-drawing of the steam and the release opens rapidly, affording a more perfect exit. Where the travel is small these good qualities should be secured by increasing this term, until the valve gives an opening equal to, or greater than, the width of the steam port. With a large travel no such attempt should be made, since it would inevitably sacrifice much work in friction and cause a far greater loss than gain.

The form of the upper valve edge here comes in as an important combination, and it is shown that a proper curvature is preferable to the more common angular form for the exterior edge.

Having thus established an intelligent basis from which to deduce the motions of the valve and its attachments, namely, the point of cut-off, and the area of the steam port resolved into its factors of length and breadth, the author proceeds to discuss the means whereby the proper motions may be ascertained and secured. In doing this his method is admirable. He begins by supposing the valve to be actuated by a crank, its pin playing in a slotted crosshead attached to the eccentric rod, and also supposing the crank on the main shaft to be actuated by a slotted crosshead acting on the crank pin. This divests the problem of all complications arising from angularity of the crank and eccentrics at half stroke, occurring when the ordinary connections are used, they being reserved for subsequent study, when the general principles of the primary motion shall have become well understood. For convenience the cylinder is always regarded as being on the *right-hand* side of the main shaft, and the point of the crank pin circle *nearest* to the cylinder as the zero or starting point of the stroke. Then follows a table of positions under these conditions, with examples showing its application. From this point of departure the author proceeds gradually forward, clearing away obstacles and rendering the ascent easy to the most complicated portions of the subject.

We have dwelt upon the earlier portions of the work because we are convinced that only by a proper appreciation of the judicious selection of the elements of cut-off, and steam port area, as a basis, from which all the required motions are most easily traced, will the reader be prepared to follow the author through his subsequent train of reasoning with pleasure or profit.

We wish we had space to here review the subsequent portion of this able treatise, but we assure the reader that we have never opened a work relating to steam which seemed to us better calculated to give any intelligent mind a clear understanding of the department it attempted to discuss. The work is profusely illustrated with diagrams and plates, and the travel scale, the offspring of the thought and study which originated the work, is affixed.

The work is published by D. Van Nostrand, No. 23 Murray street and No. 27 Warren street, New York.

THE HARTFORD STEAM BOILER INSPECTION AND INSURANCE COMPANY.

The following report of steam boiler inspections by this company in the month of May, is made to its directors:

During the month 265 visits of inspection have been made and 437 boilers examined—359 externally and 204 internally—while 23 have been tested by hydrostatic pressure. The number of defects in all discovered, 53—28 of which are regarded as especially dangerous. These defects were as follows: Furnaces out of shape, 7; fractures in all, 219—5 dangerous; burned plates, 27—1 dangerous; blistered plates, 39—3 dangerous; incrustation and scale, 65—3 dangerous; external corrosion, 67—4 dangerous; internal corrosion, 6; internal grooving, 1; water gages out of order, 20; blow-out apparatus out of order, 3—1 dangerous; boilers without blow-out apparatus, 4; safety valves out of order, 13—2 dangerous; steam gages out of order, 36—4 dangerous; boilers without gages, 12; manholes without mouth-pieces, 6—2 dangerous; boiler heads not properly stayed, 9—2 dangerous; boilers condemned as unsafe and beyond repair, 2.

We are frequently asked what is to be understood by "furnaces out of shape?" We suppose that few persons familiar with steam boilers fail to understand this. It is well known that the furnace of a steam boiler is subjected to intense heat, and consequently the iron is liable to excessive expansion. Where injudicious firing is done this is especially true, and we not unfrequently find sheets contorted their joints badly strained, and a complete overhauling absolutely necessary for safety.

Injudicious firing is a very prevalent evil. Where coal in large lumps is piled upon the grate nearly or quite to the crown sheets, the furnace cannot be otherwise than seriously injured. Formerly such practice was regarded economical, but it is now well understood that the most economical fires are those where the coal is small, and evenly scattered over the grate. In short, thin fires, more frequently fed.

Objection may be made to frequent feeding, on the ground that fire sheets are injured by a current of cold air impinging against them.

The time required to feed a fire, managed as described above, is very short, while in the old-fashioned way, the doors must be kept open some minutes to remove the slag that has accumulated on the grate bars; and further, the draft is always more or less impeded.

Internal corrosion is a difficulty frequently met with; it is deceptive and dangerous, and can only be detected by careful internal examination. We have found sheets badly defective in this respect, when the exterior of the boiler appeared sound and in good condition. This difficulty arises from impure water, and is common to a considerable extent all over the country. We are informed by the English companies that it is common there, especially in the mining districts. We have recently received from them photographs of plates, pitted and corroded to an alarming extent.

Water gages, it will be seen, are far from infallible; they are valuable, as a visible means of indicating the hight of water in a boiler, but they should not be relied to the exclusion of gage cocks.

What we would say to engineers is, Look well to all the appliances and attachments of your boiler, they all need your constant attention. It is neither guaranteed nor expected that they will do your work for you, especially if left to themselves for months and years together.

Incorrect steam gages are too common, and in the reports for this month are several, 15 or 20 pounds out of the way. We have commented on this subject so often that we will now merely ask, How many who are now running steam boilers would be willing to increase their pressure 20 pounds steadily, especially if they are now running all that they dare?

The company employs for its inspectors competent men, who, by experience, are familiar with the construction and management of steam boilers, and know where to look for weak points and defects.

NEW RULE ABOUT PATENT OFFICE DRAWINGS.

Hereafter, in accordance with the new rule of the Commissioner of Patents, all drawings sent to the Patent Office will be returned to the applicant or his agent, unless they are artistically made. The principal reason for this regulation grows out of the fact, that duplicate drawings are to be photographed—one copy to be attached to the patent, and other copies are to be used for the convenience of the examiners in charge of the respective classes. The Commissioner advises applicants to employ competent artists to execute their drawings, which is also a good suggestion.

The promulgation of this new rule leads us to remark, that recently there has grown up a practice on the part of some agents to file miserably prepared drawings, simply for the reason that their slip-shod method of doing business has forced them to adopt the cheapest possible plan. The consequence is, that the portfolio of the office are encumbered with a mass of rough outline sketches, which are neither artistic nor creditable to the office. The Commissioner, evidently, does not mean to encourage this disregard of artistic merit. He has a right to insist that all drawings hereafter to be filed shall possess a certain degree of excellence, and to faithfully illustrate the invention in detail.

To the North Pole by Balloon.

A new and daring experiment is noted by the *Pall Mall Gazette*: "The invariable failure which has hitherto attended nautical expeditions to the Arctic regions has induced two Frenchmen, Messieurs Tissandier and de Fouvièlle, to undertake the enterprise of reaching the North Pole in a balloon. The machine in which the bold adventurers are about to embark on their perilous journey, and which is appropriately named "Le Pôle Nord," is now being completed in the Champ de Mars, which the government have placed at their disposal for the purpose.

The monster balloon, beside which even the famous Géant would seem a mere toy, will contain over 10,000 cubic meters of gas, and is composed entirely of a cloth manufactured from caoutchouc, which will allow of great expansion in the rarefied strata of the atmosphere. The seams uniting the different pieces form a total length of three English miles. The car, a marvel, it is said, of strength and lightness, is constructed to carry ten passengers, 4,000 pounds of ballast, and provisions for a month."

The East River Bridge.

The plan of the East River Bridge, as proposed by Mr. Roebling, has met with with the approval of the Board of U. S. Engineers, appointed to examine it, and of the Government, and has been fully adopted by the Board of Consulting Engineers, consisting of Horatio Allen, Wm. J. McAlpine, J. J. Serrell, Benj. H. Lathrop, James P. Kirkwood, and J. Dutton Steele, who have made to the Directors of the Bridge Company their final report, of which the following is the substance: The plans, including foundations, towers, and superstructure have been laid before the Board by Mr. Roebling at various times between February 16 and April 26, and from him they have received the fullest information touching all the details. Having completed the examination of the plans and the investigation of the combinations and proportions proposed, the Board deemed it an appropriate part of their duty to examine the structures of the same general character erected by Mr. Roebling across the Monongahela and Allegheny, at Pittsburgh, in 1846 and 1860; across the Niagara Falls in 1850, and across the Ohio, at Cincinnati, in 1860. They have thus had an opportunity of learning the successive steps in bridge building, which, beginning with a span of 822 in 1854, and one of 1,057 feet in 1867, all standing this day—a practical demonstration of the soundness of the principles and proportions on which these structures have been erected, and rendering unnecessary, at least for spans of 1,000 feet, any other demonstration, and affording the best source of information as to the practicability of taking another step in a span of 1,600 feet. The bridge proposed by Mr. Roebling, a steel wire cable suspension bridge, 1,600 feet between the towers, 135 feet above the water, will be, in the opinion of the Board, a durable structure of a strength sufficient to withstand six times the strain to which it can under any circumstances be subjected, that it will bear the action of the greatest storm of which we have any knowledge, and that the method of joining the parts cannot be surpassed for simplicity and security in the result.

Editorial Summary.

THE TENNESSEE CENTRAL FAIR.—It will be noticed, by reference to our advertising columns, that this association proposes to hold a fair at Murfreesboro, Tenn., and offers liberal inducements to exhibitors of all classes of improved labor-saving machinery for mechanical, agricultural, and household purposes, and to producers of "blooded" stock, and all varieties of superior seeds for garden and farm. The liberal offer to receive the articles and have them exhibited without the expense and loss of time necessary for a personal visit from the owner, is a new and attractive feature in this class of exhibitions, and manifests a progressive and liberal spirit upon the part of the officers, which should be promptly and freely responded to by all who are interested in building up a community of social and financial good feeling between the two sections of the Union, and who desire a market in that fertile and fast-improving region of country. We hope the efforts of the directors will meet with a liberal response.

M. BIONNE has submitted the following opinion upon the nature of comets to the Academy of Sciences: "Comets are bodies which describe spirals originating in a nebula terminating in the sun; each spiral may be considered as an ellipse. Formed of the incandescent matter of the nebulæ, comets would appear to be the regulators of the grand movement of celestial bodies, the agents of that vast transformation of calorific work into mechanical work, and would come at the end of their course to lose themselves in the atmosphere of the sun, to which they would serve as an aliment."

THE NEW OCEAN CABLE.—The steamship *Great Eastern* is now engaged for the second time in laying a cable across the Atlantic ocean, this time, however, from the coast of France. The latest account represents that everything was proceeding favorably. The ship was 294 knots out of Brest, and had paid out 310 knots of the cable, the signals through to the shore continuing perfect. This affair is proceeding with all the quiet of a determined success, and we hope soon to learn of the safe accomplishment of the undertaking.

TURPENTINE.—The Bridgeport (Conn.) Iron Works are now engaged in making several large stills for the Wood Distilling Company for the manufacture of turpentine. This company has purchased several thousand acres of wood land in North Carolina, and have erected turpentine works, which are now successfully running near Bridgeport. The charcoal is said to be a valuable product of the distillation of the wood.

FORTY-SIX new discoveries of rich silver deposits are reported in the White Pine district, causing considerable excitement in that region. The shipments of bullion from thence latterly have averaged from $70,000 to $80,000 per week. The mining facilities will soon be doubled, and it is estimated that $500,000 will be shipped in July.

GRINDSTONES.—A correspondent says: "The grindstone is a self-sharpening tool, and after having been turned for some time in one direction (if a hard stone) the motion should be reversed. Sand of the right grit applied occasionally to a hard stone will render it quite effectual."

THE Dale Silk Company, of Paterson, has obtained seventeen skilled weavers from Lyons, and quartered them in the company's houses, preparatory to entering extensively into broad-silk weaving. American dress silks are selling in New York at $5 a yard.

THE Puget Sound lumber trade has increased very rapidly of late years. Upward of fourteen hundred vessels were loaded with lumber from the mills on the Sound within a year past, and there is a demand for new mills to supply the California market.

GUN-cotton explodes when metallic sodium or metallic potassium is brought in contact with it. The amalgams of these metals do not produce the same effect. Finely divided, arsenic requires percussion before it explodes the cotton.

THE canebrakes of the South are being cut down, steamed, baled, and sent to New England, where the fiber is made into wrapping paper.

AN effort has been making to change the location of the Allerton Steam Fire Engine Works, now at Naugatuck, to Norwalk.

INTERFERENCE CASE—DECISION OF THE COMMISSIONER OF PATENTS.

Commissioner Fisher has just rendered a decision in the interference case of Townsend *vs.* Fowle, for an improvement in submarine drilling apparatus, which reviews the general theory of interference so full and clear that we give the decision complete.

Cases of interference may be naturally divided into two leading classes. The first comprises those in which the applicants are both original and independent inventors, and the only question for decision is, which was the first inventor? The parties in this class of cases may be, and usually are, widely separate, and have no connection whatever with each other. The coincidence of invention is accidental, or rather results from the fact that the improvement is one which is demanded by the state of the arts, and one which many men are seeking at the same time to discover or develop.

The question of priority in these cases is usually one of easy solution. It is to be determined by ascertaining which of the parties first reduced the invention to practical form, either by a drawing sufficient of itself to enable an artisan to make the thing invented, or by a sketch accompanied by a written description, or by model, or full-sized machine. I should be unwilling, in such cases, to accept mere conversation as proof of invention, however explicit in details, unless such conversations were directed to workmen to construct the machine, and it was actually built at the time from such directions.

The second class of interferences comprises those cases in which two men have been more or less connected in the work of invention when the relations of partner or employer, and employer or friend or fellow-workmen have in some form existed. When the invention, if it is the act of both, takes place at the same time, and when the real question is not so much one of priority as of originality; when, in short, it is charged or inferred that one of the parties is in fact claiming that which he has taken from the other to whom it rightfully belongs. This class may be again subdivided into three: First, where the parties are fellow-townsmen or workmen, or so situated that either might have known of the movements of the other. Second, where one party is the general employer of the other, and in the course of his work made some improvement upon the tools or method with which he works. Third, when the one has been specially employed by the other to assist in developing or embodying the very invention in controversy.

The cases which fall within the second class are by far the most difficult. The testimony is usually contradictory, and the parties surrounded by a troop of partisans, clerks, or workmen appear, and like the seamen of opposing vessels in a collision case swear directly in each other's faces. Each is at pains to deny every fact, material and immaterial, asserted by the other, until the judge is compelled to grope painfully through a mass of contradictory evidence to find some fact, as a base for a decision, which has escaped the fury of the conflict.

There may be some presumptions which will render it possible to approximate to the truth. It may be said in general that in cases falling under the first subdivision the evidence necessary to establish priority should be substantially the same as in cases of the first class, to wit: That he is the first inventor who has reduced the invention to practice. As to the second and third subdivisions it may be safely asserted that the presumption is that the workman is the inventor in the former case and that the employer is in the latter.

When workmen are employed in large establishments it is a natural and common mistake for employers to suppose that they are entitled to the brain work as well as the hand work of their employés; that if a valuable invention is made as in some measure it is their product, being that of the mind of their servant, they have acquired such a title to it as to be able to consider themselves the inventors. This is especially the case when the employer has conversed with the workmen during the progress of the work or has exhibited any interest in its successful completion. They confound the supply of material with the supply of ideas, and sometimes confidently claim to be the inventors of mechanism which they would find it difficult to describe and impossible to operate.

But, where a man has conceived an idea and given to it more or less development, and employs a mere workman to put it into shape, it is obvious that much confusion is likely to follow, proportioned to the mechanical skill of the workman and the lack of it in the projector. So many suggestions and hints may be furnished by the workman that at last he ceases to remember the parentage of the underlying idea, and fancies that the whole machine is the product of his own invention. It must be rare, however, in such cases that the labors of the mechanic or model maker can raise him to a rank higher than that of joint inventor with him who has the original conception, while in the great majority of cases the safer rule is undoubtedly that laid down by the Supreme Court of the United States in the late case of Agawam Woolen Company *vs.* Jordan, where it is said, "When a person has discovered an improved principle in a machine, manufacture, or composition of matter, and employs other persons to assist him in carrying out that principle, and they in the course of experiments arising from that employment make valuable discoveries auxiliary to the plan and preconceived design of the employé, such suggested improvements are in general to be regarded as the property of the party who discovered the original improved principle, and may be embodied in his patent as a part of his invention."

The present case belongs to what has been called, in this opinion, the third subdivision of the second class. Fowle was a model maker. He had some experience in rock-drilling machines, in which he had made some inventions. He was without experience in submarine drilling or apparatus, and had never seen such apparatus at work.

Townsend was a submarine diver, and having opportunity to contract for the removal of rocks in Boston harbor, sought the services of Fowle for the construction of a model of a machine which should embody his invention. According to Fowle, he brought to the latter nothing but a desire to obtain a suitable machine without any idea of the means. In other words, he proposed a result to Fowle, and left him to devise means for effecting it.

According to Towsend, on the other hand, the idea when communicated to Fowle was already so far developed, even as to details, that nothing remained for the model maker but to embody the plan in metal without exercise of the inventive faculty. The testimony is very contradictory. Each party has proved his case to a demonstration, if the testimony of certain witnesses only is to be considered. Taking the testimony as a whole, however, I am of opinion that it strengthens the presumption afforded by the relative situation of the parties at the beginning of the controversy; that Townsend was the inventor and Fowle the artificer, furnishing, no doubt, some hints and suggestions; perhaps some decided improvements, but in the language of the case already referred to, "not amounting to a new method or arrangement which in itself is a complete invention."

The decision of the Board of Examiners is affirmed.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

At the late meeting of the New York Draftsmen's Association it was decided that the prize for the best original design for a capital, competition for which was open to all, be awarded on or about the first of July next. Three prominent architects of this city, members of the New York Chapter of the American Institute of Architects, were chosen, and have consented to act as judges. The prize is to be $10 and a diploma.

A contract has been concluded between the Baltimore and Ohio, and the Indianapolis, Cincinnati, and Lafayette Railroad Companies, for permanent business connections to and from the West via Cincinnati. This arrangement provides for through trains, rates, and proper facilities for the development of a joint traffic. The former company becomes largely interested in the securities of the latter. The arrangement is regarded as very important, particularly to the cities of Cincinnati and Baltimore.

The discovery of extensive clay beds at Syngack, Passaic county, N. J., has had an enlivening influence on that place. Some two or three hundred men are at work preparing for extensive operations in the manufacture of brick. Two or three acres of sheds are erecting, and a branch canal has been excavated to connect with the Morris Canal for transportation purposes.

An experiment has been made at Munich, for the purpose of determining if a railway-carriage wheel rolls regularly without sliding, so that by recording the number of revolutions of a wheel, the circumference of which is known, the distance accomplished could be accurately ascertained. The difference between the measurement by mathematical instruments and that obtained by noting the revolutions of the wheel, was found to be no more than 1-68,000 of the whole.

The street railway companies of Cincinnati have adopted the following expedient with the two-fold object of encouraging travel on their lines and of diminishing the opportunities for stealing on the part of conductors. All the tickets are numbered, and are like theater tickets in having coupons. The passenger retains one part with a number upon it corresponding to that which he gives up. All the tickets taken in a week are saved, placed in a wheel, and one is drawn out. The holder of the coupon whose number corresponds to that of the ticket, draws a prize of fifty dollars.

A submarine diver, who has recently been at work in the Shetucket river at Laurel Hill bridge, Norwich, Conn., says it is the worst place for diving he ever saw, the river bottom being covered with rocks. In one place there is a rock, the top of which is only five feet under water, while at its base there is a depth of thirty-five feet. Back of this is a cave of considerable size, the hidden beauties and strange formations of which, could the water be drawn off so as to make it accessible, he thinks would be one of the wonders of the age.

On June 24, Lord Houghton presided at a public breakfast given in London to fourteen English artisans who were about to sail to this country for the purpose of entering Cornell University. The speech of the learned chairman was full of encouragement and good advice for the enterprising young men.

In Wittenberg, Germany, an industrial exhibition was opened, and no less than 300 manufacturers, with 2,000 specimens of their industrial skill were represented on this occasion. The display was composed almost exclusively of products of German industry.

During August and September an International exhibition is to be held at Utrecht, Holland, of articles for daily household use,—the principal object being to bring to the knowledge of the workmen such articles of household use, furniture, dress, food, and work of different countries, as, at a low price, unite usefulness with solidity. Articles of elegance and luxury are excluded. The co-operative associations of the continent appear to be much interested in this scheme.

The Pittsburgh *Evening Chronicle* says that nearly all the coal shipped to New York and New England, amounting to 9,000,000 tuns per annum, is obtained from Pennsylvania. Of this quantity, 3,500,000 tuns are shipped to New York, and the balance, 5,500,000 tuns, is conveyed in sailing vessels to various ports on Long Island Sound, and ports beyond. The production of coal in Pennsylvania and Maryland in 1867 was over 16,000,000 tuns, and is increasing at the rate of 2,500,000 tuns, or fifteen per cent per annum.

Francis Joseph, Emperor of Austria, is quite a mechanical genius. He has recently found time to construct a clock, a very ingenious piece of workmanship, which he has presented to his mother, the Archduchess Sophia. There is attached to this clock a gaudily-plumed cock, which crows every day at sunrise.

The Maine lumbermen complain that the water was so high early in the season that the mills could not be run, and that now the water has fallen so rapidly that a large amount of logs on the way to market must lie over till another season.

A rink company has been organized at Hartford, Connecticut, and the rink is to be built at once. It will be 200 feet by 80, will cover 16,000 square feet of ground, hold 6,000 people in a public meeting, and, as a rink, is to accommodate 800 skaters and 3,000 spectators. It will cost $30,000.

Commissioner Wilson, of the Land Office, has received intelligence setting forth the discovery of a valuable mine of cinnabar, about twenty-five miles northeast of the city of San Francisco, in township north of range No. 1, east of Mount Diablo meridian.

The observatory of the Colby University, at Waterville, is to be erected the coming season. It will probably be built on the hill in the rear of the Maine Central buildings, as the college grounds are subject to much jarring from the passing of trains.

The returns of the several railroad corporations in the State of Massachusetts, show that 24,916,021 passengers were transported by them for greater or less distances during the year ending November 30, 1868, and out of this vast number not one was killed or injured while occupying his seat, although several were fatally hurt while attempting to get on or off the trains while in motion.

Wooden Rails.—A company has been organized, so we are informed, at Stevens Point, Wisconsin, to construct several miles of wooden track railway. It is proposed to use hard maple, and to treat it with some preparation to harden the wood and to preserve it from rotting.

The new railroad line is now open *via* the Harlem Railroad to Lebanon Springs and Manchester, Vt., and Montreal. The trains leave Twenty-sixth street at 7 o'clock A. M., arriving at Lebanon, at 3:16 P. M., connecting at Rutland with the Montreal train.

"Geissler's tubes" are now no longer provided with wires at both ends for the electrical discharge, friction alone having been found sufficient to render the gas contained in the tubes luminous.

The Commandant of the United States Armory, at Springfield, Mass., is sending away 100,000 muskets which our Government has sold to the Turkish Government.

Dispatches from Ottawa, Ontario, state that the evidence given before the Committee on the Huron and Ontario Ship Canal, establishes the fact of the importance and practicability of that great work.

A Commission has been appointed by the Secretary of War to consider the proposed location of the Hudson River West Shore Railway upon the public lands at West Point.

The President of the Des Moines Valley Railroad reports that over $100,000 will be collected in duties on railroad iron at Keokuk during the present season.

The British Postoffice Department has completed its arrangements for purchasing all telegraph lines in the kingdom.

A new tin mine has been opened in San Bernardo county, California.

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; beside, 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.*

C. T. L., of Ind.—Expert operators are able to transmit from 15 to 20 words per minute through the Atlantic Cable. The velocity with which a current or impulse will pass through the cable has been ascertained to be between 7,000 and 8,000 miles per second; the former being the velocity when the earth forms a part of the circuit and the latter when the earth formed no part of the circuit.

R. and B., of Pa.—We know of no substance which can be used to coat an iron tank for water, that can also be applied with a brush, and not affect the taste of the water at first, unless it be soluble glass. Good white lead paint will do very well indeed, after the taste has disappeared, but it takes some time before all taste will disappear. We have not seen soluble glass applied to iron and cannot tell whether it will adhere strongly or be liable to scale off. If good we think it will work well and be durable.

J. T., of Mich., asks the proper speed for a circular saw of 50 inches in diameter to run and do a good business, and if a saw of that kind requires more motion in feeding fast than it does in slow feed? Answer. A 50-inch diameter saw should make 750 revolutions per minute and do a good business. Fast feed requires more motion than that of slow.

E. E. P., of N. Y.—You can use the second pump as you specify, but the larger the pipes the greater the friction. In order that the two pumps shall work equally well, the main pipe from which the second branches out, should be one and a half inches in diameter, and the connection should not be right-angled but curved.

J. V. S., of Ohio.—It is not generally the pressure that breaks the glass tubes of water gages. It is their inability to withstand changes of temperature. They should be made of the best annealed Bohemian glass tubing. A common fault is to make them of too thick glass, which is much more likely to break than thinner glass.

T. C. P., of Ohio.—If we understand your communication, you are cutting off steam at half stroke, with a single eccentric, and get, as might be supposed, too much compression. A single eccentric cannot be used advantageously to cut off steam so early in the stroke. You should set your eccentric back and not cut off at less than two-thirds stroke. With the compression you will then have, you will not need to use lead.

C. M. R., of N. Y.—Your suggestions are mainly not new, but that steam might be advantageously adopted for towing boats in canals, properly constructed for that purpose, is beyond a doubt.

M. W., of N. Y.—You are right; a mechanic ought to read and study, as well as practice. You will find the best works on steam and engineering noticed in our new publication column as they appear.

B. M. R., of Pa.—The conducting power of a metallic rod is injured by partially burning it.

J. A. S., of Pa.—We do not wish to re-open the discussion on the theory of the tides. Your communication although ingenious and plausible is therefore respectfully declined.

W. H. W., of Ohio, asks, "if wheels of different sizes fixed to an axle will run on straight parallel rails without one of them slipping." They will not.

C. A. W., of Me.—The greatest strain on the gears of an engine lathe, is on the gear that runs the slowest.

G. D. M., of Del.—The construction of envelopes with a thread inserted in one end on the bottom, to facilitate in opening, is not new. It was patented in 1858. We returned your remittance by mail.

APPLICATIONS FOR EXTENSION OF PATENTS.

Steam Gage Cocks.—Albert Bisbee, Chelsea, Mass., has petitioned for an extension of the above patent. Day of hearing, August 30, 1869.

Corrugated Beam.—Richard Montgomery, of New York city, has applied for an extension of the above patent. Day of hearing Sept. 25, 1869.

Roofing Composition.—James West, Syracuse, N. Y., has applied for an extension of the above patent. Day of hearing October 11, 1869.

NEW PUBLICATIONS.

The Painter, Gilder, and Varnishers' Companion. Containing Rules and Regulations in everything relating to the Arts of Painting, Gilding, Varnishing, Glass Staining, Graining, Marbling, Sign Writing, Guilding on Glass, Coach Painting, and Varnishing, Tests for the Detection of Adulterations in Oil Colors, etc., and a Statement of the Diseases to which Painters are peculiarly liable, with the Simplest and Best Remedies. Thirteenth Edition, Revised. With an Appendix, comprising Descriptions of a great variety of Additional Pigments, their Qualities and Uses, to which are added Dryers, and Modes and Operations of Painting, etc., together with Chevreul's Principles of Harmony and Contrast of Colors. Philadelphia: Henry Carey Baird, 406 Walnut street. Price, by mail, free of postage, $1·50.

The number of editions which this work has reached is a sufficient guarantee of its excellence without our saying a word in its praise. Had we room we could, however, point out perhaps as many praiseworthy features in it as could be culled from any other work of its size ever published. The appendix contains much new and valuable matter, and it, as well as the body of the work, is copiously indexed.

The Centenary.

Such is the title given to a new monthly just commenced at Charleston S. C. The first number contains eighty-four pages, and gives abundant promise of success, so far as literary merit is concerned, the articles generally very readable. It remains to be seen how far the Southern people will sustain a first-class magazine. We wish it success.

Springdale Abbey is the title of a new book from the press of Claxton, Remsen & Haffelfinger, of Philadelphia. It consists of extracts from the diaries and letters of an English preacher. Edited by Joseph Parker, D. D. We have found the book very pleasant and very interesting reading, in which is also combined useful hints and instruction presented in a taking style.

The Eclectic, for July, contains two fine pictures—Landseer and his Connoisseurs, and Gutenberg 1400-1468; also a very choice contents of articles selected from the leading European magazines. We regard "The Eclectic" as one of the best serials extant. Terms of "The Eclectic"—One copy, one year, $5·00. Address E. R. Pelton, publisher, 108 Fulton street, New York city.

Recent American and Foreign Patents.

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

Fertilizer.—F. C. Renner, Ladiesburg, Md.—The object of this invention is to provide for public use a cheap and easily-manufactured composition, which shall possess superior qualities as a fertilizer for corn, garden truck, and other vegetables and cereals.

Ellipsograph.—Andrew Smith, Dayton, Oregon.—The object of this invention is to provide for public use a simple, cheap, and effective instrument for drawing ellipses, and so constructed that it can be easily adjusted to produce figures of any practicable size and shape.

Manufacture of Illuminating Gas.—Robert Alsop, Philadelphia, Pa.—The object of this invention is to produce an illuminating gas,by impregnating common atmospheric air with the vapor of suitable hydro-carbon fluids, and is carried into effect by the employment of suitable apparatus.

Tea and Coffeepot.—Nathan Lawrence,Taunton, Mass.—This invention relates to metallic tea and coffeepots, and consists in an improved handle, which will not become so quickly heated as the handles heretofore made for such articles, together with an improved construction of the bottom, to prevent it from melting, and an improvement in the method of forming the body of the pot.

Gate.—Jeremiah Snell, Evans' Mills, N.Y.—The object of this invention is to construct a simple and cheap farm gate, which can be conveniently attached and operated, and which, when thrown open, will be entirely outside of the gate posts, no part of it projecting into the roadway, so that, by no possibility, can a passing carriage come in contact with it.

Sleep Preserver and Musquito Guard.—Robert Themar, Sheboygan, Wis.—This invention relates to that class of devices adapted to protect the face, hands, etc., from the attacks of musquitos and other insects, and has for its object to provide the public with a simple, cheap, and light guard, which can be carried in a valise or hat box, and which can be placed over the head and arms during sleep, or at any other time, for the purpose indicated.

Machine for Making Twine, Cord, etc.—James McIntire, Hopewell Cotton Works, Pa.—The object of this invention is, so to improve the construction of machines for making twine, cord, etc., that the spool shafts can always be kept in gear, so as to run evenly and continuously, while the threads shall be twisted harder,and shall be guided properly and kept at the right tension in passing from the spools to the reel, whereby a better article of twine, etc., can be produced than heretofore.

Stove Pipe.—Abel D. Cook, New Madrid, Mo.—This invention has for its object to furnish an improved means by which the horizontal part of a stove pipe may be cleaned out without taking down the pipe, and without the chance of soiling or dirtying the carpet or room.

Chandelier Reflector.—Charles F. Jacobsen, New York city.—This invention has for its object to furnish an improved double cone reflecting chandelier, for use in churches, theaters, parlors, and other public and private buildings, which shall be so constructed and arranged as to light the ceilings and walls, as well as the floor and body of the room, and which shall be so constructed as to soften the light, destroying the glare and diffusing it agreeably through the room, and at the same time be highly ornamental.

Range Boiler.—Andrew Bennett, Brooklyn, N. Y.—This invention has for its object to furnish an improved range boiler, the dome top of which shall be securely and strongly connected to the body of said boiler.

Fire Grate.—Leopold Bertsche, Jr., Allegheny City, Pa.—This invention has for its object to furnish an improved fire grate, which shall be so constructed and arranged that the bars, when burst out, can be conveniently taken out singly and replaced with new ones.

Chemical Compound for Extracting Paints, Oils, Grease, and Tar from Cloths.—C. B. Skiff, Jersey City, N. J.—This invention has for its object to furnish an improved chemical compound, by means of which paint, oil, grease, and tar spots may be quickly and thoroughly removed from clothing, and other cloths, so as to leave no stain or spot upon the cloth.

Farm Fence.—Cyrus Abbott, Iowa City, Iowa.—This invention has for its object to furnish a simple, strong, and durable fence, so constructed and arranged that the body of the fence may be supported free from the ground, so as not to be liable to decay from contact with the ground.

Picture Nail.—Henry Hickman, Omaha, Neb.—This invention has for its object to furnish an improvement in picture nails, by means of which the cord will be securely held in such a way that the picture cannot be accidentally knocked down, and which shall, at the same time, hold the cord away from the wall and be in itself ornamental.

Culinary Vessel.—Henry Zachgo, Brooklyn, N. Y.—This invention has for its object to improve the construction of boilers, and other culinary vessels, in such a way that the cooking may be done in less time and with less expenditure of heat than is possible with vessels constructed in the ordinary manner.

Seed Planter.—George Banister, Hartford, Vt.—This invention consists in operating the machine by friction on a roller or wheel, and in the method of operating the slide, for discharging the seed, and in the plow and the method of gauging the same and covering the seed.

PREVENTING THE RADIATION OF HEAT.—James McFarland, Louisville, Ky.—This invention relates to a new and useful device for preventing the condensation of steam in steam pipes, in consequence of the radiation of heat therefrom, and for preventing the radiation of heat from steam pipes under all circumstances.

SEED PLANTER.—John B. Miner, Groton, Conn.—This invention relates to new and useful improvements in machines for planting corn and other seeds.

CULTIVATOR.—R. B. Parks and J. H. Parks, Neponset, Ill.—This invention relates to a new and improved cultivator, designed for cultivating crops grown in hills or drills.

BAYONET ATTACHMENT.—J. S. Alexander, Philadelphia, Pa.—This invention relates to a new and useful attachment to firearm bayonets, and is intended to facilitate the operation of soldiers in throwing up intrenchments, or excavating the earth for other purposes.

GATE.—L. W. Sibley, Ames, Iowa.—This invention has for its object to furnish an improved gate, which shall be so constructed and arranged that it may be opened by the advancing and closed by the departing wagon.

PLOW.—Daniel H. Hill, Union Springs, Ala.—This invention has for its object to improve the construction of plow frames, so as to make them stronger and lighter than the frames constructed in the ordinary manner, while at the same time causing the plows to run lighter and steadier.

TRUNK.—Henry Hickman, Omaha, Neb.—This invention has for its object to improve the construction of trunks, so that the size or capacity of the trunk may be adjusted as may be required, according to the amount of clothing or other articles to be put into it.

SCREW DRIVER.—William Hofer, New Haven, Conn.—This invention has for its object to furnish a simple and convenient screw driver, more particularly adapted for driving screws into soft wood; by means of which the screws may be driven quicker, and with less weariness to the hand of the operator than is possible when the screw driver is constructed in the ordinary manner.

MACHINE FOR CLEANING SAUSAGE CASES.—Martin Heusy, Burlington, Ohio.—This invention relates to a new apparatus for cleaning the intestines used for sausage cases, and is to supersede the ordinary scraping knives or sticks heretofore employed.

PAPER BOXES.—James L. Reber, Philadelphia, Pa.—This invention relates to improvements in paper boxes such as are shaped on one piece of paper to be folded and closed to secure the contents, without the use of any fastening material other than the parts of the paper where folded together.

CURD AGITATOR.—DeWitt C. Hall, Barnes' Corners, N. Y.—This invention consists of the arrangement in a vat having a metallic or other screen near the bottom of a sliding and rotating stirring apparatus, whereby the curd is agitated and the whey caused to pass off through the screen.

PEN AND PENCIL CASE.—J. H. Rauch, New York city.—This invention relates to improvements in telescopic pen and pencil cases (such as are made for being materially shortened for convenience in carrying in the pocket), intended to provide an arrangement whereby the extension and contraction of the pencil may be effected with fewer tubes, and less friction, and the finished pencil may be made of small diameter for convenience in carrying in the pocket and handling.

COFFEE-POTS, ETC.—Ira Yeamans, Brooklyn, N. Y.—This invention relates to improvements in coffee-pots tea-pots and other similar vessels for table use employed for holding liquids to be poured into drinking cups, and is designed to so arrange them as to avoid the necessity of raising or turning them for pouring, as required in the use of these vessels as now constructed. The invention consists in mounting such vessels in trunnions for turning in a vertical plane, the said trunnion supports being also capable of revolving in a horizontal frame.

GROOVING MACHINE.—Thos. Holt, New York city.—This invention relates to improvements in machinery for grooving stair stringers and other work in joinery and cabinet making. It consists in a rotary tool stock carrying saws and a planing tool for cutting the groove, arranged in a sliding frame to be traversed across the board to be grooved, the sliding frame being capable of adjustment to traverse the board at any desired angle. It also consists in certain devices accessory thereto.

PROJECTILE.—J. W. Hill, Jefferson, Iowa.—This invention relates to an improved construction of projectiles, having for its object to provide projectiles which will, after having traveled through a portion of their flight, discharge from a central bore, smaller projectiles, imparting to them in addition to the speed attained in being discharged from the gun an accelerated speed by a secondary charge within the shell. The part so discharged being also charged with a third part to be similarly discharged, or the same may be repeated a greater number of times, thus obtaining a capacity of shooting a great distance.

MACHINE FOR TURNING BOOT LEGS.—C. Collins, Warren, Ind.—This invention relates to a new machine for turning boot legs after they are sewed, to prepare them for the last, its object being to facilitate the turning process so that it can be rapidly carried on. The invention consists chiefly in an adjustable cylindrical support upon which the boot leg is drawn, and in arranging, within said cylinder, straps or rods that are attached to a treadle, so that they will, when fastened to the boot straps and when drawn down by the treadle, turn the boot leg over the upper edge of the cylinder.

PROCESS OF CURING MEAT.—Wm. H. Silberhorn, New York city.—This invention consists in the application by any approved means to pieces of meat of pulverized but solid salt, saltpeter, or other preservative substance, to be inserted in any way between the flesh and the bones, or into the flesh near the bones.

SUBSOIL PLOW.—James W. Murfee, Havanna, Ohio.—This invention consists in an arrangement of a horizontal wedge-shaped coulter for plowing and pulverizing the earth. This wedge is driven horizontally through the ground by being attached to an inclined and wedge-edged cutting coulter, which coulter is attached to the beam of the plow. The coulter is set as acutely with the horizon as practicable, so as to approach the line of the axis of the plow or hoe as near as may be, and the power is applied thereby as nearly in the direction of the axis of the wedge as possible. The standard of the frame is a continuation of the line of the coulter shank, and the angle which the handles make with the horizon or base of the plow point, should be a mean of the angles which the top of the point and front edge of the coulter shank make with the horizon, so that any power applied in the direction of the handles by the plowman will have the greatest effect on the point and shank.

CURTAIN FIXTURE.—J. D. Ayres, East Greensboro, Vt.—This invention relates to a new and useful improvement in the method of hanging window and other curtains, whereby they are rendered much more useful and much less liable to get out of order than when hung in the ordinary manner.

BREECH-LOADING FIREARMS.—John Adam Heckenbach, Mayville, Wis.—This invention relates to certain improvements in breech-loading firearms, and is more particularly intended for double-barreled guns, and will shortly be more fully described and illustrated in our columns.

BUSH FOR BUNGS.—David F. Fetter, M. D., New York city.—This invention has for its object to provide a lining or bushing for the bungs of barrels and other purposes, in such manner that it can be readily applied and securely fastened without injuring the wood or other material of which the barrel or other article is made. The invention consists in forming on the lower edge of the bush or lining a series of projecting bars or lugs, which, when the bush is applied, are turned out to fit under the wood.

WIRE-BENDING MACHINE.—J. N. Ayres, Stamford, Conn.—This invention relates to a new apparatus for straightening wire which is to be used for the teeth of horse hay rakes, and for other purposes, and has for its object to relieve the wire from the strain to which it is subjected in the machines now in use.

THREE WHEELED VELOCIPEDE.—Lucas A. Sinclair, Bellevue, Ohio.—This invention relates to a new steering device for a three-wheeled velocipede, and to a new manner of constructing and arranging the frame of the same. The invention consists in arranging the rear axle in the slotted rear part of the frame, and in so connecting it by a pivoted arm with the front part of the frame, and by pointed levers with a steering handle, in front, that it can, by turning the said handle, be bodily swung into the slots of the frame.

VELOCIPEDE.—Abner L. Butterfield, Brattleborough, Vt.—This invention relates to a new manner of constructing the wheels of velocipedes for the purpose of making them stronger, and also to a new driving mechanism and brake attachment, all parts being so arranged as to produce a strong and convenient velocipede.

WATER INDICATOR AND SAFETY VALVE ATTACHMENT TO STEAM ENGINES.—James Brahn, Jersey City, N. J.—This invention relates to a new device for regulating the hight of water in a steam boiler, and for controlling the pressure of steam in the same, it being so arranged that it can, with a slight modification, be adapted to either service.

CHILDREN'S CARRIAGE.—John A. H. Ellis, Springfield, Vt.—This invention relates to a novel manner of arranging the springs on children's carriages for the purpose of making them answer at once as reach and as axle supports, so that the sills or reach heretofore employed can be done away with.

MACHINE FOR FELTING HAT BODIES.—L. Robinson, L. Conine, N. F. Hyatt, and D. W. Hyatt, Matteawan, N. Y.—The invention consists in an arrangement of machinery for felting the tops more evenly than can be done by the machines now in use. Also, for felting the sides on a block, so formed as to be inserted within the crown of the hat, the latter being turned thereon to cause the whole to undergo the felting operation.

HAND SEED PLANTER.—One of the most simple hand seed planters with which we are acquainted, is doubtless the invention of Mr. A. J. Williams, of Barnesville, Ga., who recently obtained a patent for it through this office. A friend who has tried one thus writes of it: "In operation it is quite as reliable and effective as the most complex machines, and possesses this advantage over them: the laborer is near to his work, and inspects it constantly and without trouble to himself. Every failure or inaccuracy in depositing seed is seen before the deposit—or want of deposit—is covered, and mistakes are thus seasonably rectified. As compared with the seed planter affixed to the handle of the hoe—an otherwise more complete instrument because of the combination—while this requires two laborers, or a second traversing of the ground by one, the labor is so greatly reduced by the lessened weight of the hoe, that the additional time required is fully compensated for. In fact, under the most favorable circumstances for each method of planting, I would give the preference to the Williams planter, in the belief that with it the greatest amount of work in the shortest time can be accomplished."

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING JUNE 22, 1869.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT OFFICE FEES:

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

91,506.—STEAM CONDENSER.—B. C. Atkinson, Newburyport, Mass. Antedated June 8, 1869.
91,507.—STONE SAWING MACHINE.—L. E. Baldwin, Windham, Conn., assignor to the Connecticut River Quarry Company.
91,508.—HEEL CUTTER.—J. H. Bean, Marietta, Ohio., assignor to himself, Abram Pratt, and J. A. Tenney.
91,509.—COAL STOVE.—C. N. Bennett, Cincinnati, Ohio., assignor to himself, and A. T. Bennett.
91,510.—VELOCIPEDE.—G. Bergner, Washington, Mo.
91,511.—SCREW PRESS.—H. Blundell and Jno. McWilliams, Providence, R. I.
91,512.—MACHINE FOR SHEARING METALS.—Robert Briggs, Philadelphia, Pa.
91,513.—PNEUMATIC TUBE FOR TRANSPORTING GOODS.—Albert Brisbane, New York city. Antedated June 11, 1869.
91,514.—GRINDSTONE JOURNAL BOX.—T. W. Brown, Reading, Pa.
91,515.—BOILER FEEDER.—Henry I. Brunner, Nazareth, Pa.
91,516.—POCKET FOR EGG CARRIERS.—A. H. Bryant, Philadelphia, Pa. Antedated June 8, 1869.
91,517.—BASE BURNING STOVE.—W. M. Bush and Thomas B. Richards, Cincinnati, Ohio.
91,518.—WOODEN WALL FOR BUILDINGS.—Jos. Busser, Troy, Ohio.
91,519.—STOVEPIPE SHELF AND DRYER.—W. E. Canedy, Wauconda, Ill.
91,520.—COOKING STOVE.—A. E. Chamberlain, and J. B. Crowley, Cincinnati, Ohio., assignors to A. E. Chamberlain, O. N. Bush, and Franklin V. Chamberlain.
91,521.—ASH SIFTER.—Jos. Chisholm, Boston, Mass.
91,522.—LIQUOR-THIEF.—John F. Collins, New York city.
91,523.—STEAM GENERATOR FLUE BRUSHES.—Pat. H. Coyle, Newark, N. J.
91,524.—STEAM-DEVICE FOR WARMING RAILROAD CARS, AND FOR OTHER PURPOSES.—A. C. Crary, Utica, N. Y.
91,525.—HARROW.—Isaac Crum, West Chester, Ohio. Antedated June 8, 1869.
91,526.—MEAT-CUTTING MACHINE.—J. G. Divoll, Sonora, Cal.
91,527.—PRINTING TELEGRAPH.—T. A. Edison, Boston, assignor to J. H. Hills and Wm. E. Plummer, Newton, Mass.
91,528.—DOOR SPRING.—Stephen Elliott, Richmond, Ind.
91,529.—DISH WASHER.—Wm. H. Emerson, Dixon, Ill.
91,530.—LIGHTNING ROD.—Henry W. Farley, Oswego, Ill.
91,531.—MORTISING CHISEL.—Michael Feigel, New Utrecht, N. Y.
91,532.—COMPOUND RAILROAD RAIL.—Henry J. Ferguson, Manchester, N. J. Antedated June 7, 1869.
91,533.—VAPOR BURNER.—Louis Fischer, Brooklyn, N. Y.
91,534.—VELOCIPEDE.—L. B. Flanders, Philadelphia, Pa.
91,535.—VELOCIPEDE.—Allen Greene and Elisha Dyer, Providence, R. I.
91,536.—BASE-BURNING STOVE.—Joseph C. Henderson, Troy, N. Y.
91,537.—CEMENT FOR CALKING SHIPS, AND OTHER PURPOSES.—Edward Heylyn, Rochester, N. Y.
91,538.—CARRIAGE SPRING.—E. C. Hodge, Oneonta, and D. H. Mann, Delhi, N. Y.
91,539.—SKATE.—Alpheus S. Hunter, Newburg, N. Y. Antedated June 19, 1869.
91,540.—RAISED-LETTERED SIGNS, SHOW-CARDS, AND THE LIKE ARTICLES FROM PAPIER MACHE.—T. C. Jenks, Philadelphia, Pa.
91,541.—PAD FOR HORSES HOOFS.—Jonathan Johnson, Lowell, Mass.
91,542.—COOKING STOVE.—D. P. Kayner, Erie, Pa.
91,543.—OFFICE INDICATOR AND REGISTER.—Jas. M. Keep, New York city. Antedated June 8, 1869.
91,544.—WOOD SAWING MACHINE.—Isaac Keller, Randolph, Ohio.
91,545.—ROSETTE HOLDER.—I. C. Kelley, Monticello, Ind.
91,546.—HORSE POWER.—Peter Kline, Johnsville, Ohio.
91,547.—BOOT AND SHOE.—Wm. Leathe, Woburn, Mass, assignor to himself, S. B. Holden, and L. L. Holden.
91,548.—HORSE-RAKE.—Wm. A. Lewis, Joliet, Ill.
91,549.—GRAIN CLEANER.—Wm. A. Lewis, Joliet, Ill.
91,550.—VELOCIPEDE.—John Lund, Milwaukee, Wis.
91,551.—FOLDING WAGON-COVER FRAME.—Benj. G. Luther, Providence, R. I.
91,552.—CURING AND PRESERVING MEAT, ETC.—A. S. Lyman, New York city, assignor to himself, and David Lyman, Middlefield, Ct.
91,553.—COFFEE ROASTER.—Charles Mackh, Elgin, Ill.
91,554.—SWEET-POTATO FLOUR.—C. K. Marshall, New Orleans, La. Antedated June 8, 1869.
91,555.—DEVICE FOR CONVERTING MOTION.—T. A. Mitchell, Washington, D. C.
91,556.—BRUSH HEAD.—C. G. Moore and Levi S. Gambold, Coatesville, Ind.
91,557.—PROCESS FOR PRESERVING FRUIT.—E. R. Norny, McDonough, Del. Antedated June 10, 1869.
91,558.—STEAM PLOW.—James H. Northcott, Mechanicsburg, Ill.
91,559.—HAT AND COAT RACK.—J. E. Osborn, Chicago, Ill.
91,560.—HOT AIR FURNACE.—John S. Perry, Albany, N. Y.
91,561.—GRAIN SEPARATOR.—C. T. Phillips, Jordan, N. Y.
91,562.—CHURN.—A. M. Powell (assignor to himself, Wm. J. Matthews, and H. R. Johnson), Collinsville, Ill..
91,563.—COOKING STOVE.—S. H. Ransom, Albany, N. Y.
91,564.—SPADE BAYONET.—Edmund Rice, United States Army.
91,565.—UMBRELLA RUNNER.—Horace T. Robbins, Boston, Mass.
91,566.—SULKY CULTIVATOR.—John Robinson, Plainfield, assignor to Aaron Snell and Arthur T. D. Austin, Will county, Ill.
91,567.—FOOT COMFORTER.—Geo. W. Rothrock, Mifflin, Pa. Antedated May 25, 1869.
91,568.—BAG HOLDER.—Newton N. Rugg, Geneva, Ill.
91,569.—HOT AIR FURNACE.—Watson Sanford, Brooklyn, N. Y.
91,570.—BOOK-COVER PROTECTOR.—Alfred L. Sewell, Chicago, Ill.
91,571.—HORSESHOE.—Harrison Smith, Sandyville, and J. H. Evans, Bolivar, Ohio.
91,572.—CORN SHELLER.—J. P. Smith, Hummelstown, Pa.
91,573.—CARPET FASTENER.—J. V. C. Smith, New York city.
91,574.—WATER-CLOSET VALVE.—W. Smith, San Francisco, Cal.
91,575.—ENVELOPE MACHINE.—D. M. Smyth, Orange, N. J., assignor to D. Appleton, & Company, New York city.
91,576.—ROOFING COMPOUND.—Hiram G. Soules, Syracuse, N. Y.
91,577.—MACHINE FOR MANUFACTURING ROOFING.—H. G. Soules, Syracuse, N. Y.
91,578.—PAINT-OIL COMPOUND.—Wm. E. Tascott, Cleveland, Ohio.
91,579.—SLIDE FOR EXTENSION TABLES.—J. W. Teft, Buffalo, N. Y.
91,580.—TURBINE WATER WHEEL.—T. R. Timby, Saratoga, N. Y.
91,581.—GROUND ROLLER AND STALK CUTTER.—Phineas H. Tompkins and Elza Dougal, Van Buren, Iowa.
91,582.—HARVESTER RAKE.—Wm. H. Ward, Auburn, N. Y.
91,583.—LETTER BOX.—Frederick Wittram, San Francisco, Cal.
91,584.—BOAT-DETACHING APPARATUS. — W. M. Wood, Owing's Mills, Md.
91,585.—FARM FENCE.—Cyrus Abbott, Iowa City, Iowa.
91,586.—SPADE BAYONET.—John S. Alexander, Philadelphia, Pa.
91,587.—THRASHING MACHINE.—Joseph Allonas, Mansfield, Ohio, assignor to Cornelius Aultman and Henry H. Taylor.
91,588.—APPARATUS FOR MANUFACTURING ILLUMINATING GAS.—Robert Alsop, Philadelphia, Pa.
91,589.—VELOCIPEDE.—Samuel Anderson, New Orleans, La.
91,590.—LAMP.—Lewis J. Atwood (assignor to himself and Holmes, Booth, and Haydens), Waterbury, Conn.
91,591.—CURTAIN FIXTURE.— J. D. Ayres, East Greensborough, Vt.
91,592.—MACHINE FOR BENDING WIRE FOR RAKE TEETH.—J. N. Ayres (assignor to the Stillwater Company), Stamford, Conn.
91,593.—TYING-UP AWL.—Nathan W. Baker, Lynn, Mass.
91,594.—CLAMPS FOR JOINING CEMENT-LINED WATER PIPES—Phinehas Ball, Worcester, Mass.
91,595.—SEED PLANTER.—George Bannister, Hartford, Vt.
91,596.—RANGE BOILER.—Andrew Bennett, Brooklyn, N. Y.
91,597.—FIRE-PLACE GRATE.—Leopold Bertsche, Jr., Allegheny City, Pa.
91,598—STOVE TOP AND COVER.—Elijah W. Bigelow, Worcester, Mass.
91,599.—LOW-WATER INDICATOR.—James Brahn, Jersey City, N. J., assignor to himself and G. E. Cutter.
91,600.—FANNING MILL. — Henry Bruggeman, Petersburg, Ind.
91,601.—TOBACCO DRYER.—Leander Burdick, H. J. Chase, F. P. Isherwood, and W. S. Isherwood, Toledo, Ohio.
91,602.—VELOCIPEDE.—A. L. Butterfield, Brattleborough, Vt.
91,603.—LUBRICATING JOURNAL.—G. E. Clarke and Edwin P. Dickey, Racine, Wis.
91,604.—MANUFACTURE OF ENAMELED BRACELETS.—Abiel Codding, Jr., North Attleborough, Mass.
91,605.—WRENCH BAR HEADING MACHINE.—Loring Coes, Worcester, Mass.
91,606.—MACHINE FOR TURNING BOOT LEGS.—Cornelius Collins, Warren, Ind.
91,607.—FLOOD ROLLER.—W. J. Connell, West Unity, Ohio.
91,608.—STOVE PIPE.—Abel D. Cook, New Madrid, Mo.
91,609.—HINGE.— John J. Crooke, Southfield, and Lewis Crooke and Henry S. Crooke, New York city.
91,610.—PADLOCK.—Addison Crosby, Westfield, N. Y.
91,611.—BURIAL CASE.—Addison Crosby, Westfield, N. Y.
91,612.—FLOUR MILL.—Henry Cutler (assignor to S. N. Cutler and Company), Ashland, Mass.
91,613.—PITMAN.—Mexworth D. Drake, Scituate, assignor to W. E. Barrett, Providence, R. I.
91,614.—FABRIC FOR THE MANUFACTURE OF HATS, BONNETS, AND VARIOUS ARTICLES FOR USE AND ORNAMENT.—Prosper Erhard and Amelie Erhard, New York city.
91,615.—CHILDREN'S CARRIAGE.—Joel A. H. Ellis (assignor to Ellis, Britton, and Eaton), Springfield, Vt.
91,616.—BREECH-LOADING FIREARM.—Lewis T. Fairbanks, Worcester, Mass.
91,617.—STUBBLE AND SUBSOIL PLOW.—R. R. Fenner, Urbana, Ill.
91,618.—BUSH FOR BARRELS, ETC.—David F. Fetter, New York city.
91,619.—PROCESS AND APPARATUS FOR MAKING SHEET IRON.—George Weeden Francis (assignor to himself, Edwin Garfield, and Jeremy W. Bliss, assignors to themselves and George W. Williams), Hartford, Conn.
91,620.—MACHINE FOR PLASHING HEDGES.—David Gore, Carlinville, Ill.
91,621.—BEVERAGE.—Wm. H. Goss, Boston, Mass.
91,622.—CURD AGITATOR.—De Witt C. Hall, Barnes' Corners, N. Y.
91,623.—HAY RAKER AND LOADER.—F. W. Harlow, Hannibal, Mo.
91,624.—BREECH-LOADING FIREARM.—John Adam Heckenbach, Mayville, Wis.
91,625.—PLANER CHUCK FOR HOLDING BODIES OF DIFFERENT SHAPE.—Robert Henderson, Thomaston, Conn.
91,626.—FRUIT DRYER.—Henry Henley, Shoals Station, Ind.
91,627.—ORE WASHER AND CONCENTRATOR.—Wm. G. Heslep and Thomas A. Cochrane, Jamestown, Cal.
91,628.—DEVICE FOR CLEANING SAUSAGE CASES.—Martin Heusy, Burlington, Ohio.
91,629.—PICTURE NAIL.—Henry Hickman, Omaha, Neb.
91,630.—TRUNK.—Henry Hickman, Omaha, Neb.
91,631.—PLOW.—Daniel H. Hill, Union Springs, Ala.
91,632.—CONFECTION.—John Q. Hill, Worcester, Mass.
91,633.—PROJECTILE.—J. W. Hill, Jefferson, Iowa.
91,634.—SCREW DRIVER.—Wm. Hofer, New Haven, Conn.
91,635.—GROOVING MACHINE.—Thomas Holt (assignor to himself and Abram T. Merwin), Brooklyn, N. Y.

91,636.—Tweer-Arch for Blast Furnaces.—John Horton, Rochester, N. Y.
91,637.—Curry Comb.—John Edward Insley (assignor to James Fallows and John Pfeifer), Philadelphia, Pa. Antedated June 11, 1869.
91,638.—Mining-sluice for Saving Sulphurets.—Orlando Jennings, North San Juan, Cal.
91,639.—Animal Poke.—Wm. Kelly, Saranac, Mich.
91,640.—Horse Rake.—Watson King, Springfield, Ill.
91,641.—Ore Crusher.—S. R. Krom, New York city.
91,642.—Pattern for Measuring and Cutting out Dress Waists.—J. M. Lent, Schuyler's Lake, N. Y.
91,643.—Gang Plow.—J. W. Lewis, Oregon City, Oregon.
91,644.—Roller-cutter for Plows.—J. W. Lewis, Oregon City, Oregon.
91,645.—Advertising Attachment to Tables, etc.—Landon Limerick and A. H. E. Stein, Louisville, Ky., assignors to James T. Hair and O. W. Richardson.
91,646.—Fan-attachment for Sewing Machines.—Thomas A. Lyle, Pittsburgh, Pa.
91,647.—Compound for Salve.—Nicholas Lumsden and Frank Lessman, Oakland, Cal.
91,648.—Double-acting Pump.—F. A. Mack, Niles, Mich.
91,649.—Wheel-making Machine.—Thomas C. Marshall and H. W. Hawkins, Akron, Ohio.
91,650.—Self-clearing Watch Key.—William N. Martin, Providence, R. I. Antedated June 10, 1869.
91,651.—Portable Fence.—Peter McCollum, Fayette, Mo.
91,652.—Device for Preventing Radiation of Heat from Steam Pipes.—James McFarland, Louisville, Ky.
91,653.—Machine for Making Twine, etc.—James McIntire, Hopewell Cotton Works, assignor to W. C. Dickey, Oxford, Pa.
91,654.—Lubricating Oil from Petroleum.—Thomas E. Merrick, Cleveland, Ohio.
91,655.—Seed Planter.—John B. Miner, Groton, Conn.
91,656.—Machine Belting.—James Montgomery, New York city. Antedated June 18 1869.
91,657.—Subsoil Plow.—James W. Murfee, Havanna, Ala.
91,658.—Thrashing-machine Concave.—John Nichols, Battle Creek, Mich.
91,659.—Liniment for Horses, etc.—Patrick O'Halloran, New York city.
91,660.—Apparatus for Winding Maps, Songs, Curtains, etc.—J. S. Ostrander, Albany, N. Y.
91,661.—Cultivator.—R. B. Parks and J. R. Parks, Ponset, Ill.
91,662.—Printing Telegraph.—Geo. M. Phelps, Brooklyn, N. Y.
91,663.—Railway Switching Apparatus.—Daniel Pike (assignor to himself, J. E. Vose, and W. J. McCulloh), New Orleans, La.
91,664.—Wire Broiler and Toaster.—C. L. Prouty, Worcester, Mass.
91,665.—Pencil Case.—J. H. Rauch, New York city.
91,666.—Paper Box.—J. L. Reber, Philadelphia, Pa.
91,667.—Fertilizer.—F. C. Renner, Ladiesburg, Md.
91,668.—Breech-loading Fire-arm.—Westley Richards, Birmingham, England. Patented in England June 12, 1868.
91,669.—Casting Jug Tops.—F. B. Richardson, Boston, Mass.
91,670.—Felting Machine.—L. Robinson, L. Conine, N. F. Hyatt, and D. W. Hyatt, Matteawan, N. Y.
91,671.—Fruit Dryer.—Samuel D. Rogers and F. C. Selby, Allegan, Mich.
91,672.—Metallic Roofing.—C.C.Scaife, Pittsburgh, Pa. Antedated June 10, 1869.
91,673.—Picture Frame.—Geo. Schneider, Buffalo, N. Y.
91,674.—Fastening Together the Soles and Uppers of Boots and Shoes.—F. Le Roy Senour and H. L. Traphagan, Eaton, Ohio; said Traphagan assigns his right to said Senour.
91,675.—Water Meter.—H. C. Sergeant, New York city.
91,676.—Steam Pump.—H. C. Sergeant, New York city. Antedated June 17, 1869.
91,677.—Gate.—L. W. Sibley, Ames, Iowa.
91,678.—Curing Meat.—William H. Silberhorn, New York city.
91,679.—Velocipede.—L. A. Sinclair, Bellevue, Ohio.
91,680.—Compound for Extracting Oils, Paint, Grease, and the like from Clothes.—C. B. Skiff, Jersey City, N. J.
91,681.—Ellipsograph.—Andrew Smith, Dayton, Oregon.
91,682.—Velocipede.—C. H. Smith and G. D. Walker, Brooklyn, N. Y.
91,683.—Bracket Clamp.—G. W. Spaulding and G. R. Smith, Syracuse, N. Y.
91,684.—Method of Attaching Needles in Sewing Machines.—Greenleaf Stackpole, New York city, assignor to Stackpole Sewing Machine Co., Boston, Mass.
91,685.—Combined Buckle and Snap.—S. G. Sturges and W. E. Sturges, Newark, N. J.
91,686.—Organ and Melodeon.—Simeon Taylor, Worcester, Mass.
91,687.—Combination Organ and Book Case.—Simeon Taylor, Worcester, Mass.
91,688.—Bureau Bedstead.—David Trefry, Boston, Mass.
91,689.—Lining for Fireplaces.—Chas. Truesdale (assignor to William Resor & Co.), Cincinnati, Ohio.
91,690.—Writing-desk Calendar.—S.J. Tucker (assignor to J. A. Rush, for one half his right), Philadelphia, Pa.
91,691.—Turbine Water Wheel.—J. W. Upham, Worcester, Mass.
91,692.—Ash Sifter.—Wm. Vogel, Norwich, Conn.
91,693.—Pocket Knife.—Addison G. Waterhouse, San Francisco, Cal.
91,694.—Pneumatic Telegraph.—Arthur McNutt Wier and Marshall Arthur Wier, Elm Lodge, Newton Road, Bayswater, Great Britain. Patented in England, Aug. 29, 1867.
91,695.—Anti-friction Roller for Shafting.—William E. Wilcox, Peoria, assignor to himself and T. H. Wills, Beardstown, Ill.
91,696.—Coffeepot.—Ira Yeamans, Brooklyn, N. Y.
91,697.—Culinary Vessel.—Henri Zachgo, South Brooklyn, N. Y.
91,698.—Fruit Picker.—J. H. Adams, Martinsville, Ind.
91,699.—Hay Spreader.—Reuben Adams and J. D. Sheetz, Heidleberg township, Pa. Antedated Dec. 22, 1868.
91,700.—Feed-water Heater for Steam Engines.—Jas. Armstrong, Bucyrus, Ohio.
91,701.—Shell Fuse.—J. D. Bacon, New York city.
91,702.—Velocipede.—J. C. Beaumont, Wilkesbarre, Pa.
91,703.—Match Box.—L. W. Beecher, Westville, Conn.
91,704.—Steam and other Whistles.—A. S. Bird (assignor to herself and Peter Peugeot), Buffalo, N. Y.
91,705.—Hose Carriage.—Wm. Boate, Philadelphia, Pa.
91,706.—Step Ladder.—Charles Edvard Boman, San Francisco, Cal.
91,707.—Pneumatic Device for Forcing Liquids.—C. F. Bowman and Stephen Slyker, Wilkesbarre, Pa.
91,708.—Braiding Attachment for Sewing Machines.—A. H. Boyd, Rockville, Mass.
91,709.—Fire Extinguisher.—Z. Breed, Weare, N. H.
91,710.—Grain Separator.—John Brightbill, Lebanon, Pa.
91,711.—Hydrostatic Scale for Weighing Cargoes.—J. R. Burville, Springfield, Ohio.
91,712.—Beehive.—Geo. Calvert, Upperville, Va.
91,713.—Pipe and Tobacco Box.—L.G.Carr (assignor to himself and A. M. Walker), Philadelphia, Pa.
91,714.—Wagon Seat.—I. H. Chappell, Decatur, Ill.
91,715.—Churn Dasher.—J. W. Cheney and Brown Ingalls, Shelbyville, Ill.
91,716.—Handle for Crosscut Saws.—Wm. Clemson, Middletown, N. Y.
91,717.—Combined Thrasher, Separator, and Clover Huller.—Adrian Cornell, Newtown, Pa.
91,718.—Cultivator.—R. D. Craft, La Porte, Ind.
91,719.—Rail for Railway.—J. F. Cranston (assignor to himself, T. A. Curtis, and J. W. Labaree), Springfield, Mass.
91,720.—Last.—C. O. Crosby, New Haven, Conn.
91,721.—Plow.—W. H. Cummings and H. L. Childs, Barnsborough, Iowa.
91,722.—Mouse Trap.—Anthony G. Davis, Watertown, Conn.
91,723.—Gate.—L. S. Deming, Newington, Conn.
91,724.—Nut Lock.—L. L. [illegible], Canton, Ohio.
91,725.—Safety Valve.—S. B. Dougherty, South Bergen, N. J.
91,726.—Fruit Jar.—H. S. Draper (assignor to himself and J. A. Jordan), Rochester, N. Y.
91,727.—Cultivator Joint.—W. A. Dryden, Monmouth, Ill., assignor to himself and J. M. Turnbull.
91,728.—Photographic Card Holder.—W. E. Eastman, Derby Line, Vt.
91,729.—Felting Machine.—Rudolph Eickemeyer, Yonkers, N. Y.
91,730.—Hat-stretching Machine.—Rudolph Eickemeyer (assignor to Eickemeyer Hat Blocking Machine Company), Yonkers, N. Y.
91,731.—Feather Renovator.—C. H. Farnham, Canterbury, Conn.
91,732.—Signal and Switch for Railways.—Daniel Fitzgerald, New York city.
91,733.—Door Lock.—E. P. Fowler, Brooklyn, and C. J. Clements, Mott Haven, N. Y.
91,734.—Velocipede.—J. Fraser and Jonathan Austin, New York city.
91,735.—Farm Gate.—D. C. Frazeur and W. D. Cocklin, Sidonsburg, Pa.
91,736.—Railway-rail Joint.—John Fritz and R. H. Sayre, Bethlehem, Pa.
91,737.—Alphabetical Instruction Puzzle.—E. F. Gilbert, Lyons, N. Y.
91,738.—Spring-bed Bottom.—Robert A. Goodyear, Binghamton, N. Y.
91,739.—Water Wheel.—D. H. Gould, Troy, N. Y.
91,740.—Iron-roof Purlin.—George Halstead, Buffalo, N. Y.
91,741.—Hand Stamp.—F. I. Hart, New Haven, Conn.
91,742.—Paper-cutting Machinery.—Jonathan Hatch, South Windham, Conn.
91,743.—Coal Bucket.—Lewis Hayner, Clifton Park, N. Y.
91,744.—Animal Trap.—Charles Henert, Washington, D. C.
91,745.—Bridge.—J. G. Henszey, Philadelphia, Pa.
91,746.—Cornice for Window Curtains.—Chas. W. Hill, New York city.
91,747.—Harness Pad.—John Hughes, Newark, N. J.
91,748.—Paper Bag and Material Therefor.—Abiezer Jameson, Trenton, N. J.
91,749.—Bedstead.—D. H. Jennings and James Bounds, Bridgeport, Conn.
91,750.—Pump.—W. F. Jones, Syracuse, N. Y.
91,751.—Medical Compound.—Wm. N. Jordan, Cambridge, assignor to J. A. Baldwin and G. R. Waterman, Boston, Mass.
91,752.—Machine for Upsetting, Punching, and Cutting Tires.—J. C. Jordon, Watertown, and Ellis Doty, Janesville, assignors to Doty Manufacturing Co., Janesville, Wis.
91,753.—Striking Movement for Clocks.—J. H. La Bau, Brooklyn, N. Y.
91,754.—Coffee-Pot.—Nathan Lawrence (assignor to Reed and Barton), Taunton, Mass.
91,755.—Guide Rolling Hoop.—Eric Lindholm, Brooklyn, N. Y.
91,756.—Boot Crimp.—Cyrus Lomax, Paoli, Ind.
91,757.—Harvester.—G. G. Lyman (assignor to himself and J. F. Lyman), Independence, Iowa.
91,758.—Toy Steam Engine.—Philander Macy, Rochester, N. Y.
91,759.—Machine for Making Ginger Snaps and Crackers.—John McCollum and Joseph Parr, New York city.
91,760.—Propelling Apparatus.—Loring Moody, Malden, Mass.
91,761.—Lever for Operating Water Closet Pans and Valves.—G. R. Moore, Philadelphia, Pa.
91,762.—Car Wheel.—H. W. Moore, Jersey City, N. J.
91,763.—Draft Cock.—A. J. Morse, Boston, Mass.
91,764.—Shingle Machine.—Asa Newell, Jordan, N. Y.
91,765.—Rock-drilling Apparatus.—John North (assignor to himself and W. T. Holt), New York city.
91,766.—Roller Case for Maps and Charts.—J. S. Ostrander, Albany, N. Y.
91,767.—Head Block for Saw Mills.—Darius Parkhurst, St Louis, Mo.
91,768.—Medical Compound.—Hugh Pool, Montgomery Co., Tenn.
91,769.—Low-Water Indicator.—E. D. Pritchard, New York city.
91,770.—Steam Engine Condenser.—Franklin Ransom, Buffalo, N. Y.
91,771.—Ditcher.—Wycoff Robbins, Hancock county, Ill.
91,772.—Device for Treating Hides.—Herman Royer, San Francisco, Cal.
91,773.—Gage for Dressing Millstones.—Robert Ruston, Rockville, Ind.
91,774.—Last.—I. N. C. Saville, Worcester, Mass. Antedated March 3, 1869.
91,775.—Elevator.—George Scott, Louisville, Ky.
91,776.—Butter Chest.—F. S. Sears, Charlestown, Mass.
91,777.—Clod Fender.—George Seeger, J. W. Loveless, and J. W. Throp, Clark's Hill, Ind.
91,778.—Lamp Burner.—Frederick Shaller (assignor to himself and J. B. Longley), Hudson, N. Y.
91,779.—Seat for Vehicle.—S. S. Simmons, Watsonville, Cal.
91,780.—Machine for Finishing Paper Boxes.—Richard Smith, Sherbrook, Canada.
91,781.—Lasting Iron.—A. J. Smith, Canal Dover, Ohio.
91,782.—Spice Box.—H. E. Smyser, Philadelphia, Pa., assignor to "Weikel & Smith Spice Co."
91,783.—Gate.—Jeremiah Snell, Evans' Mills, N. Y.
01,784.—Machine for Sewing Brooms.—Greenleaf Stackpole (assignor to himself and H. C. Covert), New York city.
91,785.—Bath Tub.—M. A. Stevens, Hartford, Conn.
91,786.—Corn Fertilizer and Planter.—J. M. Stoner, Greenville Lodge, Pa.
91,787.—Coffee and Tea Pot.—T. B. Stout and Jos. Stout, Keyport, N. J.
91,788.—Lathe for Finishing the Driving Wheels of Locomotives.—H. D. Stover, New York city.
91,789.—Thill Coupling.—Otto Tackmann, Yonkers, N. Y.
91,790.—Hay Spreader.—J. A. Talpey, Somerville, Mass.
91,791.—Method of Manufacturing Welded Wrought Metal Tubing.—Stephen P. M. Tasker, Philadelphia, Pa.
91,792.—Water Wheel.—Samuel Teachout, Troy, N. Y.
91,793.—Musquito Guard.—Robert Themar, Sheboygan, Wis.
91,794.—Clothes Wringer and Mangle.—B. O. Thompson, Chicago, Ill.
91,795.—Hand Chopping Knife.—Fred'k M. Untiedt, East Orange, assignor to himself and Wm. Martin, Newark, N. J.
91,796.—Ventilator for Ships.—W. W. Vanderbilt, New York city.
91,797.—Horseshoe Nail Pointer.—W. T. Vann, Macomb, Ill.
91,798.—Potato Planter.—Lansing Van Wie, Bethlehem, N. Y.
91,799.—Seed Sower.—Teunis Vreeland, Watага, Ill.
91,800.—Steam Generator for Combustion.—A. J. Warren and D. W. Wilson, West Eau Claire, Wis.
91,801.—Device for Preventing Incrustation in Steam Generators.—John Webster, Chelsea, England.
91,802.—Cultivator.—W. J. Wells, Sidney, assignor to himself and W. H. Neal, Toledo, Ohio.
91,803.—Detachable Stovepipe Clothes Dryer.—Hiram Whitney, Chicago, Ill.
91,804.—Railway Car Axle Box.—W. E. Wilcox, Peoria, assignor to himself and T. H. Wills, Beardstown, Ill.
91,805.—Grain Separator.—S. M. Wirts and L. Swift, Hudson, Mich.
91,806.—Centering Awl.—Nathan Woodbury, Woodstock, Vt. Antedated May 28, 1869.
91,807.—Trace Buckle.—Alvah Worster, Hannibal, N. Y.
91,808.—Trace Buckle.—Alvah Worster, Syracuse, N. Y.
91,809.—Harness Loop.—Alvah Worster, Hannibal, N. Y.
91,810.—Combined Drawer Pull and Label.—Jeremiah Quinlan, New York city.

REISSUES.

81,392.—Railroad Car Heater.—Dated August 25, 1868; reissue 3,509.—American Car-Heating Co., New York city, assignee, by mesne assignments, of W. S. McNeil and O. S. Cadwell, Jr.
78,958.—Construction of Drilling Jar.—Dated June 16, 1868; reissue 3,510.—J. C. Byran, Titusville, Pa., assignee, by mesne assignments, of Edward Guillod.
88,142.—Tempering Steel Springs.—Dated March 23, 1869; reissue 3,511.—J. H. Deniger, Bridgeport, Conn.
87,570.—Coffin Bier.—Dated March 9, 1869; reissue 3,512.—Patrick Joyce, Rochester, N. Y.
77,310.—Dray Saddle.—Dated April 28, 1868; reissue 3,513.—John O'Mahoney, Savannah, Ga.
30,357.—Plow.—Dated October 9, 1860; reissue 3,514.—M. G. Slemmons, Cadiz, Ohio.
37,985.—Sewing Machine.—Dated March 24 1863; reissue 3,515.—M. R. Smith, Armonk, N. Y.
20,192.—Expansive Bit.—Dated May 11, 1858; reissue 3,516.—W. A. Clark, Bethany, Conn.
23,361.—Machine for Pegging Boots and Shoes.—Dated March 29, 1859; reissue 3,517.—A. C. Gallahue, Riverdale, N. Y.
86,029.—Tire for Wagons.—Dated January 19, 1869; reissue 3,518.—B. F. Morey, Clinton, Ind.
42,954.—Door Latch.—Dated May 31, 1864; reissue 3,519.—Russell & Erwin Manufacturing Co., New Britain, Conn., assignees, by mesne assignments, of M. T. Lincoln.

DESIGNS.

3 555.—Frame of a Stove Door.—Alex. Wemyss (assignor to Stuart, Peterson & Co.), Philadelphia, Pa.

EXTENSIONS.

Machine for Cutting out Boot and Shoe Soles.—C. H. Griffin, of Lynn, Mass.—Letters Patent No. 13,072, dated June 12, 1855; reissue No. 1,610, dated January 26, 1864.
Reciprocating Railway Propeller.—Henry Boynton, of New York city.—Letters Patent No. 13,078, dated June 19, 1855.

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SCIENTIFIC AMERICAN

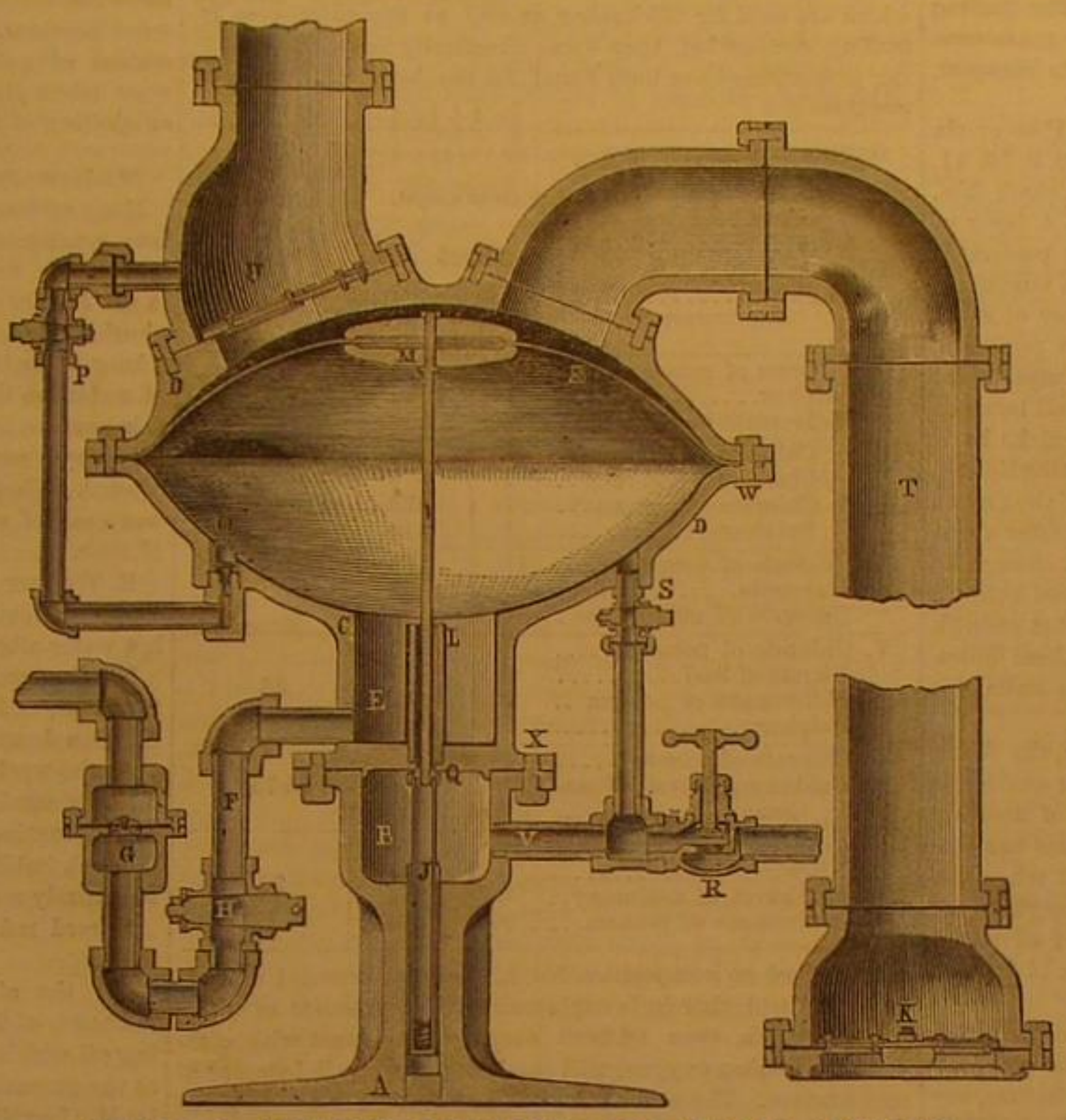
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXI.---No. 3. [NEW SERIES.] | NEW YORK, JULY 17, 1869. | $3 per Annum. [IN ADVANCE.]

Improved Pumping and Blast Engine.

The object of the inventor, in designing this pump, was to obtain the simplest and most efficient device for the purpose. It is well known that steam pumps in general are complete steam engines, having all the parts usually found in them. It will be seen by the engraving that this has no working parts that require packing, no metallic surfaces in contact, and that the details are limited in number; in fact, the only part moving is a cotton duck diaphragm, which has no friction whatever, and is simply a floating wall between the water to be lifted and the steam which lifts it. It follows from these facts, that the resistance to be overcome before the work is done, is reduced to nothing, hence no lubrication is required, and the total effect of the steam is applied directly to the water itself, the diaphragm aforesaid being the only object intervening.

The annexed engraving shows a vertical section through the center of the pump, of which A is the base or standard, and D D are hemispherical castings of iron with flanged edges, united by bolts, W. Intervening between said flanges, and stretching across said hemispheres, is a rubber-coated duck diaphragm, N, of sufficient diameter to allow it to float to the extreme upper and lower walls of the hemispherical disks, D D. The lower half of the hemispherical disk is coated with vulcanized rubber, thus preventing the too rapid cooling of the steam chamber. C is the wall of the hot well; U is outlet water-pipe with valve opening outward; T is inlet water pipe, provided with valve, K, opening inward; O is the injecting nozzle, provided with a valve opening inward. This injecting nozzle is connected by a small pipe, P, with outlet pipe, U. V is a steam pipe from boiler, provided with cock, R, and leading to steam chest, B, and also to starting cock, S. J is a tubular valve, with its seat at Q, and is provided at the bottom of its tube with a light coiled spring, as shown. I is a valve stem clasping diaphragm disks, M, and having a button or nut on its lower end, playing loosely in valve tube, J, for the purpose of operating valve, J, by opening and closing it alternately at its seat, Q. E is a well for the collection of condensed steam; L is a pipe to conduct live steam from steam chamber, B, through the hot well to lower hemisphere; F is a pipe for the escape of condensed steam, with outlet cock, H, to limit the amount of escape, and has also a valve at G, opening outward.



SHAW & JUSTICE PUMPING AND BLAST ENGINE.

The pump is operated by opening the cocks, R and S, which let steam into the body of it. The air contained therein is driven out through the pipe, F, when the cock, S, is closed. As soon as the steam in the pump is reduced to the pressure of the atmosphere, a jet of water will be thrown into the pump through the nozzle, O, which is supplied from the feed pipe, P. The steam is thus condensed, a vacuum is formed below the diaphragm, and it comes down immediately, followed by the water, which rushes in through the main suction pipe. In the act of descending, the valve stem, I, attached to the diaphragm, strikes a spring at the bottom of the valve tube, J, and opens it at its seat, Q, which allows the live steam to enter the body of the pump directly under the diaphragm, and lifting the same, precisely as a piston would do, ejects the water, which entered at its down stroke. The injection water, of course, does not enter while the steam is under the diaphragm and doing its work, as the pressure prevents it, but so soon as it is expanded, and the pressure reduced, the steam is condensed as before the diaphragm descends, and the pump acts automatically. The number of strokes per minute varies from five to ten, and the hight to which the water is elevated depends upon the pressure of steam employed.

It will be seen that it takes steam only one way, and that steam is condensed, showing a very marked advantage over pumps that take steam both ways, and exhaust it into the atmosphere or throw it away at every stroke. These pumps have been running for several months at the manufacturer's works, feeding boilers, and doing other work. They are said to have drawn water the full limit of distance allowed for atmospheric pressure, and through very many angles and crooked passages; the performance leaves nothing to be desired. They are economical in fuel, act with great regularity, and require no attention after once starting. From their simplicity, cheapness, and efficiency, they must appeal to manufacturers in general. State Rights for sale on reasonable terms.

Patented by Thomas Shaw, Dec. 15, 1868, and manufactured by Philip S. Justice at 17th and Coates streets, Philadelphia. Offices—14 North 5th st., Philadelphia, and 42 Cliff st., New York.

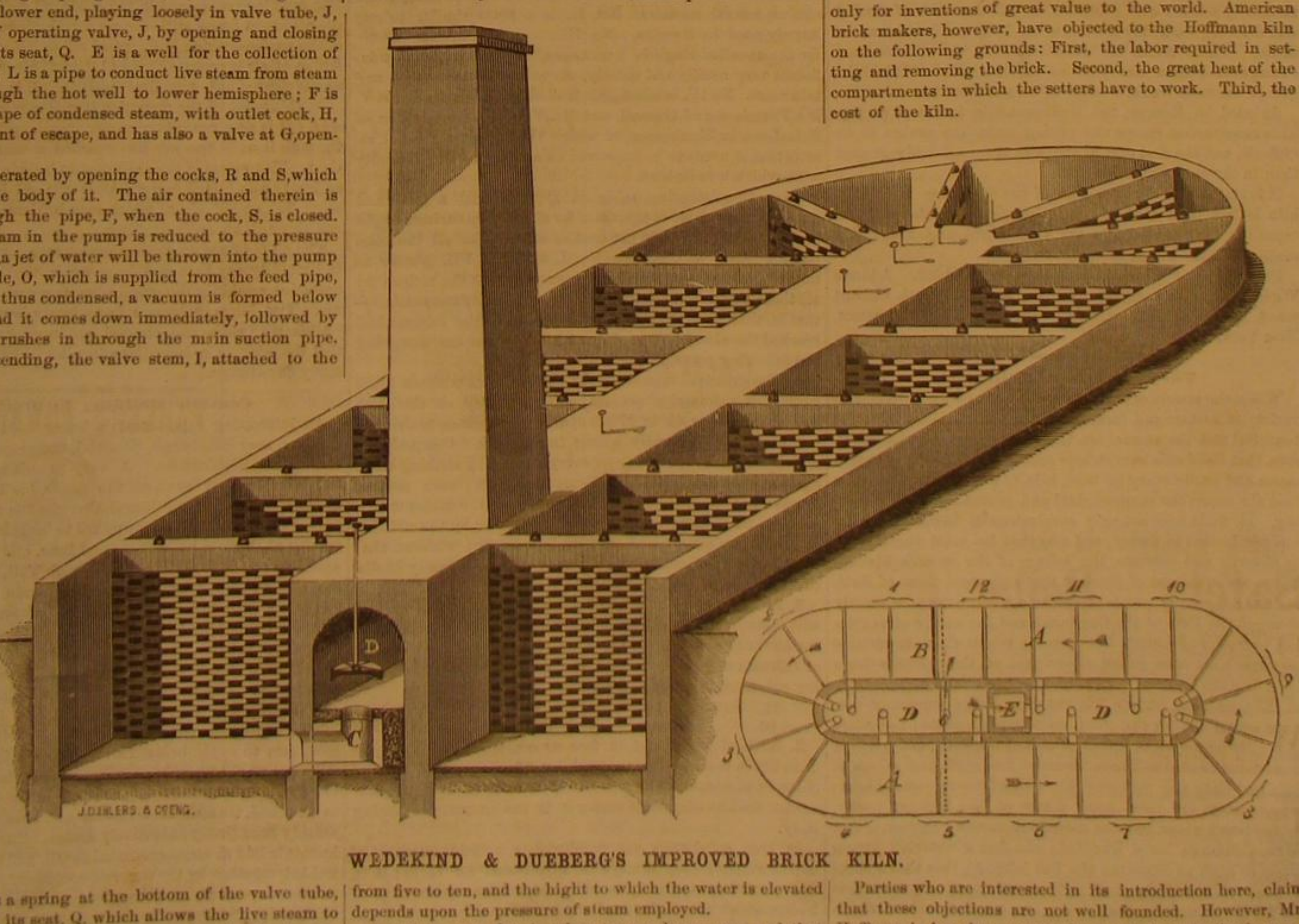
Improved Brick Kiln.

As bricks are ordinarily burned there is great loss of heat from two sources: First, during the burning, the smoke and gases of combustion pass off at a very high temperature, and are wasted. Second, after burning, all the heat the bricks contain is lost. This two-fold loss of heat is avoided in the Hoffmann system of kiln, herewith illustrated.

First, the heated gases and smoke from the burning bricks are made to pass through the green bricks, so that they are approximately burned before any fire is directly applied to them.

Second, the heat of the bricks, after burning, is utilized in heating the air for the fires, so that the fuel is consumed in air already hot. By this means a perfect combustion is obtained, as is proved by the entire absence of smoke, even when bituminous coal is used.

The Hoffmann kiln is extensively used in Europe, chiefly in Germany and England; and at the Paris Exposition, 1867, its inventor received the distinction of the "*Grand Prix*," which was awarded in but 64 instances, and only for inventions of great value to the world. American brick makers, however, have objected to the Hoffmann kiln on the following grounds: First, the labor required in setting and removing the brick. Second, the great heat of the compartments in which the setters have to work. Third, the cost of the kiln.



WEDEKIND & DUEBERG'S IMPROVED BRICK KILN.

Parties who are interested in its introduction here, claim that these objections are not well founded. However, Mr. Hoffmann's American agents have wisely determined on removing all possible ground of objection, rather than to rely on explanations to demonstrate the truth of the above statement. We present our readers with a cut showing the arrangement of the Hoffmann kiln in its Americanized form, which, with the following explanation, will, we think, be readily understood.

A long rectangular smoke chamber, D, communicating with a stack, is made either above or below ground. A gallery, open at top, is made all round this smoke chamber. This gallery is divided by means of cross walls into twelve compartments, each of which communicates with the smoke chamber by means of a separate flue. Each flue is provided with a damper. Other cross walls divide the compartments into sections. The cross walls, made of fire brick, are perforated, so as to allow a free draft from one section or compartment to the next, and are made double, with a space in the interior. These spaces are the fireplaces. At the top the cross walls are solid, except where vertical holes are made, called the feeding holes, for putting in fuel. The feeding holes are closed at top by means of closely-fitting iron covers. The fuel may be wood, coal, or peat—whatever is cheapest, and in case of coal, it may be in the form of dust.

The manner of using the kiln is as follows: Five or six compartments are filled with green bricks, say 7, 8, 9, 10, 11, 12, numbering them in order like the hours on a clock face. On top of the bricks are two platting courses and a layer of clay or sand, forming a tight covering. At the perforated wall separating compartment 12 from 1, there is a temporary partition called the "cut-off." This may be either of sheet iron or wood, as no fire comes near it. But iron is preferred, it being less easily broken. The flue of No. 12 compartment is open—all the others are closed. The cross wall between 6 and 7 is partially removed, and in setting the bricks in 7, arches are turned as in an ordinary kiln. Fires being lighted in these arches, the draft passes in the direction of the arrows through all the mass of bricks to the open flue. After about twenty-four hours, the first cross wall will be hot enough to ignite fuel. Fuel is then supplied through the feed holes in this wall; and as soon as the second cross wall is hot enough to ignite fuel, the burner commences to fire at these holes, and so on, the firing advancing as fast as the cross walls, one after another, get hot.

When five or six cross walls have fire in them, the firing at the arches is stopped; then one cross wall after another is left without fuel, so that only five or six sets of fires are burning at a time. While this is going on, setters are putting bricks into compartments, 1, 2, 3, etc., and when the gases escaping through the open flue are hot enough to be of any value in drying green bricks, the cut-off is advanced one compartment, No. 1 damper is opened, and No. 12 damper closed.

The interval of time between opening two consecutive dampers is usually twenty-four hours, and as the compartments are calculated to hold each one day's manufacture, say 20,000 bricks, it is plain that there are added to the burning mass of bricks each day, just one day's production of the yard. This goes on till all the compartments are full. By that time the bricks first fired are cool, and ready to be taken out. The compartment left empty by removing these is immediately refilled with green bricks, and the work of setting and drawing each day continues as long as bricks can be made. Where bricks are made in winter, the fires are not extinguished from one year to another. The whole kiln, except the cross walls, is made of common bricks.

As used in Europe, the Hoffmann kiln is closed at top. This construction causes the setting under the arches to be difficult, and the first cost of the kiln is considerably greater than in the open top form.

It is stated that the first cost of the open top Hoffmann kiln is less than that of any other form of kiln of equal capacity; that the repairs are very slight, and are easily made while the kiln is in operation.

Patented June 13, 1865, and December 15, 1869. Address Wedekind & Dueberg, No. 53, 55, and 57 North Calvert street, Baltimore, Md., or Caleb Huse, No. 17 Broad street, New York.

The Wonders of California.

While the novelties of climate, the strange and wonderful variety of surface and form in nature, the combination of the beautiful and the anomalous, the fascinating and the repulsive, that California everywhere presents, arouse every enthusiasm and excite every interest, it is to the student of science that she seems the most original and proves the most engaging. He finds here not only revolutions in forms and facts, but revolutions in theory, and sees that he must begin anew to observe and recreate the science of the world's history. There are evidences of glaciers that surpassed those of Switzerland; there are proofs of volcanic revolutions that utterly changed the form of the Continent, and the nature of vegetable, animal, and human life upon it; where these mountains now rise were once grand rivers; out of their depths have been dug the bones of a gigantic race that lived farther back in the ages than human life was ever before known, or perhaps suspected by the most audacious theorists; the State has diluvial deposits fifteen hundred feet deep, and granitic mountains twelve to fifteen thousand feet high, and others of lava and slate and metamorphic rock of nearly equal hight; silent craters are open upon many of her highest peaks; where Switzerland has one mountain thirteen thousand feet high, California has a hundred; she has a waterfall fifteen times as high as Niagara; she has lakes so thin that a sheet of paper will sink in their waters; others so voracious that they will consume a man, body, boots, and breeches, within thirty days; she has inexhaustible mines of gold, quicksilver, and copper; she keeps a miniature hell in blast as warning to the wicked sons of men; she has dreary deserts with poisonous waters, where life faints; she has plains and valleys that will grow more wheat and vegetables than any other equal space in the whole nation; in short, her nature is as boundless in its fecundity and variety as it is strange and startling in its forms; while her men are the most enterprising and audacious; her women the most self-reliant and the most richly dressed; and her children the stoutest, sturdiest and the sauciest of any in all the known world!—*Samuel Bowles.*

ON COMPOSITIONS FOR FRICTION MATCHES WITHOUT PHOSPHORUS.

In treating of this subject in the *Polytechnic Journal*, Vol. XC., page 369, Mr. Wladimir Tettel adopts, as a measure for judging of the quality of the various compositions, the proportion of oxygen contained in them to that of the other ingredients. In not taking into account the mucilage and gum, which are used for thickening, as well as the substances retarding combustion, they being chemically inert, the following proportions have been found for the here annexed compositions:

ORDINARY PHOSPHORUS COMPOSITION.		Parts in weight.	
I. Phosphorus	3·1	14·538	contain oxygen 1452 or 10 p. c.
Minium	36·365		
Nitric acid (50 p. c. in weight)	15·27		

	Parts in weight.	Atomic weights.	Contain oxygen in per cents.
II. Chlorate of potassa	4	122	38
Sulphur	1	16	
Bichromate of potassa	0·4	149	
III. *a.* Chlorate of potassa	2	122	38·4
Charcoal	1	6	
or *b.* Chlorate of potassa	1	122	34·8
Sulphur	1	16	
IV. Chlorate of potassa	11	122	37·5
Marcasite	1·5	60	
Binoxide of manganese	1	43	
V. Chlorate of potassa	7	122	36
Nitrate of lead	2	170	
Bichromate of potassa	2	149	
Sulphur	1	16	
VI. Chlorate of potassa	3	122	34·75
Golden sulphuret of antimony	0·25	209	
VII. Chlorate of potassa	8	122	20
Nitrate of lead	3	170	
Sulphuret of antimony	8	153	
Bichromate of potassa	0·5	149	

In regard to composition No. I., the small amount of oxygen contained therein is explained by the presence of phosphorus, which, even without coming in contact with compounds yielding oxygen, will catch fire at a small increase of temperature. The other compositions which contain no phosphorus, require a four or five times larger amount of oxygen, and though this is the case, inflammation only ensues, in correlation of them with rough surfaces, adapted for the purpose.

These compositions will not catch fire by rubbing them against smooth surfaces. No. II. is a mass similar to one largely used in Sweden. No. III., *a* and *b*, are the pastes for the so-called English "mennous," of which the first inflames very readily and quietly, while *b* is lighted with a certain noise. No IV. is a recipe indicated by H. Wagner. No. V. is a French one of Canouil, and No. VII. is a composition of F. L. Lutz, in Blaubeuren, of which the inventor himself asserts that it needs to be improved on account of the difficulty with which it is lighted.

From the foregoing table, it appears, that a good and readily inflammable composition for amorphous surfaces ought to contain from 35 to 38 per cent of oxygen, for all the compounds mentioned, except No. I. and No. VII. possess as much. It may also be taken for granted that the recipes for all these pastes were only discovered after continuous trials—that is, that they were improved on until the oxygen had reached the above indicated quantities. From the foregoing the following principles result:

1. The principal ingredient for compositions without phosphorus is chlorate of potassa. The quantity of the same amounts to from 40 to 92 per cent, in most cases, to over 60 per cent of the directly acting ingredients. Compositions which ought to take fire on every surface by striking them against it should contain still more oxygen; such masses, however, then crack and snap too much. It remains still a problem of chemistry to discover a substance by the addition of which the quantity of oxygen is increased without that cracking (explosion) ensues; it may perhaps finally be discovered in some picrate.

2. Aside of the chlorate of potassa, most pastes require still other oxygen generating compounds. Their quantity in the above masses amounts to from 10 to 40 per cent of that of chlorate of potassa, so that the quantity of oxygen yielding substances increases as follows: for

II.	IV.	V.	VII.
83	88	91	58

3. A third ingredient is free or combined sulphur. Its quantity is found to be as much as 25 per cent of that of chlorate of potassa. Except when charcoal is used, sulphur cannot well be dispensed with; it is the properly inflaming body.

In case sulphurets are employed, a certain quantity of native sulphur may always be substituted for them; it is, however, then necessary to add an equivalent percentage of bodies which retard the combustion. The use of native sulphur is always to be preferred, the washing of the metallic sulphides being thereby dispensed with.

4. As admixtures retarding the combustion, and thereby causing a quiet burning, there are used, glass powder, sand, and umber. In using one half a pound of umber, or less, for 4 pounds of chlorate of potassa in mass No. II., cracking still ensues, one and a half pounds, however, will produce a slow and quiet inflammation. Yet it may be mentioned that the quantity of the admixtures cannot be well determined, since it is solely dependent upon the chemical nature of the substances employed in the preparation.

5. The quantity of mucilage and gum for thickening should never be unnecessarily large; it ought only amount to from one third to one half of the total amount of the compounds yielding oxygen. When dried too quickly, the lighting of the matches will be attended with cracking, on account of the fact that the mass will not then present a like density throughout. Beside this, the matches thus dried become of a very inferior quality, form the fact that the denser top part leaves a compact, not readily fusible residue, while the inner less dense portions become quicker consumed than the outer portions. Thus, in consequence of the speedy generation of gases, a bursting of the outer already burned crust takes place, which is always attended with spurting, or ejecting of the ignited interior portions.

Modern Methods for Refining Vegetable Oils.

Many systems for refining vegetable or grain oils, have been practiced during the last few years. The best known is the one first preconized by the chemist Thenard. It is as follows: He adds three parts of concentrated sulphuric acid to 200 parts of the crude oil. After stirring for a long while the mixture is left to rest. Four hundred parts of water are then added to get rid of the excess of acid. For this purpose long stirring must be again resorted to, and followed by a new period of rest. The oil is then drawn off and filtered. Thenard's method has been modified in various ways, one of which consists in precipitating the acid by milk of lime.

R. Wagner employs chloride of zinc instead of sulphuric acid; he heats by means of steam, and washes the oil with hot water after defecation.

Mr. Gusher, of Nuremberg, adds $\frac{1}{25}$ of its weight of starch to the oil, and boils the mixture until the starch is carbonized. He then decants and filters.

At the works of "la Villette," in France, oil used to be refined by admixture with pulverized charcoal, but this plan was discontinued on account of the waste of oil occasioned through imbibition of it by the coal, from which it could not be entirely recovered.

Evrard refines oils by means of very weak alkaline solutions.

All the above processes are long and tedious. Mr. C. Michaud, of Honfleur, has discovered a new method of refining oil which will probably eclipse all those in general use at the present day. This method has just been communicated by M. Chevallier to the *Société d'Encouragement*, and we lose no time in submitting it to our readers.

While sulphuric acid is introduced into the oil in minute numerous streamlets, air is blown into the oil so as to produce a great commotion in the liquid and to fill it with air bubbles. The mucilage contained in the crude oil being acted on by the acid soon forms with the air a voluminous layer of scum at the surface, which is skimmed off as it forms. This insufflation of air is repeated several times in succession, and the scums cleared off every time until the oil is clarified.

At this point of the operation it still retains free sulphuric acid. It is now run into a copper vessel, and steam is forced through it until the oil has reached a temperature of 100° Cent. The steam is then allowed to bubble through for half an hour or an hour longer. After the oil has cooled down some 20° or 30° Cent., which may be done artificially, it is run through an ordinary filter.

The oil obtained by this process surpasses in quality and in limpidity any that has been made to this day, and the operation combines the great advantages of speed and economy. Two large refineries have lately been put up on the "Michaud" plan, and the oil produced by them is so pure that the wick of a lamp burning it will not carbonize after many days usage.

Concrete Building in Scotland.

An interesting experiment is being tried on the estate of Carbery, near Edinburgh, Scotland, the property of the Right Hon. Lord Elphinstone. A very promising coal pit having been recently sunk on the estate, his lordship has commenced to provide accommodation for the colliers to be employed at it, and he has determined to build in all sixty houses, twenty of them to be of stone and lime, and forty of concrete, upon the principle patented by Joseph Tall, of London. The concrete buildings are to form a separate village by themselves, and are to occupy a square of about two acres in extent, each tenement having a garden attached. On the south side of the square his lordship proposes to erect a school for the children of the miners and a reading-room for the men themselves. The construction of the village has been begun, and already the walls of a block of four houses—each containing two apartments—are about half built, if that is a correct term to apply to Mr. Tall's process, a brief description of which may not be uninteresting, seeing that this is among the first attempts to employ concrete in the erection of houses in Scotland, though in England and France the process has already been pretty extensively tested. The foundation of the houses is laid at about the usual depth, and is formed of stones welded together by the concrete compound. The foundations in this case are about fifteen inches broad for the front and back walls, and about two feet for the gables. On the foundations being completed, the next operation is to erect upon them the frame or molding machine within which the walls are to be formed. These frames consist of wooden boards eighteen inches deep, faced on the inside with sheet zinc, and bolted to upright posts. The frames are placed on the foundations—the one to form the outside.of the front wall and the other to form the face of the inside of wall. In this case the intervening breadth is nine inches for the front and back walls, and eighteen inches for the gables—the additional thickness of the gables being to provide accommodation for fireplaces, chimneys, and wall presses. When once set and carefully plummed, the work of *building*, which can be done equally well by an ordinary laborer as by a regular mason, is commenced. All that has to be done is to take a quantity of whatever sort of building material the district affords and pack it inside the frame, care being taken to keep it from touching the sides of the frame. The concrete, which may be made of a variety of articles, such as gravel, sweepings of brickworks, or coal dross, mixed in certain proportions with Portland cement, and of about the thickness of common mortar, is then poured in, in bucketfulls, upon the stones and down the inside of the frame. The concrete used by Mr. Tall in this contract is composed of seven parts of river gravel, one part of sand, and one part of Portland cement. The houses are being built in blocks of four each. The blocks measure about sixty feet in length by about thirty feet in breadth, with a concrete wall running across the middle to provide accommodation for fireplaces, etc., for the two houses in the middle.

To show the speed at which the process of concrete building can be performed, we may mention that eight ordinary laborers can add eighteen inches per day to all the walls of a block of the dimensions we have specified—in other words, they can fill the frames once per day. The frame is allowed to stand over night, and the first thing the workmen have to do in the morning is to unfasten the bolts and lift it up to the top of the portion built the previous day, bolting it with new tubes or "cores," as before. They then commence to fill in the stones, and, after having finished that work, they pour in the cement, continuing the same operation from day to day. When the frames are lifted in the morning, the work of the previous day is found to be wonderfully hardened even in that short time. When the walls get so far on as to require scaffolding, the "cores," which were originally used to bind the frames, and which were allowed to remain in their places, now come to be of service, acting as receptacles for bolts affixed to the trestles upon which the planking rests. The hollow of the tube is afterwards filled in with cement, and the ends are entirely hid from view by the outside coating which is applied to the concrete. This coating is a compound, consisting of two parts of sand to one of Portland cement, and is applied in the same way as ordinary plaster. It imparts a smooth and finished, but rather dull-looking, appearance to the buildings, which can, however, be very easily relieved by a coat of paint. The flooring of the houses is also to be of concrete, and is to be three inches in depth, the upper portion being of a finer quality than the lower. The fire-places are formed by the introduction of temporary wooden frames in the lower portion of the gable walls, and the vents are constructed by the insertion of tin tubes, which are moved upwards as the walls ascend, leaving a clear space beneath, which requires no further treatment. The windows are fitted in entire, and are securely fastened simply by the concrete taking a firm hold of the framework. It may be mentioned that it is never necessary to apply a plumb line to the walls, the frames being constructed with so much precision that, if care is taken in placing the first layer of concrete, no deflection can possibly take place in the superstructure. No skilled artificers, excepting a solitary carpenter, whose duty it is to fix the window frames and joisting, and the movable frames for the wall presses, fire-places, etc., is required in the construction of houses on this principle.

It is believed that the system has many advantages over either stone or brick buildings. A saving of from 30 to 40 per cent is expected, and the houses are supposed to be even more durable, as well as drier and warmer, than the ordinary class of workmen's dwellings. Mr. Tall took a prize for his patent at the Paris Exhibition in 1867, and has erected a number of cottages in Paris by order of the Emperor. He has more recently been employed in the same work by the Duke of Northumberland.

Diseases of Workers among Lead and Paint.

In the sixth of a series of reports "On the Preventible Diseases of the Industrial Classes," the *British Medical Journal* says: "Owing to the impossibility of keeping paint from coming into contact with the skin while they are at work; owing to the almost universal practice among them of touching their food with unwashed hands, and to the habit of some of them of wearing corduroy, fustian, and other clothes difficult to cleanse, painters absorb large quantities of the hurtful metal, and suffer gravely in consequence. An attack of colic may occur now and again, and the painter will recover; but if he continue to follow his trade, the more serious diseases—paralysis or kidney disease—are almost certain to attack him at last, and to render him, if not entirely unable to work, so weak and prostrated that in mental as well as in physical power, he will be but as the ghost of his former self. It is seldom that such workers are killed in early life; they lose power early, and soon become unable to perform a good day's work, but they drag through their labor for many years, suffering always from general weakness. From the time that lead has contaminated their bodies, their lives are wearisome and joyless. Since lead is so dangerous a metal to work with, it is most desirable that all efforts to substitute other materials should meet with attentive consideration. Different substances have been used instead of lead in the manufacture of paint, and with an encouraging amount of success. Zinc has been employed, and we have had favorable reports of it; the silicate of iron has also been used. The zinc is thinner than other paint, and workmen do not like it on this account, but in all other respects it is, we are told, as useful as leaden paint."

Our medical cotemporary suggests that all workers among lead should, before commencing or resuming work, wash their hands, not once, but many times a day, in a strong decoction of oak bark, the tannin of which would not only harden the skin, but would protect it against the action of lead. The hair of the workmen should be kept short. All painters should, during their work, wear clean cloth caps. All their clothes should be made of materials that can be easily and frequently washed. Their hands should be washed before touching food, and, if stained with paint, should be dipped into a decoction of oak bark. The mouth should be well rinsed with cold water before partaking of food. A weak oak bark decoction should be used as a wash several times a week. The body should be sponged night and morning with cold or tepid water, and the hair thoroughly washed every evening after work. The food should contain a large proportion of fatty substances, and milk should be taken in large quantities.—*London Building News.*

The Wood Screw Manufacture.

It is not easy to grasp, mentally, the extent of a manufacture of one thousand million separate and like pieces of iron goods yearly. Yet a single Birmingham firm now produces rather more than this number of wood screws every year, or, say, 150,000 gross weekly.

Until within about twenty years ago the manufacture of wood screws was carried on with the aid of comparatively primitive machinery. Yet the trade was a large one, and Mr. Nettlefold, of Birmingham, was, perhaps, then—as his firm, Messrs. Nettlefold and Chamberlain, certainly are now—the largest manufacturer of screws in the world. M. Japy, who has large screw-making works in France, took out a patent for screw machinery as early as 1845. The remarkably ingenious machinery now employed both by M. Japy and the eminent Birmingham house already named was invented by T. J. Sloane, of New York, and was first employed by Wm. Angel, of Providence, U. S. Sloan's machinery was worked some twenty years ago in London, and was introduced to our screw manufacturers by Mr. J. Burrows Hyde, of New York, assisted, in some measure, we believe, by a well-known Birmingham gentleman connected with the wire and metal trades. Even in its early stage of working the invention was valued at £20,000, although the English patents were subsequently sold for £12,000, from which £5,000 was finally deducted because of the non-fulfillment of an undertaking into which Mr. Sloan had entered that the English purchaser (Mr. Nettlefold) should visit, inspect, and study Angel's works at Providence, U. S., Mr. Angel afterwards refusing admission to any one. Sloan received a considerably larger sum for a braiding machine, in which the whole extent of his invention was the substitution of springs in place of weights, for maintaining tension upon the strands. The springs enabled the braiding machine to be worked at a speed much beyond what was possible with weights. The proprietors of the great works near Smethwick, Birmingham, are, reasonably no doubt, quite as exclusive, in respect of admitting visitors, as was the original employer of the same machinery, viz., Angel, of Providence—and what a singular association of names! Who, objecting to monopolies, would wonder at this reserve? It is not, in this case, so much the monopoly of patents as of capital. The great Birmingham house buys up and extinguishes every other concern in the trade, and it is now engaged in a notorious arbitration (Nettlefold *vs.* James), in which a certain screw business was valued by the respective arbitrators, on the one side at £14,000, and on the other at £140,000, the umpire deciding in favor of the latter amount. Of this £100,000 have been paid, and the remainder is now waiting a further award, under further arbitration. In all this there is nothing to wonder at when it is considered that wire for screws costs £11 per tun, that the prime cost of finished screws is now hardly £20 per tun, and that they sell for quite £40 per tun. It is not difficult to reckon the annual profit, at £20 a tun, on the manufacture of 100 tuns of screw wire weekly. Nor is it difficult to understand that it is likely to pay the makers to put up a blast furnace, rolling mills, and wire-drawing machinery for making their own wire at first cost, as they are now about to do. Their works already employ a thousand people, and upward of 30,000 cutting tools are ground every day. At one time not less than 60,000 gross of screws were sent weekly from Smethwick to America, the parent country of the wood-screw manufacture. The old price list is still maintained, but qualified by terrific "discounts." The latter are generally 65 per cent from the list prices; and thus, in increasing, as Nettlefold and Chamberlain once did, the discounts by 5 per cent, they really lowered the price of screws by about 15 per cent, and thus snuffed out their competitors, who were making screws at the former scale of prices.

Great numbers of machines, although these machines are of but three kinds, are employed in screw making, the threading machines forming six screw threads a minute, while the turning machines turn ten a minute. The cutting of the slit or slot in the head of the screw is effected by circular saws, of which Messrs Nettlefold and Chamberlain use and wear out 150 gross, or upwards of 20,000 saws weekly, each saw cutting the slots in about 1,000 screws. These saws, of from 90 to 100 teeth, and of but 3 inches in diameter, cost M. Japy, the French manufacturer, about 7 pence each. Mr. Batho, who was for some years the engineering brain of Nettlefold's screw factory, contrived a plan of making these saws at a cost of about ½ pence each. He placed 144 (a gross) of thin circular plates, 3 inches in diameter, upon a mandril, and subjected them, as if they were a single piece of metal, to the action of a series of slotting tools. For saws of 100 teeth he at first employed ten cutters, thus finishing the saws, 144 at a time, by ten complete cuts. He afterwards employed cutting tools adapted to form three teeth, each at a single cut, so that, for 90-tooth saws, but three changes of feed were necessary, 30 teeth being cut, by ten tools, at each adjustment. The line of cut, instead of being parallel with the axis of the mandril to which the saws were fitted, required to be spiral or twisted, to give the proper cutting angle to each tooth of the saws. This was effected by giving to the group of saws the slight necessary axial rotation during the cut, which would correspond to the requisite angle of the cutting edges of the saws. The principle, a simple one, is the same as that adopted in planing the Whitworth shot. Indeed, it is external rifling, as contrasted with the internal rifling adopted, a few years since, for the saw-tooth grooving of the Armstrong guns. It is something to save 20,000 sixpences, or £500 a week, in the mere matter of saws for cutting the slots in screw heads.—*Engineering.*

Transfer Ornamenting.

"There are many different ways of putting on the ornament, some preferring one way, others a different method according to circumstances and individual skill. We shall endeavor to give the most simple and successful method known.

"First let it be understood, that all pictures that show the colors complete, are only suitable for white or very light-colored brown; those that are covered with a white grounding, gold, metal, or silverleaf, can be used on any color, light or dark. After getting the work ready for ornamenting, give the picture a smooth, thin coat of some quick-drying copal varnish, thinned with turpentine (other preparations are used of which we will speak hereafter), being careful not to go beyond the outline of the design. Allow it to dry until it has a good tack, and put it on the work in its proper place. Roll it smooth with an india-rubber roller, or smooth it with a paper-folder, until every part adheres well. (For very large pieces, it is well to lay them, after they have the right tack, between two sheets of damp blotting-paper. It will stretch the paper and make a smooth transfer). Now wet the paper, smoothing it down at the same time, until it has absorbed all the water possible, leave it about a minute and pull off the paper carefully. Should any parts of the design still adhere to the paper, press it down again, wet-rub it until it separates easily.

"After having removed the paper press the design on well and wash and dry it off. Should any blisters appear, prick them with a pin and press down. In a few hours the design may be varnished, which will increase the brilliancy of the colors.

"An improved method has been invented by Mr. Charles Palm, of this city, which saves time and works with more certainty. The design is coated with a 'transfer cement' of his own manufacture, without regard to outline, transferred as usual, and the traces of the cement around the design washed off, with the detergent (also his own invention), which will remove every particle of cement without injuring the colors or gold in the least. A few drops poured on a sponge or chamois skin are sufficient.

"For fine ornaments, having many fine lines and touches, it is necessary to use these preparations to make a neat job."
—*Painters' Magazine.*

Proportions of Belts to Drive a Given Horse Power.

We give by permission of the author, Mr. F. W. Bacon, 84 John street, New York, a rule for proportioning belts to carry a given power, taken from a "Treatise on the Steam Engine Indicator," shortly to be published by D. Van Nostrand. It will answer several queries we have now in hand relative to the same subject.

Rule.—Multiply the horse power required to be transmitted through the belt by 36,000. Divide the product by the number of feet, or parts of a foot the belt is to run per minute; divide the quotient by the number of feet or parts of a foot in length of that part of the belt in contact with the smaller pulley; divide this last quotient by 6, and the result will be the width of the belt in inches.

The same work contains the following formula for a steam joint cement never before published in this country but long used in France, and said to be unexcelled by any other known:

"Take white lead ground in oil, a sufficient quantity. Add dry red lead enough to make a stiff putty. Put the mass in a mortar or on a block of iron or smooth stone, and pound it till it becomes soft; continue to add red lead, and pound until the mass will no longer become softer by pounding nor stick to the fingers. At this time it should be of sufficient tenacity to stretch out three or four inches, when pulled, without parting. The more protracted the pounding the softer, finer, and more tenacious the cement becomes. Interpose this putty between the flanges of steam pipe joints, taking care to put a thin grummet of packing or wicking around the diameter of the bore, to keep the cement from squeezing through when the flanges are screwed together. It is indestructible by steam or water and makes the best joint known to the engineer."

It will be seen that elbow grease is an ingredient in the above recipe that it will not do to stint.

A good cement is made by mixing clean cast-iron borings with water. If properly rammed, steam may be put on immediately. The addition of corrosive substances only serves to destroy the cement and parts joined with it.

The heat emitted from the sun in a year is equal to that which would be produced by the combustion of a layer of coal seventeen miles in thickness.

MOULE'S PATENT EARTH CLOSET.--EARTH versus WATER FOR CLOSETS.

Our readers having read the article on "Earth Closets," published on page 313, Vol. XX. of the SCIENTIFIC AMERICAN, will be prepared to duly appreciate the value of the invention we this week present to their consideration.

In that article we called attention to the enormous waste attendant upon the present general system of sewerage in large cities, to the contamination of waters by the discharge of sewage into them, to the danger to the public, arising from the saturation of soil with fœcal matter in the immediate vicinity of dwellings, to the intolerable nuisance arising from water closets . n shipboard, and to the complete remedy for all these evils afforded in the earth closet if properly constructed.

In the light of the facts set forth in the article referred to, and also referring to an article entitled "Hidden Generators of Disease," published in another column of the present issue, let us examine the construction of the celebrated Moule earth closet, which forms the subject of the present article.

Fig. 1

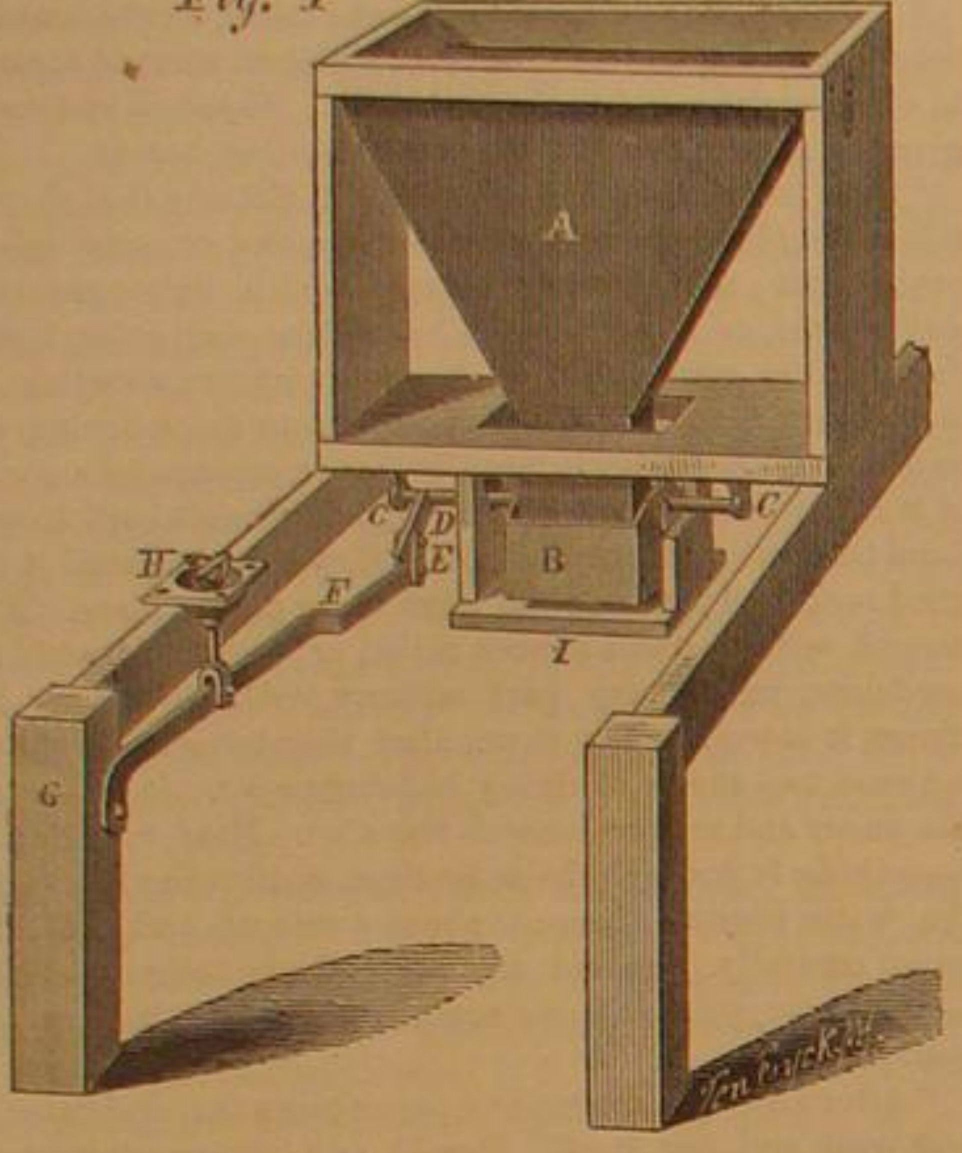


Fig. 1 is a perspective view of the uprights, bearers, and frame employed to support the seat, earth reservoir, and chucker, showing the lower portion of the earth reservoir with the chucker and levers attached to it. A represents the lower part of the earth reservoir, which is of hopper form, and may have placed at its top, a high rectangular box as large as convenience may dictate, with a tightly closing top lid. B is the "chucker" attached to a rod playing loosely in bearings, C. An arm, D, projecting at right angles from the chucker rod is pivoted to short bars, E, pivoted to the long bar, F, which is pivoted to the upright, G. This bar is operated by a handle, H, which, when raised, operates through the connections described, to rotate the chucker, B, and throw the bottom of it forward. The lower part of the "chucker" is open, a platform, I, serving to stop the fall of the earth when the chucker hangs vertically, as shown in the engraving.

Fig. 2

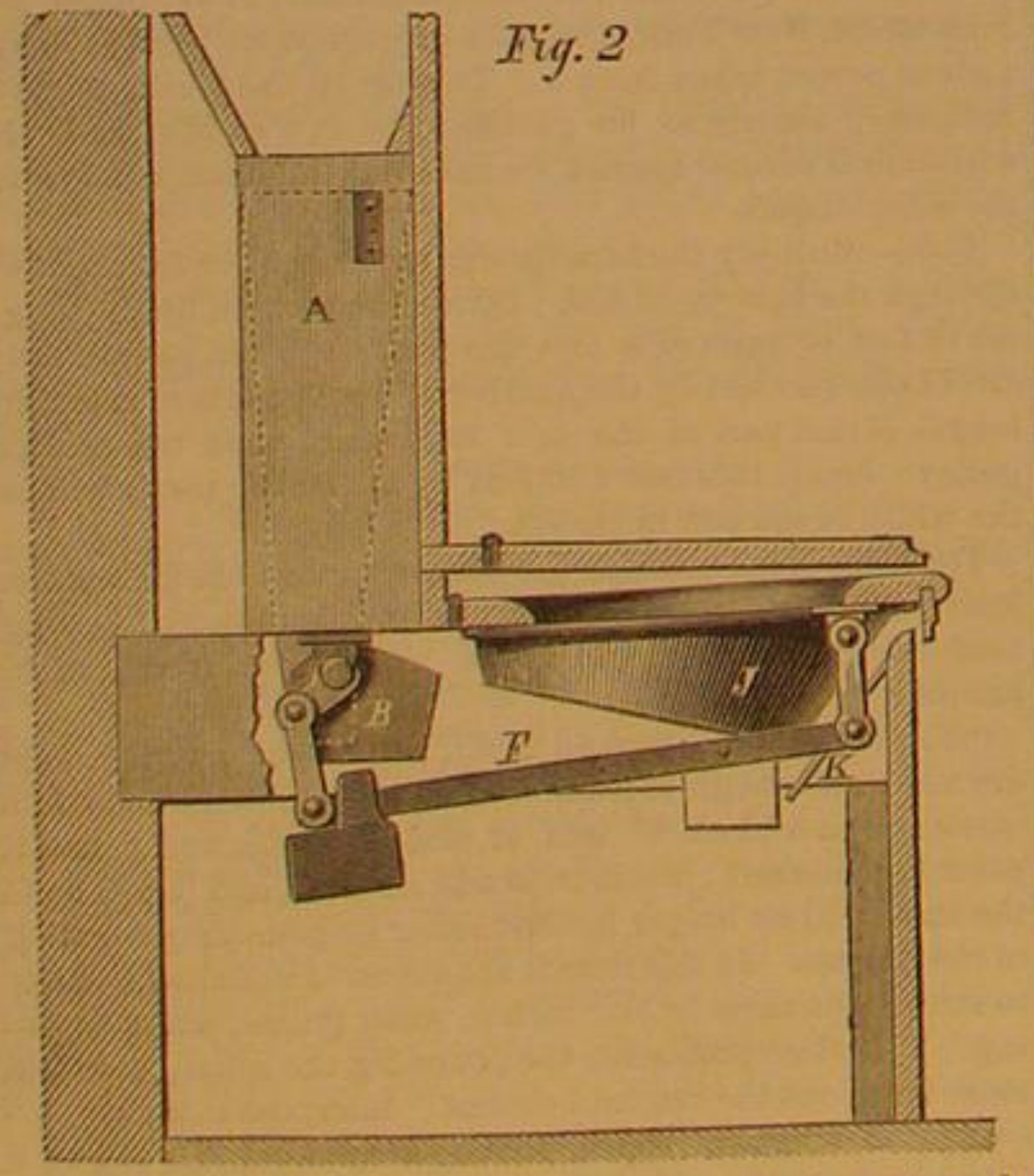


Fig. 2 shows the completed closet in vertical section, the bar being actuated by a spring seat instead of the handle, H, as shown in Fig. 1. In this case the chucker, B, is so formed that the flow of earth from A is cut off when the closet is not in use; and, when the weight of the body is thrown upon the seat it is thrown into the vertical position to receive a charge of earth. Upon rising, the spring of the seat elevates the forward end of the bar or lever, F, and tilts the chucker suddenly forward into the position shown in the engraving, again cutting off the passage from A, and precipitating the charge of earth contained in B upon the fœcal matter deposited. An earthenware pan, J, with open bottom, conducts the urine into the receptacle below, or it may be dispensed with by using an apron, K, of slate or other suitable material.

It will be seen that we have here a simple practical and effective apparatus, generally applicable in town or country, which may be used in the form of a commode for sick rooms or sleeping apartments, is capable of being elegantly finished, and equally adapted to use on shipboard as in dwellings on land.

Various reservoirs to receive the deposits may be employed —a pail, or a drawer, or a tank, as circumstances may dictate. Anthracite coal ashes are nearly equal to earth in their deodorizing effects, although the dust, in filling the earth reservoir, is an objection. This objection may be obviated by the admixture in the ashes of a very small quantity of damp earth.

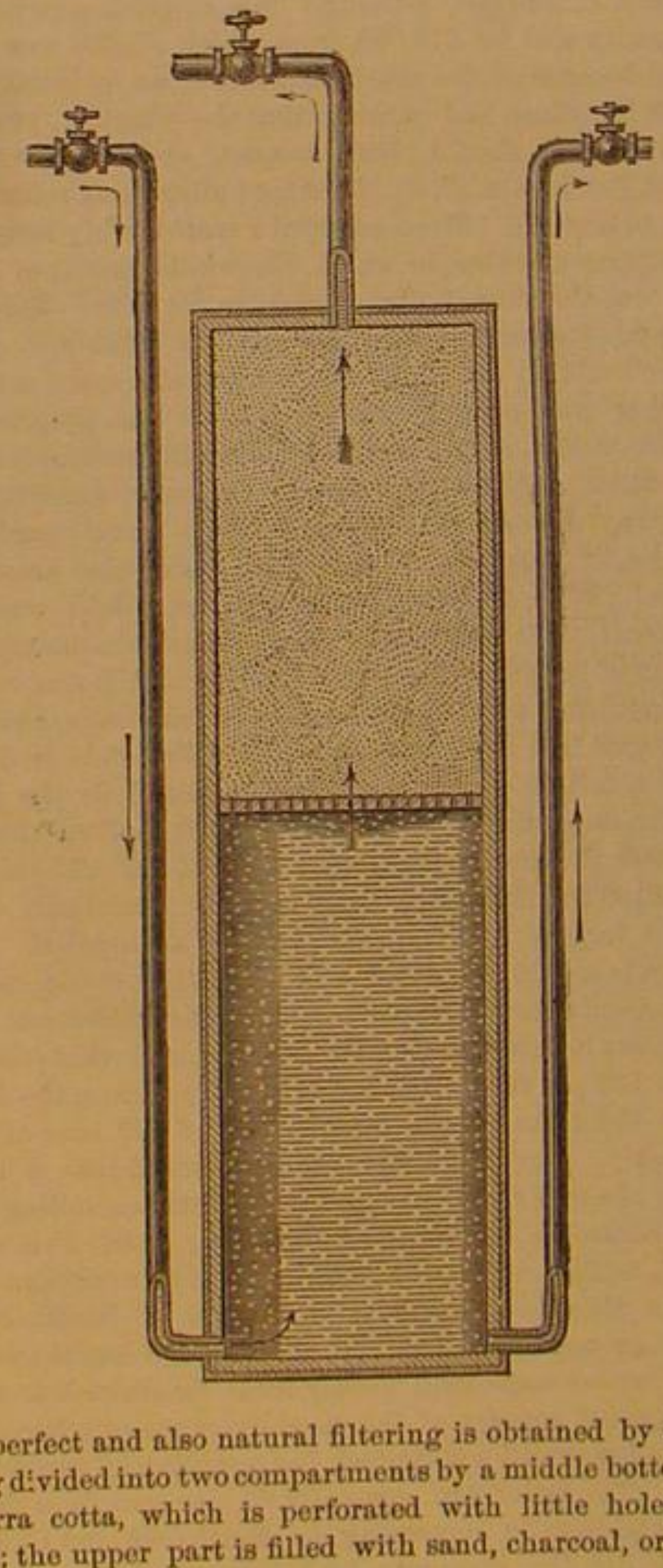
The removal of the mixed earth and fœcal deposits is unattended with any discomfort not attending the carrying out of ashes from a stove, and the compost produced forms one of the best fertilizers known.

We can see no obstacle to the general adoption of these closets, and among the more intelligent thinking people it is already being considerably patronized. The greatest obstacle it will encounter is prejudice, the great enemy of progress, but we are confident that any such prejudice must be eventually overcome by the irresistible logic of facts. The use the improved earth closet will at once receive in sick rooms, from which it will eliminate one of the greatest annoyances, will open the eyes of the public to its more extended advantages.

The patent on this invention was granted to Rev. Henry Moule and Henry John Girdlestone, residents of England, through the Scientific American Patent Agency, on the 15th June, 1869. A company has been formed in this country under title of "The Earth Closet Company," for the manufacture and sale of the article on an extensive scale. Their advertisement may be found on the back page of this paper.

IMPROVED WATER FILTER AND COOLER.

This combined filter and cooler is based on natural principles, and consists of a tube made of boiler iron and lined inside with a thick coat of cement; it is closed at both ends and placed upright in the ground from ten to fifteen feet below the surface. This depth is the proper or natural cooler; for at a depth of fifteen feet there will in most localities be found a temperature of from 50° to 55°. The water with which most cities are supplied indicates in midsummer a temperature of 60° to 80°, and in many cases after heavy rains it often gets so muddy as to be unfit even for washing purposes.



A perfect and also natural filtering is obtained by the tube being divided into two compartments by a middle bottom made of terra cotta, which is perforated with little holes like a sieve; the upper part is filled with sand, charcoal, or any filtering material.

The water is led in near the lower bottom of the tube through a pipe attached to a main or other supply pipe, and has to rise upward through the little holes and sand, and comes out clear at the top through pipes to the draw. By this operation the coarser particles of mud and fibrous substances will settle to the bottom before they reach the sand, and in order to clean out the mud when it should become necessary (which the inventor states is not oftener than once in two or three years) a second outlet is provided right opposite the supply and carried to the surface by a piece of pipe, which when opened will readily wash out the whole. Hydrants may be connected with such an apparatus and so constructed that by turning a crank one way the clear water may be drawn, and by turning the other way the common water will be obtained.

It has been adopted in Philadelphia at the public drinkiug fountain at the Ledger Building, and in many private dwellings in and around the city. In cities situated on the Ohio, Missouri, and Mississippi, where the water is most generally muddy, the application of this invention must prove especially beneficial.

The water that passes this filter placed 15 feet in the ground during the whole year scarcely varies from the temperature of 54°, is perfectly clear, and is also much improved in taste. The inventor claims that there is no trouble with it, that it cannot get out of order, that the water is cool enough for drinking without any ice and is of coarse healthy.

Patented December 12, 1865. For further information and for the sale of State rights, address the inventor, Louis Scharp, Spring Mill, Montgomery Co., Pa.

IMPROVEMENT IN THE LUBRICATING OF CROSS HEADS.

The self-lubricating cross head which is presented to our readers in the accompanying engravings, has been, we are informed, in use for months, and has demonstrated the economy of its use on locomotives. It is equally applicable to all engines using a cross head, be they vertical or horizontal. Its saving of oil and the positive distribution to the whole surface requiring oil, allowing none to be wasted, are the ends accomplished.

An expert will see its construction at a glance, nevertheless we will describe it in general terms for the benefit of the general reader.

Fig. 1

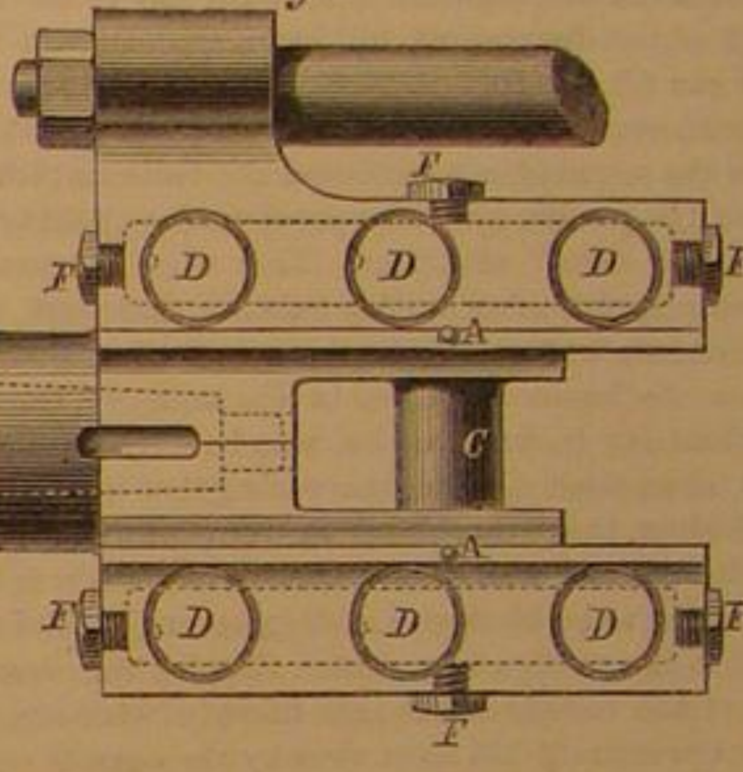
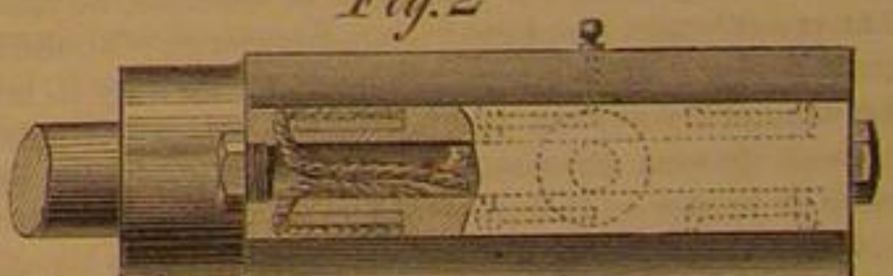


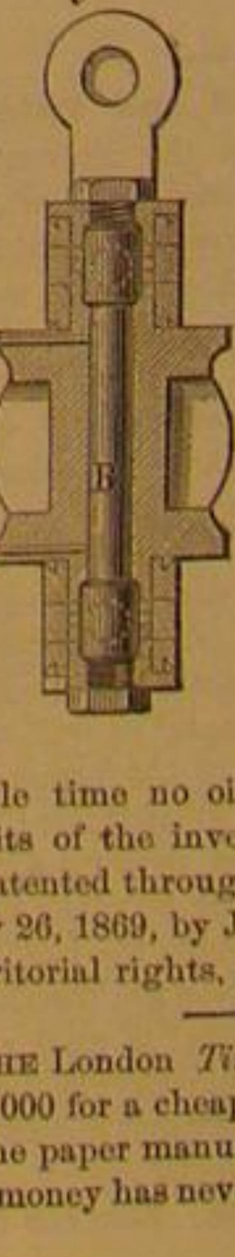
Fig. 1 shows the external appearance of this cross head, the wings of which are cored out to form reservoirs for oil which is supplied as wanted through the oil cups, A. The reservoirs thus formed are connected by a passage, B, through the wrist, C, Figs. 1 and 3. In filling, the air is permitted to escape through vent plugs provided for the purpose. In the faces of the slides, or wings, are formed circular recesses into which disks, D, Fig. 1, of anti-friction material are inserted, having dovetail or other formed grooves in their faces suitable for retaining gaskets of absorbent material, which passes through openings into the oil reservoir. These gaskets are so arranged that a portion of their saturated surfaces will bear against the faces of the guides on which the cross head plays, thus keeping them covered, but not overcharged with oil. The portion of the gasket which lies in the oil reservoir is shown at E, Fig. 2.

Fig. 2



To insure the lubrication of the upper flanges, wicks may be carried up from the reservoirs through holes in the slides and grooves in the faces of the flanges, terminating in holes for the support of the wicks. The oil will flow naturally to lubricate the lower flanges. Holes may also be perforated in the wrist so as to lead oil out from the passage, B, Fig. 3, so that it may be kept lubricated also.

Fig. 3



The reservoirs and passages may be readily cleaned by removing the plugs, F, Fig 1, provided for that purpose. Thus constant, thorough, but not profuse and wasteful lubrication is attained for all the bearing surfaces, the flow of oil being easily controlled by the size of the wick and its quality

The inventor informs us, that by a proper adjustment of the parts of this device a locomotive has been able to run 2,000 miles, and being then examined found to be in perfect working order, having received during the whole time no oil, except what was at first provided. The merits of the invention are obvious.

Patented through Scientific American Patent Agency, January 26, 1869, by J. H. Congdon, who may be addressed for Territorial rights, etc., at Omaha, Nebraska.

THE London *Times*, for many years, has made an offer of £50,000 for a cheap substitute for paper, equal in all respects to the paper manufactured from linen rags, yet the check for the money has never been drawn.

PATENT LIFE-SAVING APPARATUS.

Various as have been the devices employed to save life at sea in cases of ordinary shipwreck or sudden collision of vessels, there seems to have been only one thing considered in the large majority of them. To enable the body to float for any length of time in the water is, of course, the first requisite for any such device. A task of so easy a nature as this would scarcely merit much notice, except upon humanitarian considerations. It certainly would not rank among the grand mechanical achievements which win immortality for their originators. Nothing can be more simple. A person has merely to attach to the body, by lashings or otherwise, a sufficient quantity of some material considerably lighter than water, and which is incapable of absorbing water and sinking, and the thing is done. So effective is this simple means, that perhaps it would be safe to say that not one in a thousand people thus provided would drown at sea, were it not for loss of strength consequent upon long exposure to cold, thirst, and starvation. These are the terrible enemies which conquer, the waves only supplementing their cruel work.

The life-saving apparatus of Captain Stoner puts weapons in the hands of its possessor to fight all these enemies for days together. This apparatus was exhibited to the press of this city and a large and select party of ladies and gentlemen, invited to witness the experiments on the evening of July 1st. The steamer *Sunnyside* was chartered for the occasion, starting from Pier 39, North River, about 4 P. M. After a short but pleasant cruise up the Hudson, the steamer turned and conveyed the party out into the bay, stopping nearly opposite Fort Hamilton.

After a collation had been served, Captain John Stoner, the inventor of the apparatus, made a short address, explaining that the apparatus to be exhibited comprised two distinct devices—a life-boat, so constructed that it is impossible by any accident to capsize it, or sink it, and a life-saving apparatus, to be attached to the person, whereby the body would not only be floated in an erect position, so that the head would be at some distance above the water, but a person shipwrecked would also be thoroughly protected from cold and wet, provided with food and drink, enabled to sleep, if desired, in calm weather, and to signal approaching vessels by night or by day.

The life-boat was first exhibited. It is a strongly built boat, with air cylinders placed under the seats to give it buoyancy sufficient to float its complement of people, even when filled with water. The most prominent, and the original feature of this boat, is the method of ballasting it so that it cannot be capsized. It is a modification of the system of ship ballasting, for which, as also the life-saving apparatus, patents were obtained for the United States, February 4, 1868, and subsequently throughout the European countries, through the Scientific American Patent Agency.

The modification of the lever and weight, applied to ballast the life-boat, will be understood from the following description. A lever about twelve feet in length, pivoted at the middle point of the keel of the boat, has a weight fixed to the end opposite the pivot. A small rope being attached to this end, operated by a winch, pawl, ratchet, and brake, serves to swing this lever back, and bring it up to the level of the forward segment of the keel, in which position it forms a part of the after half of the keel itself. This is its proper position in calm weather or when the boat is under sail, with a moderately fair wind. If the wind is on the beam, and blowing strongly, the lever is let down as much as necessary to meet the emergency. When, finally, the lever reaches the vertical position, the center of gravity is brought so low, that no wind can capsize the boat. This was amply proved by the experiments. A large party of gentlemen, of whom the writer was one, entered the boat, and failed to capsize it by all the means within reach, all standing on the windward side of the boat, and finally filling it with water, when it still resisted all their efforts.

The boat has a mast and sail provided, and its model is such as to make it a fine sailer.

The life-saving apparatus attached to the person is shown in the accompanying engraving.

A is a rubber suit, made in one piece, the lower parts or feet being made thicker than the other parts, and in the same manner that rubber shoes are now made. The suit, *A*, is made large enough to be put on over the ordinary clothing of the wearer, his shoes only being removed. The only openings in the suit, *A*, are at the upper end or head, and at the wrists, for the exposure of the face and hands of the wearer. The openings at the wrists are provided with cuffs or bands, made in a piece with the suit, to confine the edges of the openings closely around the wrists of the wearer, to prevent the entrance of water. To the under side of the edge of that part of the upper or top opening that comes upon the wearer's head, is secured an elastic band, *B*, which is made tubular in form, and which passes under the chin of the wearer, beneath the chin-flap, *C*. To the inner edge of the under side of the upper opening is attached an open elastic band, *D*, formed by connecting two elastic tubes longitudinally with an elastic membrane, so as to leave a space or channel between the two tubular edges of said band. The band *D*, is buckled over the head of the wearer, and is prevented from slipping forward by an auxiliary band, *E*, attached to it, and which passes around the back of the head of the wearer.

The elastic tubular band, *B*, is then sprung into place beneath the chin of the wearer, passing also beneath the chinflap, *C*, in such a way as to lie in the space or channel between the tubular edges of the elastic band, *D*. The slack of the upper opening is gathered into a roll, and placed in the hollow between the jaws and neck of the wearer, where it is confined and secured by a strap, *F*, secured in proper position to the outer side of the suit, which is buckled around the neck of the wearer.

The flap, *C*, projects forward beneath the chin of the wearer, and is intended to protect his mouth and nose from the splash of the water. The upper or top opening of the suit is made so large that the wearer can conveniently insert his body through it. The suit is secured to the body of the wearer by the strap, *G*, secured to the rear part of the suit, and buckled around his body.

The suit is still further supported by straps or suspenders, *H*, secured to the lower part of the body of said suit, and passing over the shoulders of the wearer, as shown in cut, *I* is a cork jacket, made of suitable material; it may be smooth or flat upon the inside and corrugated upon the outside. The jacket, *I*, is worn beneath the rubber suit, *A*, is buckled around the waist of the wearer, and is prevented from slipping down by shoulder straps, *J*, passing over the shoulders of the wearer. When not in use it can be folded into a very small bulk. K are metal shoes or weights, fitting upon the feet, the greater part of the weight (about five pounds) being collected upon the instep. The shoes *K*, are made in two parts, hinged to each other at the heel for convenience in putting them on, and secured to each other by a strap *k'*, buckled around the said shoes, and around the feet of the wearer. The forward parts of the shoes or weights are kept from slipping or working upon each other by projections formed upon the edge of one part and entering holes or cavities in the other part, padded upon their inner sides and edges, to prevent them from chafing the wearer, and galvanized or wholly covered with rubber, to prevent the corrosive action of the water. *M* is the propelling or swimming device, in which m^2 is a bar or handle, to be grasped in the hand of the wearer, and to the ends of which are attached bars m^2. m^3 is a wire framework, hinged or pivoted to the bars, m^2. The entire framework, m^2, m^3, is covered with rubber, as shown in the drawings. When the hand with the device, *M*, attached to it, is moved through the water in one direction, the wings fold down, so as to encounter less resistance from the water; but when moved through the water in the other direction, the wings expand into a horizontal position, beyond which they are prevented from passing by the straps m^4 and m^5. The strap m^4, passes beneath the hand or wrist, and its ends are attached to the under side of the upper end of the middle part of the device *M*, and which buckles around the arm of the wearer, to secure the upper part of said device to the arm. The outer ends of the straps, m^5, are attached to the outer edges of the upper parts of the wings, and their inner ends are secured to the strap, m^6, near the point at which it is to be buckled. Or, if desired, the straps, m^5, may be made in one piece, passing beneath the arm, and having its ends secured to the outer edges of the said wings. *L* is a cord or strap attached to the upper part of the device, *M*, and to the sleeve of the suit, *A*, so that the said device, when detached from the hand and allowed to float upon the water cannot float away and be lost.

A prolonged experiment was made with the apparatus, Capt. Stoner, and one of the Trustees of the Life Saving and Ship Ballasting Co., each putting on a suit of it and leaping into the water. While there, these gentlemen seemed very much at their ease. Eating, drinking, smoking, and even reading the news from papers taken from the floating magazine, shown in elevation at 4, in the engraving, and in section at Fig. 2. Each of these operations, performed under circumstances hitherto considered as incompatible with bodily comfort, received hearty applause from the party assembled on board the steamer, and when finally the steamer left the experimenters to their fate, so that in the dusk of evening they could scarcely be discovered in the distance, and they made known their position by crimson lights and rockets, and the life-boat, *Eureka*, rigged her masts and sails, picked them up and brought them safely on board, the party gave vent to their enthusiasm by giving three hearty cheers to the gallant captain and his comrade, repeated with redoubled vigor when upon stripping off the rubber suits it was seen that their clothing was perfectly dry and their shirt fronts unsoiled.

Every one expressed themselves as being entirely satisfied with the results of the experiments, and if it is ever our fate to be shipwrecked, we hope to rob the disaster of much of its terror through the protection afforded by this apparatus.

BUELL'S VELOCIPEDE SPRING.

It is entirely unnecessary for us to dwell upon the importance of good springs for a velocipede destined for use on common highways. On this point our readers have been thoroughly posted. It must be evident also, that on any velocipede the effect of springs will not only add to the pleasure of the rider, but will add to the durability of the machine.

Of the various methods employed in the attachment of springs to velocipedes, we have seen none that can compare with this in graceful appearance, and it seems to be well adapted to secure perfect ease to the rider. It will be seen

that the improvement consists in the employment of four elliptic springs placed upon the uprights arising from the axles of the machine; thus not only relieving the body of the rider from the effect of concussions, but, securing the advantages of the elliptic springs which have rendered them so justly popular for all classes of vehicles.

Patented June 1, 1869, by George C. Buell, New Haven, Conn., whom address for further information.

Correspondence.

The Editors are no responsible for the Opinions expressed by their Correspondents.

American Wine Production.

MESSRS. EDITORS:—America still imports nearly all her wine from abroad, while she has all the elements for home production—climate, soil, millions of acres waiting cultivation, and thousands of husbandmen willing to engage in a paying and honest industry. Our ability to produce wine-making grapes in any quantity is beyond doubt, only the profitable manner of manufacturing the wine from the grapes in competition with Europe, is, to a great many, still a doubtful question.

The cause that prevented our wine industry to rise in importance, is simply the great cost of our domestic wine before it finds a market, the cost represented in accumulated losses by improper treatment, and the consequent long storing, which through the interest of capital, evaporation, waste, and storerooms, swallowed up the profits. Our wines, grown on richer and more virgin soils than in Europe, are richer in nitrogenous elements, therefore of stronger ground taste, which in the usual mode, only years of storing could remove so as to give it maturity. Hence our inability to profitably produce, in the prevailing modes of manufacture, wine in large quantities, and hence the comparatively small consumption of home-made wine, which, as a general beverage, would most powerfully counteract the deplorable tendency for strong alcoholic drink.

But this state of things should not continue. The process of wine making may and should be accelerated by judicious means, so as to mature the wine, free it from ground taste, and fit it for shipping in a few months.

Access of air happened to be considered inimical to fermenting beverages, because its contact with the surface of these beverages was observed to cause injury. It was lost sight of that every agency may be applied properly or improperly.

Air, the source of all organism, our fast friend, supporter, and auxiliary, if properly applied, works in a short time all the benefits, which in the present mode of fermentation by air-exclusion, are obtained only uncertainly, under no control, imperfectly, and in long time. The air should be brought in contact with every particle of the fluid alike, by passing through it from below, when it will rapidly oxidize all deleterious, nitrogenous matter, and leave the purified fluid in a proper state of preservation. Ground taste and roughness is dependent on the gluten contained in the fluid; by oxidizing, elimination of the gluten, the ground taste is removed.

A liquid may be clear and bright, and still retain dissolved gluten (young wine, beer, cider), and is harsh and unpleasant to the taste; oxidation renders the gluten insoluble and eliminates it.

All this is most profitably and certainly performed during fermentation—the process by which the sugar is converted into alcohol—the whole fermentation is quickened; in must (or other fruit juice) below 30 per cent sugar requires more than five days after foaming, and at a temperature above 65° to 70° Fah., to finish the fermentation by this patented air treatment. All air required is impelled through a perforated pipe at the bottom of the ferment tub for a few minutes at a time, two or three times a day.

Clarification takes place very rapidly; two to four weeks after the cessation of fermentation, the wine, cider, etc., are bright and ripe, ready for shipment, and proof against any after fermentation and other wine disease. Acidification, the great bugbear, which, by incorrect knowledge of its principles, was expected to result from access of air, is, in this manner, hardly possible, while the least experienced, as yet, has been unable to spoil the product by air treatment, but invariably improved it.

Slightly moldy, fusty, or otherwise impaired wine (except by acetic acidification) subjected to this treatment, with addition of sugar, and at proper temperature, is restored to soundness. No disease can prevail against properly directed action of air.

By these simple means we are therefore not only able to render ourselves independent abroad for our wines, but stop the constant drain of capital for foreign wines and brandy, while we enormously increase our commonwealth by home production, amounting together to several hundred millions annually, considering the improvement in vineyard lands. Immense tracts of land, hardly suitable for any surface production, do well in vines, that root deeply into perpetual moisture, and, tolerably well attended, yield paying crops for a lifetime.

The product is always in demand, and in proportion with the amount of production, the prices less subject to fluctuation than most other products, while the general adoption of this most natural of the exhilarating beverages would be certain to prove an additional blessing by the moral improvement it is sure to work against intoxication.

The value of American wine production is too enormous to be longer neglected. To make its success sure, the growing of grapes, manufacturing of wine, and dealing in the product ought to be distinctly separate branches, like all other industries as elucidated in your journal of June 8, 1868.

R. d'Heureuse, Patentee of Air Treatment.

New York city.

Preservative Properties of Whitewash.

Messrs. Editors:—I have information that may be of value to some of your subscribers.

Some twenty years since, I caused to be heavily whitewashed with pure lime, the furnace pipe in my cellar; it being exposed to the exhalations arising from tide water, caused me to replenish the sheet iron pipe each season. By whitewashing each year the last one remained good for six years. Gas pipes used under ground have been thus coated at my suggestion and show no oxidation as yet. Last year I tried an experiment with peaches and pears, placed in boxes allowing but little ventilation, thoroughly coated with pure whitewash. They kept seventeen days without showing signs of decay, while those left in the crate all decayed in four days.

No patent has been applied-for, for anything of this kind, and I think fruit growers would be benefited by the information. An experiment would prove quite inexpensive and no harm can possibly occur to the fruit.

Boston, Mass. W. F. Shaw.

What an Advertisement Did.

Messrs. Editors:—It may be of interest to you to learn from a disinterested source the result of a single illustration of a new invention in your valuable journal.

The New York office of the "Hinkley Knitting Machine Company" is next door to my own, and to my positive knowledge there were received over *five hundred* letters and orders within one week after issue of your paper of July 3d.

As the above result was accomplishned with no other advertisement, it conclusively shows where inventors can employ their money to the best advantage.

Hamilton E. Towle.

New York city.

[The above testimonial in regard to the value of the Scientific American as a medium to give widespread information respecting anything that appears in its columns, was handed to us by Mr. Towle, the well-known civil and mechanical engineer, 176 Broadway, New York city.

Cleaning Lamps.

Messrs. Editors:—Your correspondent Geo. Buchanan, in No. 24, Vol. XX., of the Scientific American, reviews the various ways proposed by different correspondents for extinguishing lamps, and then gives another plan which, I think, is equally objectionable. I have tried many ways during the last six or seven years, his among the rest, and still practice the way I have long used; that is, to turn the wick down suddenly, low enough to put it out, and then instantly raise it again.

But this communication is intended to call attention to a thing that is too often neglected. So far as I have observed, I have found that nearly half the persons who use lamps do not clean them as often as they should. They seem to think if the outside looks well it matters not how it is inside. This is a great mistake. The inside should be clean as well as the outside. The burnt part of the wick should be taken off every evening before lighting, and the pieces of it and all the oil wiped out from around the tube. If this is not done the danger of an explosion is greatly increased. I believe if lamps were better cleaned in general there would be fewer accidents from their use. Nearly all the explosions are caused by some carelessness. If lamps are worth having they are worth taking care of.

Phil. O'Math.

Oak Dale, Mo.

Auroral Earth-rings.

Messrs. Editors:—Professor Loomis' article on Auroras, which you copy in No. 25, last volume of Scientific American reminds me of a phenomenon not in his list, and of which I have never seen the duplicate or description, and I do not know of its having been observed or recorded by others. It happened at Harmar, Ohio, on May 3d, 1843, for I took good care to fix the date in my memory.

There had been a slight auroral exhibition in the evening, but of no unusual sort, until about eight o'clock, when the brightness suddenly increased, and all at once there was an arch or ring spanning the sky from horizon to horizon. It passed a point apparently a little west of the zenith, terminating at the earth a little west of north and a little east of south, though from its almost solid appearance throughout its entire length, and its straight cut, parallel, well-defined edges, it might have been an earth ring as continuous and perfect as a ring of Saturn. It was seemingly a little wider than a full moon and presented much the same color and general appearance of surface. But though in color and solidity resembling the full moon, it had many times more aggregate area of surface; the light was no greater than that of a full moon, and from being so distributed across the sky, it cast no shadows on the ground. The only thing about it partaking of the usual auroral character was a peculiar trembling, cloudy shadowy something, which seemed to traverse its entire length back and forth alternately, about every three or four seconds—but this seemed to travel on or along the surface only, without disturbing the main body or the edges of the arch or ring. It remained for a considerable time without noticeable change of place or appearance—probably half an hour—and finally faded out. The night was clear with the exception of the previous auroral haziness, and I do not remember seeing the moon that night at all. When the ring developed itself all other auroral signs ceased and were not renewed.

For weeks afterwards I looked in all the papers for some account or explanation of what was one of the most wonderful and beautiful sights I ever beheld—but in vain. Aurora, or ring, who can explain it? W. L. Davis.

Louisville, Ky.

[We witnessed a few years ago a similar auroral ring at Albany, N. Y., although it was not so sharply defined and regular as our correspondent describes. It must have remained as long or longer than the one described by our correspondent, and was very light throughout its entire length from horizon to horizon. Its position was however more easterly and westerly than the one seen at Harmar.—Eds.

Petroleum---Important Discovery.

Messrs. Editors:—Under the above heading an article appeared in the Scientific American of June 12 (page 376), in which it is stated that Mr. Deville, in a memoir presented to the French Academy of Sciences, dwells largely on the danger incident to the storage of petroleum, and attributes it to the very great expansion in bulk which mineral oils undergo by increase of temperature; so that when oil is barreled during the cold season it will expand on the first appearance of hot weather and burst the containing vessels, as the freezing of water ruptures hydrants, and that the inflammable material oozes out by this cause.

The whole theory is erroneous.

1. Mineral oils do not expand more by heat than most other liquids; the writer of this article made the physical and chemical properties of petroleum a subject of study several years ago, and found the expansion of crude oil, and of kerosene, from 32° to 212° Fah., 0·076 of the original bulk at 32°; this is the mean expansion; like other liquids it is somewhat less between 32° and 60°, and more from about 180° to 212°. The heavy tar remaining after the distillation expands less at about 0·070, the light products of distillation, chymogene, gasoline, and benzine somewhat more about 0·080.

Let us compare this with the expansion of other liquids, commencing with that which expands least.

Water expands from 32° to 212°	0·047
Saturated solution of common salt	0·050
Hydrochloric acid	0·060
Oil of turpentine	0·070
Ether	0·070
Petroleum	0·076
Whiskey and brandy (proof)	0·076
Sulphuric acid	0·075
Animal oils	0·080
Nitric acid	0·100
Alcohol	0·100
Olive oil	0·130
Linseed oil	0·160

It is seen from this table that the supposed very great expansion of petroleum does not exist; only water and watery solutions possess an expansion of one third less, alcohol as much more, and vegetable oils expand twice as much.

2. The leakage of petroleum barrels in hot weather, and principally when exposed to the sun, is due to the simple fact that the hoops expand by the heat, and the wooden staves shrink by its drying effect, thus they get loose, and the barrel leaks; in yards where petroleum is stored, this leakage is corrected by simply tightening the hoops from time to time during the hot season, and as barrels with a larger or smaller space above the oil leaks equally, the expansion of the oil is not the common cause of leakage.

3. The reason that petroleum fires take place mostly in hot weather is, that the volatile and inflammable portions contained in the oil are not evaporated during a cold spell, but require heat in order to mingle as vapor with the air, and in summer will evaporate through the pores of the wood, even if the barrel is only half full; wooden barrels with gasoline will be found empty after exposure to heat for only a few weeks.

4. The writer of this article has never yet seen a petroleum barrel which was entirely full, even in summer, and in which then not a space was left of at least a whole gallon; in fact, it would be impossible to close the bung hole of a barrel when it was entirely full; the space wanted for extreme cases, when the oil was barreled at 0° Fah., to leave room for expansion at the summer temperature of 100 Fah., would be to leave 0·038 or 1-26th of the bulk empty, which corresponds with a space of one and a half, say two gallons for a common barrel of forty gallons. This space has to be left, when barreling oil in very cold weather, supposing the barrel to be perfectly tight, which, however, rarely is the case.

P. H. Vander Weyde, M. D.

New York city.

[The point of difference between our correspondent and Mr. Deville seems to be only in regard to the amount of expansion in petroleum oils. It is not probable that Mr. Deville has ventured to express opinions based merely upon a guess. Our own experience in handling hydrocarbons is, that the expansibility of the gas which is always produced from the lighter oils during hot weather is the cause of the mischief. This being the case, the leaving of a space would not permit its escape through wooden barrels. Not being acquainted with the method by which the results given by our correspondent were obtained, and being equally uninformed in regard to the basis upon which M. Deville has formed his opinions, as given in the article above referred to, we cannot decide between them. Our correspondent, however, agrees that at least a space of one twenty-sixth the entire bulk ought to be left when petroleum is barreled in cold weather.—Eds.

Sundry Inventions Wanted.

Messrs. Editors:—In a recent issue of the Scientific American, a correspondent writes for you to tell him "what to invent." If your correspondent is desirous of trying his hand, I can give him the name of a few things that will bring him money and fame if he should be successful.

1. A plastic filling for decayed teeth, that will "set" in the mouth notwithstanding the saliva, and which will not "eat out," or be acted upon by the acids of the mouth. It must be white.

2. A successful scale for weighing, that will indicate the weight, in pounds and ounces, of anything placed thereon. It must be made without springs, or, in other words, it must weigh upon the principle of one weight balancing another.

3. A good substitute for rubber as a base for artificial teeth.

4. A machine for planting corn so that it can be plowed both ways without first "laying off."

5. A successful means of uniting iron and glass to make a boxing for gudgeons, and for other purposes.

When our friend has worked up any of these, we can give him and others, who desire to know what to invent, some other hints. Inventor.

Lincoln, Ill.

Hay Loader Wanted.

Messrs. Editors:—I noticed in your last number an inquiry respecting the improvements in machines now most demanded. I know of no one in greater demand among farmers during the press of haying than some good efficient machine for loading hay, and some simple contrivance for carrying back hay into a deep bay or loft, after it has been raised by a hay fork and there is no opportunity for swinging it back. Chas. B. Maxson.

De Ruyter, N. Y.

As an evident proof of the greatly advanced desire to procure for domestic purposes good and pure water and a plentiful supply thereof, it is interesting, says the *Chemical News*, to learn that within the last five years the under-mentioned wells have been bored, some of them at very great expense. At Antwerp, to a depth of 165 meters below the surface; at Ostend, 300 meters; at Oeynhausen, Prussia, 696 meters; at Mondorff, Grand Duchy of Luxemburg, 730 meters; at Passy, France, 624 meters; at Rochefort, Charente Inférieure, France, 816 meters (this is the deepest bored well now existing in Europe). At Grissee, Soerabaya, Java, a well has been bored to a depth of 549 meters through hard rock. The deepest boring in Holland has been carried to a depth of 182 meters below sea level at Gorkum, at which depth in that locality, the tertiary formation has been reached, but water only of very indifferent quality; with this exception, all the above-named wells yield water in abundance, and of great purity. As our younger readers may wish to reduce the given depths to feet, for the purpose of comparing them with the depth of some of our own wells, we may remind them that the meter is equal to 3·281 feet.

ELECTRICAL PHENOMENA OF THE PRESENT YEAR.

The frequency and violence of thunder storms do not seem to have been confined to New York city and vicinity. Accounts reach us from a distance of frequent and violent electrical displays, and those quiet but grand exhibitions, known as Northern Lights, have been more frequent than usual during the spring and the opening of summer.

We are in receipt of accounts from various parts of the country in regard to the singular freaks of lightning. In general these accounts contain little of value, but we will notice one or two of them.

"On the morning of Friday, June 18," writes a correspondent from La Crosse, "that town was visited by a severe thunder storm. The weather for a week previous had been cold and rainy. The wind during the storm was from the southwest. During a period of 35 minutes there were a great many discharges of lightning, one bolt striking the telegraph wire about one mile south of the city, and running along the wire in a southerly direction, shivering in its course forty-three poles in succession, leaving the line at last for a barn which stood within a few rods. No great damage was done to the building and the charge seems to have spent itself in this last effort. None of the telegraph poles were prostrated though every one of the forty-three had more or less wood splintered away. The wire was not damaged though the fluid came in at the office so strong as to burn the wood of the casing to a window where the end was secured."

An exchange gives an account of a singular stroke of lightning which took place June 1st, at Lexington, Virginia, injuring the residence of a citizen of that town:

"The features of the phenomenon were in some respects very remarkable. 1st. It seems to have been what the electricians call 'an upward stroke.' That is, according to Dr. Franklin's theory of electricity, the cloud was in a negative condition, and by its attractive force had accumulated a heavy charge of the 'electric fluid' (if it be a fluid) in that part of the earth below. In its efforts to reach the cloud the electricity would of course pass off at the point where it found the least resistance to its upward flow, which in this case seems to have been Mr. Jink's lightning rod.

"2d. A second peculiarity was the effects upon the ground in the vicinity of the house. The soil near the surface was furrowed in four zigzag lines nearly at right angles to each other, and all converging towards the lightning rod which stands at the western end of the house. These furrows were up-heaved very much as if a large mole had plowed his tortuous path beneath the soil—coming near enough to the surface in some parts to throw the clay entirely out on both sides of its open track. Two of the furrows seem to have commenced at least twenty feet from the base of the rod on opposite sides, and to have run in lines nearly parallel with the end of the house, while a third one met them, coming a distance of fifteen feet, and varying a little from a perpendicular to a general line of the first two. These three seem to have taken their harmless flight through the rod. The fourth, however, which had its origin on the opposite end of the house and more than 30 feet from the rod, behaved in a much more singular manner—in fact it appears to have acted as a sort of independent stroke. Instead of passing on to the rod, it took a shorter route into the atmosphere (or wherever it went) by running into a heavy locust post on which a corner of the back porch rested, and at the point of the building most remote from the lightning rod. This post was utterly demolished, its fragments being thrown off in every direction, some knocking the planks off the yard fence, and others flying away to the distance of a hundred yards.

"From the locust post the electricity passed up a wooden pillar which supported the porch roof, tearing it into a thousand splinters. When the charge reached the roof it tore up a few shingles near the corner, but after that it seems to have lost its power, for, although the house is a story higher than the porch, and intervenes between the stricken corner and the lightning rod, not a trace of electric action could be found beyond the corner of the porch roof.

"Mr. and Mrs. Jink's, who were at the time in their basement dining room, were both severely shocked, but received no permanent injury.

"The place was carefully examined after the storm was over by Professor Campbell, of Washington College, who expresses the opinion that the lightning rod saved both the house and its occupants. He thinks that the violence of the discharge was due in part to the insufficient size of the rod (it being a slender iron rod), and in part to the want of perfect conducting communication between the rod and the earth."

A violent thunder storm passed over this section on the 27th ult. At Montclair, N. J., the house of Mr. Julius H. Pratt—to which there are four lightning rods attached—was completely enveloped and pervaded by electricity. The current seemed to have been attracted to the rods in such a volume that they failed to conduct it all to the ground, and it tore off a part of the roof and entered the house. A person whose attention was attracted to the house at the time from the outside, saw upon the roof what appeared to him a ball of fire as large as a barrel. Mr. Pratt was ascending the stairs when the fluid entered, and when opposite the open door of the dining room, saw it brilliantly illuminated with waves of flame, which appeared to shoot off from a common center, each wave separating from the central point with a report. When he got up stairs he found that his little daughter, who was lying in bed with a broken collar bone, had been violently moved from one side of the bed to the other, and she informed her father that she felt as if she was all on fire. Two panes of glass in the parlor windows were broken out, and the gilding upon the molding at the top of the ceiling peeled off in considerable quantities. In the cellar the plastering was torn off the ceiling, and two servants, who had a pan of currants between them, which they were preparing for tea, said the current passed directly between them. It also traversed the wires of the burglar alarm, and left the house pervaded by a sulphurous smell. The wonder is that no lives were lost and so little damage done.

Copper, Brass, and Iron Tubes.

Were all the locomotives in the kingdom tubed with copper or brass tubes, upwards of a quarter of a million would require to be renewed yearly; indeed we are not certain that the number would not approach much more nearly to half a million. The introduction of the tubular system for locomotive and marine boilers, and also for surface condensers, has given an immense impulse to the metal tube trade. A single Birmingham manufactory, works up, probably, 2,500 tuns of copper yearly, although started only eleven years ago, long after Green and Alston's patents had been worked. The copper selected is almost invariably that from Chili, which contains a less quantity of impurities than that from Cornwall or Spain. It is melted, four tuns or more at a time, in reverberatory furnaces and thus purified, after which, for copper rollers, it is cast, under powerful pressure, into hollow ingots. These are first turned, to remove the unsoundness of the external portion, and afterwards heated and softened in cold water. They are then rolled, under very powerful pressure, upon a mandril, are afterwards soundly hammered, and are finally turned to a smooth surface for engraving. Heavy calico printing rollers are made up to 10, in. diameter, and copper steam pipes up to 16 in. diameter, and $\frac{1}{2}$ in thickness in 12 ft. lengths. This great thickness for steam pipes is given, less, we apprehend, to fulfill any necessary conditions of strength than from considerations of the price at which such large pieces must be sold, per hundredweight. On the other hand, the same works made, for the International Exhibition of 1862, a long coil of tube of but 1-16th in. bore, and of very slight thickness, yet weighing 28 lb. The tube was duly tested, and water was forced through it under very moderate pressure. The brass tubes are made of a mixture of 2 copper to 1 of zinc, and are drawn in the usual manner upon a mandril. Mr. Alexander Parkes, the manager of the works, and the well-known inventor of "Parkesine," as also of an improved process for volcanizing india-rubber, has done some remarkable things in tube punching. There is still at his works a punch, made and used more than ten years ago, of the form employed by Messrs. Deakin and Johnson, for working out gun-barrels from solid ignots. And there is the screw press with which he punched, cold, for Mr. Bessemer, in the early part of 1862, the remarkable "pots" of Bessemer steel, a foot in diameter, and nearly as deep, one of them from a flat plate of Bessemer steel $\frac{5}{8}$ in. thick, and the other from a like plate $\frac{7}{8}$ in. thick. Mr. Parkes revived, a few years ago, and, we believe, as an independent discovery of his own, the practice of hardening and otherwise improving copper by the admixture of phosphorus. This process was announced, about ten years ago, as the discovery of Mr. Abel, of Woodwich Arsenal; but it was first described by M. Sage, in France, early in the present century, and his account was translated into the *Philosophical Magazine* for 1805. Of its value, as now practiced by Mr. Parkes, there is no dispute.

There are many lines of railway on which iron tubes are found to answer as well as brass, if, indeed, they do not answer better. We believe iron tubes are very largely used on the Lancashire and Yorkshire Railway, and with good success. A single Birmingham house might be mentioned which has turned out 550 tuns and upwards of iron tubes a month, and of these as many as 10,500 have been for locomotives, corresponding to perhaps sixty locomotives in number, although it is not to be supposed that a single house has gone on at the same rate for a year together, iron tubing, in that time, as many as seven hundred or more locomotives.

It is beyond question that really good iron tubes must be of good, not to say the best, iron, and that they must be well made. To this end a fair price must be paid. Nominally all iron tube makers make at the same price, the list price, but from this there are almost all rates of discount from 20 to $47\frac{1}{2}$ per cent. No users, knowing their real interest, would prefer inferior tubes at the lower price, but manufacturers, under the pressure of competition, often feel compelled to accept the lower quotations.

Editorial Summary.

CANADIAN PATENT LAW.—The Dominion of Canada has enacted a new patent law, which goes into operatian at once. It is a ponderous statute, filling nearly four columns of the Montreal *Telegraph*, but inasmuch as it excludes all non-resident alien inventors from the benefits of its provisions our inventors can feel no special interest in its full details. Section 6th provides, however, that "any person having been a resident of Canada for at least one year next before his application, and having invented or discovered any new and useful improvement not known or used by others before his invention or discovery, may obtain a patent therefor." This provision, to say the least, is one step in advance of the old law, as, under the new system, a citizen of the United States who is willing to suffer an exile of one year by summering and wintering in the Dominion may secure a patent for his invention.

SUBMARINE DRILLING.—A board of scientific engineers, consisting of Messrs. Mowatt, Forrest, Peterson, Waite, Buckett, Marsland, and Cooper, have indorsed the mechanism of Samuel Lewis, for the removal of submarine obstructions, as illustrated in the SCIENTIFIC AMERICAN, June 19th. It is proposed to form a stock company for working the invention.

A PHENOMENON of a most extraordinary nature, says the *Pall Mall Gazette*, has lately been witnessed by the inhabitants of the borders of the Caspian Sea. This huge salt lake is dotted with numerous islands which produce yearly a large quantity of naphtha, and it is no uncommon occurrence for fires to break out in the works and burn for many days before they can be extinguished. Early in April, owing to some subterranean disturbances, enormous quantities of this inflammable substance were projected from the naphtha wells, and spread over the entire surface of the water, and becoming ignited, notwithstanding every precaution, converted the whole sea into the semblance of a gigantic punch bowl, many thousands of square miles in extent. The fire burnt itself out in about forty-eight hours, leaving the surface strewed with the dead bodies of innumerable fishes. Herodotus mentions a tradition that the same phenomenon was once before observed by the tribes inhabiting the shores of the Caspian Sea.

CHEMISTS and others know well the difficulty of keeping very volatile liquids. Bottles of ether, for example, are shipped for India, and when they arrive are found to be more than half empty. The chemist sometimes puts a bottle of benzole or bisulphide of carbon on his shelves, and when he next requires it he finds the bottle empty and dry. The remedy with exporters is a luting of melted sulphur, which is difficult to apply and hard to remove. A new cement, therefore, which is easily prepared and applied, and which is said to prevent the escape of the most volatile liquids, will be useful information to many. It is composed simply of very finely ground litharge and concentrated glycerin, and is merely painted around the cork or stopper. It quickly dries and becomes extremely hard, but can be easily scraped off with a knife when it is necessary to open the bottle.

STAINING WOOD.—Dr. Stolzel adds another to the many recipes already given for staining wood of a brown color. He first of all paints over the wood with a solution made by boiling one part of catechu (cutch or gambier) with thirty parts of water and a little soda. This is allowed to dry in the air, and then the wood is painted over with another solution made of one part of bicromate of potash and thirty parts of water. By a little difference in the mode of treatment and by varying the strength of the solutions, various shades of color may be given with these materials, which will be permanent, and tend to preserve the wood.

VERY DURABLE CEMENT FOR IRON AND STONE.—M. Pollack, of Bautzen, Saxony, states that, for a period of several years, he has used, as a cement to fasten stone to stone and iron to iron, a paste made of pure oxide of lead, litharge, and glycerin in concentrated state. This mixture hardens rapidly, is insoluble in acids (unless quite concentrated), and is not affected by heat. M. Pollack has used it to fasten the different portions of a fly wheel with great success; while, when placed between stones, and once hardened, it is easier to break the stone than the joint.

THE *Chemist and Druggist* give an account of the death of a small child from sucking lucifer matches. It appears deceased was left at home with a younger sister, and reaching some lucifer matches, which had been carelessly left on a shelf, placed them in her mouth. This, however, was not discovered until the child was seized with sickness and convulsions, the vomit smelling of phosphorus. The child only lived about an hour from the commencement of the convulsions.

FISH-JOINT.—At a late meeting of the Institution of Civil Engineers, London, there was exhibited a plan of a fish-joint, consisting of two curved plates fitting on each side of the rail, and curved to its contour, meeting below the bottom flange in the center, where the edges of the plates are turned down for a depth of about two inches, and a bent cover plate, clipping these projecting edges, is slipped over them to keep them together—the fishplates being bolted to the rail in the usual manner.

OLIVE OIL.—The two edible oils of this class, known to trade are the superfine virgin oil, cold-pressed and perfectly free from mixture, and the ordinary oil, extracted by the application of heat. The great use of olive oil, particularly in Europe, and its high price, have encouraged all sorts of adulterations, among which we may mention the mixture with it, of nut-oil, honey, goose-grease, poppy-oil, oil of sesamum, beech-oil, and oil of arachnida.

COLOR OF VERMILION.—It is a fact well known to artists that the splendidly bright color of vermilion (cinnabar, sulphide of mercury) has a tendency, especially if it has been mixed with white lead, to become blackish brown and very dark colored in a comparatively short time. This tendency of the vermilion is altogether obviated if, previous to being mixed with oil, it is thoroughly and intimately mingled with about one eighth of flowers of sulphur.

WHITEWASH FOR OUTSIDE WORK.—Take of good quicklime half a bushel, slake in the usual manner, and add one pound of common salt, half a pound of sulphate of zinc (white vitriol), and one gallon of sweet milk. The salt and the white vitriol should be dissolved before they are added, when the whole should be thoroughly mixed with sufficient water to give the proper consistency. The sooner the mixture is then applied the better.

GAS, WATER, AND DRAIN PIPES.—We have received through Messrs. W. P. Converse & Co., of this city, some samples of bamboo pipes made by Benj. F. Smith, of New Orleans. They appear to be well prepared to resist the elements and can be produced in abundance from a comparatively useless article.

Improvement in Heating and Ventilating Railroad Cars.

The chief discomforts of railroad traveling arise from the imperfect manner in which cars are heated in winter, and the defective mode of ventilating them at all seasons. The stove, placed at the end or ends of the car, overheats those in its immediate vicinity, while those in the middle of the car suffer with cold feet, and shiver in discomfort. The stoves, unprotected, in case of accident, are liable to discharge their glowing charge of fuel among the wounded and disabled, adding untold horrors to their situation.

In summer, when the stoves are not in use, and passengers are sweltering with heat, if the windows are opened to admit air, a vile and irritating dust, composed of ashes, pulverized cinders, and ordinary road dust, comes in with the air, not unfrequently mixed, also, with smoke from the locomotive, so that the last case of the much-enduring passenger is worse than the first; and he closes the window with the conclusion, that to perspire in a temperature of 90°, is better than to weep and sneeze and cough in one of 85°.

The remedy for these evils would be speedily applied if an exasperated public would demand, as a unit, reform on the part of railroad officials, too much absorbed in so manipulating stocks as to obtain liberal returns for themselves, to heed a small clamor against the neglect of the rights of passengers.

Fig. 1.

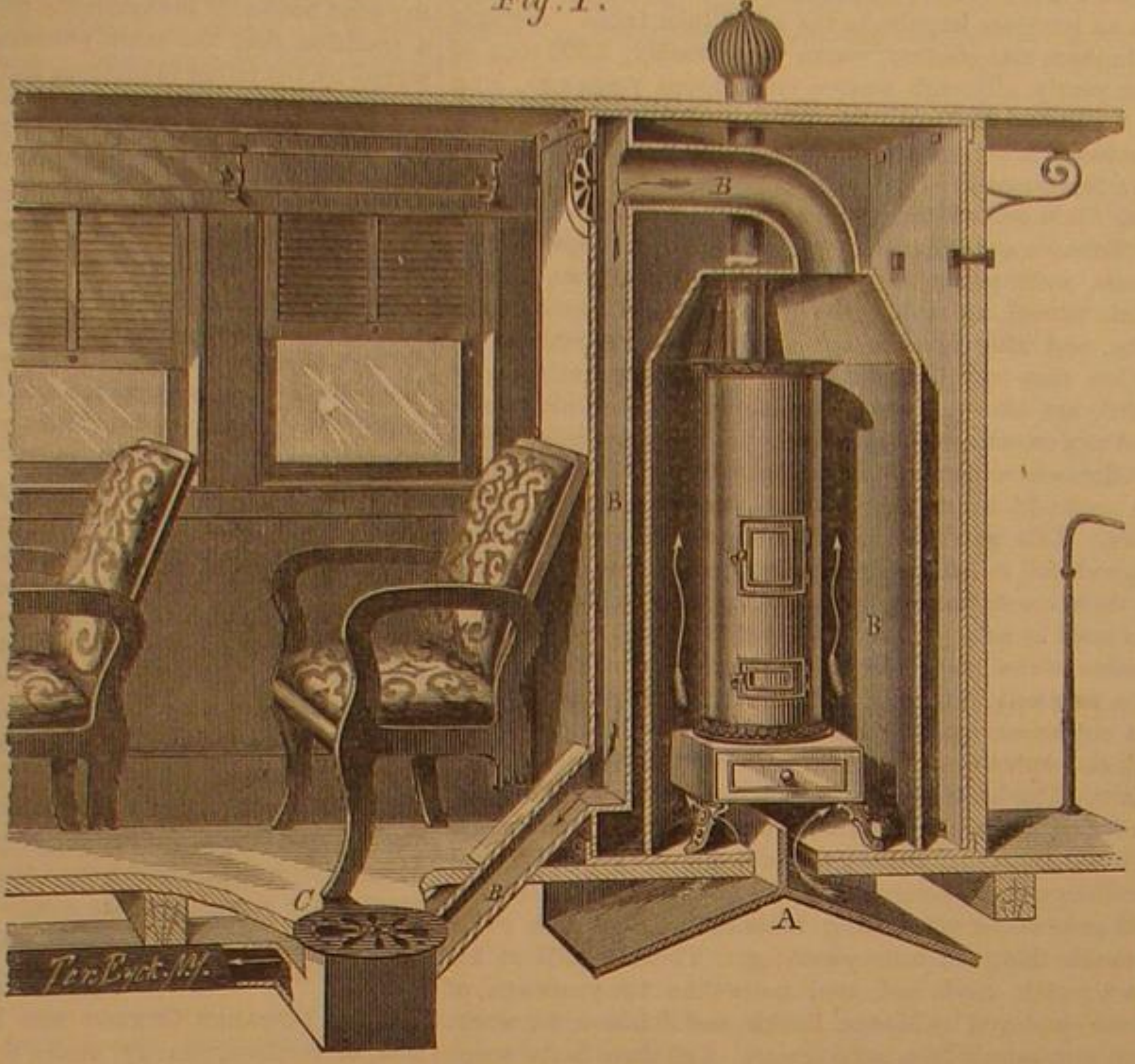
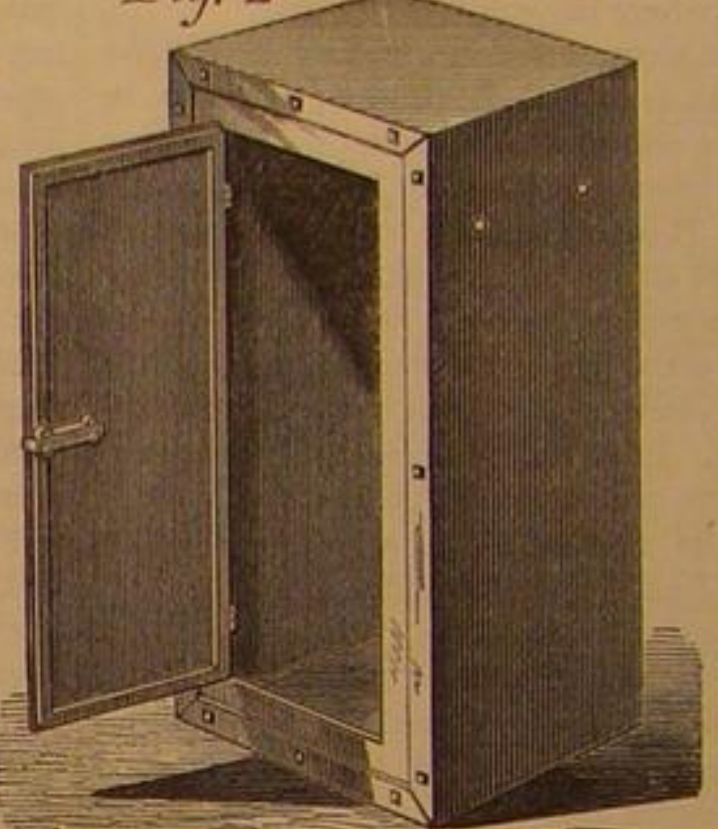


Fig. 2



HIMROD'S CAR HEATER AND VENTILATOR.

The invention herewith described, shows one of many excellent ways to prevent the evils complained of. In this device, the inventor has given us, first, a stove, completely boxed in with a case of boiler iron with riveted joints, and a door fastening securely with a spring lock. This part of the fire-proof apparatus is shown in Fig. 2.

Inside this case is placed, and securely fastened, an iron jacket, air-tight—see Fig. 1—which holds in warm embrace a stove of approved form, the smoke pipe passing out through the top of the jacket, inside the iron case, Fig. 1, and then through the top of the car. Underneath the car is arranged a double funnel, partitioned in the center, A, Fig. 1, so that in whichever direction the car may be moving, air enters the funnel, rises, and passes in the direction of the arrows, through the air-tight jacket, descending and horizontal flues, B, and emerges at registers, C, placed in the bottom of the car. Suitable registers, placed at the top of the car, give a constant circulation of fresh, pure, and, whenever required, warm air, moving, as it should, from the bottom of the car to the top, without any danger of roasting passengers, should a car-load of them be pitched down an embankment; a contingency not so remote in this country, under the present systems of railroad management, as to render the business of accident and life insurance an unprofitable investment. The device is perfectly safe, cheap, practical, and worthy the attention of railroad officials.

This invention was patented through the Scientific American Patent Agency, March 16, 1869, by Edward Himrod, of Dunmore, Pa.

Improved Nursing Table.

LARKIN'S NURSING TABLE.

The inventor of this nursing table, has endeavored to afford greater comfort to the sick by providing them with the means of supplying in a measure their own wants during the absence of an attendant. In large hospitals the want of something of this kind has been long felt, and in many cases its use in private houses would be a great convenience.

The engraving exhibits the purpose and scope of the device so admirably that a verbal description is hardly necessary.

The table is supported on casters, so that a sick person can easily move it, and is provided with tight drawers capable of receiving the contents of the stomach in vomiting, the patient being required only to rise upon one elbow and pull out the drawer.

A caster is fixed to the top of the table to hold a water jug, medicine, bottles, etc. There are also a suction tube through which water may be obtained without the patient's rising, and a discharge tube through which he may eject water after rinsing and moistening the mouth. This tube communicates with a drawer provided for the purpose by means of a passage through the top of the table

By this means a person unable to procure a nurse, may be rendered much more comfortable, and where in crowded hospitals nurses are greatly overtaxed, both they and the patients will find the table a desideratum.

Patented through the Scientific American Patent Agency, April 13, 1869, by Jeremiah Larkin, of Unionville, S. C., whom address for further information.

The Geology of Tennessee.

The report of the geological survey of Tennessee, made by Dr. Safford, of Cumberland University, State Geologist, asserts that the coal measures are co-extensive with the table-land, occupy an area of 5,100 square miles, and underlie more than one eighth of the surface of the State. The coal beds are often three, four, five, and sometimes nine feet in thickness. The quality of the coal is generally good. It is not often highly bituminous. Of the deposits the report says that their variety, amount, and fine quality entitle the State to rank among the first as an iron producing region. There are three great iron producing regions, viz.: The eastern, the dyestone, and the western. The first embraces the counties of Johnson, Carter, Sullivan, Washington, Greene, Cocke, Sevier, Blount, Monroe, Polk, and the eastern part of McMinn. There is hardly a cove or valley in which valuable deposits of ore do not occur. The number of first-class banks would justify the erection of three or four furnaces to each county.

TO REMOVE OLD PUTTY.—Dip a small brush in nitric or muriatic acid and with it anoint or paint over the dry putty that adheres to the broken glass and frames of your windows; after an hour's interval, the putty will have become so soft as to be easily removable.

SCIENTIFIC TESTS OF HYDRAULIC MACHINERY.

[Reported for the Scientific American.]

A test of turbine wheels, with the object of determining the economy of these motors and a means of saving water, which in some of our manufacturing districts is becoming a matter of considerable importance, was begun in Lowell, Mass., on the 15th of June, and is now in progress. It is a matter that concerns not only the builders of turbines, but also those who use these wheels in all parts of the country.

The turbine is rapidly taking the place of the overshot and breast wheel, as well for its economy in its first cost as for the larger percentage of power obtained. It may be used under any head and at any stage of back water, and is employed for all kinds of manufactures requiring power. These facts prove that a series of tests which will determine the absolute economy of the turbine, the best methods of using, and the best form of wheel, will be, if properly conducted, under competent supervision, and scanned by experts, of great advantage to the manufacturing interests of the country.

The interest excited by the statement made in the SCIENTIFIC AMERICAN, some time ago, that these trials were to be made, is evinced not only by the reception of many letters of inquiry, but also by the presence at the place of trial of such men as W. A. Norton, Prof. of Civil Engineering, Yale College; Prof. Winlock, Superintendent of the Cambridge Observatory; Jas. B. Francis, N. R. Harlow, C. H. Latham, J. H. Sawyer, and James Francis, of Lowell; L. B. Stone, J. H. Shedd, and Edward Sawyer, of Boston—beside a number of wheel builders and manufacturers from St. Louis, Mo.; Nashville, Tenn.; Montpelier, Vt.; St. John, N. B., and others whose names escape us.

Several thousands of dollars were expended in preparing for the tests, which are conducted under the direction and supervision of Mr. Hiram F. Mills, C.E., of Boston. The head of water is from twelve feet six inches to fourteen feet six inches; at one time, after a heavy rain, it reached fifteen feet eight inches. The weir is excellently constructed, and is a model. Every thing is planned with a view to give each wheel tested a fair trial, and the experiments are conducted with great care. The amount of water delivered to the wheel, and the amount discharged from the wheel, are accurately measured, constantly, during the trial.

The velocity of discharge, number of revolutions of the wheel, temperature of the water, variations of head, and resistance offered are all carefully noted by experienced assistants during each trial, which lasts from five to twenty minutes, and in one case one hour and thirty-nine minutes. The test of power is made by the well known Prony brake and the Emerson dynamometer, described and illustrated in Vol. XX., No. 1, SCIENTIFIC AMERICAN. These testing instruments were applied both conjointly and separately, and in either case the result was almost the same; so near that one was used to correct the other. An ingenious arrangement, contrived by Mr. Emerson, kept the parts embraced by the friction band perfectly cool, and lubricated the parts in contact, while the amount of friction could be accurately determined

At the time of our observation (June 16th and 17th) the Swain wheel, built at North Chelmsford, Mass., was on trial. The Leffel and the Bryson wheels are to follow, and others will undoubtedly be entered. In such a notice as this, and at this stage of the experiments it would, of course, be improper to draw conclusions as to the relative merit of different wheels. A full report will be published in pamphlet form at the close of the experiments Our object is merely to call the attention of those interested to the importance of these trials. Information may be obtained by addressing James Emerson, Lowell, Mass.

A SIGNIFICANT FACT.—*Engineering* contains the following, which needs no other comment: "In the United States patents are granted for seventeen years for a single payment of £7. Every specification is carefully examined by experts previous to granting the patent. The consequence is that about four times as many patents are applied for, yearly, as are protected in England, and that no nation has derived so great benefits from useful inventions as America. In Switzerland there is no patent law, and, practically, no inventions. Nobody, we think, ever heard of an invention coming from Switzerland, unless, as in the cases of Bodmer and Heilman, the inventor came with it

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THE USE OF PULVERIZED COAL AND COAL SCREENINGS AS FUEL.

The two motive powers upon which the world must rely, probably for some time to come, are the fall of water and the heat generated from the combustion of fuel. The latter source is limited, and it is time the world opened its eyes to the fact. It is a duty we owe to posterity, not merely to give a general assent to this proposition, but to appreciate its full significance. The world, at the present time, begins to feel the pressure of scarcity. Wood has so advanced in price, by its vast consumption, in many districts where it has hitherto been relied upon as the principal fuel, that coal is now transported long distances, at much cost, to supply the want.

Although the amount of coal buried in the earth must still be enormous, and the period at which it will ultimately be exhausted very remote, it may, by no means, be so long before the nearest and most accessible supplies may be sufficiently reduced to greatly enhance its price. In view of these facts, and in view of the fact that all kinds of fuel upon which any reliance can be placed, aside from coal and wood, would, in the aggregate, only supply a small fraction of the world's necessities, those who are struggling to reduce the enormous waste of coal now prevailing, must rank as philanthropists, and ought to have all the encouragement possible.

The waste of coal may be placed in two categories—that consequent upon imperfect combustion, and that which takes place in the mining of coal and its transportation. Of all these causes of waste, two only are of much account; namely, imperfect combustion, and the waste occasioned by the necessity of screening. Really, however, impossibility of producing perfect combustion, in unscreened coal, in many kinds of apparatus, is the origin of screening, and hence we find that the great bulk of the waste is, directly or indirectly, caused by imperfect combustion.

This is an anomaly. Combustion of coal is neither more nor less than the chemical combination of carbon and oxygen to form carbonic acid. And it is a well-established fact in chemistry, that one of the conditions necessary to a rapid and complete reaction, when one or more constituents are solid, is, that the solid substances shall be pulverized. The main other conditions are, that the substances to be combined shall be intimately mixed and a proper temperature maintained.

We see, then, that if the other conditions can be fulfilled, the combustion ought to be all the more rapid and perfect the finer the fuel is pulverized. The defects in combustion must be attributed, therefore, to imperfect admixture. In other words, if sixteen pounds of oxygen be intimately mixed with six pounds of heated fine carbon powder, an almost instantaneous combustion would take place,and the combustion would be complete. No loss from debris would occur, and no smoke would be generated, carbonic acid being the only material product of the combustion.

In the furnaces of marine engines and locomotives, nothing like such a result is obtained. There is more or less carbon always passing out at the smoke pipe, and more or less waste of fuel through the grate. In smelting and puddling furnaces of the old type, there is always a still greater waste. An old iron master told us, not long since, that more than half the coal consumed in the works which he superintended was wasted. We believe that the proportion of waste is, on the average, fully three fourths in such works. And we are surprised that, ere this, some more perfect mode of producing combustion has not been generally adopted. The reason, certainly, is not that such modes do not exist. The furnaces of Whelpley and Storer, and the Siemens furnace, are a sufficient demonstration of this.

But although the combustion of pulverized fuel is much more rapid than that of coarse fuel, still it takes time to burn it, instantaneous combustion not being practically possible.

We now learn from *Engineering*, that Mr. Thomas Russell Crampton has been experimenting, in England, with a view to produce a furnace that should conform to the principles above enunciated in a more perfect manner than has yet been accomplished. In reducing the coal to powder, Mr. Crampton uses ordinary millstones,having a blast of air passing between them, operating to keep the stones cool, and to carry away the fine dust as soon as produced. The coal is passed through crushers before being fed to the stones. Mr. Crampton employs various methods for delivering the coal,intimately mixed with air, to the combustion chamber. The most ordinary one, however, and the one most generally applicable, is as follows:

A kind of injector, formed of a conical pipe or nozzle, receives the powdered dust as it is fed from a hopper. Within the first nozzle is a smaller one through which a blast of air is forced. Instead of introducing the mixed air and coal dust directly into the chamber, where the heat is to be utilized, it is forced through a long chamber with baffling screens, to give time for the combustion to become complete before the hot gases, thus produced, are brought to the point where the heat is required.

The system is said to have given very satisfactory results, but while we are bound to pronounce it correct in theory, it is not impossible that further use may develop practical difficulties not yet discovered.

The progress of the improvement will be watched with interest everywhere, and we shall notice any further information that comes to hand respecting it.

THE PHILOSOPHY OF CHEAP PRODUCTION.

How is it that certain articles can be produced so cheaply? We find ourselves surrounded with luxuries and comforts which cost us little—so little that the power to obtain them at their price is almost a miracle. Take, for example, this newspaper which you are now reading. You get fifty-two copies for three dollars, or a single copy, if you are a regular subscriber, for a small fraction over five and three fourths cents. To produce this newspaper in just the way it is now produced, and in as perfect a manner, beginning at the very outset, with nothing but raw material, would cost an enormous sum, yet you get it for less than six cents.

Let us see. First, there is the paper to be made which implies the growth of the fiber, harvesting, marketing, and not only the manufacture of the implements for these operations, but the tools and machines to make the implements. Then comes the paper mill, with its hands for sorting, attending the pulping machines, packing, shipping, etc., etc., and the machinery, and the tools and machines and labor necessary to make the machinery. Then the shipping, and the facilities for shipping, be it railroad or canal, warehouse for storage, and all the labor and tools etc., for constructing these. Then the commercial part of the business, the merchants and clerks who buy and sell, and the banks and bankers who facilitate commercial transactions, and at last the drayman who delivers it at our office.

We are now in possession of our paper on which to print. Now to get our type we must mine at least four kinds of ores, and erect reducing works to get this metal in a sufficiently pure state. We must have separate metal molds cut for each kind of capitals and small letters of the alphabet, and for every kind of rule, dash, punctuation mark, space, figure, or character used in the printing of our paper. This alone would involve an enormous labor and expense. Then the types must be cast, and cases made to hold them, and the composing sticks, and the minor tools employed in type-setting manufactured, and still we are not ready to make a newspaper.

We have yet to have a power press and a steam engine to run it, coal to be mined and transported, blocks upon which to engrave our illustrations, which implies tools and machines to shape them; engravers, and costly machines and tools for their use; draftsmen with the utensils of their art; paper upon which to draw, another kind for ordinary writing, still another kind for wrappers and the paper mills to manufacture them; a library of costly books, office, and fixtures; brain labor to furnish the matter; and oftentimes physical labor too, prolonged long after the paper you are now reading has dropped from your hand, and you have gone to revolve in dreams the wheels and pinions, belts and pulleys, over which you have been poring.

Then there is the engineer, fireman, and pressman, and the folders and mailers, and Uncle Sam's army of postmen and postmasters, and the stamp office, and so, finally, the one copy comes out, costing, Heaven knows how much, but having through contributions of labor from countless workers, and employing capital to an extent which makes one hold his breath even to think of, at last been perfected and laid upon your table a welcome weekly visitor.

What would it cost to produce a single paper in this way? Dear reader, it passes our power to estimate, but we venture to say, that were the most experienced publisher in the world to hazard a candid guess, he would not at first thought say one tenth the real cost. The cost of the manufacturing establishments required would crowd up into millions of dollars without saying anything about the labor.

How is it then that you can get your paper for less than six cents? The answer to this question involves the entire philosophy of cheap production. It will be seen that in the manufacture of our one newspaper the principal expense was entailed in making the preparation to do the work in the manner required. It would have been cheaper to have employed an artist to draw each letter and character and each engraving upon the paper itself, were only one copy required, but to produce cheaply it is necessary to produce infinitely more rapidly than unaided manual labor can possibly produce. Therefore we make all this extensive and thorough preparation, open our mines, cultivate our land, put up enormous paper mills and type founderies and printing press manufactories, build our railroads and canals and warehouses, incorporate our banks, inaugurate commerce and trade, print books, etc., etc., establish mail routes and telegraph lines, and when thus finally and thoroughly prepared, the world is flooded with literature in less time than the artist can finish the drawings which illustrate a single number of a pictorial paper.

It is seen in this case, and it will be found true in all others, that the production of large amounts of one kind of thing, in a short space of time, implies previous great distribution of labor through a long period of time. It has taken centuries to render the modern newspaper possible.

In the physical, as well as the moral world, a man's works live after him. So the great dead workers, Faust and Watt and Stevenson and Fulton, and hosts of others, stand as it were to-day the dead helping the living to live; giving the poor man of to-day luxuries that a few centuries ago a king could not purchase, pulling the lowly up faster than the high, so that they continuously approach that grand universal level which all mankind shall one day attain.

We also see how no department of work is independent of any other. As soon as mankind begins to improve and adapt the productions of nature, so that they will better minister to his wants, a bond is created strong in proportion to the advantage achieved. The individual who makes an improvement, makes others more or less dependent upon him only in turn to become dependent himself upon others. Thus we have this great bond of mutual dependence which unites the workers of the world not only with those who now exist but with those who are dead, and the yet unborn workers who will begin where we leave off, strengthening and tightening the bond, and so on through the ages, until labor, co-operating throughout the world, shall redeem it.

HIDDEN GENERATORS OF DISEASE.

Although earth closets by properly mixing the earth with fœcal matters, enable the absorbent power of the earth upon foul gases to act in the most efficient manner, eliminating all smell, and effectually guarding against the production of disease from this source, it is not to be supposed that the burial of a large mass of such matter in the earth without intimate mixture of earth, will act in like manner. The cases are very different.

The cesspools employed to receive the contents of water closets, in new streets and suburban districts of American cities, accumulate large quantities of night soil, which gradually decomposes, generating fœtid and poisonous gases which make their way through the thin superstructure of earth and masonry employed to cover them, gradually tainting the air and becoming a fruitful cause of disease.

Were the escape of the foul gases less insidious, it would become so unendurable that prompt remedies would be applied. It is because their escape is undetected that they are more dangerous. The sense of smell becomes deadened to peculiar odors when generated continuously. This is shown by their almost immediate detection by those who have long been accustomed to pure air, while those who are accustomed to them do not perceive them.

Thus in entering large cities, those whose residences are in rural districts almost invariably detect a peculiar sickening smell, arising from the commingled odors of decaying organic matter in the streets, effluvia of leaking sewers, gas-pipes, and, last but not least, those hidden generators of disease, the cesspools.

In deep sand and gravel beds like that upon which a large portion of the city of New York stands, the fluid contents of cesspools filter through and are soaked up, while the gases are more perfectly absorbed and retained than they would be on other less favorable sites; but where the fine soil is thin lying upon a clay hardpan, into which the opening is dug, the fluids are soaked off very slowly, and a very small portion of the gases generated are absorbed, the bulk filtering through the superstratum of earth to the air above.

Sometimes the abominable practice of placing cesspools directly under houses is permitted. In other cases they are placed so near, and are made so small that they overflow, and their contents leak through into the cellar. But the most dangerous practice is that of allowing them to remain, after sewers are opened, to be forgotten, and to breed pestilence for years afterward. We say most dangerous, because as the closed cesspool is for the most part in this country used only as a make-shift until a sewer is completed, its deleterious action in many cases, hardly commences before it ceases to be used while it frequently continues many years afterward.

It is not our intention to cite the numerous instances on record of violent and destructive epidemics, either directly traceable to, or greatly aggravated by this neglect, but to point out simple and effective means whereby such ill consequences can be avoided. Of these the most obvious and thorough is to empty and fill with earth every cesspool as soon as it ceases to be used, but another method may in many cases be adopted. A hole being dug at some distance from the original cesspool, of considerably larger size than the first, the contents may be gradually drawn through a narrow earth-cut into the new reservoir while the earth is thrown back, thus intimately mixing the gas generator with the gas absorber. After the first cesspool has been thus almost emptied of its contents, it may in time be filled with earth, and thus a stop put to any foul exhalations in the future.

Whatever may be the regulations in the cities of New York and Brooklyn in regard to cesspools, we know it to be a common practice to leave them as they are when the water closets are connected with sewers, simply cutting off and often imperfectly closing the communication between them and the dwelling. It is not often, we believe, that cesspools are placed directly underneath dwellings in this country, but it is we know sometimes the case. The evils that arise from leaving unused cesspools thus situated is shown in the following extract from a report of the health of the parish of Marylebone, England, by Dr. Whitmore.

"In my last report, I had occasion to notice the unusual prevalence of typhoid fever in certain districts of the parish, and I ventured to predict that, unless measures of sanitary precaution were promptly adopted, not only by the local authorities but by the householders generally, it would in all probability increase and assume a decidedly epidemic character. * * * * *

"Have the householders in these districts attended to the cleansing and disinfecting of their houses, drains, and closets; and have they caused careful examination to be made in the basements of their respective dwellings to ascertain if old disused cesspools still exist there? For if they do not, the inevitable result will be that, sooner or later, some member of the family will be attacked, and probably die of typhoid fever. A large proportion of the fatal cases of this disease have been clearly traceable to some such cause as this. I have the strongest reasons to believe that in the basements of many of the largest and best houses in the parish, large disused cesspools still exist; which at the time that the house drains were connected with the sewers, were bricked and cemented over, but which were not previously emptied. So long as the mortar and cement covering these pits of abomination and filth remain undisturbed, probably no great risk or injury to health will ensue, but in time some portion of the mortar and cement gives way, or perchance an adventurous rat eats its way through this covering, and thus makes a vent hole for the more rapid escape of the pent-up gases, the deadly poison of which has become greatly intensified, owing to the length of time that the process of putrifactive fermentation has been going on, thus rendering the foul emanations from these old cesspools far more dangerous to health and life than those which ordinarily come from untrapped drains or closets.

THE INTERESTS OF LABOR.

Our attention has been called to a well-written article bearing the above title, which appeared in the Albany *Morning Express*. It is evidently written in a spirit of earnest friendship for the workingman, and a strong desire to aid him in attaining his proper status in relation to capital; a feeling which we as well as all true philanthropists share.

We have ever given the broadest and strongest expression in regard to the intrinsic value of labor, its nobility, and its effect upon the well-being of mankind; and have never failed to give it its appropriate place as the highest and most effective of all human agencies at work to ameliorate the condition of our race.

Nevertheless, there are some statements in the article referred to from which we must dissent if they are to be considered as fundamental principles upon which systems of ethics and political economy are to be reared; while there is much with which we can agree.

We agree that workingmen have the right to combine to protect what they consider their mutual interests. We have never denied this right; but we have had doubts, and still have doubts, that the organizations called "trades unions," as they have been, and are now conducted, are wisely calculated to promote the interests of the workingmen belonging to them. We have heretofore expressed our reasons for entertaining these doubts.

We dissent from the opinion that labor-saving appliances have had any depressing effect upon labor, or that they have produced any disability on the part of labor to compete with capital, which did not exist in a still greater degree before their invention and introduction. We have shown in elaborate articles on this subject heretofore, that all so-called labor-saving machines are in reality labor-creating machines, which, although they decrease the amount of labor necessary to produce a given quantity of any article of luxury or utility, invariably increase the demand for the same in a far greater ratio, and thus increase the amount of labor required in its manufacture. This might be shown to be true on general principles of political economy, but it is also confirmed in the history of any department of industry where labor-saving machines have been largely employed. There is to-day an enormously increased consumption of any kind of goods produced by such aid, estimated proportionally to a given population, than existed when labor-saving machinery did not exist, so that many more laborers are required in their production. It is safe to say that when, by the aid of machinery, the labor of producing any article of general adaptability is so reduced that the cost of production is diminished one half, the number of workmen required to keep pace with the increased demand will be quadrupled. In many cases the ratio has been far greater than this.

We do not think the following quotation from the article in question will bear close scrutiny:

"There are certain principles lying at the foundation of the relation between capital and labor, which they should seek to understand, and from which they cannot deviate without endangering their usefulness and efficiency, nay, their very existence. Let us endeavor to state a few of these.

"First, it is the right of every man to do what he will with his own; not only the right of the operative to do what he will with his labor, but the right of the employer to do what he will with his capital, for capital is only stored-up labor."

The only thing sound in this quotation is, that "capital is stored-up labor." There are two forms in which labor, or rather the results of labor are perpetuated. One is material wealth, the representative of which is money, and the other is the entire category of scientific lore and mechanical improvements, preserved from diminution or total loss formerly by written, but in the present age by printed records. The latter category is by far the most valuable, and is generally diffused. It cannot be monopolized by individuals, put to usury, issued in stocks, or speculated in "on change." We see, then, that though capital is stored-up labor, it is only a small portion of the wealth of the world. It should, therefore, be subjected, as far as practicable, to the same laws that govern labor, of which more anon.

No man has a right to do what he will with his own. Man in his earliest association in savage tribes, accepting their social laws, renounces certain natural rights held in common with wolves and bears, accepting in return the protection formed in association. He agrees not to take the property or lives of his associates, if they will agree not to take his and band together to protect each, confiningtheir depredations to those not belonging to their tribe. At each step from a savage state toward civilization more rights are surrendered, until, when civilization is reached, savage license has been almost entirely shorn away; and man finds himself merged into a civilized body, a member capable of many motions seemingly independent, but found, on strict analysis, to be intimately connected with the motions of all the other members.

Certainly, if a man owns anything it is his own body, but he has not the civil right to do what he will with even that. He may not obstruct the motions of other men's bodies with it, except under certain conditions; nor when it is corrupted with infectious disease expose others to contagion from contact with it. Neither is he permitted to violate public decency and good order. Further, he has not the right to be lazy. The laws of civilization suppose each man who accepts them to have some lawful occupation, a *visible* means of support; and if he has not that, he is declared a vagabond, ruled out of society, outlawed, and confined as a person dangerous to the public weal. Clearly, society does not recognize the right of idleness. Of course it is understood by this that general and habitual idleness is meant, not temporary relaxation from work, or honorable retirement from active life in old age, after a life of honest toil, or the leisure gained by the possession of capital, requiring little attention on the part of its owner.

It is just because capital is stored-up labor that the latter should not be permitted to lie idle. A miser who hides away money in nooks, or buries it in the earth, is morally more culpable than the vagabond. There is a consideration, however, in favor of the miser; namely, there is not a contingency that he may become a dependent upon others for support.

Practically, however, there are great difficulties in putting the miser legally on the same footing with the vagabond, although we believe him the greater sinner of the two. The vagabond buries only the labor of one, the miser secretes the stored-up labor of many.

The right of a capitalist to do what he will with his money amounts to this only. He may select whatever field he thinks best in which to employ it. He may loan it to others in interest, which is simply equivalent to furnishing labor—stored-up labor—to others for a consideration, or he may exchange money, the representative of property for property, or in conjunction with the labor of workingmen, he may use it in producing anything included in the two categories of wealth above-named.

The workingman has precisely the same right of selection in regard to his labor; and we are firmly convinced, that if these two fundamental rights, which if not tampered with can never conflict, are not interfered with, and all attempts at coercion of individuals by associations should cease, the time would not be far distant when the only way capital could find employment would be by taking labor *into partnership* with it. By this we mean that it would have to be loaned to co-operative associations of workingmen, at low rates of interest, or enter into co-operation with them dividing profits rather than paying stipulated wages, taking its share as stored up labor *pro rata*, with the labor co-operating with it.

We believe that, on the average throughout the country, taking all kinds of business into consideration, capital is not really getting its *pro rata* share, considering it as stored-up labor.

We are informed, that in some of the iron districts in Pennsylvania, a step has been taken in this direction, the wages of the workmen rising and falling with the price of iron, and this adjustment has proved so satisfactory that strikes on the part of the workmen are no longer dreaded.

We have been led into a much longer discussion upon this interesting topic than we intended, yet we cannot refrain from making one other quotation.

"There is also a little point in human nature which must not be overlooked. Men do not like dictation in what they have a right to consider their own business. It is not dictation to tell a man you must have so much for your labor, or you will not work, for selling your labor is *your* business; but when you tell him that he must discharge this person, or employ that person, or must sell or refrain from selling to such and such parties, or for such and such prices, or you will leave his employment, you must be a very valuable man or set of men to him if he does not tell you to 'stand not upon the order of your going, but go at once.'

"If anything will induce combination among capitalists it is this spirit of dictation on the part of trades unions. So long as it is a mere question of dollars and cents, that course which has the most profit in it is likely to be adopted; but when it comes to a question of the right of every man to manage his own business, an element of personal pride and feeling, 'grit,' comes in, and pride and 'grit' are luxuries which the capitalist can afford better than the operative.

"This is written in true friendship for the workingman. Let the trades unions be kept within their proper bounds and they will do, as they have done, much good. They have, too, at times done harm, and always will do harm when swayed by passion and prejudice rather than reason."

The sum of the matter may be stated thus: So long as workingmen quietly, but firmly, demand prices within such limits that capital is not compelled to withdraw from the partnership, they will obtain their demands; but if coercive measures are adopted, to prevent those who feel disposed from laboring, or capital from employing such as are willing to labor, the fundamental rights of both capital and labor are menaced; society itself is menaced, and the horrors of anarchy begin to assert themselves.

This matter is beginning to be seen in its true light, both by capitalists and the thinking workingmen. Co-operation, not oppressive and arbitrary "trades unions," is the hope of the workingman. Remember, also, that great reforms must be accomplished slowly, and avoid destructive haste.

REFRIGERATOR CARS.

The Davis Refrigerator Cars, of which we gave a brief description on page 197, Vol. XIX. of the SCIENTIFIC AMERICAN, are again employed this season for transporting fish, fruits, etc., over long distances. These cars are made thirty feet in length, and are about seven feet wide. The walls are nine inches thick, filled in only partially. The space between the inner and outer surfaces of the walls is partly occupied by a layer of felt, in all three inches thick. A board partition separates this layer from the remainder of the space, leaving an air chamber between the partition and the outside wall.

Ice boxes of galvanized iron are placed at each end of the car. Two and a half tuns of ice last ten days. On the roof are placed two boxes of salt, one barrel of which lasts ten days. The ice boxes are filled from the top once every twenty-four hours. They are narrower at the bottom than at the top so that as the ice melts it falls down slowly, the water and condensed moisture passing through escapes made in the floor of the car. It is stated in the Detroit *Post* that strawberries have been kept sixty days in these cars; and other fruits and different kinds of meats are equally well preserved.

If this is the case there are few products raised in any part of the United States that need fail to find a market, however perishable they may be. We shall expect to see grapes, raised in California and brought over the Pacific railroad, for sale in the New York market this season.

Artificial Coloration of the Electric Spark.

Mr. E. Becquerel has shown that the electric spark may be diversely and beautifully colored by being made to pass through saline solutions. If an electrical spark from an inductive apparatus be made to pass into the extremity of a platinum wire suspended over the surface of the solution of a salt, this spark will acquire special coloration according to the chemical composition of the solution traversed. The saline solutions are best concentrated and the platinum wire positive. The experiment is readily performed in a glass tube.

Salts of strontia will color the spark red; chloride of sodium yellow; chloride of copper bluish green, etc.

The light from these sparks, analyzed by the spectroscope, furnishes a method for the determination of the nature of the salts contained in the solution.

Exhibition of the New York Skating Club.

Mr. J. L. Plimpton, patentee of a number of inventions on roller skates, flung open the doors of his magnificent skating parlors, corner Ninth street and Stuyvesant square, on Tuesday evening, to the New York Skating Association. The evening was sultry, but, regardless of the hot weather, a large number of ladies and gentlemen assembled, and vigorously exercised themselves around the large room during the evening. The idea of providing this kind of amusement for young people is a good one, and Mr. Plimpton, who is something of an enthusiast in this line, spares no pains to promote the comfort of his guests.

Production of Ozone for Industrial Purposes.

M. Beanes, as noted in the *Genie Industriel*, recently exhibited to his scientific friends an electrical apparatus for the production of ozone at a small cost, which has not received the attention it deserves. His apparatus consists in a condenser between the plates of which atmospheric air, the oxygen of which is to be ozonized, is made to pass. The electricity acts here by influence and directly. The gas, on leaving the machine acts energetically on india-rubber, turmeric, etc. It is suggested that this simple electrical ozonizer might probably be applied with profit to the bleaching of tissues, liquors, and other substances.

Enormous Belt.

There is now on exhibition at the warehouse of the New York Belting and Packing Company, 37 and 38 Park Row, a mammoth rubber belt which is quite a triumph in the way of American manufactures—being the largest ever made. It is 4 feet wide, 320 feet long, weighs 3,600 lbs, and is to be used as a main driving belt for the largest grain elevator in Chicago. To make a leather belt of this size the hides of 180 cattle would be required, and these would have to be selected from three or four thousand in order to get the necessary size and quality.

THE REPORT OF THE HON. ISAAC N. MORRIS ON THE PACIFIC RAILROAD.

The official report of the Hon. Isaac N. Morris, one of the Government Commissioners appointed, last March, to inspect that portion of the Pacific Railroad remaining unaccepted, has submitted a report, not at all reassuring as to the condition of the road. The portion of the road which was to be examined, extends a distance of eighty-six miles from what is called the "Thousand-mile Tree," to the eastern summit of the Promontory Range.

The report of Mr. Morris sets forth that the trestles are very frail and dangerous, so much so, that, on one occasion, the cars were detained twenty-four hours, while they were being braced. The width of the road at the grade line on the embankments is, in many places, no wider than the length of the ties, and, in some cases, even narrower, so that the ends of the ties project over the embankment.

Out of sixteen culverts, two only are of stone, the rest being of pine timber. The two stone culverts are partially built of sandstone so poor that it is even now crumbling to pieces, although only quarried last winter. It seems that large use of this worthless material has been made in the construction of the road. Mr. Morris says:

One culvert having sandstone abutments, west of Morgan City, had given way, and as a further evidence of the unreliability of such stone used upon the road, for they are evidently all about alike, I must introduce into my report, as germane, an extract from a letter I received from a gentleman in high official position, who traveled over the road with his family. The letter bears date April 26, 1869, and while it was intended for my eye alone, I think the Government is entitled to its benefit.

[Extract.]

"We had one or two narrow escapes on the Union Pacific Railroad. A bridge over Bitter Creek, just east of Green river, crumbled away under the train, precipitating the engine, tender, and express car into the creek, and the passenger car in which I was, was only saved by a stringer or beam of the bridge catching into the roof and holding it suspended about half over the brink. We had to crawl out the best we could. One passenger was killed, and several more or less injured. The conductor and engineer both prudently walked over first and then signaled the fireman to run us across. The bridge, as well as two others in the same vicinity, had been examined the day previous and pronounced unsafe, and the officers were notified of the fact. The unanimous opinion is that it was criminal to attempt to cross. The western portion of the road is *dangerous*."

The writer is correct. The portion of the road he refers to, is the worst I ever traveled over, and decidedly dangerous. It is as well to state in this connection as anywhere else that a gentleman long and still identified with the road, and who passes over it daily in the discharge of his duty, stated that he never rode over the bridges, so-called, without holding his breath and drawing a long one of relief after he got over, that he considered them, especially the one at the Devil's Gate; as unsafe, and he would not ride across at all but to give confidence to passengers. Two tunnels are passed through, one 750 and one 260 feet long. These tunnels are not arched. They are cut through a sandstone formation, and are only wide enough for a single track—not a double one, as the standard of construction requires. With this exception, I think them safe. While I may be possibly somewhat at fault in the details I have given, I feel satisfied I am substantially correct. But, however important or unimportant these details may be, they cannot affect the great truths I shall now state:

First, the road is not, as the law requires, a "first-class road."

Second, it is not supplied with the necessary buildings.

Third, it has not safe and substantial bridges.

Fourth, the tunnels are not wide enough for a double track.

Fifth, the road bed at the grade line is not of a uniform width of fourteen feet, nor has it been properly leveled nor the rails lined.

Sixth, it would be extremely dangerous for heavy trains to pass over the western portion of the road.

Seventh, the ties in many instances have sunken, sometimes at one end and sometimes entirely, the dirt being washed from under them on the embankments. Miles upon miles of them were laid during the winter, while the frost was in the ground. The rails, consequently, have an uneven bearing, and in numerous instances are bent, and appear, as you look back upon them, like a succession of small waves. I saw, however, a number of men at several different points engaged in raising the ends of the ties and packing dirt under them, so as to even the track as far as that would do it.

Two considerations remain which I deem of more importance than others:

First, the road is not ballasted, nor is any part of it. True, hands have been employed in throwing a few shovels of such materials as the road-bed is composed, taken in all cases from the sides of the embankments where the road passes over them, between the ties. But this, I submit, is no compliance with a provision under the head of "ballasting" established by the board convened to fix upon a standard of construction. I again refer to that provision to be found with others in a former part of this report. It is certainly of the highest moment that the road through Salt Lake Valley, which passes mainly over an alkali land should be well ballasted with stone certainly not less than eight inches in thickness. Cross-ties are laid with great irregularity on the bed of the road. They appear, indeed, to have been pitched on, and the rails spiked to them wherever they fell, provided they did not fall too far apart. No attention appears to have been paid to regularity of distance between the ties, that varying from fifteen to twenty-six inches, the distance at the ends being rarely uniform. The material objection is, however, to the ties themselves. They are soft white pine on the road I examined, as well as on the Central Pacific, the first being obtained from the neighboring mountains and the latter from the Sierra Nevada. The board which fixed the standard of construction says of cross-ties: "Oak or other suitable timber should be used where it can be obtained with reasonable transportation. When such timber cannot be had for all the ties at reasonable cost, then the best the country affords may be adopted; but if it be cottonwood, or similar soft material, it must be Burnettized or Kyanized thoroughly so as to increase its durability. But in all cases the joint-tie should be of oak or other suitable timber the better to hold the spikes at their points."

The ties, as I have stated are all white pine, there being none of oak or other desirable wood used at the joints and none of them are Burnettized or Kyanized. Their average on the face, I should judge, from a number I measured, is about six and a half inches. Whether such ties were ever before used on any other road I am not advised. White pine will soon rot on the surface or in the ground; it is easily destroyed by heat or dampness, and consequently is affected by both the winter's snows and the summer's sun. Even in the dry latitude of Salt Lake it is not possible for it to last long.

I had no opportunity of weighing a rail, but have no question that they weigh 56 pounds to the yard. The iron is of American manufacture, and has the appearance of being a good article. The joints are braced by plates on each side of the rails, secured by four bolts with heads and nuts, two on each side of the joint, the bolts of course pass through the plates and rails.

It appears that the only thing praiseworthy about the portion of the road examined is the quality of the iron. The report is a damaging one, and confirms the doubts we have hitherto expressed in regard to the manner in which the work was being performed. The main object the Company seem to have had in view was to hasten the work forward to as rapid completion as possible, in order to receive the subsidies from the Government. The durability of the work appears to have been altogether a secondary consideration.

Mr. Morris also points out the danger that the Government lien may be altogether extinguished by foreclosure and sale under the mortgage bonds. We pointed out this danger some time ago. The Act of July 2, 1864, subordinates the Government lien to the mortgage bonds of the Company, and its extinguishment is, therefore, only a matter of adroit financial manipulation, requiring far less skill than many operations which were successfully manœuvered through the past year.

Notwithstanding the danger is plain, we have no confidence that adequate measures will be adopted to avert it, and patiently wait the final move in this stupendous confidence game.

Final Appeal in the Patent Office.

The late Commissioner decided, when in office, that under the act of 1861, the appeal fee, on an appeal from the decision of the Commissioner of Patents, in person, to one of the Judges of the District Court of the District of Columbia, was abolished. The present Commissioner reverses this decision, after submitting the point to the Attorney General and receiving his opinion thereon, and the fee of twenty-five dollars has now to be paid with the filing of the paper taking such appeal.

NEW PUBLICATIONS.

PAPERS FROM OVER THE WATER. A Series of Letters from Europe by Sinclair Tousey. Published by the American News Company. New York: 121 Nassau street.

The author of this book of 204 pages was a *companion du voyage* with us for about six months; our trip together extending through France, Spain, Italy, and Great Britain. The letters, however, include observations of a run through Switzerland, Germany, Holland, and Belgium. Mr. Tousey is the well-known President of the American News Company, and claims only to be a man of business, but he is a keen observer of men and things, and in his sketches he has taken notice of a great variety of "little things," such as enter largely into the every-day life of the people, which a purely literary traveler would scarcely notice, and yet they are the things that make up the very spice of European life, and are so woven together as to form, not only an agreeable, but very instructive volume. We are able to bear testimony to the correct judgment which Mr. Tousey has formed respecting the manners and customs of the transatlantics.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

The Paris correspondent of the *American Traveler* says: "American institutions seem to flourish finely in Europe. The sewing machines, the rubber goods, the Remington rifles, etc., are all making fortunes for their owners and those who represent them here. Just now a new stock is being sold upon the Bourse and seems much sought after. It is a company of 4,000,000 francs, organized some little time ago, to work and extend the operations of the Works' Liquid Fuel Patents, as a general fuel for metallurgy and for steam generation. Its success seems to be well established, and the company prosperous.

The Chicago journals assert that iron can be manufactured in that city at very low rates. Lake Superior pig iron, it is asserted, can be procured at Chicago for $18 a tun, and Indiana coal for $2 a tun. From these facts, it is argued, that smelting furnaces should be established in Illinois and Indiana. The coal is reported to be free of sulphur and of good quality.

At a town meeting in Meriden, Conn., Conn., on Saturday afternoon, it was voted almost unanimously, to petition the legislature for the privilege of subscribing $100,000 of the stock, or loaning the credit of the town to that amount, toward building the Meriden and Cheshire Railroad.

At San Francisco, in a meeting between the Congressional Ways and Means Committee, and several Chinese capitalists, the latter complained of the injustice of California laws bearing on their countrymen, and advocated that the Government act so as to induce men of money in China to invest in this country.

The Australian wool growers, it is stated, have become alarmed at the competition from South America, where, it is reported, 70,000,000 sheep are shorn every year, and the exports of wool amount to 230,000,000 pounds.

It has been officially announced that the Pass a l'Outre channel of the Mississippi has been deepened by the Government steam dredge, *Essayers*, from 15 to 18 feet, and that a steam vessel of 17½ feet draft of water had passed over the bar.

The engines of the United States Steamer, *Nantasket*, are said to have been the first ever built at Portsmouth, N. H., and they are reported to be satisfactory in every respect.

Wilmington, N. C., is soon to have horse cars on the street railway now nearly completed. This is the first enterprise of the kind in that State.

The work of constructing the telegraph line from Boston to Duxbury, Mass., to connect with the new French cable, was begun on the 29th of June.

The land along the coast of Florida, from Indian River to Cape Sable, is considered to be very suitable for the cultivation of coffee.

The California State Fair will open in Sacramento on September 6th. The premiums offered amount to $20,000.

APPLICATIONS FOR EXTENSION OF PATENTS.

INTERLOCKING GRATE BARS.—Samuel Van Syckel, of Titusville, Pa., has petitioned for an extension of the above patent. Day of hearing, September 20, 1869.

PRODUCING MUSIC BY STEAM OR CONDENSED AIR.—J. C. Stoddard, of Worcester, Mass., has applied for an extension of the above patent. Day of hearing Sept. 20, 1869.

CHIMNEY STACK.—B. F. Miller, New York city, has petitioned for an extension of the above patent. Day of hearing September 13, 1869.

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; beside, 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 advertisemets at $1·00 a line, under the head of "Business and Personal."

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

A. H. M., of Conn.—Your mode of testing belts is defective, as you do not take into account the diameter of the shaft to which the clamps are applied. We give elsewhere a rule for proportioning width of belts to horse-power.

C. H. C., of Iowa.—Byrne's Practical Metal Workers' Assistant, published by H. Carey Baird, Philadelphia, contains the information you require.

J. McD., of Ill.—Proto-phosphate of iron is thrown down as a white powder by adding a solution of phosphate of soda to photo-sulphate of iron. It will turn blue after a little. Perphosphate of iron is precipitated by adding phosphate of soda to persulphate of iron, as well as by several other methods.

F. R., of N. Y.—The discrepancy of which you speak is owing to the fact that the pressure in your boiler is far greater than the mean effective pressure in your cylinder or even the initial pressure. The gain from condensation only directly affects mean effective pressure in the cylinder; it does not directly affect the pressure in the boiler, or initial pressure, although of course, to do the same work when you condense, you do not need to carry much steam in the boiler.

O. R., of N. Y.—We think it would be hard to devise a worse boiler than the one of which you send us a diagram. We think it an unsafe and uneconomical plan, and should not expect it to give more than half the horse power of a properly constructed boiler. The number of square feet usually allotted to a boiler of a stationary engine where condensation is not employed is from ten to twelve feet according to the circumstances of the case.

H. B., of Ohio.—The tenacity of lead is much weakened by heating it to a temperature of 212 degrees, this will account for your pipe bursting when hot water was passed through, and withstanding the same pressure when cold water was forced through it. The expense of your advertisement will be $4 for each insertion outside, and $3 inside.

J. R. J., of R. I.—A common preparation for frosting glass to prevent the too direct action of the solar heat in green houses, etc, is a wash of whiting and glue water. It must not contain too much glue, as it is desired to wash off late in the season by the action of rain to compensate for the decrease in temperature.

C. F. P., of Ga.—We know of no cheap work specially treating of hydraulics, that is exhaustive. "The Power of Water," by Glynn, published by D. Van Nostrand, N. Y. will probably contain all you desire. You can raise water in the shorter leg of syphon as high as you can raise water in an atmospheric pump, no higher. Therefore the syphon you propose will not work.

C. D. R., of Ohio.—The scales and the white powder sent are identical in composition except that the scales have a little oxide of iron and organic matter in them. They are carbonate of lime with a little sulphate of lime. Its precipitation from the exhaust steam indicates that your boiler primes.

J. V., of Ala.—Lead may easily be detected in solution in several ways. Add sulphuric acid, a white precipitate of sulphate of lead is formed. Add hydro-sulphuric acid, a black precipitate of sulphide of lead is produced. Add solution of bichromate of potassa, and a brilliant yellow precipitate of chromate of lead is found. These three are the most ordinary and useful tests.

H. F. C., of Pa.—The plastic slate made by the Plastic Slate Roofing Company, of this city, makes a good blackboard surface to be used either with chalk or slate pencil. The "steam man" was in Newark, N. J., the last we heard of him. He is not a man we would repose a great deal of confidence in.

T. F. R., of Ohio.—The work you need is the "American Entomologist" published at Salem, Mass. You will find that more or less fading in the tints of bright-colored insects is inevitable in the cabinet.

P. O. M., of Mo.—The specimen of ore you send us is nothing but iron pyrites, bisulphide of iron. It is of no marketable or industrial value, if we except the fact that clays containing it are in some places made use of to manufacture alum.

H. C. S., of R. I.—The relative horse power of engines which is what we suppose you mean by size, cannot be estimated from the sizes of their cylinders alone.

A. S. G., of Conn.—You will not probably be able to restore the blue color of your pistol. The process is one requiring delicate manipulation.

J. D., of N. J.—The mineral sent us is hornblende. There is no silver in it.

W. F., of Pa.—Bourne is a standard authority on the steam-engine.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

980.—PAPER PULP.—J. G. Holbrooke, New York city. March 31, 1869.

1,641.—MANUFACTURE OF WROUGHT IRON.—J. O. York, New York city. May 28, 1869.

1,719.—CRUCIBLES AND OTHER REFRACTORY ARTICLES.—J. L. Hall and J. V. Morgan, Montreal, Canada. June 3, 1869.

1,721.—MANUFACTURE OF IRON.—John Burt, Detroit, Mich. June 3, 1869.

1,736.—MACHINERY FOR THE MANUFACTURE OF WOOD-BORING INSTRUMENTS AND IN AUGER BITS.—W. A. Ives, New Haven, Conn. June 4, 1869.

1,740.—BRAKES FOR WHEELS.—William Loomis, Wilkes Barre, Pa. June 5, 1869.

1,762.—APPARATUS FOR FOLDING PRINTED SHEETS OF PAPER.—R. M. Hoe, New York city. June 7, 1869.

1,798.—METHOD OF CONVEYANCE AND TRANSPORTATION IN PNEUMATIC TUBES.—Albert Brisbane, New York city. June 10, 1869.

1,800.—EXPLOSIVE POWDER.—P. A Oliver. New York city. June 10, 1869.

1,797.—COVERING FOR FLOORS AND OTHER SURFACES.—S. H. Pearce, Boston, Mass. June 10, 1869.

1,834.—SUBMARINE CANNON OR MORTAR.—D. Fitzgerald, New York city. June 14, 1869.

1,849.—MACHINERY FOR PRODUCING A POLISHED SURFACE UPON SHEET IRON.—George Weeden, F. E. Garfield, J. W. Bliss, and Geo. W. Williams, Hartford, Conn. June 15, 1869.

Business and Personal.

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

Recent American and Foreign Patents.

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

Machine for Upsetting Tires, Axle Trees, etc.—Orlando Patee, Ypsilanti, Mich.—The object of this invention is to construct a machine for the purpose of upsetting tires, etc., which shall operate effectively and with greater convenience than any heretofore employed.

Feed Gear for Saw Mills.—Geo. L. McCahan, Baltimore, Md.—The object of this invention is to provide for public use, a more simple and perfectly operating feed gear for saw mills than any heretofore employed.

Machine Paper Folder.—John Macnair, New York city.—The object of this invention is to provide for public use, a cheap and easily operated machine which will rapidly, neatly, and uniformly fold paper, or textile fabrics, and drop them, thus folded, into a suitable receptacle.

Oxygenating Furnace.—George Stamm, Pittsburgh, Pa.—The object of this invention is to increase the proportion of oxygen in the air that supports combustion in the furnace, and thereby to cause the gases to be consumed more thoroughly, and a greater intensity of heat to be produced than in ordinary furnaces.

Combined Corn Planter and Fertilizer.—G. W. Moy ers, Gordonsville, Va.—The object of this invention is to improve the construction of combined corn planters and fertilizers, in such a manner as to prevent their cracking the corn, and to distribute the fertilizer in a better manner than heretofore. In attaining this object an improved arrangement of the several parts of such a combined machine is also had.

Horse Hay Fork.—B. F. Alexander, Glen Hope, Pa.—This invention relates to that class of forks, in which is employed a piercing instrument that slides upon a stock and operates in connection with a locking device, and with arms that are thrown out and drawn in by its movements. This improvement consists in the peculiar construction and arrangement of the operating parts, whereby the instrument is made stronger, less costly, and more convenient of operation than heretofore.

Stereoscope.—John Francis Adams, New York city.—This invention relates to a new and important improvement in instruments used in viewing stereoscopic or photograph pictures, and consists mainly in the use of magnets for receiving and holding the picture in the proper position.]

Car Axle Box.—Willis Davis, Elizabethport, N. J., and Crowell Macan, Rahway, N. J.—This invention relates to a new and useful improvement in car axle boxes, and consists in the novel method of securing the cap of the box.

Steam Governor.—Charles A. Condé, Indianapolis, Ind.—This invention relates to a new and important improvement in governors for regulating the motion of steam engines.

Velocipede.—Lyman F. Hodge, Poughkeepsie, N. Y.—This invention relates to a new and useful improvement in velocipedes, having particular reference to the steering gear and the method of operating the brake.

Method of Raising Water.—Christian H. Kock, Davenport, Iowa.—This invention relates to a new arrangement for elevating water from wells and cisterns.

Combined Anvil and Vise.—H. D. Chandler, Fairhaven, N. J.—This invention relates to a combination of two well-known articles, the blacksmith's anvil and iron vise.

Pocket Stereoscope.—T. D. Simonton, St. Paul, Minn.—This invention relates to a new and useful improvement in stereoscopes, whereby they are made much more convenient and useful than they have hitherto been.

Compressing Device.—Tappey, Lumsden, and Steel, Petersburgh, Va.—This invention relates to a new and useful device, designed to facilitate the operation of packing tobacco.

Air-heating Furnace.—Peter H. Carman, Brooklyn, N. Y.—This invention relates to a new and useful improvement in furnaces for heating air for warming purposes.

Spoke Fastening.—H. N. Houghton, Brattleboro', Vt.—This invention relates to a new and useful method of repairing buggy, carriage, or wagon wheels, applicable where spokes are broken off at the felly for new wheels.

Stock and Balance Indicator.—Christopher Brunschwiler, New York city.—This invention relates to a new and improved method of showing or indicating the state of the account of those dealing in gold and stocks with brokers and bankers, and for all operations of a similar nature.

Hanging Sliding Doors.—A. J. Culver, White Hall, Ill.—This invention has for its object to furnish an improved device for hanging sliding doors upon cars, buildings, and other places, which shall be simple in construction and easily attached, and which will not require the lower part of the door to be provided with a guard or guide to keep the door in place.

Tucker Attachment for Sewing Machines.—A. S. Dinsmore, New York city.—This invention has for its object to furnish an improved tucker for sewing machines, which shall be so constructed that it may be conveniently attached to and detached from the ordinary presser foot of a sewing machine, and which will enable narrow tucks to be conveniently and accurately formed.

Furling Gaff Topsails.—Capt. George A. Ford, Oswego, N. Y.—This invention has for its object to furnish an improvement in furling gaff topsails, and other triangular sails, which shall be constructed and arranged that the sails may be furled and unfurled from the deck quickly and conveniently even when a strong wind is blowing.

Gate.—N. Harrier, Muscatine, Iowa.—This invention has for its object to furnish an improved gate, which shall be so constructed and arranged that it may be opened and closed by the wheels of the passing vehicle.

Air-escape Funnel.—Joseph I. Beaumont, St. Paul, Minn.—This invention has for its object to improve the construction of the improved air-escape funnel, patented by the same inventor, July 7th, 1868, and numbered 79,799, so as to make it simpler and cheaper in construction, and equally or more convenient in use.

Corn Planter.—George W. Bunker, St. Anthony, Minn.—This invention has for its object to improve the construction of corn planters, so as to make them more convenient and effective in operation, doing more and better work than the corn planters constructed in the ordinary manner.

Copper Water Boilers.—A. C. Brownell, Brooklyn, N. Y.—This invention has for its object to furnish an improved water boiler, or distributing reservoir, which shall be simple in construction, strong, close, and durable.

Cultivator.—Josiah Shepard, Newport, Me.—This invention has for its object to furnish an improved cultivator, which shall be so constructed and arranged that it may be readily adjusted for turning the soil towards or from the row of plants being cultivated, or to break down and level off ridges or rows of hills, or for digging potatoes.

Plow.—Josiah Shepard, Newport, Me.—This invention has for its object to improve the construction oi plows, so as to diminish the friction at the bottom and landside of the plow, and thus lessen the draft.

Corn, Cane, and Seed Harvester.—John Poffenberger and Ira M. Poffenberger, Urbana, Ohio.—This invention has for its object to furnish a convenient and effective machine for cutting and shocking corn, cane, and hemp, which shall be so constructed and arranged as to do it work thoroughly and well.

Railroad Car.—John M. McGehu, Milton, Fla.—This invention has for its object to furnish a simple and convenient car and track, designed especially for use in handling lumber, and similar uses, in places where ordinary roads are difficult of construction, and where ordinary railroads, if built, would be too expensive.

Hay Fork.—F. L. Morrison, New Albany, Ind.—This invention relates to a new hand hay fork, which is so constructed that it can be used to convey a load of hay from places where it is inconvenient to employ other conveying apparatus.

Bed Bottom.—F. C. Hagen, Cuba, N. Y.—Thisl nvention relates to certain improvements in spring bed bottoms, whereby the same are made more durable and convenient and more easy to repair. The invention consists in arranging separate head and foot pieces at the ends of the mattress, so that they can be removed and changed at will.

Harness Tug or Trace Supporter.—Clinton W. Terpening, Geneseo, Ill.—This invention relates to a new device for suspending the tugs or braces of the harness from the hip strap, so that the connection can be readily separated or re-established. The invention consists of the peculiar construction of the snap hook whereby an ornamental and convenient fastening device is produced.

Machine for Turning and Scraping Grindstones.—P. Leonard, Sharon, Pa.—This invention relates to a new machine for holding the tool that is used for turning and scraping grindstones, and has for its object to make the said tool adjustable in every direction and position, to be adapted to grindstones of different sizes and kinds.

Chimney Top.—Henry Markthaler, Elizabeth, N. J.—This invention has for its object to provide an improved cap for smoke stacks, ventilators, or lamps of all kinds, whether used on buildings, locomotives, cars, or other devices, in such manner that free egress of the escaping air or gases is provided, while the ingress of wind through the top is successfully prevented.

Device for Opening Cans.—Wm. M. Bleakley, Verplanck, N. Y.—This invention relates to a new device for opening sheet metal cans of all sizes, and consists of a double-pointed swivel bar, secured in the end of a lever that carries the adjustable cutter. The two points of the swivel bar are forced through the cover of the can, and serve to hold the can fixed, while the lever is revolved to cut a circular hole.

Rope, Cord, etc.—Louis Gabriel Yon, Paris, France.—This invention relates to a new manner of making ropes and cables, so as to utilize the material to the best advantage.

Potato Digger.—Wm. T. Andrews, Watson, N. Y.—This invention relates to a new potato digger which is made adjustable, to work to any desired depth, and which is provided with a self-acting vine-pulling attachment, whereby the operation of gathering the potatoes from the ground, is considerably facilitated. The invention consists chiefly in the application of two rotary vine-pulling cones which operate in front of the machine, above the digging implement of the same.

Slime Ore Concentrator.—J. W. V. Rawlins, and Samuel Stephens, Houghton, Mich.—This invention consists in a peculiar arrangement of apparatus for spreading the slime upon a slowly revolving table, whereon the ore will be deposited while the water flows away, and from which the said ore is finally scraped off into a receptacle.

Dining Table.—John Simonsen, Hermon, N. Y.—The invention consists in the arrangement of an extension table, so that when extended it will assume the form of a portion of a circle, having a space at the axis thereof for the head of the family, permitting the other occupants to be disposed around the curved outer side at equal distances from the said central person.

Cultivator.—Wm. Snook, Pleasant Plain, Iowa.—This invention relates to improvements in cultivators, designed more especially for cultivating corn, and adapted for cultivating on each side of a row simultaneously and to be operated by two horses.

Apparatus for Reducing Rotary Motion.—Adin Gauntt, Chagrin Falls, Ohio.—The invention consists of an arrangement of reducing gear, within the space inclosed, by a set of hollow conical pulleys having a fast motion, whereby a slow, unpowerful motion is imparted to a live spindle, as the spindle of a lathe, or other rotary shaft having the same axis of motion as that of the said pulleys, and adapted to disconnect the reducing gears and connect the said shaft or spindle directly to the pulleys, so as to move at the same speed that they do when required.

Manufacture of Enameled Bracelets.—Abiel Codding, North Attleborough, Mass.—The object of this invention is to provide a more simple and inexpensive method of manufacturing a kind of bracelet called enameled bracelet.

Machine for Distributing and Setting Type.—M. Umstadter, Norfolk, Va.—This invention relates to a new and improved machine for distributing and setting type; and it consists in a novel means employed for carrying the types to be distributed from the stick in which they are deposited to a series of chambers, from which they are taken to be set up. The invention also relates to certain means for adjusting or placing the types in proper position to be conveyed to the chambers above specified, and also in certain means for depositing the types in said chambers. The invention further relates to certain means for discharging the types from the type chambers upon a carrying device which conveys them to the receptacle from which they are adjusted in a proper stick. This part of the invention includes the "setting up," as it is technically termed.

Straw Cutter.—L. B. Hyatt, Flemington, Pa.—This invention relates to improvements in the construction of straw cutters. The object is to provide a more durable pivot joint for the hand vibrating cutter lever, also to prevent lateral play of the said lever on the pivot.

Platform for Submarine Drilling.—John Cody, New York city.—This invention has for its object to furnish an improved adjustable platform designed especially for use in submarine drilling, but which may be used with equal advantage for other purposes, and which shall be so constructed that that it may be readily adjusted as required.

Burial Case.—A. Crosby, Westfield, N. Y.—This invention relates to a new and useful improvement in the construction of leaden burial cases,and has for its object economy in the manufacture of the same, strength and lightness combined, facility in making the cases air-tight, and an improvement in the general appearance and finish of the same.

Rock-drilling Apparatus.—John Cody, New York city.—This invention has for its object to improve the construction of the improved drill,patented by the same inventor, April 5, 1864,and numbered 42,167,so as to make it more effective in operation and more convenient in use.

Machine for Forming Paper Boxes with Flanged Ends.—Joseph Spooner and Ebenezer Spooner, New York city.—This invention has for its object to furnish an improved machine for forming paper boxes with flanged ends, which shall be simple in construction and effective in operation, enabling the work to be done quickly, conveniently, and neatly.

Harrow.—Thomas B. Collins, Noank, Conn.—This invention has for its object to furnish an improved harrow, simple in construction, strong, and durable,which will adjust itself to irregularities of the surface of the ground, and which may be conveniently adjusted for transportation without its being necessary to load it upon a wagon, or other vehicle for that purpose.

Spring-bed Bottom.—James Collins, Grand Rapids,Mich.—This invention has for its object to furnish a simple,strong, durable,and elastic bed bottom which shall not be liable to break or get out of order.

Cultivator.—F. L. Perry, Canandaigua, N. Y.—This invention relates to a new and improved cultivator, of that class which is constructed with a view of being expanded and contracted to suit the width of the spaces between the rows of plants. The object of the invention is to obtain a cultivator of this class which will, in being expanded or contracted in width, automatically adjust the teeth,so that the latter will, at all times, or under any adjustment of the harrow, be in line with the draft, or all the teeth of the cultivator be in parallel planes. The invention has further for its object a means for regulating the depth of the penetration of the teeth into the earth.

Suspender Pocket.—J. Summers, Winchester, Va.—The object of this invention is to provide for public use a neat and cheap pocket which can be attached between the suspenders and the waistband of the pantaloons, for the purpose of carrying the watch or other valuables, it being so constructed that it cannot be cut open, and cannot be detached or unbuttoned in any way without the owner being instantly aware of what has been done.

Plow Cleaners.—J. Miles and E. P. Miles, Pleasant Hill, Ohio.—This invention relates to improvements in plow-clearing devices, such as patented January 8, 1867, and numbered 61,083. The object being to make the apparatus therein described applicable for attachment, so as to be readily removed from one side to another of any plow, also for adjustment vertically.

Lock.—A. Crosby, Westfield, N. Y.—This invention is designed as an improvement upon the ordinary padlock, whereby simplicity is obtained with security, and difficulty in picking or illegitimately opening the lock, while the interior of the same is protected from moisture, and prevented from being choked or clogged up with rust or ice during the winter season.

Harrow and Cultivator.—R. W. Cummings, McCutchansville, Ind.—This invention relates to improvements in apparatus for harrowing an cultivating corn, cotton, etc., planted in rows, whereby it is designed to provide a machine adapted for harrowing and cultivating at the same time on each side of a row, and which may also be readily adjusted for operation as a harrow alone.

Corn Planter.—S. Y. Orr, Morning Sun, Iowa.—This invention relates to a new and improved corn planter, of that class which is designed f planting in check rows; and it consists in a novel construction and arrangement of the same.

Medical Compound.—W. L. McCord, Abbeville C. H., S. C.—This invention relates to a new and useful medium for the cure of the colic in horses and other animals.

Moustache Guard.—M. C. Heptinstall, Enfield, N. C.—The object of this invention is to provide moustache guards for drinking cups, capable of removal and attachment to any cup within certain ranges as to size, to which the said guards may be adapted.

Parasol.—James Williams, New York city.—This invention relates to improvements in parasols, designed to provide an arrangement of the arms which support the cover and the braces, whereby the cover, when extended, will represent in form a flat disk with a conical central part. Also a reversible arrangement of the said cover, arms, and braces, whereby the conical part may be made to project upward or downward from the flat part. Also certain improvements in the springs for holding the runners; and also an arrangement whereby the cover may be folded towards either end of the stalk.

Milk Cooler.—R. D. Gardner, Watertown, N. Y.—This invention relates to improvements in apparatus for cooling milk, and consists of an arrangement of means for causing a circulation of the milk between two vats of cold water, or other cooling substance.

Alarm Gun.—M. C. Heptinstall, Enfield, N. C.—The object of this invention is to provide a simple and reliable alarm gun. It consists of a metallic cylinder having a bore in each end for holding the charge to be fired, the said bores running nearly to the center of the cylinder, where each is provided with a nipple and fuse hole, over which are spring hammers which are allowed to escape from the set position to strike the nipples, by the turning of a vertical pin having arms to which cords may be drawn in any position to be disturbed and cause the escape of the hammers by any person or thing approaching.

FAN ATTACHMENT FOR SEWING MACHINES.—Thomas A. Lyle, Pittsburgh, Pa.—This invention consists in combining with the needle arm of sewing machines, fans with clamping devices suited to the needle arm of any machine, and adapted to be readily detached when not wanted, or adjusted so as not to disturb the arm or act thereon to produce a current.

Official List of Patents.

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91,811.—EXTENSION WAGON COUPLING.—John P. Allensworth, Mackinaw, Ill.
91,812.—LAMP-LIGHT EXTINGUISHER.—J. M. Aubrey, Portage City, Wis.
91,813.—MODE OF CONSTRUCTING ARCHITECTURAL ORNAMENTS OF SHEET METAL.—Herman Baeuerle, New York city.
91,814.—MACHINE FOR PREPARING BAR LEAD.—Harry J. Bailey, Pittsburgh, Pa.
91,815.—MACHINE FOR MAKING TIN-LINED LEAD PIPE.—Harry J. Bailey, Pittsburgh, Pa.
91,816.—FARM GATE.—James Baughman, Suffield township, Ohio.
91,817.—OAR LOCK.—Wm. E. Beman, Portland, Me.
91,818.—METALLIC CARTRIDGE.—Edward Mounier Boxer, Royal Arsenal, Woolwich, England. Patented in England, October 13, 1866.
91,819.—MACHINERY FOR RAISING AND LOWERING GOODS.—Wm. Bradbury, Newton, Mass.
91,820.—DOOR PLATE AND BELL ALARM.—Wm. G. Brady, Lowell, Mass.
91,821.—COAL STOVE.—Moses Breen, Troy, N. Y.
91,822.—MACHINE INDICATOR FOR CLOTH MANUFACTURING, ETC.—Wm. H. Brown, Lowell, Mass.
91,823.—EAVES-TROUGH ATTACHMENT.—Francis M. Buckles (assignor to himself and John A. Stuckey), Altoona, Ill.
91,824.—RAILROAD CAR HEATER.—De Witt C. Chipman, Noblesville, Ind.
91,825.—BOOT-BLACKING APPARATUS.—Henry Churchman, Horsham, England. Patented in England, August 6, 1868.
91,826.—SHINGLE MACHINE.—Walter R. Close (assignor to himself and Thomas N. Egery), Bangor, Me.
91,827.—SPEAKING TUBE SIGNAL.—James R. Creighton, Boston, Mass.
91,828.—SEWER.—Thomas Dark, Buffalo, N. Y.
91,829.—VELOCIPEDE.—J. G. Dillaha, Waco, Texas.
91,830.—DRESSING CASE.—H. W. Eastman, Baltimore, Md.
91,831.—HOLDBACK FOR THILL.—J. B. Eaton, Fryeburg, Me.
91,832.—ROCKING AND RECLINING CHAIR.—Jacob Edson, Boston, Mass.
91,833.—POCKET LAMP.—John Erpelding and Wm. E. Huttmann, Chicago, Ill. Antedated June 15, 1869.
91,834.—STEAM RADIATOR.—Hampton W. Evans, Philadelphia, Pa.
91,835.—WALL OR BRACKET CASTER.—Andrew J. Forbes and Wm. G. Fletcher, Boston, Mass.
91,836.—WINDOW PULLEY.—J. M. Ford, Brooklyn, N. Y.
91,837.—PUSHING JACK.—Alfred Freeman, Peoria, Ill.
91,838.—WRENCH.—Thomas Garrick, Providence, R. I.
91,839.—HOUSEHOLD IMPLEMENT.—Thomas Garrick, Providence, R. I.
91,840.—APPARATUS FOR TREATING AND AGEING SPIRITOUS LIQUORS.—George Goewey, Philadelphia, Pa.
91,841.—NUT MANDREL.—George A. Gray, Jr., Cincinnati, Ohio, assignor, by mesne assignment, to himself and Alexander Gordon.
91,842.—MACHINE FOR MAKING PAPER.—Richard C. Harris, Harrisville, N. J.
91,843.—INSTRUMENT FOR TESTING THE INFLAMMABILITY OF ILLUMINATING OILS.—Henry M. Hartshorn, Malden, Mass.
91,844.—MANUFACTURE OF BOOTS AND SHOES.—Gilbert Hawkes, Lynn, Mass.
91,845.—PROPELLER.—J. O. Heyworth, Chicago, Ill.
91,846.—TENONING MACHINE.—Levi S. Hicks, Peoria county, Ill.
91,847.—PLOW CULTIVATOR.—E. S. Huff, Zanesville, Ohio.
91,848.—MACHINE FOR KYANIZING WOOD.—David W. Hunt, San Francisco, Cal. Antedated June 22, 1869.
91,849.—PNEUMATIC DENTAL PLUGGER.—Edward A. Hyde, Ann Arbor, Mich.
91,850.—SUGAR SIFTER.—Gustavus A. Jasper, Charlestown, Mass.
91,851.—RESERVOIR COOKING STOVE.—Wm. H. Johnson, Troy, N. Y.
91,852.—BELLOWS FOR REED ORGANS.—Samuel H. Jones (assignor to S. D. and H. W. Smith), Boston, Mass.
91,853.—CANT HOOK.—Wm. P. Kilgore, Hampden, Me.
91,854.—MODE OF HITCHING HORSES.—John L. Kreider, Drumore township, Pa.
91,855.—DEODORIZING APPARATUS FOR WATER CLOSETS.—Peter S. Luther (assignor to the Earth Closet Company), Hartford, Conn.
91,856.—MACHINE FOR RE-PRESSING BRICKS.—Henry Maurer, New York city.
91,857.—COAL STOVE.—Oscar F. Mayhew, Indianapolis, Ind. Antedated June 17, 1869.
91,858.—HORSE RAKE.—Robert W. McClelland, Springfield, Ill.
91,859.—CARRIAGE WHEEL.—Robert W. McClelland, Springfield, Ill.
91,860.—GRAIN BINDER.—J. M. McMaster, Rochester, N. Y.
91,861.—WOOD PAVEMENT.—Alexander Miller, Chicago, Ill.
91,862.—FLUX FOR SMELTING ORES OF GOLD, SILVER, AND OTHER METALS.—Charles W. Moore, San Francisco, Cal.
91,863.—SELF-OILING CAR WHEEL.—Wm. Owen, Hubbard, Ohio, assignor to himself, Daniel B. Stambaugh, same place, and Daniel Smith, Girard, Ohio.
91,864.—ORDNANCE.—William Palliser, Pall Mall, England. Patented in England, December 10, 1867.
91,865.—COMBINED LATCH AND LOCK.—Herman G. Pein, Peoria, Ill.
91,866.—MACHINE FOR REMOVING LINT FROM COTTON SEED.—William F. Pratt (assignor to E. Carver Company), East Bridgewater, Mass.
91,867.—SEED SOWER.—George H. Reister, Washington, Iowa. Antedated June 15, 1869.
91,868.—WIND WHEEL.—G. H. Reister, Washington, Iowa.
91,869.—STEAM GENERATOR.—W. K. Rhodes, Portland, Me.
91,870.—MANUFACTURE OF ROASTED COFFEE.—Edward E. Rinehart, Pittsburgh, Pa.
91,871.—MEANS FOR ATTACHING COVERS TO GLASS JARS.—Daniel C. Ripley, Pittsburgh, Pa.
91,872.—SHINGLE MACHINE.—Adam C. Ritz, Elizabethtown, and John B. Carter, Heartsville, Ind.
91,873.—CASTER.—T. L. Rivers, St. Louis, Mo. Antedated June 22, 1869.
91,874.—SULKY CORN PLANTER AND PLOW COMBINED.—Rezin Robins and Albert S. Robins, Dundas, Ill.
91,875.—COOKING STOVE.—J. J. Savage, Troy, N. Y.
91,876.—CULTIVATOR.—Alexander Shaw, Monmouth, Ill.
91,877.—RAILWAY RAIL SPLICE.—W. S. Shoemaker, Towson, town, Md., and E. H. Shoemaker, Lancaster, Ohio.
91,878.—AMALGAMATOR.—George Stevens, San Francisco, Cal.
91,879.—COFFEE BOILER.—W. H. Stewart and J. H. Tilley, Orion, Wis.
91,880.—COTTON SEED HULLER.—John D. Stillman, Memphis, Tenn.
91,881.—DEVICE FOR FEEDING SWINE.—Nathan Stockwell, Windsor, N. Y.
91,882.—TWEER.—Peter Sweeny, New York city.
91,883.—COMPOUND FOR EXTINGUISHING FIRES.—Eli Thayer, New York city, assignor to Paul P. Todd, Boston, Mass. Antedated June 11, 1869.
91,884.—PACKING CASE FOR BOTTLES AND JARS.—William Thompson, Dublin, Ireland. Patented in England, November 19, 1868.
91,885.—BEE HIVE.—David G. Watt, Lawrence, Kansas.
91,886.—MEDICAL COMPOUND.—William Weber, Cincinnati, Ohio.
91,887.—HOG TRAP.—Charles B. Weeks (assignor to himself and F. H. Ferris), Galesburg, Ill.
91,888.—REED FOR LOOMS.—Benjamin F. Whitcomb, Claremont, N. H.
91,889.—METAL-CORRUGATING MACHINE.—James B. Williams, Glastenbury, assignor to the Hartford Sorghum Machine Company, Hartford, Conn.
91,890.—EVAPORATING PAN.—J. B. Williams, Glastenbury, assignor to the Hartford Sorghum Machine Co., Hartford, Conn.
91,891.—MACHINE FOR WINDING THREAD, ETC.—Henry Willis and Geo. Rice, Worcester, England.
91,892.—COMBINED TRY SQUARE AND BEVEL.—Chas. Winterbottom (assignor to W. S. Winterbottom), Philadelphia, Pa.
91,893.—RAILWAY SLEEPER.—E. H. Woodsum and F. H. Whitman, Harrison, Me.; said Woodsum assigns his right to said Whitman.
91,894.—CULTIVATOR.—J. A. Woodward, S. S. Woodward, and Thos. Mason, Sandwich, Ill.
91,895.—SCRUBBING AND MOPPING MACHINE.—Wm. Zierath and C. J. Smith, Sheboygan, Wis.
91,896.—VELOCIPEDE.—A. M. Allen, New York city.
91,897.—POTATO DIGGER.—Wm. Andrews, Watson, N. Y.
91,898.—EMBROIDERING ATTACHM'T FOR SEWING MACHINES.—W. B. Bartram, Danbury, Conn. Antedated June 17, 1869.
91,899.—FUNNEL.—J. I. Beaumont, St. Paul, Minn.
91,900.—SCROLL-SAWING MACHINE.—James M. Blackstock, Tarentum, Pa.
91,901.—APPARATUS FOR THE MANUFACTURE OF PIG BLOOM.—T. S. Blair, Pittsburgh, Pa.
91,902.—CAN OPENER.—W. M. Bleakley, Verplank, N. Y.
91,903.—CONSTRUCTION OF SHEET METAL BOILERS.—A. C. Brownell, Brooklyn, N. Y.
91,904.—CORN PLANTER.—G. W. Bunker, St. Anthony, Minn., assignor to himself and David Thayer, Boston, Mass.
91,905.—COMMERCIAL ACCOUNT INDICATOR.—Christopher Brunschwiler, New York city.
91,906.—BUTTON.—L. L. Burdon, Providence, R. I.
91,907.—BROOM.—Marshall Burnett, Boston, Mass.
91,908.—AIR-HEATING FURNACE.—Peter H. Carman, Brooklyn, N. Y.
91,909.—ANVIL AND VISE COMBINED.—R. D. Chandler, Fairhaven, N. J.
91,910.—LATHE.—C. S. Clark, Providence, R. I.
91,911.—PLATFORM FOR SUBMARINE DRILLING.—John Cody, New York city.
91,912.—ROCK-DRILLING APPARATUS.—John Cody, New York city.
91,913.—SPRING-BED BOTTOM.—James Collins, Grand Rapids, Mich.
91,914.—HARROW.—T. B. Collins, Noank, Conn.
91,915.—STEAM-ENGINE GOVERNOR.—C. A. Conde, Indianapolis, Ind.
91,916.—HANGING SLIDING DOOR.—A. J. Culver, White Hall, Ill.
91,917.—HARROW AND CULTIVATOR COMBINED.—W. R. Cummings, McCutchanville, Ind.
91,918.—FENCE.—P. Davis, Newport News, Va.
91,919.—RAILWAY CAR AXLE BOX.—Willis Davis, Elizabethport, and Crowell Macan, Rahway, N. J.
91,920.—BOOT AND SHOE STRETCHER.—J. L. Devol, Parkersburg, West Va.
91,921.—IRONING TABLE AND CLOTHES DRYER.—J. L. Devol, Parkersburg, W. Va.
91,922.—TUCKING ATTACHMENT FOR SEWING MACHINES.—A. S. Dinsmore, New York city.
91,923.—CURTAIN FIXTURE.—Le Grand Dodge, Syracuse, N. Y.
91,924.—WATER FILTER.—A. T. Dunshee, Pittsburgh, Pa.
91,925.—COMBINED GRAIN DRILL, SEED SOWER, AND CORN PLANTER.—David Evans, Newton, Iowa.
91,926.—CAR WHEEL.—H. B. Fernald, Dedham, Mass. Antedated June 19, 1869.
91,927.—FURLING GAFF TOPSAILS.—G. A. Ford, Oswego, N. Y.
91,928.—MILK COOLER.—R. D. Gardner, Watertown, N. Y.
91,929.—APPARATUS FOR CHANGING SPEED IN MACHINERY.—Adin Gauntt, Chagrin Falls, Ohio.
91,930.—LATHE.—Myron Gore, Shelby, Mich.
91,931.—BED BOTTOM.—F. C. Hagen, Cuba, N. Y.
91,932.—GATE.—Nathaniel Harrier, Muscatine, Iowa.
91,933.—LAMP.—E. K. Haynes (assignor to William Carleton), Boston, Mass.
91,934.—LAMP EXTINGUISHER.—M. C. Heptinstall, Enfield, N. C.
91,935.—ALARM GUN.—M. C. Heptinstall, Enfield, N. C.
91,936.—MOUSTACHE GUARD.—M. C. Heptinstall, Enfield, N. C.
91,937.—VELOCIPEDE.—L. F. Hodge, Poughkeepsie, N. Y.
91,938.—SPOKE FASTENER.—H. N. Houghton, Brattleborough, Vt.
91,939.—STRAW CUTTER.—L. B. Hyatt, Flemington, Pa.
91,940.—HEATING DRUM.—Thomas Jefferis, Council Bluffs, Iowa.
91,941.—WAGON BRAKE.—W. K. Johnston (assignor to himself, Edith R. Wynkoop, and Daniel Zimmerman), Cordova, Ill.
91,942.—APPARATUS FOR OPERATING CHURNS.—H. J. Klingenberg and J. J. Mau, Davenport, Iowa.
91,943.—WATER ELEVATOR.—Christian Henry Kock, Davenport, Iowa.
91,944.—MACHINE FOR TURNING AND SCRAPING GRINDSTONES.—Philip Leonard, Sharon, Pa.
91,945.—SASH HOLDER.—B. B. Lewis, New York city.
91,946.—MOLD FOR GLASS FROM GAS CARBON OR GRAPHITE.—Jean Baptiste Lhote, Paris, France, assignor to Sewell H. Fessenden, Boston, Mass.
91,947.—DUST DEFLECTOR FOR RAILROAD CARS.—J. P. O. Lownsdale, Portland, Oregon.
91,948.—PAPER-FOLDING MACHINE.—John Macnair, New York city.
91,949.—STEAM GENERATOR GRATE BAR.—James Mahoney, Newport, R. I.
91,950.—CHIMNEY TOP.—Henry Markthaler, Elizabeth, N. J.
91,951.—TILE MACHINE.—Samuel Mattix and Jas. McPherson, Clinton county, Ind.
91,952.—SHINGLE MACHINE.—Benjamin F. Mayhew, Carmel, Me.
91,953.—DISTILLATION OF HYDROCARBON OILS.—Francis McCarty, Smith's Ferry, Pa.
91,954.—MEDICAL COMPOUND.—W. L. McCord, Abbeville, S. C.
91,955.—SELF-CLOSING TELEGRAPH KEY.—J. H. McElroy, Warwick, N. Y.
91,956.—RAILWAY CAR TRUCK.—John M. McGehu, Milton, Florida.
91,957.—PLOW CLEANER.—J. Miles and E. P. Miles, Pleasant Hill, Ohio.
91,958.—PORTABLE STRAINING PRESS.—Stephen Moore and Homer Rogers, Sudbury, Mass.
91,959.—HAY FORK.—F. L. Morrison, New Albany, Ind.
91,960.—SIRUP-HOLDER FOR SODA FOUNTAIN.—A. J. Morse, Boston, Mass.
91,961.—CORN PLANTER.—S. Y. Orr (assignor to himself and J. M. Virgin), Morning Sun, Iowa. Antedated June 22, 1869.
91,962.—MODE OF UTILIZING TIN-PLATE CUTTINGS IN THE MANUFACTURE OF IRON AND STEEL.—D. D. Parmlee, New York city.
91,963.—CULTIVATOR.—F. L. Perry, Canandaigua, N. Y.
91,964.—CORN HARVESTER.—John Poffenberger and I. M. Poffenberger, Urbana, Ohio.
91,965.—MACHINE FOR FORMING THREADS ON SCREWS.—T. T. Prosser, Chicago, Ill.
91,966.—ORE CONCENTRATOR.—J. W. V. Rowlins and Samuel Stephens, Houghton, Mich.
91,967.—CLOTHES BOILER.—J. H. Rickett, West Dover, Vt.
91,968.—COOKING STOVE.—Francis Ritchie, Troy, assignor to S. S. Jewett, Buffalo, N. Y. Antedated June 15, 1869.
91,969.—FOLDING OPERA GLASS.—Joseph Saxton, Washington, D. C.
91,970.—BRAIDING MACHINE.—Socrates Scholfield, Providence, R. I.
91,971.—MACHINE FOR CUTTING VERMICELLI.—Gottlied Schwarzwalder, Pittsburgh, Pa.
91,972.—PLOW.—Josiah Shepard, Newport, Me.
91,973.—CULTIVATOR.—Josiah Shepard, Newport, Me.
91,974.—EXTENSION TABLE.—John Simensen (assignor to himself and and Otis Earl), Hermon, N. Y.
91,975.—POCKET STEREOSCOPE.—T. D. Simonton, St. Paul, Minn.
91,976.—POCKET STEREOSCOPE.—T. D. Simonton, St. Paul, Minn.
91,977.—HARROW.—Valentin Sippel, Niagara City, N. Y.
91,978.—DOOR HOLDER.—Otto Sliker, Lincoln, Ill.
91,979.—EXTENSION TRESTLE.—Otto Sliker, Lincoln, Ill.
91,980.—PIPE FOR WATER, GAS, ETC.—B. F. Smith, New Orleans, La.
91,981.—CULTIVATOR.—Wm. Snook, Pleasant Plain, Iowa.
91,982.—COMPOSITION FOR COVERING STEAM GENERATOR.—F. H. Snyder, Jersey City, N. J.
91,983.—PAPER-BOX MACHINE.—Joseph Spooner and Ebenezer Spooner, New York city.
91,984.—ATTACHMENT FOR COMB.—Geo. Stackhouse, Mount Washington, Pa.
91,985.—TOBACCO PRESS.—W. H. Tappey, W. C. Lumsden, and Alex. Steel, Petersburgh, Va.
91,986.—HARNESS TUG OR TRACE SUPPORTER.—C. W. Terpening, Geneseo, Ill.
91,987.—AXLE.—H. W. Tilton, Walpole, Mass.
91,988.—TYPE-SETTING AND DISTRIBUTING MACHINE.—M. Umstadter, Norfolk, Va.
91,989.—FLUID METER.—J. B. Van Deusen, New York city.
91,990.—WOOD PLANE.—Paul Vicellio, New Orleans, La.
91,991.—FLUID METER.—Franz Wagner (assignor to himself and Joseph Metzner), New York city.
91,992.—COOKING STOVE.—J. B. Wilkinson, Troy, N. Y.
91,993.—COOKING STOVE.—J. B. Wilkinson, Troy, N. Y.
91,994.—REVERSIBLE PARASOL.—James Williams, New York city.
91,995.—ROPE, CORD, ETC.—L. G. Yon, Paris, France.
91,996.—HORSESHOE.—A. A. York, De Lancey, N. Y.
91,997.—STEREOSCOPE INSTRUMENT.—John F. Adams, New York city.
91,998.—HORSE HAY FORK.—B. F. Alexander, Glen Hope, Pa.
91,999.—GRATE FOR STEAM GENERATOR AND OTHER FURNACES.—B. T. Babbitt, New York city.
92,000.—STEAM GENERATOR.—B. T. Babbitt, New York city.
92,001.—COMBINED SEED SOWER, HARROW, AND ROLLER.—E. A. Barton, Boonville, Ind.
92,002.—STUMP EXTRACTOR.—Isidore Bezenah, St. Martins, Ohio.
92,003.—FUEL.—Ira Bicknell, Cincinnati, Ohio.
92,004.—MANUFACTURE OF STEARIC ACID.—F. C. A. Bock, Copenhagen, Denmark.
92,005.—ROCK DRILL.—N. P. Bradish, Jerseyville, Ill. Antedated June 18, 1869.
92,006.—APPARATUS FOR COLLECTING THE WASTE GASES OF SMELTING FURNACES.—Barnerd Branon and G. H. Baldwin, Sharon, Pa.
92,007.—REGULATOR FOR GAS BURNER.—Jos. S. Bromhead, Peckham, England. Patented in England, July 23, 1868.
92,008.—BROILER.—W. F. Browne, New York city.
92,009.—PROCESS OF ROASTING AURIFEROUS SULPHURETS.—Wm. Bruckner, Central, Colorado Ter.
92,010.—ANIMAL TRAP.—D. R. Bruton, Thomasville, N. C.
92,011.—HARNESS TUG BUCKLE.—G. H. Buckius (assignor to himself, C. Aultman, A. C. Tonner, and P. S. Sowers), Canton, Ohio.
92,012.—WINDOW SHADE FIXTURE.—A. H. Burgess, Philadelphia, Pa.
92,013.—BREECH-LOADER.—Bethel Burton, Brooklyn, N. Y.
92,014.—ROCK DRILL.—G. F. Case, New York city.
92,015.—SODA FOUNTAIN.—J. W. Chapman, Madison, Ind.
92,016.—GANG PLOW.—Luke Chapman (assignor to himself and Collins Company), Collinsville, Conn.
92,017.—WATER WHEEL.—Gardner Cox, Pierrepont, N. Y.
92,018.—BEEHIVE.—Joseph Croner, Cross Creek Village, Pa.
92,019.—GANG PLOW.—F. R. Crothers, Sparta, Ill.
92,020.—STENCH TRAP.—J. F. Dacey, Charlestown, Mass.
92,021.—RAILWAY RAIL SPLICE.—Geo. E. Dering, Lockleys near Welwyn, England. Patented in England, Nov. 23, 1860.
92,022.—PLASTERING TROWEL.—J. C. Dietrich and Charles I. Humphrey, Rochester, N. Y.
92,023.—FRUIT CAN LABEL.—John Dunlap, Pittsburgh, Pa.
92,024.—POTATO DIGGER.—Robert Dunlap, 1st, South Lyons, Mich.
92,025.—WAGON BRAKE.—David Eaton, Rochester, Vt.
92,026.—MAT AND SCRAPER.—Wesley Farrington, Morrisania, N. Y.
92,027.—PROCESS OF PREPARING WOOD FOR PAPER STOCK.—Albert Fickett (assignor to himself and C. T. Moore), Rochester, N. Y.
92,028.—STENCILING APPARATUS.—T. E. Fields, Louisville, Ky.
92,029.—SPRAY DAMPENER.—R. R. Foote, Chicago, Ill.
92,030.—WINDMILL.—F. J. Forsyth, Au Sable, Mich.
92,031.—ARTIFICIAL LEG.—J. A. Foster, Detroit, Mich.
92,032.—COPYING PRESS.—Joseph Fowler, Saugatuck, Mich.
92,033.—SUBMARINE FOUNDATION.—W. H. Foye, San Francisco, Cal.
92,034.—SCRUBBING TOOL.—Joseph Frey and Wendel Ehrle, Battle Creek, Mich.
92,035.—APPARATUS FOR SLAUGHTERING AND CURING MEAT.—G. W. Fulton, Fulton, Texas.
92,036.—CARRIAGE SEAT.—John Gale and M. B. Ames, Lawrence, Mass.
92,037.—SHOE-PEGGING MACHINE.—A. C. Gallahue, Riverdale, N. Y.
92,038.—SMUT MACHINE.—Jacob Getz (assignor to himself and Samuel Wilson), Buffalo, N. Y.
92,039.—STOVEPIPE SHELF.—C. M. Granis, Morrisville, N. Y.
92,040.—MACHINE FOR PREPARING CLAY FOR BRICKMAKING.—W. N. Graves (assignor to himself and E. C. Sterling, St Louis, Mo.
92,041.—LATHE.—O. M. Grimes, Newark, N. J.
92,042.—SELF-ADJUSTING EQUALIZER FOR PLOWS, ETC.—J. T. Hagerty, Camp Point, Ill.
92,043.—COAL STOVE.—Wm. Hailes, Albany, N. Y.
92,044.—VELOCIPEDE.—H. F. T. Hale, East Saginaw, Mich.
92,045.—RAILWAY RAIL AND SPLICE.—Jos. Hall and Daniel Hall, Chicago, Ill.
92,046.—FARM GATE.—Calvin Hart, Farmington, Ill.
92,047.—DOOR LATCH.—C. F. Herrick, Independence, Iowa.
92,048.—BREECH-LOADING FIREARM.—M. J. Hinden, Detroit, Mich.
92,049.—FIRE-PLACE GRATE.—G. W. Hinman, Paducah, Ky.
92,050.—PRINTING PRESS.—R. M. Hoe and S. D. Tucker, New York city.
92,051.—STEAM ENGINE GOVERNOR.—W. H. Howland, San Francisco, Cal.
92,052.—STEAM ENGINE VALVE.—W. H. Howland, San Francisco, Cal.
92,053.—LAMP BRACKET.—T. A. Hunter and John Blewitt, New York city.
92,054.—FLUX FOR MANUFACTURING STEEL.—Jacob Jameson, Philadelphia, Pa.

92,055.—Cooking Stove.—B. F. Johnson, Troy, N. Y.
92,056.—Corn Sheller.—John Jordan, Red Wing, Minn.
92,057.—Hydraulic Press.—Agur Judson and S. A. Farrington, Newark, N. J.
92,058.—Harvester Rake.—W. W. Kingsbury, Kalamazoo, Mich.
92,059.—Brick Machine.—Joseph Klinkhardt, St. Louis, Mo.
92,060.—Shovel Handle Tops.—S. M. Knapp and Joseph Switter, Massillon, Ohio.
92,061.—Grain Separator and Scourer.—W. C. Knox, Jacksonville, Ill.
92,062.—Draw Bar.—Wenzel Kotzum, Aurora, Ind.
92,063.—Lantern.—Thomas Langston, Brooklyn, N. Y.
92,064.—Lantern.—Thomas Langston, Brooklyn, N. Y.
92,065.—Compound to be Used in the Cure of Rheumatism.—Reuben Lighthall, Brooklyn, N. Y.
92,066.—Electro-Magnetic Motor.—L. T. Lindsey, Jackson, Tenn.
92,067.—Water Elevator.—Zephaniah Lockwood, Saratoga Springs, N. Y.
92,068.—Sewing Machine.—Daniel Macpherson, Edinburgh, North Britain.
92,069.—Railroad Platform Scale.—Wm. Maguire (assignor to himself and F. B. Loney), Baltimore, Md.
92,070.—Flour Bolt Feeder.—John Mallin, Chicago, Ill.
92,071.—Harrow.—M. R. Marcell (assignor to himself and Hiram Culver), Dansville, N. Y.
92,072.—Thrashing Machine.—I. W. Martin, Goodville, Pa.
92,073.—Cockle-Separating Machine.—F. W. Mase, Waukau, Wis.
92,074.—Bed-Bottom.—Abel Matson, Blockville, N. Y.
92,075.—Bedstead and Sofa or Chair.—J. S. McCurdy (assignor to G. L. and J. B. Kelty and Company), New York city.
92,076.—Saw Swage.—John McDonald, Portville, N. Y.
92,077.—Fertilizing Compound.—Edward N. McKimm and H. W. Bender, Benderville, Pa.
92,078.—Speed Indicator for Vessels.—H. Metcalf, Washington, D. C.
92,079.—Skating Shoe.—C. F. W. Meyer, Oconomowoc, Wis.
92,080.—Saw.—Edward Miall, Jr., London, England.
92,081.—Carriage Axle.—J. H. Moffett, Reading, Mich.
92,082.—Fluid Meter.—Chas. Moore, New York city.
92,083.—Weighing Apparatus.—Thos. Morrison, Cincinnati, Ohio.
92,084.—Corn Planter.—G. W. Moyers, Gordonsville, Va.
92,085.—Instrument for Relieving Choke and Bloat in Cattle.—N. Q. Munger, Casco, and G. B. Pomeroy, South Haven, Mich.
92,086.—Medical Compound.—Wm. B. Myers, Frenchtown, N. J.
92,087.—Turbine Water Wheel.—Jas. Newman, Portland, Mich.
92,088.—Hoisting Machine.—J. S. Park, Montondon, Pa.
92,089.—Machine for Upsetting Tires, Axle-Trees, etc.—Orlando Patee, Ypsilanti, Mich.
92,090.—Coffee Roaster.—Jas. B. Peake and Jas. A. Lusby, Washington, D. C. Antedated June 19, 1869.
92,091.—Mechanism for Converting Motion.—E. S. Pierce, (assignor to the National Screw Company), Hartford, Conn.
92,092.—Elevator.—H. G. Porter, Grand Rapids, Mich.
92,093.—Carriage Spring.—Benj. F. Power, Morgan county, Ohio.
92,094.—Curtain Fixture.—R. B. Prindle, Norwich, N. Y.
92,095.—Enameled Bell.—Francois Raymond, Woodhaven, N. Y.
92,096.—Device to Operate the tilting Floors of Malt Kilns.—J. C. Rhodes, Chicago, Ill.
92,097.—Railway-Car Brake.—J. W. Rice, Springfield, Mass.
92,098.—Process of Treating Vegetable Fibers.—E. T. Rice, New York city.
92,099.—Gang Plow.—Wm. B. Rice, Oakland, Oregon.
92,100.—Pruning Knife.—Wm. Richard, Clyde, Ohio.
92,101.—Tobacco Cutter.—T. M. Richardson, Stockton, Me.
92,102.—Combined Drawer Pull and Label.—C. H. Robinson, Greenwich, N. Y.
92,103.—Corn Sheller.—J. M. Ross, Linden Hall, Pa.
92,104.—Railway Car Brake.—E. S. Scripture, Brooklyn, N. Y., and John H. Darragh, Aurora, Ill.
92,105.—Manufacture of Vapor Gas.—C. A. Seely, New York city. Antedated April 10, 1869.
92,106.—Hand Carriage.—D. S. Shanabrook, Greencastle, Pa.
92,107.—Medicine or Cordial.—John Shapley and A. D. Hutchinson, Rosefield, Ill.
92,108.—Core Bar for Molds used in Casting Metal.—Fred. Shickle, St. Louis, Mo.
92,109.—Stovepipe Shelf and Sadiron Holder.—Henry Shirey and J. M. Furman, Fond Du Lac, Wis.
92,110.—Apparatus for Measuring Fluids.—E. G. Shortt, Carthage, N. Y.
92,111.—Telegraph Insulator.—W. Edgar Simonds, Hartford, Conn.
92,112.—Bottle Washing Machine.—N. H. Sirrelle, Baltimore, Md., assignor to Martin Burnell and Wm. Tassil Tassil.
92,113.—Fruit Dryer—A. J. Smith, Decorah, Iowa.
92,114.—Stovepipe Drum.—C. D. F. Smith, Geneva, Ill.
92,115.—Safety Stove for Railroad Cars.—C. J. Smith, Norfolk, Va.
92,116.—Combined Cleat and Capstan.—Diton Snedeker, Lockport, N. Y.
92,117.—Hot-Air Engine.—Lars A. L. Soderstrom, Paris, France.
92,118.—Fence.—Frank F. Sommer, Detroit, Mich.
92,119.—Stovepipe Shelf.—R. H. Springsteed, Vandalia, Mich.
92,120.—Oxygenating Furnace.—Geo. Stamm, Pittsburgh, Pa.
92,121.—Hub for Carriage Wheels.—S. T. F. Sterick, Washington, D. C.
92,122.—Hay Spreader.—Joshua C. Stoddard, Worcester, Mass.
92,123.—Safety Pocket for Attachment to Suspenders.—J. Summers, Winchester, Va.
92,124.—Sawing Machine.—J. P. Summers, Tiffin, Ohio.
92,125.—Folding Chair.—Gregor Trinks, New York city.
92,126.—Railway Car Coupling.—Jas. Turnbull, Edinburgh, Scotland.
92,127.—Neck Yoke.—R. Voris, Oneida, Ill., assignor to the Western Neck-Yoke Company.
92,128.—Steam-Engine Slide-Balance Valve.—J. F. Walton, Birmingham, Pa.
92,129.—Breech-Loader.—W. G. Ward, New York city.
92,130.—Door Bolt.—A. F. Warren, Brooklyn, N. Y.
92,131.—Lubricator.—G. Waters, Cincinnati, Ohio.
92,132.—Velocipede.—Fred. Westphal (assignor to himself J. V. R. Spencer, and Alex. Beakes), Jersey City, N. J.
92,133.—Folding Chair.—C. A. Wiedemann, New York city.
92,134.—Machine for Bending Tubes.—M. G. Wilder (assignor to N. F. Griswold and G. F. Searles), West Meriden Conn.
92,135.—Sulky Cultivator.—Nathaniel Wilson, St. Louis, Mich.
92,136.—Manufacture of Metallic Cartridge Cases.—D. Williamson, New York city.
92,137.—Advertising Device.—R. F. Rankin, Columbus, Ohio.

REISSUES.

56,345.—Corset Spring.—Dated July 17, 1866; reissue 2,929, dated May 12, 1868; reissue 3,520.—F. L. Barnes, New York city, Administratrix of the estate of Samuel H. Barnes, deceased.
15,354.—Mowing Machine.—Dated July 15, 1856; reissue 3,521.—Division B.—E. M. Fowler, Bay City, Mich., assignee of J. W. Thompson.
22,232.—Horse Rake.—Dated Dec. 7, 1858; reissue 3,522.—Christian Garver, Middletown, Pa.
28,482.—Coal Stove.—Dated May 29, 1860; reissue 1,506, dated June 30, 1863; reissue 2,459, dated January 15, 1867; reissue 3,523.—Joseph C. Henderson, Albany, N. Y.
17,779.—Harvester.—Dated July 14, 1857; reissue 3,524.—Division A.—J. P. Manny, Rockford, Ill.
17,779.—Harvester.—Dated July 14, 1857; reissue 3,525.—Division B.—J. P. Manny, Rockford, Ill.
17,779.—Harvester.—Dated July 14, 1857; reissue 3,526.—Division C.—J. P. Manny, Rockford, Ill.
65,826.—Device for Unloading Grain Cars.—Dated June 18, 1867; reissue 3,527.—I. H. Palmer, Lodi, Wis.
79,870.—Water Wheel Regulator.—Dated July 14, 1868; reissue 3,528.—R. D. Snow, Bennington, Vt.
38,521.—Utilizing Waste of Puddling Furnaces, etc., in Generating Steam.—Dated May 12, 1863; reissue 3,529.—James Watt, Charlestown, Mass., and Henry Childs, Buffalo, N. Y., assignees of Jas. Watt.

DESIGNS.

3,556.—Croquet Mallet.—A. C. Bullock, North Providence, R. I.
3,557.—Paper Collar.—C. A. Brown, Troy, N. Y.
3,558.—Trade Mark.—H. D. Dickinson, G. P. Kinney, and M. F. Wilson, Painesville, Ohio.
3,559.—Paper Collar.—Franklin Field, Troy, N. Y.
3,560.—Medallion.—Wm. Miller, Philadelphia, Pa.
3,561.—Trade Mark.—C. L. Morehouse, Cleveland, Ohio.
3,562.—Terret Ring.—C. H. Thornton, Newark, N. J.
3,563.—Cooks' Stove.—N. S. Vedder and Francis Ritchie, Troy, N. Y., assignors to Greer and King, Dayton, Ohio.
3,564.—Frame of a Fireplace.—Alex. Wemyss (assignor to David Stuart and Richard Peterson), Philadelphia, Pa.
3,565.— Stove-Door Bracket.—Alex. Wemyss (assignor to David Stuart and Richard Peterson), Philadelphia, Pa.
3,566.—Show Case.—Gerhard Winter, New York city.

EXTENSIONS.

Bridle Winkers.—Wm. Boyd and Wm. F. Boyd, of Mansfield, Mass.—Letters Patent No. 13,119, dated June 26, 1855.
Method of Securing Cutters to Rotary Disks.—Jonah Newton, of New York city.—Letters Patent No. 13,096, dated June 19, 1855; reissue No. 2,728, dated August 13, 1867.

How to Get Patents Extended.

Patents granted in 1855 can be extended, for seven years, under the general law, but it is requisite that the petition for extension should be filed with the Commissioner of Patents, at least ninety days before the date on which the patent expires. Many patents are now allowed to expire which could be made profitable under an extended term. Applications for extensions can only be made by the patentee, or, in the event of his death, by his legal representative. Parties interested in patents about to expire, can obtain all necessary instructions how to proceed, free of charge, by writing to

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SCIENTIFIC AMERICAN

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

Vol. XXI.---No. 4. [NEW SERIES.] | NEW YORK, JULY 24, 1869. | $3 per Annum. [IN ADVANCE.]

The Darien Automatic Ventilator.

This is one of those simple and eminently practical devices that produce a favorable impression upon the mind at first sight. Its design is to obviate the necessity of personal attention, and to render a ventilator capable of adjusting itself to meet the exigencies of changing winds, excluding rain or snow, while it, at the same time, offers no obstruction to the free passage outward of impure gases or heated air.

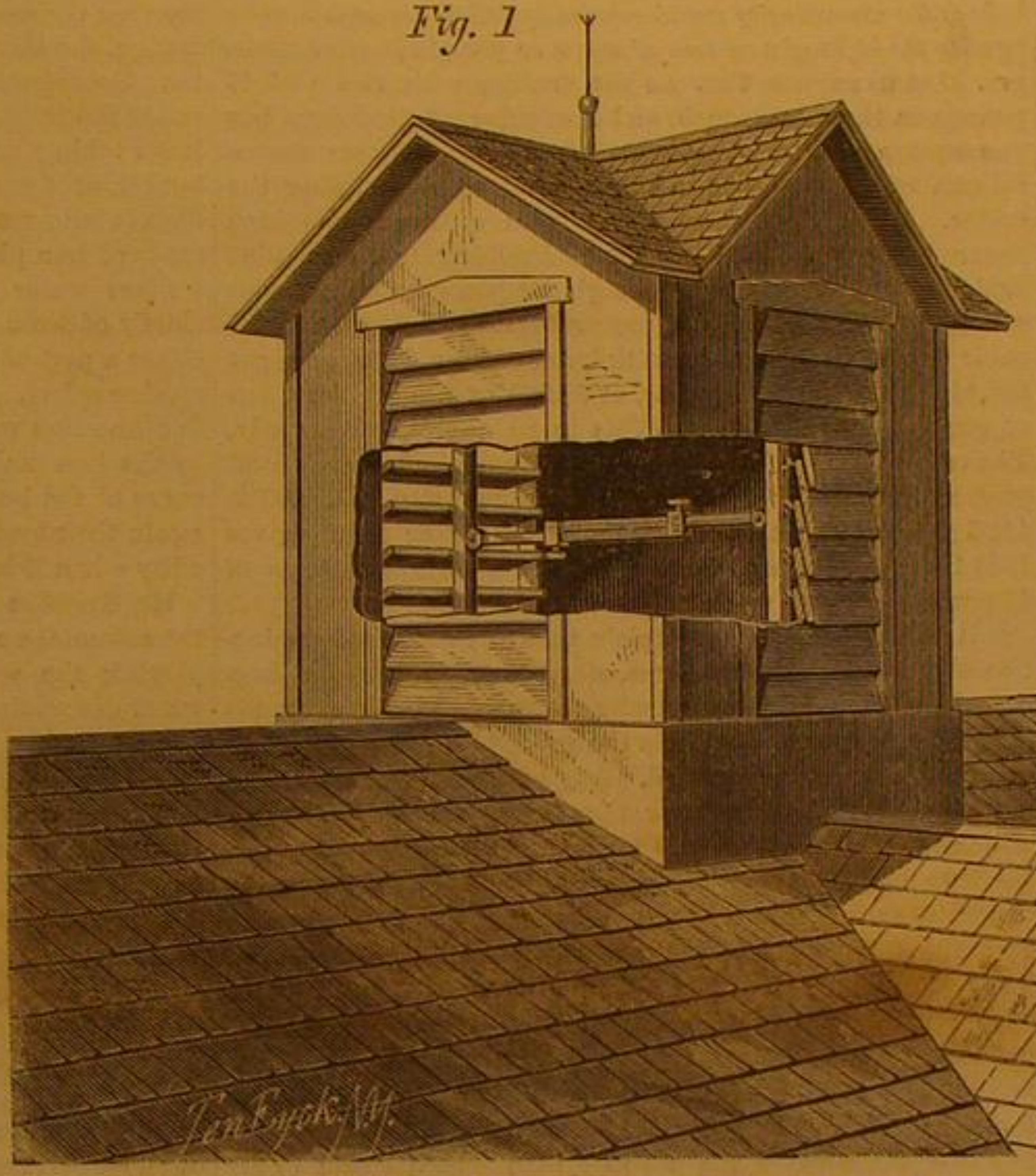
Fig. 1 represents this improvement as applied to the cupola of a brewery, malt house, or barn. A connection is established between the slats of the blinds placed on opposite sides of the cupola by means of bars, each having a collar and a set screw on its inner end, which slides on the other bar, so the length of the connection thus formed may be adjusted. When thus properly adjusted the set screws are turned so as to render the adjustment permanent.

The slats are so formed by placing their pivots above their central axis, that their overhang balances the weight of the rods, thus enabling a very slight pressure to turn them. The wind blowing against the slats on one side closes them and through the connecting rods forces open the ones on the opposite side. When the wind changes the reverse takes place.

Fig. 2 illustrates a simple means whereby the adjustment may be made and altered to suit circumstances, from the lower floor of a building, avoiding the necessity of climbing to the top of the building for that purpose.

A is a pulley having a screw thread cut through its axle, B, which extends far enough to have a square shouldered groove turned in it, in which groove plays the collar, C, attached to the inner end of the connecting rod, F. The screw thread in the interior of the axis, B, plays on a screw cut on the bar, D. Turning the pulley, A, either shortens or lengthens the connection between the opposite blinds so as to regulate the amount of ventilation. The turning is accomplished by an endless cord passing to the lower part of the building. This permits of a convenient and accurate adjustment at will.

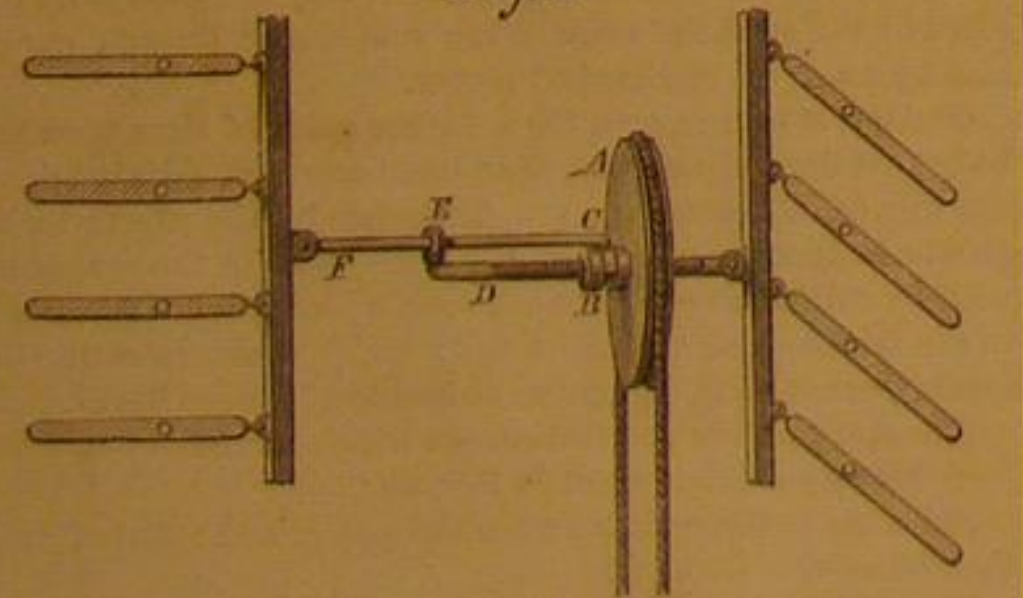
Fig. 1



MEAD'S AUTOMATIC VENTILATOR.

The want of such a ventilator has long been felt, and its numerous applications will be readily perceived. It can be made as ornamental as desired, and will take the place of the vaned hood for chimneys. The inventor states it will act much more rapidly and perfectly than the hood, on account of the trifling power needed to actuate it. It seems well-adapted to use in breweries, factories, hotels, churches, and

Fig. 2



especially in all large buildings having ventilating well-holes needing external protection from winds. The closing of the slats on the side toward the wind, and the opening of those opposite, will effectually prevent smoking in chimneys, sensitive to the effects of external winds on account of their position, and can be easily applied to those already built. It has been subjected to trial for nearly a year, and has, we are informed, proved entirely satisfactory in all respects.

This device was patented through the Scientific American Patent Agency, May 18, 1869. Agents are desired to sell farm and town rights. Apply to F. H. Hoyt, Darien Agency, Darien Depot, Connecticut.

The Use of Diamonds in the Mechanic Arts.

Many suppose that any substance so scarce that only small quantities can be found, will merely, on account of its scarcity, possess a high value. Such a supposition, however, is without foundation. To be valuable otherwise than as a cabinet specimen, any substance must possess some intrinsic worth, as beauty, indestructibility, or capability of being applied to some peculiar purpose where it is of great service. Were gold as uncomely as chalk, as easily broken and lost, and as disagreeable to handle, instead of being ductile, malleable, unoxidizable under ordinary circumstances, and beautiful, thus being capable of many important industrial applications, no degree of scarcity would have attained for it a value such as is now assigned to it.

The same is true of the diamond. Its scarcity does not alone render it valuable, although like all other useful materials, scarcity increases the price at which it would otherwise be sold. This is proved by the fact that those imperfectly crystallized forms of the diamond, called by some carbon diamoods, used for pointing drills, etc., are worth from five to six dollars a carat, in gold, an industrial value merely, as they cannot be used for ornament.

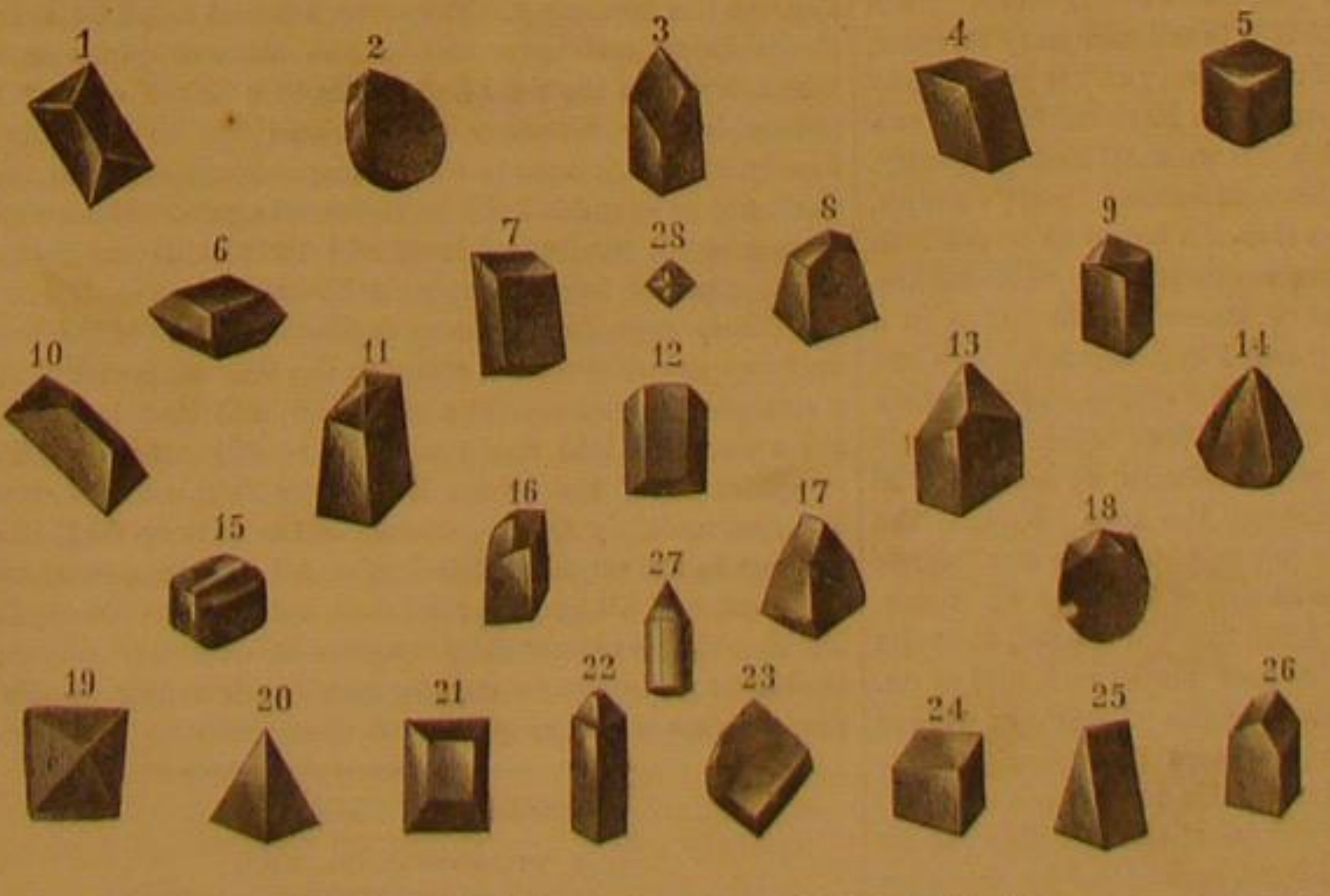
The increased use of these diamonds in the arts, of late years, and their successful applications in dressing mill stones, and drilling and working other hard substances, for which numerous patents have been granted in America and Europe, realizing to the patentees large fortunes, have created much curiosity and occasioned many inquiries from our readers as to the durability and efficacy of the diamond for mechanical purposes other than cutting glass. We have been induced to investigate and ascertain to what actual and prospective uses diamonds are or may be applied. To obtain such information we were referred to Mr. John Dickinson, whose house, if we are rightly informed, is the oldest of its kind, in existence, having been established by his ancestors in Europe in the last century, and since its foundation engaged in the manufacture of glaziers' diamonds, and cutting and working diamonds for all mechanical purposes. The number of these establishments is very limited, owing to the secrecy observed in conducting the business, the knowledge of which has been handed down from father to son as an heir loom. Mr. Dickinson is the grandson of Joshua Shaw, who was the inventor of the swivel diamond now so universally used, as also the percussion wafer cap and cannon lock, which have rendered signal service in the wars of this and other countries.

We found Mr. Dickinson not only willing to give such information as we desired, but also to practically demonstrate in our presence the numerous uses and purposes to which the diamond is and may be applied. The matter thus obtained will prove interesting to our readers.

Diamond or carbon (the latter name is preferred) stands the severest tests for mechanical purposes without apparent wear, especially where there is considerable friction, and where the hardest steel cutters would not hold their edge. Being used for grinding and shaping diamonds and other gems, it is proved to be the hardest known substance. The comparative recent discovery of this valuable mineral, in the same mines where the perfect crystallized diamonds are found, and its adoption for mechanical purposes, have attracted the attention of scientific men, as well as the most experienced judges, dealers, and workers in precious stones. From all the information we can obtain as to its conformation, it is identical in composition, yet, at the same time, much harder than the gem diamond. From its rapidly increased utilization and demand, where saving of material and time, and accurate work are desired, it promises eventually to rival the gem diamond in intrinsic value.

In view of what has been above stated of the irregularity of shapes in which it is found, the impossibility of obtaining them with sufficiently exact cutting edges, and the difficulty of setting them securely, their general use has been some what retarded. To obviate all this, Mr. Dickinson has made certain improvements in the preparation of diamond or mineral carbon stone dressers or cutters, some of which are illustrated as above, and are used to point, edge, or face tools for drilling, reaming, sawing, planing, turning, shaping, carving, engraving, and dressing flint, grind, Arkansas, and other stones, emery, corundum, tanite, or tripoli wheels, iridium, nickel, enamel, crystals, glass, porcelain, china, steel, hardened or otherwise, chilled iron, copper, or other metals.

The advantages of these carbon points or cutters, over the natural crystallized carbon or steel, are numerous, the most important of which being that as they are more durable and do not require sharpening, by their being artificially formed into wedge, angular, or other shapes, fewer of them are required; also they can be firmly and solidly adjusted in dovetailed seats or grooves in a holder or tool, with the greatest facility.



DICKINSON'S CARBON TOOL POINTS.

The engraving represents some of the various forms to which these diamonds are ground, and are referred to by number. Their uses may be enumerated as follows: No. 1 is a triangular prism-like cutter for turning or working stone, etc. No. 2 is a flat drill point for drilling stone, glass, or metal No. 3 is a burin for cutting or turning metal. No. 4 is a quadrangular prism for working stone, etc. No. 5 is a hexahedron to be inserted in the edge or face of a circular saw for cutting stone. No. 6 is a double-sided trapezoid, used in various positions for marking or turning stone, steel, or other substances. No. 7 is a chisel point or cutter for turning metàl, etc. No. 8 is a drill-faced parallelogram for pointing combination drills for drilling and reaming stone, metal, etc. No. 9 is a quadrangular prism with a planer cutting point for cutting or planing metal, etc. No. 10 is a truncated prism for working stone, etc. No. 11 is similar to No. 8, and used for the same purpose. No. 12 is a truncated prism used for facing or edging ring or cylinder drills and circular saws for cutting stone, metal, etc. No. 13 is a quadrangular double-faced drill point for drilling stone, etc. No. 14 is a quadrangular pyramid used for reaming stone or metal. No. 15 is similar to No. 5, and is used for the same purpose. No. 16 is a quadrangular cube with graver edge for cutting metal, etc. No. 17 is a flat octahedron for drilling stone, glass, etc. No. 18 is a flat ovoid; with double drill point, for drilling or countersinking stone, metal, etc. No. 19 is a tetrahedron, used the same as No. 18. No. 20 is a pyramidical drill point, used the same as Nos. 18 and 19. No. 21 is a truncated prism, used the same as Nos. 1 and 10. No. 22 is a drill-pointed prism reamer. No. 23 is similar to No. 22, and used the same. No. 24 the same as No. 7, with angular edges, and used for the same purpose. No. 25 is a double-inclined plane wedge for cutting stone or metal. No 26 is a quadrangular wedge for turning stone or metal. No. 27 is an acute conical-turned diamond point, used for engraving, etching steel by bank-note engravers, etc. No. 28 is a diamond in its natural crystallized state, as found in the mines. Crystallized carbon, of which the above points are made, is of a black or gray color, opaque and irregular in shape and devoid of angles. The above illustrated points or cutters range in size from one-sixteenth of a carat to ten carats each (a carat is equal to four grains). Their perfectness of finish depends upon the purpose and material to which they are to be applied. For metal they require to be sharper than for stone. The prices are fixed in accordance to their shape and finish. A patent for this important improvement in the preparation of diamond carbon was obtained by Mr. John Dickinson, 64 Nassau street, New York, June 1, 1869.

The superior accuracy of work done by the diamond point is owing to the fact that it does not wear away and become blunted like a steel tool. It therefore has come largely into use for fine steel engraving, engraving on stone, etc. We shall probably give, on a future occasion, an illustrated description of some of the various cutting machines and tools employing diamonds for the above purposes.

The operation of these tools was witnessed by us as we have already said, on a recent occasion, and the speed and certainty with which the hardest known substances can be drilled, turned, and cut by them, is really astonishing. A drill with a carbon point like that seen at No. 2 in the engraving was made to pass through a block of Arkansas stone in less time than the same thickness of cast iron could have been penetrated by a well-tempered steel drill. Vulcanized emery wheels, so hard that they could not be clipped with the cold chisel, were drilled and turned with seemingly still greater facility. But the most interesting experiment to us was the performance of the patent millstone-dressing machine, which, by means of a diamond point, enables a boy to work with his eyes shut and do more accurate work, and a much larger quantity of it, than can by any possibility be done in any other method ever before employed. A description of this machine, for which there is a large and growing demand, is deferred for the present.

The uses to which this form of carbon can be put, in the form of saws, drills, and other cutting tools are daily found to be more and more numerous, and though their first cost is greater, the large saving of labor they effect, renders them the cheapest tools which can be employed for such purposes.

ON THE FLOW OF ELASTIC FLUIDS THROUGH ORIFICES OR PIPES.

We condense from *The Engineer* the following on the above subject. It being one upon which we are very frequently asked to give information, it will be of interest to many of our readers:

"In order to determine the number of cubic feet of steam or air, or other gas, which will be discharged through a given orifice in a given time, it is necessary to ascertain the velocity of issue. In no other way can the problem be solved, except by experiments with vessels of known capacity, from one of which the air, steam, or gas, flows to the other. Such a solution is, for reasons on which it is not necessary to enter, practically beyond the reach of most men; and it has already been tried by many, with results which have enabled a general law to be laid down, to which law we shall come presently. If the velocity is known all the rest follows easily enough. Let us suppose the orifice in the side of a boiler to be one inch square. A cubic foot of steam contains 1,728 cubic inches. We may suppose this cubic foot of steam all contained in a column or bar 1,728 inches long and 1 inch square. Let one end of this bar be brought opposite the orifice and the work of expulsion begun; then it is obvious, that before the whole cubic foot of steam is discharged, a column of steam 1,728 inches long must be passed through the hole. Now, if the velocity of efflux is 1,728 inches per minute, then one minute of time will be required for the escape of one foot of steam. If it have a velocity of efflux of 1,728 feet per second, then the orifice will discharge one cubic foot per second, and so on. And this law is totally independent of the pressure or weight of the steam. As the pressure increases the *velocity* of discharge will increase in a certain ratio to be presently explained; but the pressure will not affect the fact that the *velocity of discharge in inches per second*, multiplied by the area of the orifice in square inches, and divided by 1,728, will give the discharge in cubic feet per second.

"When a discharge of water, steam, gas, or other liquid or fluid takes place through an orifice in a thin plate, a certain contraction takes place in the issuing column which reduces the amount of discharge below that proper to the actual area of the orifice, but it is needless to do more than mention the fact here. It is quite unnecessary to complicate a statement which we wish to make as simple as possible, by further reference to the *Vena Contracta*.

"We have said that the velocity is regulated by the pressure, but this fact only holds good for each particular fluid. Speaking comprehensively, the velocity of discharge depends on the density as well as the pressure of the fluid; the lighter the fluid the greater will be the discharge. Thus, hydrogen will issue more rapidly under a given pressure through a given orifice, than will atmospheric air under the same conditions of pressure and orifice. If our readers have followed us thus far, they will be able to comprehend the nature of the law determining the velocity of discharge under given conditions of orifice and pressure. But before giving this law it may be as well to explain that any body falling freely under the influence of gravity has a progressively accelerated rate; the velocity being in England, and similar latitudes, such that 16 feet 1 inch will be traversed the first second, 48 feet 3 inches in the next second, 80 feet 5 inches in the third second, and so on. The velocity of a falling body at any distance from the point where it started, may be found by multiplying the square root of the hight passed through in feet by $8\frac{1}{24}$, the product being the velocity in feet per second. Thus, a bullet has been suffered to drop from the top of a tower 100 feet high; what is its velocity at the moment of touching the ground? The square root of 100 is 10, and 10 multiplied by $8\frac{1}{24}$, gives 80·042 feet as the velocity. Our non-mathematical readers will now be in a position to understand the law regulating the velocity of efflux of elastic fluids, such as steam, under pressure, which may be thus stated: *Elastic fluids flow into a vacuum with a velocity the same as that which a body of the same density would acquire in falling through a space equal to the hight of a column of steam or gas of the given pressure.* Let us suppose that we are dealing with steam of 45 pounds on the square inch, and the orifice of discharge has one square inch of area. Let us further suppose that a column of steam stands on a valve temporarily closing the orifice. What hight must the column of steam one inch square be to weigh 45 pounds? Avoiding fractions, nine cubic feet of such steam will weigh one pound; therefore, our column of steam one inch square must contain 9×45, or 405 cubic feet of steam; and multiplying 405 by 1,728, we get 699,840 as the hight in inches, or 58,320 as the hight in feet of our column of steam. (This is an approximation only. The true volume of one pound of steam at 45 pounds total pressure is 9·000216 cubic feet.) The square root of 58,320 is 241·5 nearly, and this multiplied by $8\frac{1}{24}$, or 8·042, gives 1942·14 feet per minute as the velocity with which steam of 45 pounds pressure would issue into a vacuum.

"It is here necessary to explain that to avoid the introduction of a multiplicity of figures, we have omitted several fractions, and, therefore, the velocity we have given above is too low, but this in no way affects the principle of the arithmetical process we have described. Any of our readers mastering it will be able to calculate for themselves the velocity with which elastic fluids flow into a vacuum. The calculation, as we have worked it out, is, however, laborious, and for the benefit of such of our readers as understand logarithms, we give the following comprehensive rule for finding the velocity of discharge: Add 4·29 to the pressure in pounds per square inch; deduct the logarithm of this sum from the logarithm of the pressure; to one half the remainder add 3·3254, and the natural number of this sum will be the velocity in feet per second. The difference between the velocities due to any two pressures is the velocity with which steam or air will flow into the lower pressure. Thus, if the pressure in a cylinder is 20 pounds, while that in the condenser is 5 pounds, at what rate will the steam flow from the former to the latter? The velocity proper to steam of 5 pound pressure, calculated by the last rule, is 1,552 feet per second, while that proper to 20 pounds is 1,919, and 1,919 — 1,552 gives 367 feet per second as the velocity of the exhaust.

"In the earlier portion of this article we stated that the actual area of the column of discharge was less than that of the orifice through which it flowed, and it is now time to say that this fact materially modifies the results of such calculations as the foregoing. Moreover, account must be taken of the frictional resistance due to the sides of pipes or tubes through which the fluid flows. On this latter subject there is considerable diversity of opinion; the subject has been keenly discussed once in our correspondence columns, and we shall not be surprised if it be discussed again. Meanwhile we cannot better conclude this article than with the following rule, extracted from 'Bourne's Treatise on the Steam Engine,' and regarded by many engineers as one of the best yet made on the subject. It refers to the flow of steam through a straight pipe of uniform diameter, and its relation to the rules we have laid down will be readily traced: 'To the temperature of the steam in degrees Fah., add the constant 459, and multiply the square root of the sum by 60·2143; the product is the required velocity.' All enlargements and contractions, and all bends or elbows, will reduce the velocity, but there is no trustworthy formula in existence which will enable us to determine exactly how much in any of the particular cases which may suggest themselves to our readers."

OVERSHOT WHEELS.

BY JOSEPH GLYNN, F.R.S.

It is not difficult to imagine that if a small stream of water descending from a hill side were directed into the mouths of the earthern vessels or wooden buckets of wheels used for irrigation, the vessels so loaded would descend and the wheels revolve, so that rotary motion and mechanical power would be gained; the buckets emptying themselves at the lowest point, as they were before emptied at the highest; the wheel turning in the opposite direction, because the weight or gravity of the water was now the moving power of this overshot wheel.

In the undershot wheel the impulse of the water striking the floats drives the wheels; in the overshot wheel the weight of the water flowing into the buckets turns the wheel, and all impulse must be avoided; the water must flow with the same velocity as the wheel, or just so much in excess as will prevent the buckets from striking the water as they present themselves to be filled. Experience soon showed that the earthern jar or the suspended bucket were cumbrous and inconvenient, and as larger and more powerful wheels were applied to more copious streams, a series of simple wooden troughs formed across the face of the wheel were found to answer the purpose better. When the supply of water was ample and the wheels large, it was found that to fill these troughs well and regularly the stream should be made nearly as broad as the wheel, and shallow in proportion to its width. The wheel was then formed by placing two sets of arms, at a sufficient distance apart, upon the axle, and fixing to their ends segments of wood to form the circle; upon these segments across the face of the wheel, and equal to, or somewhat exceeding in length the width of the stream or sheet of water, were nailed the sole-boards; on the end of these boards, and at right angles to them, so as to form a projecting rim or ledge on each side of the wheel's face, was fixed the shrouding, formed of stout plank generally from 12 to 18 inches broad; and between these shroudings, across the face of the wheel, were placed the buckets, made of lighter planking, and having their ends let into the shrouding, by which the ends were closed. The edge of the bucket board meeting the sole plank formed two sides of a triangular trough, the third being open to receive the discharge of water. Subsequently the bucket was made in two boards, one called the front, and the other the bottom of the bucket, the latter taking off the angle and making the section of the bucket, or form of the trough, that of a trapezium, which form it long retained, until the buckets of water wheels were made of iron plate.

Since water wheels have been made wholly of iron, and chiefly of wrought iron, the form of the bucket has been either a part of a circle, a cycloid, an epicycloid, or an Archimedian spiral. These forms are noticed in a subsequent page in connection with breast wheels. Great pains are now taken by the best makers of water wheels to form and adapt the curve of the buckets so that they may readily fill with water, retain their load as long as possible, and discharge it with facility when it has ceased to be useful.

Mr. Smeaton had the merit of proving and demonstrating the advantage and the difference of effect resulting from employing the weight instead of the impulse of a volume of water descending from a given hight.

In reasoning without experiment, one might be led to imagine that, however different the mode of application is, yet that wherever the same quantity of water descends through the same perpendicular space the natural effective power would be equal; supposing the machinery free from friction, equally calculated to receive the full effect of the power, and to make the most of it: for if we suppose the hight of a column of water to be 30 inches and resting upon a base or aperture of 1 inch square, every cubic inch of water that departs therefrom will acquire the same velocity or momentum, from the uniform pressure of 30 inches above it, that 1 cubic inch let fall from the top will acquire in falling down to the level of the aperture; one would therefore suppose that a cubic inch of water let fall through a space of 30 inches, and then impinging upon another body, would be capable of producing an equal effect by collision, as if the same cubic inch had descended through the same space with a slower motion, and produced its effects gradually; for in both cases gravity acts upon an equal quantity of matter, through an equal space; and, consequently, that whatever was the ratio, between power and effect in undershot wheels, the same would obtain in overshot, and indeed in all others; yet, however conclusive this reasoning may seem, it appears upon trial, that the effect of the gravity of descending bodies is very different from the effect of the stroke of such as are non-elastic, though generated by an equal mechanical power.

Gravity, it is true, acts for a longer space of time upon the body that descends slowly, than upon one that falls quickly: but this cannot occasion the difference in the effect; for an elastic body falling through the same space in the same time will, by collision upon another elastic body, rebound nearly to the hight from which it fell: or, by communicating its motion, cause an equal one to ascend to the same hight.

The observations and deductions which Mr. Smeaton made from his experiments were as follows:

First. As to the ratio between the power and effect of overshot wheels.

The effective power of water must be reckoned upon the whole descent; because it must be raised to that hight, in order to be in a condition for producing the same effect a second time.

The ratio between the powers so estimated, and the effect at the maximun as deduced from the several sets of experiments, is shown to range from 10 to 7·6 to that of 10 to 5·2; that is nearly from 4 to 3, and from 4 to 2. In these experiments, where the heads of water and quantities expended are least, the proportion is nearly as 4 to 3; but where the heads and quantities are greatest, it approaches nearer to that of 4 to 2, and by a medium of the whole the ratio is that of 3 to 2 nearly. We have seen before, in our observations upon the effects of undershot wheels, that the general ratio of the power to the effect when greatest was 3 to 1; the effect, therefore, of overshot wheels, under the same circumstances of quantity and fall, is, at a medium, double to that of the undershot.

Second. As to the proper hight of the wheel in proportion to the whole descent.

It has been observed that the effect of the same quantity of water descending through the same space is double, when acting by its gravity upon an overshot wheel, to what the same produces when acting by its impulse upon an undershot. Therefore the whole hight at the fall should be made available, because, when the water is laid upon the top of the wheel, it is upon the gravity, and not the impulse, that the effect depends. A sufficient fall, however, must be given to lay on the water with a velocity somewhat greater than that of the circumference of the wheel, otherwise the wheel will not only be retarded by the buckets striking the water, but a part of it will be dashed over and lost, while the buckets will not be so well filled: but no greater velocity should be given than is sufficient to accomplish these objects, as it would be power wasted.

Third. As to the best velocity of the wheel's circumference in order to produce the greatest effect.

If a heavy body fall fairly from the top to the bottom of the descent, it will take a certain time in falling, but during the fall no mechanical effect is produced; for in this case the whole action of gravity is spent in giving the body a certain velocity; but if this body in falling be made to act upon something else, so as to produce a mechanical effect, the falling body will be retarded, because a part of the action of gravity is then spent in producing the effect, and the remainder only in giving motion to the falling body; and therefore the slower a body descends, the greater will be the action of gravity applicable to produce a mechanical effect.

If an overshot wheel had no friction, or other resistance, the greatest velocity it could attain would be half a revolution in the same time that a heavy body laid upon the top of it would take to fall through its diameter, but no mechanical effect could be derived from the wheel.

It is an advantage in practice that the velocity of the wheel should not be diminished further than what will procure some adequate benefit in point of power, because, as the motion becomes slower, the buckets must be made larger, and the wheel being loaded with water, the stress upon every part of the work will be increased in proportion.

Mr. Smeaton's experiments showed that the best effect was obtained when the velocity of the wheel's circumference was a little more than 3 feet in a second; and hence, it became a general rule to make the speed of the overshot water-wheels at their circumference 3½ feet per second, or 210 feet per minute.

Experience showed this velocity to be applicable to the highest water wheels as well as the lowest, and if all other parts of the work be properly adapted thereto, it will produce very nearly the greatest effect possible; but it has also been practically shown that the velocity of high wheels may be increased beyond this rate without appreciable loss, as the hight of the fall and the diameter of the wheel increase, and that a wheel of 24 feet high may move at the rate of 6 feet per second without any considerable loss of power.

The author has constructed several overshot water wheels of iron 30 feet diameter and upward; and for these he has adopted a speed of six feet per second with great advantage.

Portland Cement and Tar for Roofing.

Reid's Treatise on Portland Cement contains the following directions for making roofs of that material in combination with tar.

1st. The inclination of the framework of the roof (which must have an even surface) should be at the rate of from one half to three quarters of an inch per foot. The rafters or joists should not be more than 2 ft. 3 in. apart, so as to give sufficient strength. As the rafters rest on the side walls, a comparatively small quantity of timber is required. Boards of an inch or an inch and a quarter thick, are fastened or nailed on the rafters, and should be dovetailed. These are then covered with a layer of sand a quarter or half an inch thick, in order to produce an even surface.

2d. Strong brown paper, in continuous rolls, and as broad as possible, is then laid upon it, so that each length overlaps the other by about four inches. When the whole, or a large part h s thus been covered with paper, the mixture is put into a cauldron, in the proportion of a hundred pounds of tar to one hundred and eighty pounds of Portland cement. Care must be taken to heat the tar gently, and to mix the cement with it gradually, in order to prevent its boiling over. This mixture of tar and cement (wood cement) must then be laid as hot as possible on the paper with a tar brush. The next layer of paper is then laid upon it, and smoothed with a light wooden roller. In this way the whole roof must be covered. In order to break the joints of the paper, begin the second layer with half the breadth, and proceed as before. The third and fourth layers are,in like manner,laid with alternate layers of wood cement and brown paper.

The last layer must be carefully covered with the cement, and then strewed with sifted ashes to the thickness of a quarter of an inch. Next to the gutter is a board, covered with zinc and projecting about two inches. It should be laid on after the second layer has been completed, so as to be covered by the third and fourth. If there are any chimneys projecting through the roof,they should be surrounded with zinc immediately after the first layer has been finished, and before the gravel is strewn upon it. This zinc should rise six inches up the sides of the chimneys and three inches upon the roof; the upper edges should be bent, so as to be let into the joints of the brickwork, where they should be carefully fixed with cement. By this means any water that may run down the outside of the chimneys is diverted to the roof.

3d. The whole is then finished with a coating of sifted gravel containing about one third of dry loam, truly leveled with rakes and scrapers.

This work should not be attempted in rainy or frosty weather.

The workmen should wear very light boots, or, better still, none at all, and should always stand on thin boards when working at the roof.

The advantages of this system of roofing are:

1. A smaller quantity of wood is used.
2. The roof, being flat, gives more room in the upper floors of the house.
3. It is more convenient for constructing garrets.
4. Protection from external fire, and affords easy access to firemen.
5. If properly constructed, these roofs never require repair.

Several roofs, at Hirschberg, in the Reisengebirge, constructed on this principle, are now twenty-two years old, and have never been repaired.

Economy in Iron Manufacture.

It is the determination, says the London *Mining Journal*, of the people who have the management of the iron mills in Russia, to do their work upon the most approved plans. For instance, possessed already of steam hammers, of considerable power, they are, nevertheless, having these supplemented by others of a force equal to any to be found in the most modern department of any British iron works. The tools which they are now using have been sent out from this country,and those which they will soon receive will,also, go from the same firm. A member of it has only just returned from making the requisite arrangement in the Muscovite empire.

Illustrative of the circumstance, that at the iron works in Russia, the managers are keeping themselves abreast of all the latest improvements in this country,is the fact that at the same time that they are increasing their individual hammer power, ironmasters in Great Britain,who are occupied in chief part in the manipulating of rails, are simultaneously extending their operations in a like direction.

Much economy results from care in this respect. Rails of large proportions and of higher quality than have hitherto been common, are demanded by foreign customers. In the producing of these, at a moderate outlay, much saving is effected by the rapidity with which forceful concussion can be brought to bear upon the metal in its early stages of manipulation. Ironmasters, who, in this country, have long held a distinguished position in the rail trade, are determined that they will not allow themselves to be distanced in the competitive race by modern firms, either here or abroad. They are, therefore, giving instructions for hammers of a caliber which would, only a few years ago, have been thought altogether out of proportion to the work required, but which are now acknowledged to be requisite to be laid down. And the firms who are doing this have, at the same time, intimated that they will not hesitate to make further advances as need may require.

Cause for gratification is found in the circumstance, that in the iron works of this country, the steam hammer, in its varied shapes, is supplanting, in not a few instances, the old helve. There is one extensive iron works in this country in which there is not now, I think, a helve to be found. The notion which iron-works managers of the old school clung to for a long time, is being exploded. It is now admitted by men who know most upon the subject, that better work can be done with the steam hammer than with the helve, even where much dross has yet to be beaten out of the iron. Then the immensely greater advantage which accrues from the use of the steam tool, when the blow has to be modulated, gives it a place which cannot be occupied by the helve. Most of the firms who produce these hammers are doing more in that branch of their trade than has marked their operations for some time past.

The New Zirconia Light.

Three or four months ago, says the *Mechanic's Magazine* the news spread in England, through the medium of the scientific newspapers, that a discovery had been made in France, which would have the effect of abolishing the lime light by substituting zirconia for the lime cylinder. The advantages were stated to be that zirconia is not eaten away by the oxyhydrogen flame, and that when not in use, it does not absorb moisture and crumble to pieces like lime; also, that in consequence of this stability, the ordinary clockwork of oxyhydrogen lamps to turn the lime cylinder would be unnecessary with zirconia. It was further said, that the zirconia gave more light than lime under the same oxyhydrogen flame. Considerable interest in the new invention was, consequently, raised in this country, among the many who use the lime light, but weeks passed away without anybody being able to procure the zirconia cylinders in London. One night, however, at a *soiree* at King's College, the zirconia light was exhibited burning with great steadiness and brilliancy, in the presence of Professor W. Allen Miller, F,R.S., and many others, but no accurate tests were made, and both then and afterwards, the zirconia cylinders were as unprocurable in London as ever. Three weeks since, however, one of the first zirconia lamps procurable for examination in this country reached London, and was sent by Mr. R. J. Fowler, the Parisian correspondent of the "British Journal of Photography," to Mr. John Traill Taylor, the editor of that journal, with the request that he and Mr. W. H. Harrison would test its working qualities. The lamp was the property of Messrs. Harvey, Reynolds, and Co., Leeds. Accordingly, some experiments with the lamp were tried at the workshops of Messrs. Darker Brothers, philosophical instrument manufacturers, at Lambeth.

At present, the French company refuses to sell the zirconia cylinders without their lamp be also purchased. According to the "Engineer," this lamp made for special use with the zirconia, gives a vertical flame, and the piece of zirconia is held in it by a little brass support. The piece of zirconia was excessively small—about as big as a pea—and here at once was a source of great loss of light, because the flame was competent to raise to whiteness several times the area presented to its action. On this account alone, the total amount of light was very much less than the same flame gave with a lime cylinder, so as to put competition between the two out of the question, unless the zirconia surface be very greatly increased in size. The experimentalists then cut down a piece of lime till it equaled the zirconia in size, and the lime and zirconia were exposed in turn to the flame, the result being that the zirconia was found to emit a less white and brilliant light than the lime under the same conditions, nor did variations in distance from the nozzle of the jet alter this result. Next, many variations in the pressure of the gases were tried, but the result was not altered. Then, substituting an English "blow through" jet for the blow-pipe sold by the French company, the same inferiority of the light from the zirconia was perceptible, nor did variations of pressure affect the result. Lastly, a good orthodox oxyhydrogen blow-pipe was tried, wherein the two gases mix thoroughly some little distance behind the nozzle, and again the results were the same. These conclusions do not in any way affect the question of the permanency of zirconia under the fierce heat of the oxyhydrogen flame; but such permanency, if purchased at the expense of inferior light, is too dearly bought, and will condemn the invention. Unless the inventors are acquainted with some peculiarities of zirconia unknown to those who are versed in the use of the lime light, and can by an unknown method bring out a light from the zirconia equal to that given by lime, the zirconia light, from an economical point of view, is a failure.

A few other experiments were tried, showing that soft lime and hard lime have to be placed at different distances from the blow-pipe nozzle to get the maximum amount of light from each. Chemical composition even more than hardness varies the amount of whiteness of the light. Magnesia cylinders were found to take a longer time to heat to whiteness and a longer time to cool than either lime or zirconia. Quartz rapidly vitrified under the flame, and asbestos could not resist the intense heat. It requires time and repeated heatings and coolings to test the permanency of zirconia under the oxyhydrogen flame to ascertain whether it does away with the necessity for clockwork apparatus. The piece used looked at the close of the experiments none the worse for the operations it had undergone, and a native zircon crystal, which, on previous occasions, Messrs. Darker had occasionally ignited under the oxyhydrogen blow-pipe, is now as hard as ever, having shown no tendency to crumble or soften like lime beneath atmospheric influences. The heat had produced in it traces of vitrification, which could be seen only by the aid of a lens.

Photographs with a White Surface.

Put into a small mortar a teaspoonful of kaolin, add thereto about a quarter of an ounce of sensitive collodio-chloride, and stir well with the pestle until it becomes a smooth paste. Add to this three fourths of an ounce more of the collodion, and again stir, and pour the whole into a bottle with one or two drops of castor oil. Shake well, and place it aside until the coarse particles have subsided.

Edge a piece of talc or glass for about a quarter of an inch all round with dilute albumen, afterwards coat with the kaolin collodion, and dry by gentle heat, when the talc or glass, if placed upon a piece of white paper, will have the appearance of alabaster.

If the film splits, it should have a trifle more castor oil in the collodion; but the best remedy is to choose a more powdery collodion.

If the film is upon glass, the progress of printing may be examined from the back; but if talc be the medium used, it may be turned back in the same manner as when printing upon paper.

Tone, fix, and wash in the same manner as with an ordinary collodio chloride print upon opal glass, and mount in a frame or case, to protect the picture from being scratched. It must not be varnished.

After three years' trial the film has been found not to crack or leave the talc or glass after the picture has been once finished.

Many pretty effects may be produced by putting different colored papers behind vignettes produced in this way, as whatever color is placed behind the picture gives a delicate tinge of that color to the picture.

Talc may be obtained in sheets as large as ten by eight inches.—*Charles Durand in the Photographic News.*

Collodion Varnish for Photo Prints.

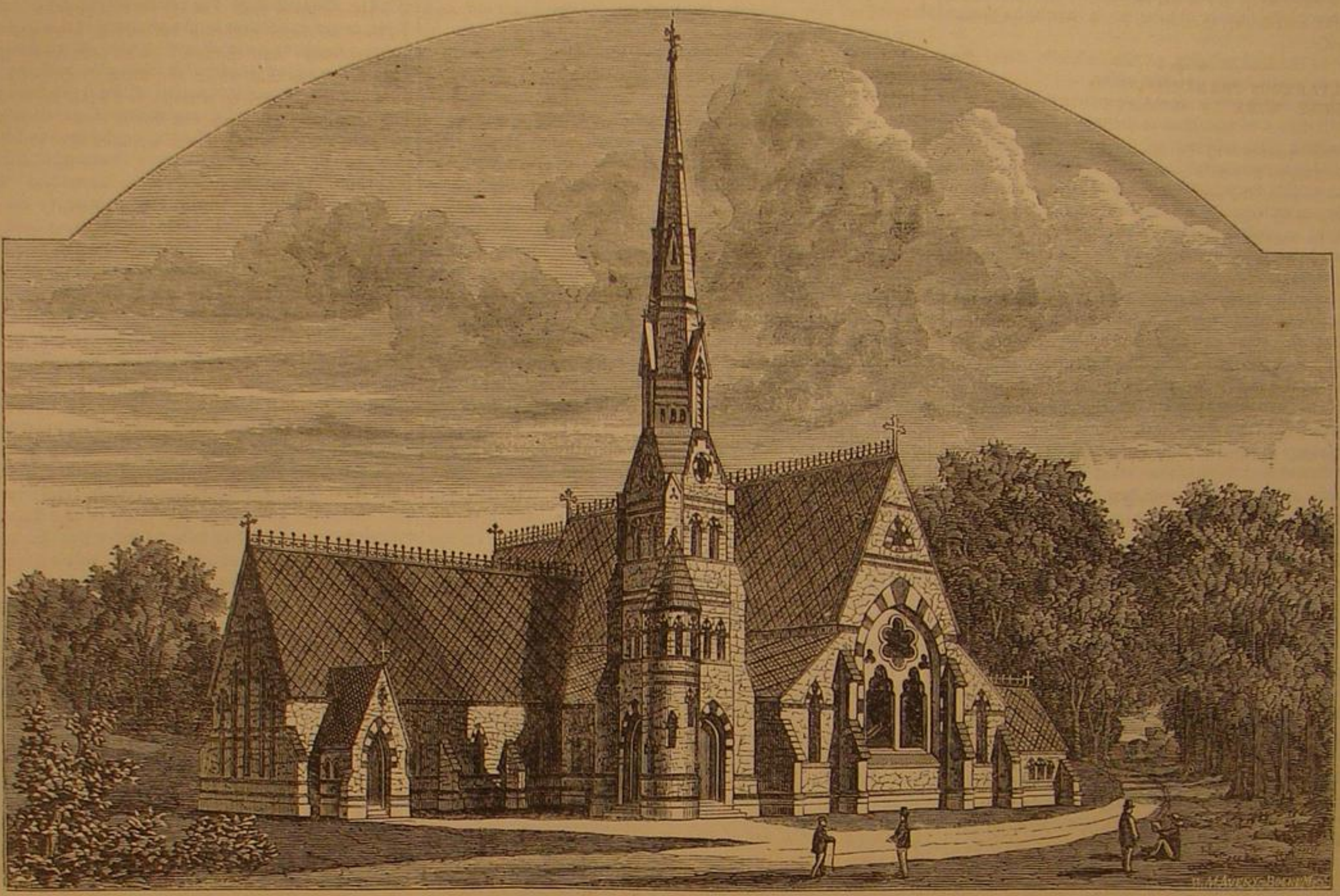
A very effective and agreeable polish is communicated to card or cabinet prints, etc., simply by coating them with a glutinous plain collodion. This polish is not so flagrant on the one hand as the so-called enamel surface, nor so dead as an ordinary albumen print that has undergone all the operations up to the mounting. I think I am justified in recommending the operation. Prepare the collodion as follows:

PLAIN COLLODION.—Alcohol 8 ounces, ether 4 ounces, pyroxyline, 42 grains. Dissolve and filter in the usual manner.

The prints are first cut out to the proper size and floated on the reverse side upon clean water until they lie perfectly flat; then take one print at a time and place it on a piece of glass of the same size as itself, moist side downwards; it easily adheres to the glass. Let the excess of water drain off and remove all moisture from the picture surface; now coat it with the collodion and let it drain in the usual way, then dry it before the fire or in any manner which is most convenient. The operation is quick; and, it seems to me, the gloss is just about right.—*Professor John Towler, M.D., in the Philadelphia Photographer.*

"CHURCH OF THE GOOD SHEPHERD," ARMSMEAR, CONN. A BEAUTIFUL MONUMENT.

The engraving of the beautiful church we this week reproduce is from the excellent and elegant monthly, the *Architectural Review and American Builders' Journal*, and for which we are indebted to the courtesy of its publishers, Messrs. Claxton Remsen & Haffelfinger, 819 and 821 Market Street, Philadelphia. It was erected by the widow of the late Col. Samuel Colt, at Armsmear, near Hartford, Connecticut, in memory of her deceased husband and children, as a church for the use of armorers and their families, and others employed on the estate. It is a



THE CHURCH OF THE GOOD SHEPHERD, ARMSMEAR, NEAR HARTFORD, CONN.

Gothic Church designed by Mr. Edward T. Potter, architect, and embraces a nave and aisles; chancel, with arrangements for a choral service; Sunday-school, opening out of the church as a transept; baptistry; organ-room and vestry; and a tower and spire.

The walls are of Portland brown stone, relieved with dressings of Ohio stone. Around the semicircular apse of the sacrarium, which terminates the chancel, is carried an arcade of thirteen lancet windows filled with stained-glass, bearing figures of our Lord and the Twelve Apostles, after the design of Overbeck. The arcade is decorated, externally with alternate polished shafts of red and black granite, standing free, whose capitals are carved with olive foliage and the appropriate apostolic symbols.

The church has an open-timbered roof, of polished chestnut, novel, but beautiful in design, illuminated with gold and vermilion.

Rich borders with texts and other decorations in color, are introduced in the interior. The baptistry and organ room, on either side of the chancel open into it and into the church by arches. Those in the chancel are carried on polished red columns, with white marble capitals, carved with water lilies.

The design of the font—suggested by Mrs. Colt, and being carried out by Mr. Moffitt, sculptor—consists of three children supporting a shell, executed in white marble; and is intended as a memorial.

At the west end of the church is a large memorial window, of elaborate design and beautiful coloring, which—as well as the other windows (all of which are filled with stained glass)—is by Mr. Sharp.

A screen divides the Sunday-school from the church. It is made of chestnut wood, like the wainscoting, pews, and furniture of the church, some of which is richly carved. The screen is filled with plate glass, and can be opened or closed at pleasure, uniting or separating the church and Sunday-school. Similar but smaller screens are introduced in the arches of the organ room and baptistry.

Among the carvings which adorn the exterior, perhaps the most interesting are those of the south porch, the armorers' porch as it is called. Under the symbol of the cross, and half concealed in foliage, are representations of the different parts of all the fabrics in making which the workmen's days are spent. Around the entrance arch is carved this text: "Whatsoever ye do, do all to the glory of God;" words which are, for those who placed them there, or those who read, at once an admonition and prayer.

How much better such a monument than the costly piles often erected over the tombs of the once wealthy dead, whose only use is to point out the spot where lies a little human dust. The latter speaks only of death. The former speaks of a better and enduring life beyond the grave.

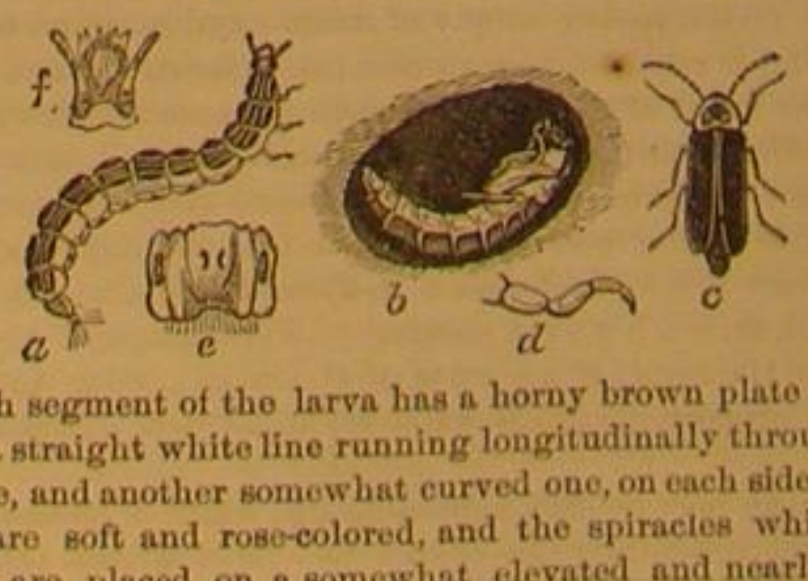
Iron and Steel Crystals.

Mr. Schott, of Ilsenberg, Saxony, says the *Railway Times*, has made many microscopical examinations of the structure of steel and iron. He maintains that "all crystals of iron are of the form of a double pyramid, the axis of which is variable, as compared with the size of the base. The crystals of the coarser kinds, as compared with those of the finest qualities of crystalline iron, are of about twice the hight. The more uniform the grain, the smaller the crystals, and the flatter the pyramids which form each single element, the better is the quality, the greater is the cohesive force, and the finer the surface of the iron. These pyramids become flatter as the proportion of carbon contained in the steel decreases. Consequently, in cast iron and in the crudest kinds of hard steel the crystals approach more the cubical form, from which the octahedron proper is derived, and the opposite extreme or wrought iron has its pyramids flattened down to parallel surfaces or leaves which in their arrangement produce what is called the fiber of the iron. The highest quality of steel has all its crystals in parallel positions, each crystal filling the interstices formed by the angular sides of its neighbors. The crystals stand with their axes in the direction of the pressure or percussive force exerted upon them in working, and consequently the fracture shows the sides or sharp corners of the parallel crystals. In reality good steel shows, when examined under the microscope, large groups of fine crystals like the points of needles—all arranged in the same direction and parallel."

The Fire-Fly.

This insect is not strictly speaking a fly, but a true beetle, belonging to the order *Coleoptera* and the family *Lampyridæ*.

Everyone is familiar with the appearance of these beetles, as their soft glow which is ever and anon vanishing and reappearing, illumines the pleasant evenings of July and August. At *a* is represented the larva as it appears when full grown. It lives in the ground, where it feeds on other soft bodied insects. At times these fire-fly larvæ must subsist almost entirely on young earth-worms, for we have found them abundantly in soil, on which no vegetation had grown for at least one year, and where in consequence there was scarcely another animal to be found besides these two—the fire-fly larva feeding upon the earth-worm, and the latter subsisting on the earth itself.



Each segment of the larva has a horny brown plate above, with a straight white line running longitudinally through the middle, and another somewhat curved one, on each side. The sides are soft and rose-colored, and the spiracles which are white, are placed on a somewhat elevated and nearly oval dark brown patch. On the under side it is of a cream color, with two brown spots in the center of each segment as shown enlarged at *e*. The head (magnified at *f*) is thoroughly retractile within the first segment, which is semicircular, and gradually narrowed in front. But the most characteristic feature is a retractile proleg, *d* (or *houppe nerveuse*, as the French have more graphically called it) at the extremity of the body, which not only assists in its locomotion, but serves to cleanse the head and fore part of the body from any impurities that may adhere to them after it has finished a meal. It is quite amusing to watch one, as it deftly curles its body and stretches this *houppe* fan-like over its head, and literally washes itself.

When full grown, or during the latter part of June, it forms an oval cavity in the earth, throws off its larval skin, and becomes a pupa as represented at *b*. In this stage it is white, with a tinge of crimson along the back and at the sides, and after a rest of about ten days, it throws off its skin once more and becomes a beetle like *c*.

The light which is of a phosphorescent nature, is emitted from the tip of the underside of the abdomen, two of the segments being of a sulphur-yellow color, in contrast with the rest, which are dark brown. The light is emitted both by the larva and pupa, though not so strongly as in the perfect insect.

There are other species belonging to this family which inhabit North America, and which emit a light, and these are doubtless popularly known as fire-flies in their several districts. In some of them the females are almost or quite wingless, with but very short wing cases, but in this species both sexes are winged, and have full-sized wing cases.—*Entomologist.*

Pasteboard and Asphalte Roofing.

The *Building News* contains an account of an application of pasteboard in connection with asphalte as roofing material, recently tried in Copenhagen. It says this material satisfies all the requirements of a substantial roofing, resisting effectually the influence of water, fire, heat, and cold. The article is cheap, and its use considerably lessens the cost of timber work; a roof covered with it having at the utmost only one third the weight of a tiled roof. It stands high with regard to safety from fire, the result of several public trials being that the Danish Insurance Companies, as well as the English and German Companies, represented in Copenhagen, consent to insure goods stored in buildings roofed with the asphalte pasteboard at the premiums fixed for buildings with fire-proof roofing. Prize medals have been awarded to the manufacturers at Stockholm, Odense, and the Havre Maritime Exhibition of 1868. The price of the material is low, 6s. 6d. per roll containing 7½ yards, while the asphalte mastic with which the roof has to be coated when completed, is sold at 9s. 9d. per cwt., one hundred weight covering a surface of 65 square yards.

The roofing material is most suitable for flat roofs, having a fall of one inch and a half to four and a half inches per running foot; it may, however, also be used for roofs having a greater fall, the expense being in this case somewhat larger than by flat roofs, the laying on being more difficult.

The roof has to be first covered with dry boards three-quarters of an inch to one inch thick, and rather not above six inches broad; but if the boards are more than six inches broad, or if not sufficiently dry, they ought to be split once before being laid on, in order to keep them from warping, as also every board should be fastened with three nails at least on each of the rafters. The boards do not require to be rabbeted; only that end of the boards which, forming the eaves, extends beyond the wall, ought to be joined in the said manner. In case of boards three quarters of an inch thick being applied, the rafters should not be more than two feet from each other, as the boards else may be too elastic and not strong enough to support the weight of the workmen during the roofing, while the roof will not be perfectly substantial.

The roofing may be done either from gable to gable, or from the eaves to the foot ridge, the first roll being laid with a bend of one inch beyond the roof and fastened with the flat-headed iron wire nails supplied for that purpose. The second roll is laid one inch or one inch and a half over the first, and so on till the roof is covered. The joints and heads of the nails are then coated with the asphalt-mastic, and the seams thus coated are strewed with dry sand. The whole roof is then coated with the mastic and strewed with sand. This coating, which is only to be effected in dry weather, renders the roof perfectly water-tight, and it can then, if it be desired, be painted or whitewashed.

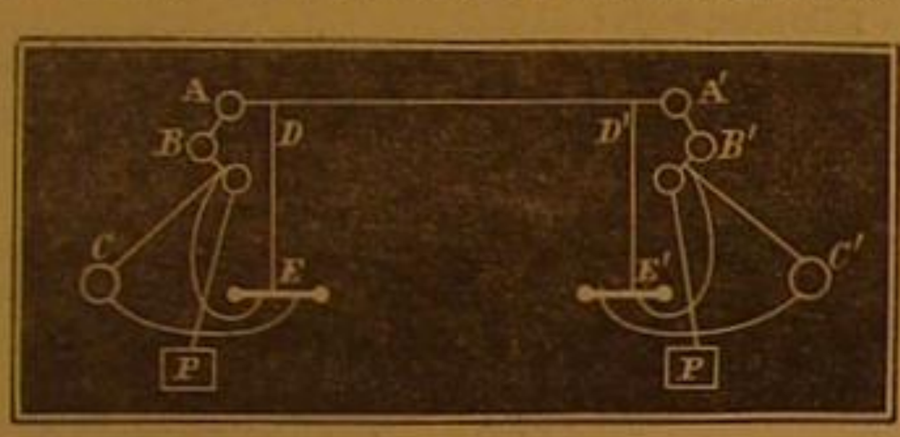
THE SIMULTANEOUS TRANSMISSION OF MESSAGES OVER A SINGLE WIRE IN OPPOSITE DIRECTIONS.

Many of our readers will be interested in understanding how it is possible to transmit messages over the same wire in opposite directions at the same time. The following from the London *Telegraphic Journal* will explain one of the ways in which it can be done:

The transmission of messages over a single wire in opposite directions at the same instant, had occupied the attention of the scientific, both in Europe and America; and the problem has been solved, in as many different ways, by no less than five individuals. The following drawing illustrates the method devised by Dr. Gintl, of Germany, which seems to be very simple, and proves, upon trial, to work with entire success.

The apparatus used is that of Professor Morse. The arrangement of the circuit is that technically known as the open circuit.

Let me premise that in transmitting a dispatch by this system, the electro-magnet of the transmitting station does not work—only that of the receiving station is operated by the current. When the key, or transmitter, is at rest, a spring closes the connecting point at the back end, and when it is pressed down by the operator in transmitting a message, the back connection is broken, and the front one established.



I have represented a section of line between London and Liverpool, A A', are two rheostats in the offices of London and Liverpool, which represent, each of them, the exact resistance of the line wire between these two points. B B' are electro-magnets of peculiar construction, being so arranged that a current may traverse either half or the whole of the coils, or may traverse one coil in one direction, and the other coil in the opposite direction. C C' are the batteries; E E', the keys; and P P' the ground plates.

Let us now suppose that London wishes to send to Liverpool. The operator at London presses down his key, and the current from the battery, C, passes through the key to the main wire, and thence down the branch wire, D', through the key, E', to magnet, B', thence through the ground plates, P' and P, to the magnet, B', and thus back to its starting point in the battery at C. When the current passes through the coil, B', at Liverpool, it operates the apparatus there in the usual manner. But I have not described the entire course of the current. When it reached the junction, D, one half of it passed through the rheostat, A, through the upper half of the magnet, B, and thence to its starting point at the battery. It will thus be seen that one half of the current having passed in one direction through one of the coils, B, and the other half in the opposite direction through the other coil, B, C', that its effect is neutralized and that no action takes place in the magnet at the transmitting station.

Now let us suppose that London and Liverpool both press their keys down at the same moment, each sending to the other. The current from the batteries, C and C', would meet at the junction D and D', and neutralize each other, and consequently, no current would pass over the wire. It would, in fact, be the same as if the wire were actually broken between these points during the time that both keys were pressed down. Under these circumstances the current from the battery, C, returns through the rheostat, A, through one half of the coil, B, and thence back to the battery, C. What takes place at London, of course occurs at Liverpool under the same conditions.

* Thus the writing upon the London and Liverpool instruments is actually performed by their own respective batteries, but as this record depends upon the closing of the key at the distant station, it amounts to the same as if done by the battery of the other.

Having now shown how the record is made while the receiving station has his key in its ordinary position of rest, as well as where it is pressed down in the act of transmitting, let us now consider what will be the course of the current when it is in neither of these positions—that is to say, when the back connection has been broken by pressing the lever to make a letter, but before the front contact has been established. We will consider that Liverpool's key is in this position, and that London is writing. In this case the current, on arriving at D', does not pass down the branch wire, as there is no outlet for it, but passes on through the rheostat, A', thence through both coils, B', to the ground plate, P'. The current in this case passes not only along the line between London and Liverpool, but also encounters a resistance at A' of equal extent; but this is equalized by passing through both coils of the electro-magnet, B, so that the adjustment of the instrument remains the same throughout.

If this apparatus has not been generally used, it does not arise from its inutility. With a line well constructed and properly insulated, there would be no difficulty in working it. It could not be relied upon where there is heavy escape, and to have entire success the resistance coils should exactly equal the resistance of the line wire, and the magnets be well constructed.

Correspondence.

The Editors are no responsible for the Opinions expressed by their Correspondents.

Cotton Picker Wanted.

MESSRS. EDITORS:—In your issue of the 3d inst., I noticed a plan for directing the attention of inventors to the perfection of machines generally needed. The idea is good, and if the different sections of the country will make known their several necessities I have no doubt but that we will see valuable acquisitions to the already voluminous catalogues of machinery. The necessities of the South in the way of machinery are many. The statistics of cotton show that we have lost about one half of our labor. The experience of every honest planter shows that there is an increasing yearly diminution of labor which so far as the negro is concerned, must go on so long as he controls the Government and makes his money by going into politics, and holding all the offices.

The additional experience of our farmers is, that not more than three bales of cotton can be gathered per hand, there are exceptions to this of course. But I lay down the proposition that three bales per hand are more than the average gathered even with the additional labor of the women usually hired during the picking season, and I will sustain the fact by the testimony of every planter in South Carolina. Here then is an urgent necessity for a machine to gather cotton; and to the fortunate inventor, whoever he may be, there are laurels and money brighter and more bountiful than have been reached by mowing machines, or sewing machines, or any other invention since the days of the saw gin. The South, the North, the world needs, and must have a machine to "pick out" cotton, and until we have it, it is folly to talk of raising a "bale to the acre," etc. I have for three years past raised upon our old plan, more cotton than I gathered with all the additional labor that I could hire. Give us a machine to gather, and we may meet the deficiency of labor in raising, by the use of seed planters and other machinery now used in the cultivation of the plant. But don't let it partake of any of the utter worthlessness of that miserable little tin tube with a crank and endless chain, with which we have been humbugged since the war. T. W. WOODWARD.

Winnsboro, S. C.

The Coming Boiler.

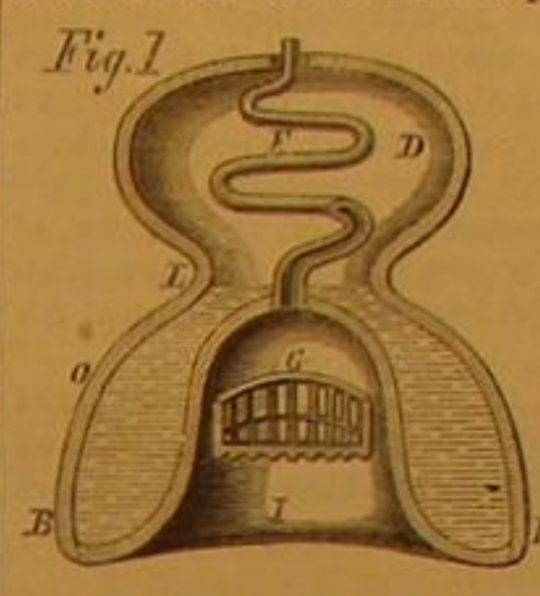
MESSRS. EDITORS:—After reading the article on Improvements in the Steam Engine (page 361, last volume), I concluded to give you my opinion as to wherein the present system of applying heat to steam boilers is really defective, and in what manner the "coming" steam generator must differ from that now in use.

First, let us look at the act of making steam in its simplest light: We apply heat to a vessel of water, and when the temperature rises to 212° Fah. it is gradually converted into vapor, for, at that degree of heat, the expansive force of the unconfined particles of water just overcome the pressure of the atmosphere. It is gradually converted into steam, because each atom, as it expands, absorbs a great amount of heat from the surrounding mass of water—the latent heat which is necessary to its existence as steam—and this must be replaced by a continued application of heat from the combustion of the fuel so long as the operation is prolonged. A greater intensity of heat will raise the temperature no higher, but, by more abundantly supplying this "latent heat," will hasten the evaporation. If the latent heat of steam was the same as that of water, other conditions remaining the same, as soon as a mass of water reached the boiling point, it would undoubtedly explode with great violence. Now, as steam at 212°, while under the pressure of the atmosphere, is not capable of performing work, to make it a power, we must still further heat it; and not only that, but confine it, in order that we may apply its increased expansive force to useful purposes. To use steam economically would seem to be to apply heat in such a manner that no more water be heated than necessary to keep up a constant supply of steam; and no more heat be used than is required to maintain the evaporation, and to expand the vapor of water to the desired pressure. In the ordinary boiler (it is more properly called "boiler" than steam generator), a large volume of water is kept constantly far above the boiling point, and, as its radiating surface is necessarily very large, it requires a great amount of heat to maintain it at such a high temperature; remembering this, we can imagine the result if a portion of the boiler gives way, when a great proportion of this water would instantly expand into steam.

So much may be said, supposing the water to be absolutely pure, but practically this cannot be. The various saline impurities so common in feed water, increasing its density, the more as its depth increases, are, by continued boiling, deposited as a non-conducting incrustation on the bottom and sides of, and within the boiler. To remedy this, I would never apply heat to the bottom of a steam generator. As it is not necessary to heat the entire mass of water—the object not being merely to make it "boil," as in cooking—for the sake of safety and of economizing heat, I would, also, not place the fire underneath the steam boiler. Safety and economy cover the whole ground as to the value of a steam generator. Now, as it is impracticable to apply heat directly to the surface of the water, which would be, it seems to me, the nearest way of getting at the theoretical result of the amount of heat used in the evaporation of a certain quantity of water, the nearer we approach this point, in the adaptation of the form of the boiler, and in the mode of applying the heat to meet the requirements of the case, not overlooking other important requisites, so much nearer shall we be to the attainment of that greatly-to-be-desired *ne plus ultra* of steam generators.

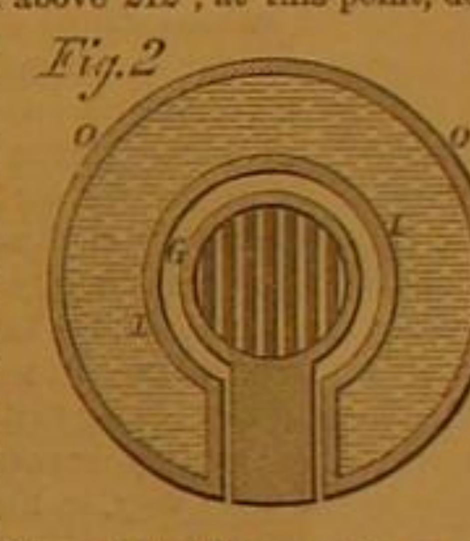
After a great deal of study on this subject, I have designed a form of boiler, differing entirely in principle from any that I have seen; and though I by no means say that it is of the same form as that which the steam boiler will ultimately assume, yet, for various reasons, as I shall show, it seems to me to be more nearly perfect in theory than any other description of boiler with which I am acquainted. Fig. 1 shows it in vertical section.

Fig. 1



The boiler proper, B B, is bell-shaped, spherical in its horizontal section, Fig. 2, O being the outer, and I the inner shell. D is the steam dome in which the flues (only one of which is shown, at F), should expose a large heating surface. The grate, I, is placed considerably above the bottom of the boiler, a space being left entirely around between it and the boiler, except at the furnace door, to admit air for the perfect combustion of the fuel. Fig. 2 is a horizontal sectional view at the level of the grate. The water level, L, is at the point of greatest heat; and in practice, the temperature would vary from above 212°, at this point, down to perhaps 40° at the bottom of the boiler. As the saline matter became more concentrated, it could be drawn off as often as desired, with very little loss of heat. Near the bottom, also, the feed-water should be introduced. The form of the boiler shows great strength, which would safely admit of the use of a high pressure; and owing to its shape, also, and the position of the furnace, there could be no unequal expansion.

Fig. 2



With a safety valve, I believe, that even if the feed-pump gave out—the fire being undiminished—there would be no great danger of an explosion, for, as the water level depressed, the influence of the fire would grow less and less until the heat would only be expended in gradually expanding the steam, the result of which would not be hazardous. A considerable depth of water constantly remaining in the boiler, would prove a great means of safety. Other advantages might be named, such as no foaming; rapidity of making steam after "firing up," owing to the small quantity of water heated at once; ease of noting the hight of water from the temperatures of different hights. Of course, the form might be somewhat modified from that which I give; as, for a very large boiler, or, to suit its location, it could be made oval or oblong, from front to rear, remaining about the same in cross section.

As the foregoing is as yet merely an opinion, deduced from the laws of steam, as I understand them, not based on a trial of the principle proposed, I may be somewhat in error. If such is the case, please inform me wherein it consists.

CALORIC.

Montour, N. Y.

Ought Patent Rights to be Perpetual?

MESSRS. EDITORS:—In No. 2, current volume, of the SCIENTIFIC AMERICAN, there is an article from Horace Greeley on the rights of property, and after advocating the protection by law of *all* property, including copyrights and patents, Mr. G. says, "'Then why not make patents and copyrights absolute and perpetual?' is often asked. I answer: There are *no* absolute rights of property. The land you bought of Government yesterday may be taken from you for the bed of some highway or railroad to-morrow, and you have no redress. *All* rights of property are held subordinate to the dictates of national well-being, and the Government will batter down or burn to ashes your house if it shall have become (through no fault on your part) a harbor or defense of public enemies, and make you no compensation therefor."

Mr. Greeley has dismissed the great question, "Why not make patents and copyrights absolute and perpetual?" in a very summary manner, for one who usually reasons as closely as he does. Yes, why not make patents and copyrights absolute and perpetual? And as sacred to the author as any other property? What is an invention? What is an original book, or picture, or statue? Are they not the work of the human brains and hands? Most certainly. And fully recognizing this fact, Mr. Greeley says, "Whenever the laws of my country shall refuse to protect the inventor, they should, in simple consistency, bid the land owner, the bond holder, the merchant, 'take care of yourself and of all that you call your own.'"

Now if the inventor has a right of property in his invention at all, it must, in the nature of things, be a perpetual right, just as much so as the right of the land owner, the bond holder and the merchant to their property, which is the property of their brains and hands. Mr. Greeley does not state the question fairly in regard to the right of Government to take private property. The illustration of the power of Government to "batter down your house," etc., has reference only to time of war, and therefore has no place in this discussion. In every other case, if Government takes land or other private property for a railroad or for public improvements, compensation is made for the same. Neither the first nor the third Napoleon have dared do otherwise with the property of their subjects.

Why should not property in patents and copyrights be as sacredly kept under the protection of law as any other product of human brain and labor? The land owner or the merchant may make a million of dollars in a month; the banker may make it in a week, or either of them in an hour. Does the Government ever presume to say to the merchant, the land owner, or the banker, "You made this money quickly, you may have the use of it seventeen years, and at the end of that time we shall withdraw all protection from you, and anybody may take the fruits of your thought and labor who chooses?" The Government never says this to the parties above-named, and why should they say it to the inventor? The land owner, the merchant, the banker in the case above cited, have got all their money by speculation. They have not necessarily added one iota to the wealth and comfort of the people; nay, it is scarcely possible that they have accumulated this large sum without injury to the welfare of the public generally.

I copy the following from a recent paper: "The number of thrashing machines in the United States is about 229,000, and they save five per cent more of the grain than the flail. There is, accordingly, a saving by these machines of about ten millions of bushels of grain annually."

Here, then, we see a saving of "ten millions of bushels of grain annually," with which bread is made for the people. Can Mr. Greeley point to any speculation in stocks, to any lucky speculation in "corner lots," or to any fortunate result in private mercantile speculations upon the comforts and necessaries of life which saves ten millions of bushels of grain annually (or their equivalent) for the benefit of the people; and which adds this amount of wealth annually to the sum total of the country? Yet this large saving is from the use of one invention only. Now in the name of all that is just and right, should not the inventors of these thrashing machines be protected in their property as fully and perpetually as the land speculator, the merchant, the banker, and stock broker? If any fogy farmer is fool enough to use the old-fashioned thrashing flail, he is at full liberty to do so: and if he uses a thrashing machine, and every year saves hundreds of dollars worth of grain by its use; why, in the name of justice should he not pay something to the inventor, and that too as long as the invention is used, or property of any kind is protected by law? No good reason can be given to the contrary.

A few weeks since two poor half-starved miners in Australia were standing near a tree. One of them struck his pick a few inches into the earth beneath it, and lo! a gold nugget worth some $50,000 was discovered. It was the work of a minute only. They did not even own the land on which the treasure was found. Did the English Government say to these men, "You found this great treasure in a minute, and that on Government land. Others would have found it some time if you had not. You may have the benefit of it fourteen years, and after that any body may take it from you who chooses." Of course it would not do to say any such thing. It would strike a blow at the safety of all property. The land owner, the banker, the merchant—all speculators—creating nothing of wealth, and the gold finder also; all these are fully protected by law, and may enjoy the fruits of their good luck, or skillful calculation through life, and bequeath the same to their children. But the inventor whose invention saves ten millions of bushels of grain annually, or whose skill and ingenuity add to the comfort and wealth of the people in a thousand ways, is protected a few years only, and the products of his brains and hands is then taken from him by the people whom he has benefited!

The father of the writer of this article invented, many years since, stone pipe for conducting water. Twenty-five years the brave old man struggled in vain to bring the public to see its merits and adopt the invention. Poverty and disappointment were all he received. Now this most useful invention is adopted everywhere. The original inventor has long been in his grave; but if his right to his invention had been, as it should be, perpetual, his children at least would have received some benefit from the long years of toil and privation which they shared with their father.

This loose recognition of a man's innate and perpetual right to the product of his brains and hands—this talk of the Government "giving!" a man a right to the property which he has created, and which he already possesses, for a "term of years," is the real basis of the conduct of that gang of sneaking thieves who hang around a successful invention, and by their audacious infringements keep the inventor in constant litigation, and it is also the basis of the infamous attempt of Macfie, in the British House of Commons, to abolish all property in patents. G. W. P.

Boston, Mass.

Discarded Nutriment.

MESSRS. EDITORS:—Immediately beneath the outer surface or skin of every kernel of grain, particularly of wheat, there is a thin layer of very nutritious and valuable matter for the sustenance and health of the animal system. In milling, this is discarded as the hull. It constitutes about twelve per cent of the whole matter of the bran, and is more useful for the promotion of nutrition, than that portion of the grain ground into flour. This substance consists of a compound vegetable ferment, together with vegetable casein, analogous in form to the thin pellicle between the shell and the albumen of the egg. This may be readily obtained by infusing bran in cold water, and precipitating with alcohol, or evaporating the water. Its office is to bring the other constituents of the flour taken into the stomach with it, into an appropriate state for assimilation by the organs of nutrition. This substance and linseed meal have been tried with marked success in the case of impaired nutrition, and in diminishing the number of cases of consumption. As a test, a soup was made of two ounces of meal, one of bran, and a quart of water; this was boiled for two hours, and then strained, to which lean beef was added, and the whole made into a soup with vegetables. Under this diet the frequency of consumption greatly diminished among the inmates of the City Hospital. It would seem as if impaired nutrition was really an antecedent to the fell disease. If a dog or other strictly carnivorous animal be fed exclusively upon fine flour bread with only water to drink, it will die of starvation in about three weeks; whereas, if fed upon bran or whole meal bread under precisely similar conditions it will continue to flourish *ad infinitum* without any apparent diminution of vitality or physical strength.

H. M. R.

Hudson City, N. J.

To Inventors---One Thing Needed.

MESSRS. EDITORS:—In your last number I notice a request from an inventor for suggestions in relation to what to invent. In the same number is a cut and description of a knitting machine which will "do better work than can be done by hand." In a number some time ago was a call for the invention of a small, cheap, household power.

Now all of these suggest to me a train of thought.

Nearly every farmer in the country raises a few sheep; or, if they do not, they ought to, to the extent of their own mutton at least. Nearly every farmer also has a "family of girls," who have "nothing to do" but to read the *Revolution* and beg "pa" for a seven-hundred dollar piano. Most of these also have "nothing to wear" but "store clothes," and some, in the Eastern States have but little to eat. Their brothers and fathers and bachelor uncles (they never take me for one of the latter) wear out a great many pairs of stockings, and would be very grateful for numerous other knit garments, such as drawers and shirts and overvests, and even "coats without a seam," all so comfortable and nice to fit and easy to wear and lasting.

All of these might be made in the house *from the wool.*

For a power, a small steam engine of one half-horse power will fill the bill, and in the winter will cost nothing to run, its heat being wanted to warm the house. It need not be larger, boiler and all, than two men can lift about; neither need it be of complicated construction, or have a very "economical" and therefore unsafe "generator."

This can be made to saw its own wood and pump its own water, with some to spare, and do a great deal in the family and animal culinary department. Make it safe, with a large valve and light "poise," and a large water space above the flues, and it may be intrusted to the boy just commencing on "The Natural Properties of Bodies" to run, as a first-class illustration of his first lesson in physics.

Next—and here is what is to be invented—we must have a household yarn factory got up on new principles, or a new adaptation of old ones, to fit the occasion. It seems to me that a corder and spinner, etc., *can* be made that will do a heap of work, and not be hard to manage. I know nothing about their construction, or I think I could send you a sketch of something that would work in a day's study. Let the "experts" plan these out, if old plans will apply on so small a scale; if not, let some original barber (?) like Arkwright give it a shave.

Then, with the knitting machines, and a loom for flannels if you wish, let the girls go to work, and stop lolling about.

The whole apparatus should not cost more than a piano, and, in my opinion, would be a much better investment as the first one.

Let the piano be bought and paid for with the proceeds of the socks, and then can be sung with a clear conscience to its jingling accompaniment—

Call me not lazy-bred beggar and bold enough;
For I have learned both to knit and to sew.

But I forget—the SCIENTIFIC AMERICAN is not poetical, but is down even on the "poetry of notions."

CHARLES BOYNTON.

(For the Scientific American.)

ARTIFICIAL PRODUCTION OF THE COLORING MATTER OF MADDER.

BY DR. REIMANN.

A method of artificially producing the coloring matter of the madder plant, known under the name of "alizarin," has been recently discovered by Messrs. Graebe and Liebermann, of Berlin.

The extraction of alizarin from the madder root was effected some time ago by Mr. Kopp, whose process was as follows: He heated the powdered madder with a watery solution of sulphurous acid (SO_2), which extracted two coloring matters, the alizarin and purpurin, with other substances.

When this solution was heated to 122° Fah. a precipitate, consisting of almost pure alizarin, was deposited. On filtering the solution and heating it again to 212° Fah. the sulphurous acid was all expelled, and the solution consequently lost its ability to retain the second coloring matter or purpurin, which was therefore precipitated.

The two coloring matters just mentioned are prepared on a large scale in the manufactory of Messrs. Schaaf & Lauth, Wasselonne, France, and supplied to cotton manufacturers for dyeing and printing.

The coloring matters obtained from coal tar have the property of removing all other coloring matters except indigo, cochineal, and madder. Strange to say, the chief coloring matter of the last is now produced from coal tar itself.

On distilling coal tar, volatile and fixed oils are obtained which boil at from 86° to 572° Fah. Among the latter is found a hydrocarbon, called "anthracene," the formula of which is $C_{28}H_{10}$. From this substance was obtained alizarin, previously only found in the root of the madder.

The method of producing alizarin was first made known by the publication of the French patent, the particulars of which will be here narrated, with additional observations on the manner in which the formation of the alizarin can be effected.

In the introductory remarks respecting the patent, it is stated that alizarin is the chief coloring matter of the madder that dyers, and especially calico printers employ to dye their goods rose, pink, violet, brown, and black, according to the kind of mordant made use of in the operation of printing. It is also asserted that the prepared madder, called goraneen (*fleurs de garance*), is consumed to the extent of thousands of tuns yearly. In modern times also the pure coloring matters were extracted from the madder and used in dyeing and printing operations.

The process discovered by Messrs. Graebe and Liebermann, of Berlin, consists in the production of alizarin without the employment of madder, and in an entirely new way. The process presents three different stages.

In the first place the hydrocarbon called anthracene, already alluded to, is employed as the raw material.

For some time past the antracene, or parapraphthalin, has been obtained from the destructive distillation of coal tar. This anthracene must be transformed in the first stage of the process into a substance containing more oxygen than itself; namely, oxanthracene, or anthrachinon. This substance has been already obtained by other chemists by heating anthracene with nitric acid, and then purifying the product by distillation, when it presents itself in the form of yellow needles. Messrs. Graebe and Liebermann, however, effected the transformation of anthracene into anthrachinon in the three following ways:

In the first process the anthracene is treated with a solution of bichromate of potash, and then treated with sulphuric acid, until all the chromic acid is reduced to peroxide of chromium.

As regards the relative quantities of the two substances made use of, one part of anthracene is treated with two parts of bichromate, and the necessary amount of sulphuric acid afterward added.

Any other chromate may be employed instead of the bichromate of potash.

The oxanthracene, or anthrachinon, thus obtained appears as a solid, insoluble brown mass.

In the second process, two parts of bichromate of potash are heated with one part of anthracene, and about fifty parts glacial acetic acid, until all the chromic acid is reduced. When cold, the anthrachinon is found in the same form as in the preceding process. Some of the anthrachinon which remains dissolved in the acetic acid, may be obtained by distilling the latter.

In the third operation a mixture of anthracene and glacial acetic acid is heated to 176° Fah., and heated with nitric acid, which must be added a drop at a time.

The relative quantities of the two substances employed are one part of anthracene to one part of nitric acid. In this process the anthracene is converted into a substance richer in oxygen than itself, the formula for anthracene being $C_{28}H_{10}$, while that of the oxanthracene is $C_{28}H_8O_2$.

In the second stage of the operation the oxanthracene is heated with bromine, when two equivalents of hydrogen are replaced by two equivalents of the latter, and a substance is formed which has the composition $C_{28}H_6O_2$.
B^2_2

To obtain this substance the anthracene is placed in a sealed tube, with two equivalents of bromine, and heated ten hours at a temperature of 176° to 266° Fah. The hydrobromic acid formed during the operation can be removed by leading the gases into a solution of some alkali. A crystalline mass is found in the tube, which has to be purified by recrystallization. This substance has the composition $C_{28}H_6O_2$.
B^2_2

It may be obtained likewise in the following way: Eight equivalents of bromine are allowed to act upon one equivalent of anthracene ($C_{28}H_{10}$), when a substance is formed having the composition $C_{28}H_8B^2_8$, and which appears in the tube as a crystalline mass.

On treating this substance with an alcoholic solution of potash it is transformed into an anthracene in which four equivalents of hydrogen are simply replaced by four equivalents of bromine. The formula therefore of this new substance is as follows: $C_{28}H_6$.
B^2_4

When this last is treated with any oxidizing agents a new substance is formed, two equivalents of bromine replacing two equivalents of oxygen, so that the new substance has the composition $C_{28}H_6O_2$. This is the so-called bibromide of anthrachinon. B^2_2

By employing chlorine instead of bromine an analogous substance is formed, in which two equivalents of chlorine have replaced two equivalents of hydrogen. This is the bichloride of anthrachinon, as its discoverers call it. Its formula is $C_{28}H_6O_2$. This substance is treated with a con-
Cl_2
centrated solution of an alkali, and heated to a temperature

of from 356° to 500° Fah., when the liquid becomes blue. When the formation of this blue substance is completed the liquid is allowed to become cold, and the substance is then extracted by water. This is a salt, in which an organic acid is united to potash.

On heating the bichloranthrachinon ($C_{28}H_6O_4Cl_2$) with an alkali, the chlorine is replaced by hydrogen, and six equivalents of water are at the same time added to the composition of the new substance

$$(C_{28}H_6O_4Cl_2)+2\,KO\,HO+2O=2KCl+(C_{28}H_8O_8)$$

The substance $C_{28}H_8O_8$ is still in combination with the alkali, but can be separated from the latter by adding an acid to the alkaline solution, when a yellow precipitate results.

This yellow precipitate is found to be pure alizarin, and can be employed in dyeing and calico printing.

Experiments were made in the manufactory of Messrs. Liebermann, of Berlin, to test the efficacy of this artificial alizarin, and the results were extremely satisfactory. It is to be regretted, however, that this interesting discovery of Messrs. Graebe and Liebermann has hitherto been turned to little practical account.

In the first place the anthracene, or raw material from which the alizarin is extracted, is very difficult to obtain. The coal oils contain only very minute quantities of anthracene. But then the same method which was employed to produce aniline may be chosen. But even the aniline was found in such small quantities in the tar that the employment of aniline would be far less extensive than it is in the present day if this were its only source.

The labors of Zinin, Béchamp, Mitscherlich, and others, taught us to prepare aniline from benzole, a substance abounding in the elements of tar.

The same synthetical method must be employed to obtain anthracene. Messrs. Limpericht and Berthelot showed that anthracene can be prepared synthetically.

To prepare aniline toluen, a hydrocarbon consisting of $C_{14}H_8$, is heated with chlorine and then decomposed at 392° Fah. by the vapor of water, or the toluen is conducted through a tube heated to redness $[2\,\underset{\text{toluen.}}{C_{14}H_8}]=\underset{\text{anthracen.}}{C_{28}H_{10}}+6H$.

The possibility of forming anthracene synthetically is shown in our laboratories. Why, then, should it not be used to produce alizarin on a large scale?

It is, of course, necessary that the new preparation or artificial alizarin should be cheaper than the alizarin extracted from the root of the madder. One considerable obstacle to this is, that alizarin obtained from madder is already prepared on a large scale in France.

But, after all, the new discovery must be considered as an important step in the art of manufacturing colors, and it is sincerely to be hoped that the new method of preparing artificial alizarin will soon be cheap enough to allow of its general employment in dyeing and printing.

On Lacquering.

The *Painter, Gilder, and Varnisher's Companion* gives the following recipes:

LACQUER FOR BRASS.

Seed-lac, six ounces; amber or copal, ground on porphyry or very clean marble, two ounces; dragon's blood, forty grains; extract of red sandal wood, thirty grains; oriental saffron, thirty-six grains; pounded glass, four ounces; very pure alcohol, forty ounces.

Articles, or ornaments of brass, to which this varnish is to be applied, should be exposed to a gentle heat and then dipped into the varnish. Two or three coatings may be thus applied, if necessary.

Articles varnished in this manner may be cleaned with water and a bit of dry rag.

LACQUER FOR PHILOSOPHICAL INSTRUMENTS.

Gamboge, an ounce and a half; gum sandrac, four ounces; gum elemi, four ounces; best dragon's blood, two ounces; terra merita, an ounce and a half; oriental saffron, four grains; seed-lac, two ounces; pounded glass, six ounces; pure alcohol forty ounces.

Terra merita is the root of an Indian plant; it is of a red color, and much used in dyeing. In varnishing, it is only employed in the form of a tincture, and is particularly well adapted for the mixture of those coloring parts which contribute the most towards giving metals the color of gold. In choosing it be careful to observe that it is sound and compact.

The dragon's blood, gum elemi, seed-lac, and gamboge, are all pounded and mixed with the glass. Over them is poured the tincture obtained by infusing the saffron and terra merita in the alcohol for twenty-four hours. This tincture, before being poured over the dragon's blood, etc., should be strained through a piece of clean linen cloth, and strongly squeezed.

If the dragon's blood gives too high a color, the quantity may be lessened according to circumstances. The same is the case with the other coloring matters.

This lacquer has a very good effect when applied to many cast or molded articles used in ornamenting furniture.

GOLD-COLORED LACQUER FOR BRASS WATCH CASES, WATCH KEYS, ETC.

Seed-lac, six ounces; amber, two ounces; gamboge, two ounces; extract of red sandal wood in water, twenty-four grains; dragon's blood, sixty grains; oriental saffron, thirty-six grains; pounded glass, four ounces; pure alcohol, thirty-six ounces.

The seed-lac, amber, gamboge, and dragon's blood must be pounded very fine on porphyry or clean marble, and mixed with the pounded glass. Over this mixture is poured the tincture formed by infusing the saffron and the extract of sanal wood into the alcohol, in the manner directed in the last receipt. The varnishing is completed as before.

Metal articles that are to be covered with this varnish are heated, and, if they are of a kind to admit of it, are immersed in packets. The tint of the varnish may be varied in any degree required, by altering the proportions of the coloring quantities according to circumstances.

TO MAKE LACQUER OF VARIOUS TINTS.

Put four ounces of the best gum gamboge into thirty-two ounces of spirits of turpentine; four ounces of dragon's blood into the same quantity of spirits of turpentine as the gamboge, and one ounce of anatto into eight ounces of the same spirits. The three mixtures should be made in different vessels.

They should then be kept for about a fortnight, in a warm place, and as much exposed to the sun as possible. At the end of that time they will be fit for use; and you can procure any tints you wish by making a composition from them, with such proportions of each liquor as practice and the nature of the color you are desirous of obtaining will point out.

TO CLEAN OLD BRASS WORK FOR LACQUERING.

First boil a strong lye of wood ashes, which you may strengthen with soap lees; put in your brass work, and the lacquer will immediately come off; then have ready a pickle of aqua fortis and water, strong enough to take off the dirt; wash it immediately in clean water, dry it well and lacquer it.

The Faraday Lectures---Reception of Dumas in England.

A crowded meeting of Fellows of the Chemical Society and their friends, including many ladies, was held in the Theater of the Royal Institution of Great Britain on Thursday, June 17, Mr. Dumas (the Faraday of France) having been invited to deliver the inaugural address. The chair was occupied by Prof. Williamson, F.R.S., who briefly explained the nature and object of the lectures which it was intended to inaugurate, concluding by presenting Mr. Dumas, on behalf of the society of which he is president, with a large gold medal, which he stated in a few appropriate remarks (in French) had been specially struck in commemoration of Mr. Dumas' visit to this country.

Mr. Dumas having acknowledged the high honor that had been conferred upon him by selecting him as the representative of the *savans* of his country, delivered a brilliant and eloquent discourse, in which he traced the progress of discovery in chemical science from the time of the ancient Greeks until now, and compared the knowledge which they possessed with that which modern research had placed us in possession of. He remarked that the ancient Greeks recognized only the four elements—earth, air, fire, and water; but although they had thus distinguished them from each other, they had left everything to be discovered concerning them, rich as their materials were for the making of discoveries. The action of these elements the Greeks perfectly understood; but it was left for Lavoisier to teach us how to understand nature more completely. The elements of Lavoisier were those which were irreducible, and so far as the principle was concerned his views were still adopted, but while Lavoisier could only recognize thirty-one elements, subsequent researches had discovered no less than thirty-five new ones. He referred to the researches of Dr. Dalton and Dr. Prout, and to the views entertained as to the atomic numbers being exact multiples of a standard number, urging that all elements were but varied combinations of some primary element with which as yet we are unacquainted. The remarkable nature of the progression of the numbers representing the atomic weights of elements of the same class was, he was convinced, not the result of mere accident. There was lithium, with its number 7; sodium, 23; and potassium, 39—each progressing by the number 16.

Then, again, there was magnesium, 12; calcium, 20; and iron, 28—each progressing by the number 8, or the half of 16, which was certainly a most remarkable fact, and tended, in connection with our other knowledge, to show how much we have still to learn.

Referring to Faraday's researches in connection with the natural forces, he observed that it was Faraday who had shown the correspondence of electricity, magnetism, light, and heat; and that it was Faraday that had taught them that chemical affinity obeyed the same laws as those of physics. Newton foresaw much, but Faraday demonstated it. Newton discovered the law of universal gravitation; and to show how little they knew even now he would say that there was no one present at that meeting, at which the strongest lights of the science of England were represented, who could tell them anything of the cause of that universal gravitation.

He then traced the effects of light and heat upon organized beings, and our ignorance of the cause of those effects, pointing out the enormous field which was open for future investigation.

At the conclusion of the discourse, Dr. Tyndall, as an old student of Dumas, moved the cordial vote of thanks of the Chemical Society to him for having inaugurated their Faraday Lectures, remarking that the impression which Dumas had produced upon his mind when as a student he first heard him at the College de France, nearly twenty-five years since, led him to think that he was then at the zenith of his power, but the discourse they had heard that evening had convinced him he was mistaken, for his vigor and eloquence now surpassed anything he had heard from him many years ago.

The vote was carried with acclamation, and having been acknowledged with much emotion by Dumas, the meeting separated.

Enameling and Polishing.

In speaking of enamel it must be understood as polished paint on the surface of woodwork, such as doors, architraves, window shutters, etc. Enameling and polishing is an art which requires the exercise of the greatest care and patience in its execution. A little carelessness or inattention at the finish may undo the work of days. The work will not bear any hurry, either in the material or labor, but must go through its regular course, have its proper time to darken between each coat and process; and the rubbing down must be patiently and gently done—heavy pressure will only defeat the end in view. Great care should be taken in the selection of the pumice stone, both lump and ground, as the slightest particle of grit or hard pressure will scratch, and thus cause hours of labor to be thrown away.

In describing the material used for the purpose, we shall only describe that which we consider best suited for getting up the white or light-tinted enamel. There are several kinds of filling up color used and sold by the colormen, but most of them are of a dark color, not suited for light work, as they require so many coats of paint afterward, to get a pure body of color that it defeats its own object. In practice, we find it best to fill up from the first with the same tint of color we intend to finish with, thus forming a solid body of pure color, which will bear much rubbing down without being shady. For all dark grounds, which have to be finished a dark color, the black or dark filling is the best.

The tools and material required are as follows, viz:

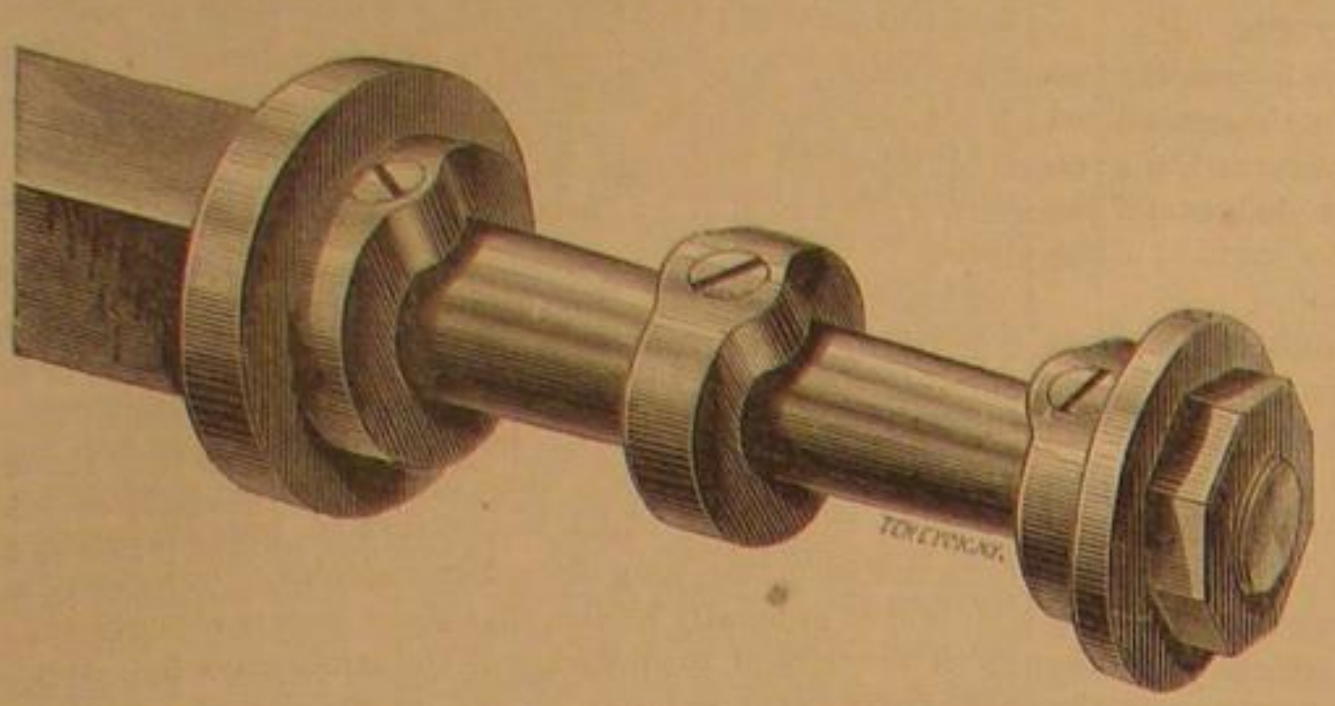
1. White lead ground in turpentine, and best white lead in oil.
2. A clear, quick, and hard-drying varnish, such as best copal, Manders Brothers' white coburg, and white enamel varnish, etc., etc.
3. Ground and lump pumice stone, or putty powder.
4. Rotten stone, ground in water or oil.
5. Some white felt, from a quarter to a half inch in thickness, and of the best quality.
6. Several flat wooden blocks, of various sizes and forms, suitable for getting into corners and moldings; these must be covered with the felt on the side you intend to use.
7. Two or three bosses, made with cotton wool and covered with silk.
8. Sponge, and wash or chamois leather.

In order to simplify the description we will take a plain panel to work upon. If it is new, give it two coats of oil color, mixed in the ordinary way; now mix the white lead ground in turps with only a sufficient quantity of varnish to bind it with, thinning to a proper consistency with turps. It is as well to add a little of the ordinary white lead, ground in oil, as it helps to prevent cracking. Give the panel four or five coats of this mixture, leaving a sufficient interval between each coat to allow it to dry well. Let it stand for a few days, until it is hard enough to rub down. When it is ready, you may rub it down, first with a soft piece of lump pumice stone and water, to take off the rough parts. Now use the felt and ground pumice stone and cut it down, working the hand in a circular form or manner. You will require to exercise much care and patience to rub it down to a level surface and without scratches. When you have got it down level, if it is scratched or not sufficiently filled up, give it one or two more coats, laying it on as smoothly as you can, and rub down as before. If done properly, it will now be perfectly smooth, level, and free from scratches; wash well down, and be careful to clean off all grit or loose pumice stone. Now mix flake white from the tube with the before-named varnish, till it is of the consistency of cream. Give one coat of this; when dry give another, adding more varnish to it. Now, let this dry hard, the time for which will of course depend upon the drying qualities of the varnish; some will polish in eight or nine days, but it is much the best to let it stand as long as you possibly can, as the harder it is the brighter and more enduring will be the polish. When it is sufficiently hard, use the felt and very finely ground pumice stone and water; with this cut down till you get it perfectly smooth; now let it stand for a couple of days to harden the surface, then take rotten stone either in oil or water, use this with the felt for a little while, then put some upon the surface of the silk boss, and gently rub the panel with it, renewing the rotten stone as required. It is always better to rub in a circle than straight up and down, or across. Continue this until you have got it to a fine equal surface all over; it will begin to polish as you go on, but it will be a dull sort of polish. Clean off—if the rotten stone is in oil, clean off with dry flour; if in in water, wash off with sponge and leather, taking care that you wash it perfectly clean, and do not scratch. You will now, after having washed your hands perfectly clear, use a clean damp chamois leather, holding it in the left hand, using the right to polish with, keeping it clean by frequently drawing it over the damp leather. Now use the ball of the right hand press gently upon the panel, and draw your hand forward or toward you; if you do this properly, it will bring up a bright polish on the work, and every time you bring your hand forward a sharp shrill sound or whistle will be produced, if this is the case, you may be sure you are in the right path. Continue this until the whole surface is one even bright polish. It will be some time, and will require much practice, before you will be able to do this in the best manner; but with perseverance and practice the difficulty will soon vanish. A soft smooth skin is best for polishing; if it is very dry and hard it is apt to scratch. The latter part of these instructions referring to the polishing, will of course, apply to polishing up on imitation woods and marbles, or on any polishing varnish, using the varnish pure, of course.—*London Building News.*

THE good conductor of heat is the good conductor of electricity, and the bad conductor of heat is the bad conductor of electricity.

IMPROVEMENT IN AXLES FOR VEHICLES.

The engraving shows a simple device designed to lessen friction and save wear upon the axles of vehicles; it consists of three or more collars placed upon the bearing part of the axle, and fixed in place by set screws, the rings or collars being reinforced where the screws pass through them to give them uniform strength throughout.



These washers receive the weight of the vehicle, and when worn may be easily replaced. Washers have been heretofore used as bearings for carriage wheels, but securing them in the manner indicated and reinforcing them as described, must increase their utility. The washers or collars are made of hardened steel or iron, and thus are likely to prove durable.

Patented June 8, 1869, by Thomas Spurrier, of Sharon, Pa., who will either sell the entire right, or rights for States or counties, and who may be addressed as above.

IMPROVEMENT IN VENTILATORS FOR BUILDINGS AND RAILROAD CARS.

This improvement is based upon the truth that it is not enough that we get air to breathe, we must have *pure* air if we expect to retain health or recover from disease. The device not only admits air, but it filters and absorbs. The air in entering through it passes through a layer of sponge which filters out floating organic dust, and absorbs extraneous moisture. It next passes through a layer of charcoal lumps, which absorbs any foul gases present in it, and finally enters the room through a finely perforated screen which prevents the formation of sharp currents, and gently diffuses it, directing it inward and upward.

Fig. 1

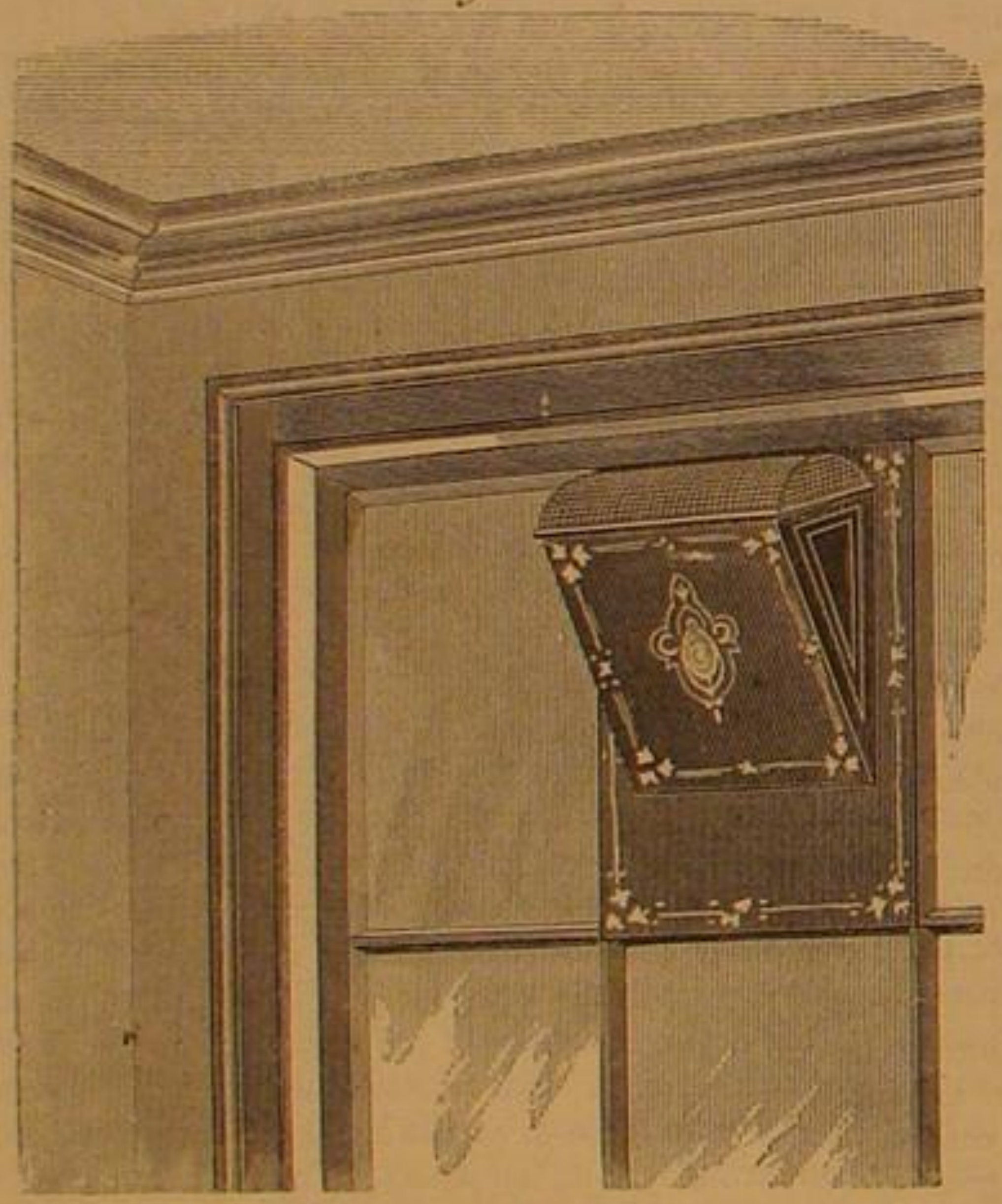


Fig. 2

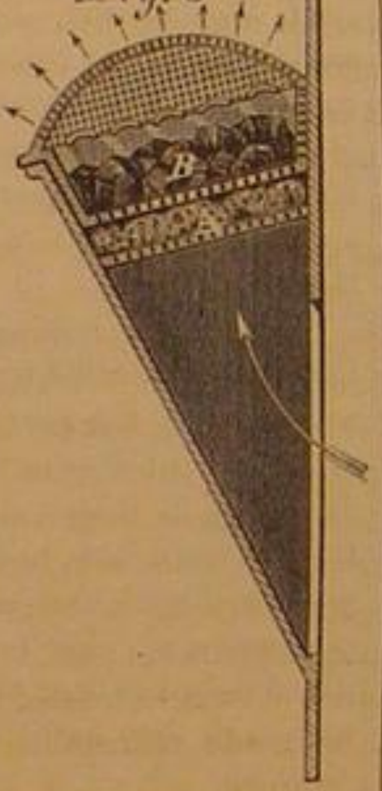
Its operation will be seen upon reference to the engravings. Fig. 1 is a view of the ventilator as seen from the interior of an apartment, Fig. 2 is an exterior view of it placed in a window, and Fig. 3 is a sectional view exhibiting its construction, which is extremely simple. A is the layer of sponge resting upon a finely perforated plate of sheet metal, B is a layer of lumps of charcoal, the powerfully absorbent quality of which is well known, resting on a second perforated plate, having slats, cross sections of which are shown, immediately over it, so as to keep an open space between the layer of charcoal and the perforated dome through which the air finally flows.

This ventilator is constructed upon sound scientific principles, and the employment of well known and thoroughly proved means to accomplish the ends sought, will give confidence to their tasteful combination, as used in the apparatus. It was exhibited to the New York Association for the Encouragement of Science and Arts, and a committee was appointed to investigate its merits, which made a very favorable report. The following extract from this report sufficiently sets forth the views of this committee.

"Your Committee, after careful examination and mature deliberation are convinced that the Lesperance ventilator will perform all that the inventor proposes it should do, and we hail with great satisfaction this addition to science and art, considering that it will be found one of the best means for the preservation of health, and its restoration to diseased bodies, especially in hospitals."

It is also heartily indorsed by Professor Henry, of the Smithsonian Institute, and other leading scientific men. It was also exhibited before the Polytechnic Association of the American Institute, April 15, and the minutes of the meeting show that it was considered by the members present as a very important and valuable improvement. The instrument has been placed upon many public buildings, hospitals, etc., and receives from all who have used it the highest testimony in its favor. Among the most valuable of these is one from Henry Howard, M. D., formerly surgeon of St. Patrick's Hospital, Montreal, now Professor in the St. Lawrence School of Medicine. This gentleman states that while in charge of the Provincial Lunatic Asylum the building was crowded with patients to the extent of twice as many as hygienic principles would justify, and although he made the utmost exertions to properly ventilate the building, using for that purpose all the usual appliances, everything failed until Lesperance's ventilator was tried. The latter was placed in every window of the asylum, and found to completely ventilate the building. He adds that he has tested the ventilator in every possible way known to science, and found it perfect.

Fig. 3



It will be seen that the air enters this ventilator by virtue of the pressure of the external air, the specific gravity of the air inside an occupied and warmed room being less than that outside. Hence it is not subject to being affected by external winds as much as many other kinds of apparatus. It appears to us to be one of the most important devices yet invented to secure ample and perfect ventilation in public school buildings, hospitals, churches, and private dwellings.

This invention was patented through the Scientific American Patent Agency, February 9, 1869. Address for further information Thomas Howard, P. O. Box 3,088, New York City.

"Galvanized Iron."

Three centuries ago, says *Engineering*, a French monk wrote of the injurious effects attendant upon the use of copper cooking utensils, and he also attributed like effects to the use of iron vessels. He proposed to coat the interiors of the vessels, in both instances, with zinc, and that by almost the identical means now followed in the so-called galvanized iron manufacture. The term "galvanizing," long known to be incorrect, was introduced, we believe, by Mr. Malins, a brother of Vice-Chancellor Malins, and it was the same gentleman who promoted the formation of the Galvanized Iron Company, long known as the firm of Tupper and Carr, the senior partner of this firm being, by the way, no other than the eminent "proverbial philosopher."

Messrs. Morewood and Co., of Birmingham, have long been among the largest manufacturers of galvanized iron, employing, when in full work, about 450 men and boys at their plate mills at Bilston, and 250 at their galvanizing works at Birmingham heath, where as many as 180 tuns of plates have been turned out weekly. The processes of tinning and "galvanizing," *i.e.*, zincing, the plates, or other objects, has often been described, and the greater proportion of galvanized goods being merely zinced, the operation is one, mainly, of removing the scale by sulphuric acid and afterwards immersing the articles in a bath of melted zinc.

The "continuous roofing sheets," formed by gripping and rolling together the edges of galvanized plates, end to end, to lengths up to 500 ft. where required, have come into extensive use. These, and all galvanized plates are known to stand well where unaffected by sulphurous fumes as from coal, and even where a good deal of coal is burnt beneath a galvanized roof it is nearly certain that the zinced plates last longer than plain iron, however painted. Roofs of the great spans now made, sometimes upwards of 200 ft., could not well be slated, and pure zinc, by its great expansion and contraction, is objectionable where the extremes of temperature are considerable.

Artificial Ice Manufacture.

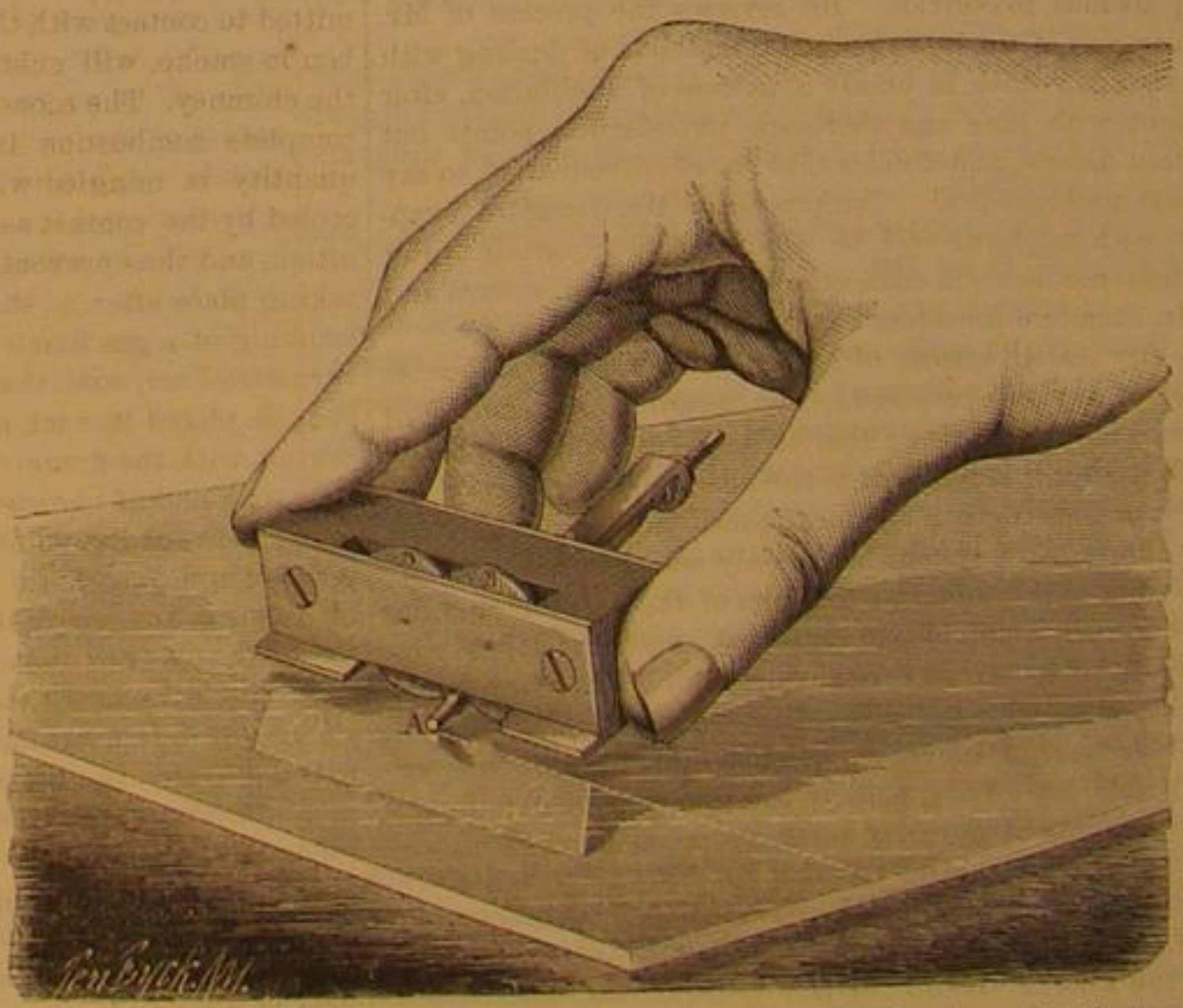
The *Evening Telegram* says that the ice factory at New Orleans, situated in one of the elevators, is a great success. It consists of six retorts of a chemical freezing mixture. From these six retorts six pipes descend to six huge chests, which chests in turn radiate severally off into four compartments. In each compartment are long, thin, tin cases, seven on one side and seven on the other. This making by all the rules of arithmetic a total of fifty-six cases in a box, and their being four boxes to a chest, and six chests to a factory, it follows that at full blast this Southern ice factory can turn out 1,344 cakes of ice, eighteen inches long, twelve broad, and two thick, at the completion of each process. The ice is much harder than that frozen naturally, and lasts much longer. The factory is a joint stock enterprise, and the property is exceedingly lucrative.

CUTTING GLASS WITH STEEL---THE MAGIC DIAMOND.

The cutting of glass with steel has been demonstrated to be possible provided its point is ground into the form of the common glaziers' diamond. But while hard steel of this form will cut glass, it is difficult to bring a steel point to the required shape, and it also soon wears out and becomes worthless, until reground. Many efforts have been made to make a tool of steel that would compete at least approximately with the real diamond for this purpose. It has been discovered that a small cylindrical point of steel when made to rotate upon glass in such a manner that its longitudinal axis shall make an angle of 45 degrees with the surface of the glass, approaches in effect so nearly to that of the real diamond that it is a very cheap and effective substitute.

The engraving illustrates the form of an instrument, and the mode of applying the principle enunciated to the cutting of glass. A is the end of a small cylinder, which is turned on the end of a spindle; this spindle rolls on the edges of two small disks, B, which lessens its friction enough to permit free rotation. The opposite end of the spindle has also a pointed bearing running in an adjustable center, so that the friction is very small. The following is the mode of using this tool.

The cutter is placed on the glass as shown in the engraving, care being taken to secure the proper angle of 45 degrees. It is then drawn toward the operator with a gentle pressure. The tool emits a peculiar singing sound as the edge cuts the glass.



It is claimed for this implement that it is very durable, that it can be used with great facility, that it is not liable to get out of order or break, and that it will cut glass even more rapidly than the diamond. We have tried its cutting properties, and can vouch for the remarkable facility with which glass can be cut by it. The cutting edge can be kept sharp by means of an ordinary whetstone, a small wooden cylinder being fixed to the spindle so that rotation can be prevented while sharpening. Curves are cut as easily as straight lines. The facility with which it cuts has won for it the name of the magic diamond. A clock manufacturing firm doing an extensive business at Bristol, Conn., have used it for cutting circular glass plates, and pronounce it superior to the diamond for that purpose. Patented Dec. 29, 1868. For further particulars address Messrs. J. Russell & Co., 83 Beekman street, New York city.

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THE SEWAGE QUESTION.

Few engineering topics are at present discussed with greater ability than those connected with the disposal of sewage. Our readers have been frequently posted by us, in regard to the end desirable to be attained; namely, the disposal of sewage so that it can be utilized as fertilizing material, or in some manner that will not tend to impair the public health, or comfort.

Among the best of the labored articles upon this subject we have perused is one entitled "A Chemist's view of the Sewage Question," by Edward C. C. Stamford, F. C. S., published in the *Chemical News*. Mr. Stamford clearly shows in his essay that the problem cannot be solved upon merely mechanical data. He says: "The present water closet system, with all its boasted advantages is the worst that can be generally adopted, briefly because it is a most extravagant method of converting a mole-hill into a mountain. It merely removes the bulk of our excreta from our houses, to choke our rivers with foul deposits and rot at our neighbors' doors. It increases the death rate, as well as all other rates, and introduces into our houses, a most deadly enemy, in the shape of sewer gases."

Mr. Stamford, predicts that the water closet will be ultimately doomed to oblivion. He reviews the process of Mr. Chapman, one of the latest proposed methods of dealing with town sewage, which is briefly a process of distillation, after treatment with lime and thorough putrefaction, points out important defects, and decides that its effectiveness is to say the least problematical. The process of Mr. Glassford, evaporation with sulphuric acid, he deems far more certain. But both these methods are connected with the water system and this Mr. Stamford considers a radical defect.

The dry earth system of Moule, he considers the most hopeful of any yet proposed. The question of removal of sewage is not the only one that is to be considered, what to do with it after it is removed is the most puzzling part of the problem and is strictly a chemical question.

The Moule earth system is the only one that has taken into full account the chemical bearings of the question and has dealt with it in a simple and practical manner. It at once provides for disposal and removal, making the former the prime object.

Mr. Stamford in order to obviate a difficulty which seems to us purely imaginary, namely the difficulty of obtaining a sufficient supply of pure dry earth, proposes to substitute seaweed charcoal, a powerful absorbent.

Now so far as this is concerned we believe there will ultimately be no difficulty in obtaining earth for the purpose, but if the system should become general, the privilege of furnishing earth and taking away the resulting compost will be so valued as to make it a subject of solicitation: perhaps even a commercial value will become fixed to the compost, and we may live to see the time when it will be found quoted in commercial price lists with guano and other fertilizers.

The amount of earth required is only three and one half times the weight of the excreta, and as seaweed charcoal, though only one fourth as much would be required, would certainly cost more than earth, the latter could never compete with the former except on shipboard, or in cases where large bodies of earth must be transported unless the charcoal could be in some way renovated and its absorbent power restored.

As charcoal can be used over several times, and then redistilled with the mixed excreta, the whole ammonia product being recovered, and the charcoal thus renovated recovers its absorbent power, it may be that the system of Mr. Stamford will be found to possess some advantages.

Mr. Stamford has made some interesting researches on the products of the distillation of the mixed charcoal and excreta. These products are, he finds, remarkably similar in composition to the distillates from bones, in manufacturing bone-black. Ammonia, acetic acid, butyric acid, acetone, and pyrol are the most marked products, and the charcoal produced is, he asserts second only in value to that of bones. The redistilled seaweed charcoal, and the charcoal resulting from the destructive distillation of the excreta will give an increased weight of charcoal, so that if this process were adopted the product for the city of Glasgow alone, it is estimated would be nineteen tuns per day.

The uses to which this charcoal might be applied are various. The system seems to have been the result of much study and close thought, but we doubt whether its merits will ever prove so great as to supersede the dry earth method.

THE CONSUMPTION OF SMOKE.

In an article on the use of pulverized fuel we recently stated the conditions necessary to rapid and complete combustion. When those conditions—namely, fine division of fuel, intimate mixture of the proper proportion of oxygen as it exists in the mixed gases of the atmosphere, and sufficiently elevated temperature are maintained—there would be no smoke produced. What would then pass off through a chimney would be carbonic acid, the nitrogen of the air, the sulphurous gases, and volatilized impurities of the coal or other fuel employed.

The constitution of smoke in the ordinary acceptation of the term, is a mixture of unconsumed gases with particles of solid carbon, called soot. Some of the gases, carbonic oxide, etc., are combustible, as is also the soot. These combustible materials may be utilized, and it is the object of all smoke-consuming furnaces, stoves, etc., to consume them.

It is the object of this article to investigate the general principles which must be observed to obtain perfect combustion of smoke. We have already shown that the admission of a proper quantity of oxygen is an essential condition, but as the chemical character of smoke varies according to the kind of fuel used, and the more or less perfect character of the combustion of the fuel which produces the smoke, it is obvious that this must be taken into account. It would by no means be correct to infer that because a furnace will consume the smoke and gases from a prime quality of anthracite coal, that the same furnace similarly adjusted would burn completely the dense smoke of bituminous coal. A perfect smoke-consuming apparatus ought, therefore, to take into account the amount of oxygen needed to consume different kinds of smoke, and be made adjustable thereto, according as circumstances may require.

Although a small excess of air would not be likely to interfere with perfect combustion it will be plain, from the following considerations, that there must be both an economical limit to such excess, and another limit beyond which success would be defeated.

We have seen that a proper temperature must be attained in order that combustion may commence, and that it must be maintained in order that combustion may continue. The capacity of gases for heat is much greater than that of solids; hence every pound of air not necessary to combustion admitted to contact with the combustible gases and floating carbon in smoke, will subtract heat and carry it away through the chimney. The economical limit is then reached as soon as complete combustion is attained. But if cold air in large quantity is mingled with smoke, the gases may become so cooled by the contact as to fall below the temperature of ignition, and thus prevent combustion, condensation of the gases taking place after a short time. This is illustrated by the smoking of a gas flame when placed in strong and irregular currents of air, and the instant deposit of soot when a cold body is placed in such a flame. Let the body thus placed in contact with the flame of an ordinary gas burner be of sufficient size and of sufficient conducting power to maintain a temperature at the point in contact with the flame below the point of ignition, and a continuous deposit and accumulation of unburned carbon will take place. The same is true when the body is a poor conductor of heat, but a rapid conveyer. This is the case with a thin glass vessel filled with water, suspended over a gas flame and in contact with it. The particles of water here rapidly convey away heat from the bottom of the vessel, while a deposit of carbon on the bottom immediately takes place.

It is evident, then, that when it is possible to supply heated air to smoke in precisely the quantities needed, the best conditions for perfect combustion are obtained. It is further evident that because a furnace completely consumes its smoke, it is not therefore necessarily an economical furnace, since it is possible to waste more heat through a chimney by excessive draft than the amount gained by the consumption of smoke.

Many important attempts have been made to secure perfect combustion of smoke, and so far as these apply to small furnaces where a complicated apparatus is out of the question, or to illy-constructed furnaces, to supplement imperfect action, they are many of them complete successes. Until the beau ideal of a furnace is attained, cheap, uncomplicated, and efficient, that shall burn fuel so completely that no smoke shall be generated, they will be valuable. The use of pulverized fuel, the only way in our opinion whereby the generation of smoke can be obviated, has hitherto entailed expense only possible to the larger kinds of establishments. It would seem, however, that the limits of possibility do not exclude a cheaper method of using pulverized fuel capable of more generla application, and of being employed on a smaller scale than has yet been accomplished.

DRAFT IN CHIMNEYS.

One of the many unphilosophical terms still retained in modern technology is the word "draft," as applied to the motion of air and gases through a chimney. There is no case where this term can be applied in its true meaning. It was like many other terms still retained, employed at first to express an utterly false idea of the nature of the thing for which a name was sought. The misfortune of retaining such terms in scientific language, is, that although the scientific man is not often misled by them, the unscientific are sure to be misled.

A chimney has no draft, if by draft is meant the power to draw anything. The time was, before the fact that air had weight was demonstrated, when it was thought that flame and smoke went up a chimney because the chimney had a mysterious power which drew them up. A similar error prevailed as to the way in which water rises in pumps; hence the term suction pump, long since demonstrated to be a misnomer. It is now generally known that water rises in atmospheric pumps by virtue of the pressure of the atmosphere upon the surface of the water exterior to the pump, the office of the plunger being principally to remove the pressure of the atmosphere from the interior of the pump.

The principle of the chimney is that a body, fluid or solid, plunged into a fluid of greater density will if unrestrained rise to the top. If as in the case of air the fluid into which the body is plunged is more dense at the bottom than at the top, the body immersed will rise until it reaches a stratum of fluid of equal specific gravity, and then cease rising. This is a natural result of the laws which govern the pressure of fluids. Air when heated has its density decreased, hence a volume of heated air, surrounded by air not heated, will immediately rise, if unrestrained, until it reaches a stratum of air of the same density as itself. A balloon filled with heated air will rise, but no one ever thought of speaking about the draft of a balloon.

What then is the use of a chimney, if the heated air will rise without it? Air rising through a tube and issuing through the top, the air which rushes in to fill the void is forced to enter at the bottom. Rising unconfined it would expand, and diffuse, mixing with the surrounding air, rapidly losing its heat and ceasing to rise much sooner than would be the case, when confined within the walls of a tube. Besides, the air rushing in to fill the void would be distributed more or less along the irregular sides of the heated and ascending current, instead of passing as desired through the fuel to maintain combustion.

The utility of high chimneys will now be manifest. The column of heated air rising as one body is impelled by the pressure of an equal volume of cold air entering at the bottom, and the higher the chimney the greater the volume, and of course the greater the force with which it will rush into the bottom through the fuel.

It must be obvious, also, if the principles we have stated are clearly comprehended, that anything which tends to check the ascent of the heated air in a chimney will more or less obstruct the flow of air into the bottom. Those correspondents therefore, who have written us with reference to the effect of horizontal and descending flues, arguing that a certain proportion of such flues would facilitate what they call, and is generally called, the draft of chimneys, are radically wrong in their views.

All the draft (if we must use the word for want of a better) a chimney has, it has by virtue of the ascending flues, all others are subtractors from the efficiency of the structure.

In conclusion, we suggest that the term circulation would be a good substitute for the term draft as applied to chimneys in general, ridding the language of one of its most inappropriate terms.

THE CORNELL UNIVERSITY.

The public is watching with much interest the attempts making to promote industrial and scientific education in this country. Undoubtedly the most important effort of this kind is the Cornell University, at Ithaca, N. Y. The tide of opinion has of late been rapidly setting toward a more practical kind of education than has for a long time prevailed. The applications of scientific discovery, have revolutionized the arts, and success in any department of industry is getting to depend more and more upon knowledge of fundamental principles, as science advances.

The field, too, is getting so wide that it is useless to hope that any one mind can thoroughly explore more than a portion of it. It has, therefore, become necessary to provide for the special education of youth in order to fit them for anything like a high station in any industrial department.

Special education in schools has, till within a short period, been chiefly confined to law, theology, medicine, and the fine arts. In many cases it was preceded by a course of classical training supposed to be the very best substratum upon which special education could be based. The fact, however, that very many of the most successful professional men (if we except theologians, to whom the knowledge of the ancient tongues is, perhaps, more essential than to lawyers and physicians), achieved their success without such training, while the greater majority of young men who had it failed to accomplish anything above the average of mankind, led to grave doubts as to its importance in a system of training adapted to the needs of modern times. Doubt, engendered discussion, and it is safe to say that at present a large body of thinking men are convinced of the superior value of thorough scientific training.

Such a conclusion could not long be entertained without attempts to put it in practice, and schools have been established both in America and Europe, subordinating classical training to scientific instruction. The Cornell University is such an institution, and although it gives special prominence to agriculture and the mechanic arts, making other scientific and classical instruction secondary, it yet deserves, in our opinion, to rank as the first school in the United States, when it is considered with reference to its scope and its immense endowment.

In saying this we do not disparage those scientific schools which, with a narrower scope, and on a smaller scale are doing most excellent work. Of these the Polytechnic Institute at Troy, N. Y., and several others, cannot be too highly praised, for their judicious management and the thoroughness of their course of instruction. The organization of the Cornell University is, however, so radically different from these schools, that it must be looked upon as an experiment in American education. As yet it has not got fully under way, and its ultimate success or failure is problematical. We believe it will prove a triumphant success, and we have had this faith from the outset.

Its annual register has come to hand, and from it we gather that it has a large corps of able professors, and a very large class of students—four hundred and twelve being the number instructed during the past year.

The scheme of military instruction, in compliance with the act of Congress, has been partially developed, and is made accessory to the preservation of quiet, order, and health. The shops which are ultimately designed to form a marked feature of the institution are not yet ready, but it is hoped that another year will witness their completion.

The following extract from the register, will show what is designed to be accomplished by the labor department:

When the shops are in operation good practical machinists, who have already a sound ordinary English education, and who wish to make themselves thoroughly scientific master mechanics, can probably do much toward their own support, and at the same time perfect themselves in their special department, in making models of instruments, machines, and apparatus for the University and other illustrative collections. But this will require skilled labor—the labor of young men already more or less accustomed to the use of tools.

The largest part, however, of the existing corps is composed of young men who can give only unskilled labor. For these almost the only work at present is upon the University farm, or in the grading of roads and paths on the University grounds. The time usually given is three hours a day, from two o'clock to five P. M., except on Saturday, when more time may be taken. Much excellent work has been done, and many students, while doing much toward their support, have thus physically strengthened themselves. The price paid is just what would have to be paid to other parties doing the same work, and as a student has usually less muscular development then an ordinary laborer, his earnings must be less. An energetic and capable student, coming at the beginning of the long summer vacation—extending from the first of July to the middle of September—could earn enough on the farm to give him an excellent pecuniary start, which, with what he could earn during the Trimesters, would do much toward carrying him through the year. But during the year now begun, with very few exceptions, students commenced work at the beginning of the fall Trimester, and as their studies have taken much time they have had comparatively little opportunity to labor toward self-support. It is hoped, too, that some simple remunerative manufacture may be introduced which will aid in supporting students, but, at this time, the University authorities cannot recommend any young man to come relying entirely on unskilled manual labor for support. Some few have that peculiar combination of mental and physical strength required thus to entirely support themselves—the great majority have not.

Why would not a beet-sugar establishment be just the branch of manufacture needed? If the beet will grow well upon the lands of the institution it might afford employment for many, and at the same time aid much in the permanent establishment of an important branch of industry. It will aid, also, in sustaining the agricultural science department, in which there seems to be a deficiency of interest at present.

The library now numbers nearly twenty-five thousand volumes. An important feature of this library is the publications of the Patent Office of Great Britain, comprising about twenty-five hundred volumes. The Museums of Geology, Mineralogy, Botany, Agriculture, Zoology, and Technology, embrace many large and fine collections. In addition to these there are large collections of apparatus, etc., in chemistry and physics, as also collections in the fine arts. These collections are receiving valuable additions from time to time, and form a very useful and attractive feature of the institution.

Although agricultural science was intended to occupy a conspicuous place in the University course of study, the register shows that only thirty have studied agriculture out of the large number matriculated during the past year, while of those pursuing mechanic arts, engineering science, and the arts in general we find 106. This number will doubtless be augmented when the workshops are opened. We do not argue from these figures that agricultural science is less needed in this country than mechanical science, but that there is perhaps a greater avidity for the acquisition of knowledge on the part of young mechanics, or those who desire to become mechanics and engineers than among those who desire to cultivate the soil. It is the nature of the arts to stimulate a thirst for knowledge which agricultural pursuits, as they are conducted, do not. This is not the fault of the latter occupation *per se*. It is the fault of the present morbid state of society, which draws away the more ambitious youths to glittering centers of trade, depleting the farming classes of a kind of intellect which, if retained in it, would give a much higher intellectual tone to the occupation.

But we have extended our remarks to a much greater length than we intended. The Cornell University has our best wishes, and we hope the experiment will result in an improved system of education throughout the United States.

AMERICAN SILK.

The present state of this industry in the United States, is very satisfactory. Not only are important advances making in the manufacture of silk goods, but the growth of raw silk in various localities is on the increase.

We have been informed that the Dale Manufacturing Company, of Paterson, N. J., has been importing workmen from France, and making extensive preparations to commence the manufacture of dress silks, and we have seen dress silks produced in this country, which, in our opinion, are in no way inferior to French dress goods of the same class.

The Positive Motion Loom, described in No. 2, current volume of the SCIENTIFIC AMERICAN, weaves dress silks of a quality equal to those woven by hand, and at a very much more rapid rate, and is doubtless destined to become largely identified with the manufacture of silk dress goods, not only in this country, but abroad.

A great stimulus to silk culture has been given by the demand for American eggs in foreign markets. It has been found that by the purchase of these eggs the old stock, which in many European localities had become effete, may be replaced by a new, vigorous, and healthy stock, so that for some time the export of eggs from this country has become an important and growing business.

In this trade, California has as yet had the largest share, but Louisiana is destined to become a formidable competitor.

We have before us a specimen of cocoons, grown by MM. Rocci & Maillé, in Covington Parish, La., crop of 1868, which will compare favorably with any grown in any part of the world. These cocoons average about 450 to the pound. The entire crop, amounting in round numbers to 1,000,000 cocoons, was grown during March and April.

The original stock of this firm was introduced into Louisiana in 1845, and its offspring has ever since been remarkably free from disease.

Italy paid, in 1868, 50,000,000 francs to Japan for silkworms' eggs, and the Italian government offers, for 1869, a prize of 50,000 francs for the best sample of eggs to be sent to that government for examination. MM. Rocci & Maillé feel confident that their chances for securing the premium are as good, to say the least, as any others.

Some of these eggs, with specimens of cocoons, having been sent to Italy, the government deemed the matter of so much importance that it has sent a special agent to examine and report upon its merits. We are informed this agent is now here, and that his report will probably be very favorable, as the facts in the case are such as to warrant this belief.

This statement shows to what an extent the silk industry may be developed if properly fostered by our government, and also justifies the statements we have hitherto made in regard to the adaptability of certain sections of the United States for the culture of silk. They are also another proof of the large and varied resources of our country; resources so great that the enormous importations we are making of foreign products is a blot upon the statesmanship of our legislators as well as a serious drain upon the vitality of our institutions.

THE ELASTICITY, EXTENSIBILITY, AND TENSILE STRENGTH OF IRON AND STEEL.*

Although Sweden possesses in its numerous lakes and canals extensive means of water communication, yet owing to the severity of the climate this mode of traffic is necessarily suspended during at least five months in the year. In spite, however, of the manifest advantages of a rapid and uninterrupted means of intercourse, it was not until about twenty years ago that railway communication was first introduced into Sweden. The construction and management of these railways, or at least of the main lines, were undertaken by the government; for it was believed that the amount of traffic in a country so thinly populated would be insufficient to render any private speculation of this kind remunerative.

It might be supposed that a country possessing such vast iron-making resources as Sweden would naturally manufacture its own railway plant. It was soon found, however, that English materials could be obtained for considerably less than the cost of similar articles manufactured at home, and hence Sweden was for many years dependent chiefly upon England for its supply of railway materials. Indeed, the Swedish charcoal iron always commanded so high a price in the English market, that it was advantageously exported for the use of the steel manufacturers of Sheffield, while English iron of a lower quality, but suitable for rails, tires, axles, etc., was imported into Sweden; this interchange being facilitated by the free trade enjoyed by that country.

After the importation of foreign materials for the construction of railways had continued for about five years, the Swedish Diet called attention to the expediency of using products of home manufacture. As the question was one of great national interest the government was induced to appoint a scientific commission for the purpose of determining whether Swedish raw material was equally suitable for the manufacture of railway plant, and whether its superior quality would adequately compensate for its increased cost. The members of this committee were selected from among the most experienced men of the country, and consisted of Messrs. Ekmann, Styffe, and Grill.

The execution of the experiments was confided to Mr. Styffe, who secured the assistance not only of certain practical engineers but also of several men of science connected with the University of Upsala. It is an account of these investigations that forms the subject of the work before us.

Experience has taught us the necessity of thoroughly examining the elasticity, extensibility, and tensile strength of iron and steel intended for the construction of railway plant.

In England important investigations on the strength of these metals have been undertaken by Messrs. Fairbairn, Hodgkinson, Kirkaldy, and other engineers. On the continent of Europe experiments on this subject have been ably conducted by several eminent physicists, among whom may be especially mentioned Lagerhjelm, Wertheim, and Kupffer.

The Swedish committee in prosecuting their inquiries of course availed themselves of the results of these previous investigations, but extended the methods of experiment to the question immediately under their discussion. Their researches extended over a period of five years, and were prosecuted on account of the Swedish government without any regard to expense; the sole aim being to attain accurate results. In the present work the minute details of this important investigation are recorded with admirable fidelity and clearness; but while these details are of the greatest value to the man of science, it should be distinctly understood that it is by no means necessary to study them in order to arrive at the main results of the inquiry. Indeed these results are stated so plainly and succintly as to be understood by any iron-master or practical engineer, while the refinements of the experiments and the investigation of the formulæ may, if necessary, be omitted without much prejudice to the reader.

The materials examined by the committee were obtained from the most renowned iron works of Sweden, and from the chief iron producing districts of England.

As noticed in the title of the work, the researches were directed principally to an examination of the elasticity, extensibility, and tensile strength of iron and steel; these properties being regarded as of prime importance in determining the value of railway materials. It is, however, to be regretted that no experiments were made on the relative capacities of different kinds of iron and steel to resist concussion; for railway materials are, by their nature, constantly exposed to shocks of this kind, and there seems to be a very uncertain relation between the strength of a material to resist tensile strains and to withstand the force of impact; the extensibility or power of extension under a tensile strain is, however, a character more worthy of reliance as a comparative measure between these two properties of the metal.

Formerly but little attention was directed to the connection between the chemical composition of iron or steel and its mechanical properties. During the last ten years, however, the subject has recived considerable attention, especially with reference to Bessemer steel; and it is now usual to determine the carbon at most of the European steel works—thanks to the simple coloration test introduced by Prof. Eggertz.

In most of the tables appended to this work the author has given the amount of carbon in the bars examined. Considerable attention has also been paid to the influence of phosphorus on iron and steel; and the author remarks that he knows no instance of a good steel containing more than 0·04 per cent of this element.

The effect which slag exerts on iron is also noted, and under certain conditions its preference is said to be beneficial.

Not only does the author trace the connection between the chemical composition and the strength of the material, but he also examines the influence exerted by the manipulation to which the material has been subjected. In a valuable series of curves he shows graphically the manner in which the properties of iron and steel are affected by their chemical constitution and mode of manufacture.

In examining the results of some of these investigations, the manufacturer will be struck by the results obtained from "Cleveland iron" as compared with Staffordshire iron. These results are certainly not confirmed by general experience, and their explanation is possibly to be found in the author's note (p. 25) in which he tells us that the bars representing the Cleveland iron were procured through an agent, and were therefore probably selected. On the other hand, the so-called Staffordshire specimens were purchased in Stockholm, and nothing known as to their manufacture.

The author's experiments on hardening tend to corroborate a fact previously known; namely, that iron admits of being hardened, although to a far less extent than steel. When steel is hardened by being plunged into cold water, the scale of oxide formed upon its surface is thrown off, and it may be said that this behavior of the metal constitutes the only practical point of difference by which steel may be distinguished from iron.

But perhaps the most important part of Mr. Styffe's work is that which relates to the effect exerted by differences of temperature on the strength of iron and steel, as detailed in Chapter III. The subject had indeed been previously examined by Dr. Fairbairn, but in the Swedish experiments a lower limit of temperature was attained, the thermometer falling to the freezing point of mercury, or 40° Fah.

In Sweden the difference between the extremes of temperature in summer and winter is twice as great as the corresponding difference in England; and hence materials well suited for use in that climate may be dangerous for a Swedish railway.

As the same remark of course applies to other countries that suffer from severity of climate, the subject cannot be too attentively studied by engineers in Canada and certain parts of the United States.

The great point brought out by Mr. Styffe's researches is, that the bars of iron and steel tested by him for tensile strength, so far from being weaker, as generally supposed,

* The above is the title of a work, by Knut Styffe, Director of the Royal Technological Institute at Stockholm. It has been translated from the Swedish, and supplied with an original appendix, by Christer P. Sandberg, Inspector of Railway Plant to the Swedish Government and Associate of the Institute of Civil Engineers, and is published by John Murray, London, 1869.

were actually stronger at low than at ordinary temperatures. Strange as these results may appear, the number of experiments made by the author and the care with which they were conducted, utterly preclude the supposition that any source of error has affected the results. But as the author applies these results to the question of the strength of railway materials in winter, Mr. Sandberg has deemed it necessary to institute experiments on this subject, the results of which are apparently opposed to the conclusion drawn by the author, and are presented in the form of a valuable appendix to this work.

Although the translator, as he admits, adopted a rough and ready method of testing which strikingly contrasts with the refined experiments of the author, he nevertheless has the advantage of experimenting with entire rails such as are really subject to shocks in railway traffic, while it must be remembered that the author employed bars so thin as to be little else than stout wires, and which therefore would be very considerably influenced by any slight irregularity of structure arising from the mode of manufacture.

Another source of difference between the results obtained by the translator and those by the author is to be sought in the chemical composition of the bars examined; for while Mr. Sandberg used ordinary rails, which may be supposed to contain a considerable proportion of phosphorus (the Cwm Avon rail, according to the author, contains 0·20 per cent). Mr. Styffe experimented for the most part on comparatively pure materials. But the chief source of discrepancy, doubtless, arose from the different manner in which the strain was applied in the two sets of experiments. The author examined the *tensile* strength of his samples, and, for this method of testing, his results are doubtless accurate: but the translator subjected his bars to the *impact* of a falling weight, and thus dealt with forces which are of a more practical nature. It is, therefore, as the translator justly admits, only the conclusions which the author draws from his results that require modification and not the results themselves.

To the scientific reader this work will prove an interesting and valuable work. It has received warm commendation from the scientific press of England, and will doubtless be equally well received in this country. The experiments will be of peculiar value to those interested in the manufacture of iron with charcoal and coke. We commend the work as one of much practical and scientific importance, and a valuable addition to the literature of metallurgy.

MODERN PRACTICES IN FINANCE.

The anxiety to become suddenly rich, which now so widely prevails in this country, has promoted a marked demoralization in business circles—quite different from what it was a few years since when our merchants and bankers were expected to keep themselves above even a suspicion of wrong doing.

We do not intend to say that all honor has fled the business community. On the contrary, New York, and other cities, can boast a large class of strictly honorable business men, but we do mean to say that certain transactions in and out of Wall street, if perpetrated fifteen years ago would have brought the authors to merited punishment and disgrace, but are now set down as merely shrewd operations, and their authors walk abroad among a host of admirers and would-be imitators.

The sad result of these iniquitous practices appear in the columns of our daily journals with startling frequency, in the shape of safe and bank robberies, defalcations, and other somewhat more genteel villainies. The men concerned in these things are simply noted down as "sharpers," and flourish mightily on their ill-gotten gains. It would not be a difficult task to designate the parties who have been the chief instruments of this wide-spread demoralization, but when protected as they are by venal judges, it is useless for the press to expose them as they deserve.

Money in Wall street is loaned out at large usurious rates. Indeed, all respect for this wholesome law has long since disappeared from our money centers, and the "sharpers" fleece all they can. Our Grand Jury has just now put on a show of virtue, and proposes to indict certain well-known money brokers, but we fear that the whole thing will be but a "flash in the pan."

Gas as a Calorific Agent.

While the use of coal gas for illuminating purposes has extended rapidly, in this country at least, its adoption as a calorific agent has been so slow as to disappoint the hopes of its early advocates. The advantages claimed for gas in this respect are cleanliness and freedom from trouble, it being unnecessary to carry coal or other fuel to feed the fire, or to remove the ashes, etc. The rapidity with which heat may be generated and the ability to instantaneously extinguish the fire are great recommendations—particularly in summer when it is desirable to perform the duties of the *cuisine* with as little elevation of temperature as possible.

The Gas-Light Journal says that, in England, and particularly in London, gas is largely used for cooking, and it is said to perform its office most acceptably. For families living in apartments, where the trouble and expense of carrying coal or other fuel would be great, gas has proved a great desideratum. By means of approved burners, and admixture with the proper portion of atmosphere air at the time of consumption, a large amount of heat is generated, and where sufficient ventilation may be had, the products of combustion are readily conveyed away, causing no inconvenience or injurious results. Possessing these advantages, it may appear strange that it is not more generally adopted; doubtless it would be, but for the high price of gas in this country; the ordinary methods for generating heat have the preference because of their economy. The probability is that if the price of gas were reduced, so as to make it practicable to employ it for eating, the demand for it would increase in a large ratio, and he concession might be more than atoned for in the enlarged ales which would undoubtedly follow.

That the calorific properties of gas are equal to other agents used for heating, is proved by the fact that in analytical chemical laboratories, charcoal and other fires have been, to a considerable extent, replaced by gas, and the operations of boiling, evaporation, fusion, ultimate organic analysis, and even cupellation, are now performed by easily regulated gas furnaces, their use conducing far more to the personal comfort of the operator, than the troublesome and cumbersome stoves formerly employed. The inventions of gas furnaces, such as are constructed by Griffin and others in England, and Krause and Haskins in this country, have displayed much ingenuity, and, by their use, the laboratory of the chemist presents a much cleaner appearance than formerly—no dangerous sparks or cinders being formed, nor ashes being blown about the room, to the detriment of other substances in the vicinity.

From the success attending the use of gas stoves in the laboratory, it is safe to assert that many of the operations of the household could be performed in the same manner.

The introduction of the improved process of manufacturing gas by the Gwynne-Harris plan of decomposing high steam to produce hydrogen as a heating agent, and for a motive power, in lieu of steam power is commencing a new epoch in the history of political and domestic economy. The same process applied to the ordinary coal gas manufacture lessens the first cost of production so greatly that it will soon be a matter of consideration with gas companies whether the selling price may not be lessened, with a view to its introduction into these new industries; thus opening a much more extensive demand, which, in the aggregate, will largely increase the dividends of gas companies, and add a new element to the progress of the age.

Steel Rails---Their Durability.

The annual report of the State Engineer of New York, prepared by S. H. Sweet, Deputy Engineer, contains the following regarding steel rails: "Bessemer steel rails have been in regular and extensive use abroad over ten years. For some five years large trial lots have been laid on various American roads having heavy traffic, and during the last two years importations have largely increased. The manufacture of steel rails has also been commenced at four large establishments in this country, and some 7,000 tuns of home manufacture have been produced and laid down. It is estimated that from 40,000 to 50,000 tuns of steel rails are in use on our various railways. Among the users of steel rails are the Hudson River, Erie, and Pennsylvania Railway—10,000 tuns or more each; the Lehigh and Susquehannah (entirely built of steel); also the Philadelphia and Baltimore; Camden and Amboy line; Lehigh Valley; New York Central; New York and New Haven; Naugatuck; Morris and Essex; Cumberland Valley; South Carolina; Chicago and Northwestern; Chicago and Rock Island; Chicago and Alton; Michigan Central; Lake Shore line; Chicago, Burlington, and Quincy; Pittsburgh, Fort Wayne and Chicago; also the Boston and Providence, Boston and Worcester, Boston and Maine, Boston and Albany, Eastern, Connecticut River, and other lines in New England.

"The Wear of Steel Rails.—As no steel rails are reported to have worn out on our roads, the comparative durability of steel and iron cannot be absolutely determined. The president of the Philadelphia and Baltimore Railway states (in the letter before quoted) that the use of steel commenced in 1864, that the rails (25 miles in all) were laid on the most trying parts of the line; that none have been taken up on account of breakage, wear, or defect; that upon the portion of the line near Philadelphia, the first steel rail imported had already worn out sixteen iron rails; and that none of the steel rails have shown any imperfection, but are all wearing smoothly and truly.

"On the Pennsylvania Railway, the Report of the Chief Engineer for 1868 states that 11,494 tuns of steel rails had been purchased, and 9,956 tuns laid. The first were laid in 1864. They are all wearing smoothly, showing no change except the slight dimunition of section to be reasonably expected from the heavy traffic. No steel rails have yet worn out. The report of the superintendent (Feb. 1869,) says: 'The use of steel rails continues with satisfactory results, and 4,544 tuns of this material have been laid since date of last report.' It is officially reported that on the Camden and Amboy line, some of the steel rails laid three years ago are now good in places where iron lasted but a few months.

"The last report of the Engineer of the Lehigh Valley Railway says: 'Another year's wear has made no perceptible impression upon the 200 tuns (of steel rails), the first of which was laid in May, 1864, none of which has broken or given out since last report. These rails have had a severe test, being, in those places in the track where they are subject to the greatest wear, laid with a chair, which is much inferior to the most approved joint now in use. There is no longer any possible doubt as to the superiority of steel over iron in economy, as in every other respect.'

"Unofficial reports from the Erie, Hudson River, and other roads, show that the above statements represent the average quality of steel rails. The last report of the New York and New Haven Railway states that 'the subject of steel rails has received special attention, and after a careful investigation of all the points involved, it has been determined hereafter to make all renewals of track with steel rails only; 2,900 tuns of Bessemer steel rails have been contracted for on account of renewals for the present year.' The report of the Morris and Essex Railway for 1868 says: 'During the last year one track through the tunnel has been ralaid with steel'—also some 150 tuns of steel laid elsewhere. 'The wear of steel shows conclusively that economy will require its use on all heavy grades and sharp curves.' The last report of the New Jersey Railway and Transportation Company says: 'It is probable that steel rails will be gradually laid the entire length of the road, the greater durability of these rails, overcoming the objection to their increased cost.'"—*Railway Times.*

Editorial Summary.

There seems to be no end to great engineering projects, for, besides the underground railroad which has got a start, books are now open for subscriptions to form a capital stock of $6,000,000 for the purpose of cutting a ship's canal from New York to Newark. On the completion of the canal it is proposed to run ferry boats over it half hourly. The length of time which it is estimated a trip either way will consume is but 40 minutes—less time than it takes to go by rail at present from here to Newark. The proposed ferriage will be particularly serviceable to those who find it economical to do their transportation by team. The value of property alone to be created by its construction will reach, it is thought, between $12,000,000 and $13,000,000.

A Good Appointment.—Commissioner Fisher has recently determined to place all interference cases under the charge of a single Examiner, to be specially designated for that work and relieved from other duties; and we understand that John M. Thatcher, Esq., Principal Examiner recently in charge of the class of harvesters, etc., has been promoted to the place. The duties of Mr. Thatcher's new position are arduous and important, requiring for their successful performance a very high order of ability, with great industry and integrity. The Commissioner could hardly have made a better selection, and we are confident that the interests of inventors will be decidedly promoted by the new method of adjudicating these important cases.

The Century Plant, about to blossom in Rochester, N. Y., has reached a hight of 15 feet 9 inches, and will probably reach 20 feet. It has 20 branches and buds now visible, which are to bear the clusters. The lower branches are about 15 inches in length and 5 inches apart, where matured, and they gradually shorten until they reach the top. The lowermost arm is 11 feet 6 inches from the ground, and there are 105 distinctly formed buds in this cluster. We estimate there will be 1,500 flowers on the plant. The great beauty is the wonderful pyramidal form which it attains when in full bloom, the large clusters and numerous flowers in each, which will appear at the ends of the arms or branches, the lower ones being the longest, and gradually shortening in pyramidal form till they reach the top, where there will be a huge cluster of flowers.

A California journal announces with becoming gravity that the problem of aerial navigation is solved, and that, within a year, travel will be habitually carried on between San Francisco and New York, Europe and China, by aerial carriages. It says that within four weeks, the first aerial steam carriage, capable of conveying six persons, and propelled at a rate exceeding the minimum speed of thirty miles an hour, will wing its flight over the Sierra Nevada on its way to New York and remoter parts. The notice here given is very short, but we do not doubt that our citizens will organize to give hospitable welcome to the celestial visitor.

We notice druggists' advertisements in some of our city exchanges of dry pure earth for surgical purposes. It is well known that earth has been used with great success lately as an application to putrid sores and ulcers. The earth kept for sale is not claimed to have any superior efficacy to other earth, but as it is difficult in large cities to obtain the proper quality of earth at short notice, its being kept in stock at apothecaries establishments, will prove a great convenience.

On the 29th June we received a package from California having been only seven days in making the transit. This is one of quite a number lately received from various parts of California which have been only from seven to nine days in making the passage.

The *Tribune* makes itself responsible for the statement that a man in Adair county, Iowa—name of the town not given—has invented a cannon which he claims will throw a projectile fourteen miles, and has gone to Washington to get a patent. He proposes to offer it to the Government for $1,000,000.

The underground railroad corporation has already commenced business and $10,000 have been subscribed to begin work. The capital stock is fixed, we believe, at $10,000,000, therefore there remains to be taken only $9,990,000 to complete a work which interests all New Yorkers.

Alex. T. Stewart returns an income for 1868 of $3,019,218, upon which he pays a tax of upwards of $150,000. Wm. B Astor returns an income of $1,072,212. Mr. Stewart is said to be the richest man in the world who has made his own money.

Credit was inadvertently omitted to the excellent article on "Copper, Brass, and Iron tubes," page 39, present volume, which was copied from *Engineering*.

Lava has been known to flow over a layer of ashes, underneath which was a bed of ice. The non-conductivity of the ashes saved the ice.

NEW PUBLICATIONS.

THE AMERICAN ANNUAL CYCLOPÆDIA for 1868. New York D. Appleton & Co.

This valuable work is continued this year in the very creditable manner which has secured for it heretofore a wide-spread and enviable popularity. Its frontispiece is an admirable likeness of Schuyler Colfax, whose prominent position before the country renders the engraving as fitting a selection perhaps as could have been chosen. The opening article is one on Abyssinia, geographical and historical, embodying the history of the recent war, resulting from the savage obstinacy of King Theodore in retaining English prisoners. It is a valuable and interesting article. Some important information is also furnished upon our newly-acquired territory in Alaska. The article on "Literature and Literary Progress in 1868," is an excellent and carefully-prepared summary of information in regard to that interesting topic. Among the scientific notices we observe a well-written article on "Astronomical Phenomena and Progress," containing a well-prepared account of the "Total Solar Eclipse," and the results of the various expeditions sent to observe it. The lunar crater, Linne, and other supposed changes in the moon, observations upon nebulæ, and suspected changes therein, are also noticed. It would be vain for us to attempt an elaborate notice of the rich and varied contents of the volume. Suffice it to say, that no one who desires a work of reference, fully up to the times, can afford to do without it.

WE are in receipt of the REPERTORIUM DER TECHNISCHEN, MATHEMATISCHEN UND NATURWISSENSCHAFLICHEN JOURNAL LITERATUR.—"Repertory of Literature, Technical, Mathematical, and Natural Science," issued by F. Schotte, Engineer and Librarian of the Royal Industrial Academy at Berlin, with the assistance of official data, under sanction of the Royal Prussian Ministry of Commerce, Trade, and Public Works. It is a valuable catalogue of German works relating to the subjects enumerated. It is issued monthly, and sold by M. Westermann & Co., German booksellers and importers of European literature, 471 Broadway, New York city.

BEAUTIFUL SNOW, AND OTHER POEMS. By J. W. Watson. Published by Turner Bros. & Co., Philadelphia.

It is very beautifully got up, and is sold at $1.25.

"MARRIED" is the title of a new domestic novel, by Mrs. Newby, author of several well known works of fiction, just issued by Messrs. Turner Bros. & Co., Philadelphia. Price, 50 cents.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

That portion of the Atlantic ocean occupying the triangular space between the Azores, the Canaries, and the Cape Verd Islands, has a thick growth of weeds, which, as our young readers will remember, occasioned gloomy thoughts in the breasts of the crews of Columbus' vessels. Though these weeds—*fucus natans*—are now far from being so abundant as then, an enterprising Frenchman proposes their utilization, and he estimates that enough may be collected every year to make a fertilizing manure for more than a thousand million acres of land. The plan suggested is that the vessels employed in cod fishing should bring cargoes of the weeds at such times of the year as they cannot be engaged in fishing.

M. Dubois Caplain has patented an improvement in refining metals. Instead of leading the vapors and gases disengaged during the process simply into water, he introduces fine wrought iron shavings into the chambers for their reception and condensation. He also brings them in contact with a jet of steam situated in the line of draft. Under the combined action of the steam and iron, the vapors of the sulphuric and sulphurous acid are decomposed and sulphate of iron is formed which passes off in a state of solution. The reaction will be the same whatever metal may be substituted for the iron, although the product may be different, that is if the metal can be attacked by sulphuric acid.

A fearful disaster has occurred at Carnarvon, Wales, during the cartage of some packages of nitro-glycerin from the harbor to the quarries. The material exploded on the way, and the cart horses and the men attending were blown to atoms. The railway station, near the scene of the explosion, was torn to pieces, and a village a quarter of a mile distant, was much damaged by the shock, which caused great consternation among the inhabitants. Four men were killed by the explosion.

A correspondent says that there are now two salt wells in successful operation at Coshocton, Ohio, that the brine has been struck for a third, and the work of sinking a fourth is about half done. Large beds of fire clay are being discovered and also numerous bands of graphite. He considers the mineral wealth of the Muskingum Valley capable of extraordinary development, and adds that it is contemplated to build soon a railroad from Mahoning County, in a south-westerly direction, through the heart of the best mineral district in Ohio.

According to the London *Mining Journal*, the attention of society in Turkey is now directed to industrial enterprises, and mining operations are in great favor. A dozen concessions of rights to work minerals on national lands have been granted to companies and individuals.

An international exhibition of the products of workmen's labor will be held at London in 1870, and Mr. Thornton, the British Minister, has been requested to make the matter known to the citizens of the United States, which he will proceed to do when more fully advised in regard to details. The great aim is to develop physical labor throughout the world.

The Directors of the Connecticut Western Railroad Company, have voted at a meeting held in Hartford, to locate the road from Hartford to Collinsville, by way of Bloomfield, Tariffville notch, and North Canton. The road is to follow Brick Kiln brook from Hartford, through Blue Hills to Bloomfield.

The *White River Journal*, Devall's Bluff, Arkansas, tells us that Gen. Dunlap, of Goliad, Texas, has ramee plants growing on his plantation four feet high. He is the pioneer in that new field of enterprise in Western Texas.

Two new air compressors, each running ten drills, making a two-inch hole and capable of sinking a foot per minute, are said to be now put in at the west shaft of the Hoosac tunnel. Twenty-five dollars worth of nitro-glycerin is daily used at the central shaft.

The Mormons of Utah, during last year, irrigated and reclaimed 93,799 acres of land. Altogether they had a large amount of land under cultivation: 80,518 acres in cereals, 1,817 in sorghum, 6,839 in root crops, 766 in cotton, 29 976 in meadow, 993 in apples, 1,011 in peaches, 75 in grapes, and 195 in currants. The larger part of these lands is artificially irrigated.

Three tuns of solid silver consigned to Chicago, recently passed through Davenport, Iowa. It was in bricks which weighed 1,500 to 1,501 ounces each. With one exception the bricks were in sealed leather sacks. The exception was bare. It weighed 125 pounds and 2 ounces, and bore the stamp "$1,501·96." Most of the silver was from the Equator lode in Georgetown, Colorado.

Of the 10,027,300 furs sold in St. Petersburg, Russia, last year, about 9,000,000 were from Siberia and 186,500 from Alaska. The value of these furs in gold was about $3,489,375.

The coinage of the branch mint in San Francisco for June was $1,340,000 in gold, and $8,000 in silver. The total for the year ending June 30, is given at $19,016,000.

Edmund About, the well-known French writer, is engaged on a work on Workingmen's Unions. The Emperor Napoleon, has, it is said, given him $4,000 for the book.

A new telegraph cable has been successfully laid between Peterhead' Scotland, and the coast of Norway.

APPLICATIONS FOR EXTENSION OF PATENTS.

CORRUGATED REFLECTORS.—Bernard Goetz, of Philadelphia, Pa., has petitioned for an extension of the above patent. Day of hearing, September 20, 1869.

GRAIN SEPARATOR.—Peter Geiser, Waynesboro, Pa., has petitioned for an extension of the above patent. Day of hearing September 20, 1869.

Recent American and Foreign Patents.

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

RUBBER AND GUTTA-PERCHA HOSE.—E. L. Perry and Chas. Manheim, New York city.—The object of this invention is to provide rubber hose so protected at the ends as to prevent the canvas from exposure to water or air, which, when so exposed, as they are now constructed, takes up the water by capillary attraction and retains it to such an extent that the ends of the hose soon become weak and rotten, and burst by the pressure of the water.

ROCKING CHAIR.—Chas. Singer, South Bend, Ind.—This invention relates to improvements in the construction of rocking chairs with air blowing attachments, having for its object to provide a stand or base, for the support of a bellows, with tracks or rails on which the rockers, which are fixed close to the seat, may work, instead of on the floor.

CAR COUPLING.—J. C. Smith, Stoughstown, Pa.—This invention relates to improvements in car couplings having for its object to provide a simple and reliable self-coupling apparatus, which may be uncoupled by a simple movement of a hand lever, and attached so as to be readily changed from one end to the other of the cars.

GRAIN CLEANER.—W. B. Smith, Clayton, Ill.—This invention relates to improvements in grain cleaning machinery designed to combine a fanning and scouring apparatus in one machine, and consists in the arrangement of the blowers, screens, and scouring apparatus relatively to each other. Also, in the arrangement of means for shaking the shoe which supports the screens. Also, in the arrangement of the air passages for distributing the air upon the screens, and for action upon the grain after leaving the screens.

WATCH SAFE.—J. W. Durham, Ripley, Tenn.—The object of this invention is to provide match safes capable of being readily connected to the clothes of the carrier, for convenience in using. The invention consists in providing hinged pins and catches for the same on one side for securing the boxes to the clothes.

MEDICINE SPOON.—Mrs. Susan C. Currie, New York city.—This invention relates to new and useful improvements in spoons, whereby it is designed to provide a spoon suitably adapted for administering medicine, having an attachment for connection to the cork of the medicine bottle, serving both as a cork screw or drawer, and for supporting the spoon in a conspicuous position where it will be readily noticed when wanted, and be prevented from being misplaced.

APPARATUS FOR UNLOADING GRAIN.—John Beattie, Chicago, Ill.—This invention relates to improvements in machinery for unloading grain in bulk from cars, and consists in an improved arrangement of means for gearing and ungearing the main winding drum with the driving shaft; also in a guiding arrangement for the main rope.

STRAW CUTTER.—F. B. Newton, Bouckville, N. Y.—This invention relates to improvements in feed cutters, designed to provide an improved construction of the same, calculated to facilitate the removal of the cutters for grinding; also certain improvements in the arrangements of the feed mechanism and the pressing apparatus.

CLOD FENDER FOR PLOWS.—R. A. Kelley, Hope, Ind.—The object of this invention is to provide an adjustable and yielding clod fender for plows, such as are used for plowing between the rows of young plants for cultivating, that will yield to the inequalities of the ground without jumping, and which may be readily adjusted to allow more or less earth to be turned up toward the rows of plants and turn the clods back into the furrow.

INJECTOR.—C. Hughes, Niles, Ohio.—This invention relates to improvements in the injectors for feeding steam boilers, designed to simplify and cheapen the construction of the same, also to produce improvements in the operation thereof. The invention consists in an improved construction of the shell whereby common T-pipe joints may be used to form the same. It also consists in an improved arrangement of the water valve; also, in an improved arrangement of the steam valve for imparting a spiral motion to the steam and the water, making the jet more compact and less liable to be broken and neutralized by jarring and for packing the steam ports.

THRASHING MACHINE.—H. K. Averill, New Oregon, Iowa.—This invention relates to improvements in portable grain thrashing machines, designed to adapt them for the application of wind mechanism for operating them by hand power; also, to provide a straw chaff and grain carrier, and separating apparatus of improved construction, adapted for cleaning the grain ready for market, without the employment of fans by the action of the wind; also, to adapt the machine for the application of either wind or horse power, or both.

RAILROAD COUPLING.—R. F. Baughn, Lexington, Miss.—The object of this invention is to so construct a railroad coupling that it shall uncouple automatically, in case the car to which it is attached is thrown from the track or turned on a short angle with the next car ahead.

ELECTRO-MAGNETIC ALARM.—John G. Butler, New York city.—This invention relates to improvements in magnetic instruments for making signals or giving alarms, as, for instance, when connected with the doors and windows of a dwelling by the wires of a battery.

STOVE DRUM.—Marshall Turley and J. D. Bayliss, Council Bluffs, Iowa.—This invention relates to a new and useful improvement in drums for radiating heat generated in stoves, and consists in the arrangement of radiating tubes, chambers, and jackets, and in placing in the tubes iron spirals for retarding the heated products of combustion.

CULTIVATOR.—D. H. Paul, De Witt, Iowa.—This invention relates to a new and useful improvement in cultivators, and has for its object the prevention of the choking or clogging of the implement by weeds, stalks, and similar trash.

WATER GATES.—Vernon E. Smith, Lancaster, N. H.—This invention relates to a new and improved arrangement for operating water gates in discharging water on to water wheels, and for all other purposes for which water gates are used.

SECURING BUTTER JARS.—Moses H. Nichols, Hancock, N. Y.—This invention relates to a new and useful improvements in means for securing and protecting jars of butter, lard, preserved meats, fruits, desiccated vegetables, and other articles which are placed in glass or stone jars or pots for preservation from the air and for transportation.

CHIMNEY TOP.—William Musbash and Chas. R. Smith, Middletown, N. Y.—This invention relates to a new and useful improvement in a fixture for topping-out chimneys.

MOTION FOR REAPERS AND MOWERS, AND OTHER PURPOSES.—George S. Ellard, Westerly, R. I.—This invention relates to a new and improved method of producing a reciprocating motion, more especially designed for reapers and mowers in operating the cutter bars of those machines, but applicable to other purposes.

LOG TURNER AND LOADER.—Samuel Snyder, Delaware, Ohio.—This invention relates to a new apparatus, by means of which logs can readily be turned on stationary and portable corn mills, and by means of which also logs and lumber of all kinds can readily be loaded upon sleds, skids, or other devices.

MOISTENING ATTACHMENT TO LITHOGRAPHIC MACHINES.—John Crawley, Brooklyn, N. Y.—The object of this invention is to regulate the flow of water from the water reservoir to the absorbing fabric by which the lithographic stone is moistened, and to prevent the too rapid discharge of the water.

INVALID BEDSTEAD.—Franklin H. Smith and Wm. F. Wood, North Hebron, N. Y.—This invention relates to an improved bedstead for invalids, which is so arranged that the occupant can be elevated above the bedding to have the same rearranged.

BAG FILLER.—Asa J. Olney, Van Buren, Ind.—This invention relates to a new bag-filling attachment to the elevating apparatus of winnowing machines, and has for its object to be readily detachable, and to operate without injuring the bags.

COMBINED YARD MARK AND KNIFE.—E. D. Richardson, Chardon, Ohio.—This invention relates to a new device to be applied to counters in stores and salesrooms, and has for its object to serve at once as a measure like the ordinary buttons put into counters, and as a knife for cutting the edge of the cloth or fabric measured preparatory to tearing the same, and for cutting twine, etc.

TELEGRAPH SOUNDER.—Wm. E. Davis, Jersey City, N. J.—This invention relates to a new manner of constructing the sounding column of a telegraphic sounding apparatus for the purpose of producing a clearer tone, and also to certain improvements in the construction of the other parts that pertain to such apparatus.

MAGIC LANTERN.—L. J. Marcy, Newport, R. I.—The object of this invention is to prevent the over-heating of case, or shell, of a magic lantern and of the lenses, and to provide a convenient manner of removing and inserting the lamps.

MUZZLING FOR DOGS.—Hermann Kaempf, Newark, N. J.—This invention relates to a dog's muzzle, which is so constructed that it will be light, substantial, and entirely reliable, without being in the least cumbersome to the animal, and without preventing the same from drinking. The invention consists in forming a muzzle, partly of wood rods, and partly of a flat metal spring, the collar band being an independent wire spring or ring.

HARROW.—Jay Knickerbocker, Dunning, Pa.—This invention relates to a new jointed harrow, which is so arranged by being made of several pieces, which are hinged together, that it will adjust itself to the nature of the ground, and that it may, to avoid trees, stumps, or rocks, be folded together, and made narrower without difficulty.

APPARATUS FOR OPERATING SCRAPERS.—James F. Brooks, Stafford Springs, Conn.—This invention relates to improvements in apparatus for operating scrapers, more especially adapted for employment in connection with an improved scraper, heretofore patented by me, which said improved scraper is liable to a considerable lateral or side draft, which it is the object of this invention to counteract.

HANGING WINDOW SASHES.—R. A. Warner, Columbus, Ga.—This invention relates to improvements in hanging window sashes, the object of which is to dispense with the employment of weights and the consequent necessity of providing the boxes for the weights. It consists in connecting an endless cord to the sash and passing it over pulleys at the top and bottom of the window frame, and applying friction to the pulleys to hold the sash suspended.

OIL CAN.—E. G. Kelley, New York city.—This invention has for its object to produce a cheap can, for retaining petroleum and other hydro-carbon or oily substances, and consists in the use of paper, or paper pulp, for this purpose, together with oil and water-proof cements or coatings for the cans.

LUBRICATOR.—H. A. Daniels, Thomaston, Conn.—This invention relates to a new adjustable lubricator, which can be turned in the journal box so as to adjust its valve to a greater or less supply of lubricating material. The invention consists in screwing the shank of the lubricator into the journal box, so that the valve stem may rest upon the shaft when the valve stem is open.

BORING TOOL.—Charles Carrol Strong, Defiance, Ohio.—This invention relates to a new boring tool, which is to be applied to lathes of all descriptions, and which is so arranged that it will be guided and held in the proper manner. The invention consists in arranging a loose collar on the tool, said collar turning freely on it, so that it may be supported in a suitable stand, or in the article bored, as may be desired.

SELF-CLOSING CIRCUIT KEY FOR TELEGRAPHS.—William E. Davis, Jersey City, N. J.—This invention relates to a new key for automatically closing the circuits of telegraph lines, and consists more particularly in the application to a swinging lever, by which the circuit can be opened and closed in the ordinary or suitable manner, of an elbow lever, which is by means of a spring held against the stationary part of the key, so as to automatically establish a circuit, when the apparatus is not used.

STEAM ENGINE.—F. C. Richer, Gilmer, Texas.—This invention relates to certain improvements in that class of steam engines in which an oscillating cylinder, for moving the driving shaft, is employed, and is applicable to locomotives or shops, as well as to stationary machines. The invention consists in a novel manner of introducing the steam into a valve box, arranged upon the cylinder, and in a novel packing device for the hollow trunnions of the cylinder; also in arranging a water box, around or on the supporting frame of the cylinder to receive the exhaust steam from the cylinder, and to utilize its heat by supplying the boiler with the water thus heated. The invention also consists in the application and arrangement of two pumps, which are used to inject water into the said box, to exhaust the steam, and to force the water from the box into the boiler.

DEVICE FOR DETACHING HORSES FROM CARRIAGES.—C. McElroy, New Baltimore, Mich.—This invention has for its object to furnish an improved device, by means of which the horses may be instantly detached from the carriage when desired, and which will securely connect the tugs to the thills, holding them firmly.

PLOW.—A. G. and J. R. Cummins, McKenney, Texas.—The object of this invention is to provide a simple and effective substitute for the usual cumbersome and expensive gang plows, as heretofore made.

HAND STAMP.—E. D. Chamberlain, New York city.—The object of this invention is to provide for the common hand stamp, a simple and convenient device, which will always indicate to the eye the day of the month to which the stamp is set, without putting the operator to the inconvenience of turning the stamp bottom up, or of taking an impression in order to ascertain when he has turned the cylinder to the right point.

DEVICE FOR PROPELLING CARRIAGES.—Thomas A. Hires, New York city.—The principle involved in this invention, is that of employing a spring and clockwork apparatus for driving each wheel, there being one such apparatus on each side of the carriage, and the driver winding up the apparatus on one side, while that on the other is running down and impelling the carriage forward. In connection with these devices is a steering apparatus, and a new and improved form of the carriage to adapt it to the mechanism employed, and the use to which it is to be put.

LOCK WARDROBE HOOK.—Oscar Nicholson, New York city.—This invention has for its object to furnish an improved wardrobe hook, for holding clothing in halls, offices, and other places to which others beside the owner of said clothes have access, which shall be so constructed and arranged that it may be securely locked to secure the clothing from being carried off.

REVOLVING DINING TABLE.—R. Wilson, Rees Corners, Md.—This invention has for its object to furnish an improved dining table, which shall be so constructed and arranged that the plates and other dishes, which the guests use in dining, may stand upon a stationary part of the table, and the dishes from which the guests are served, may stand upon the revolving part of the table, so that each guest can conveniently bring any desired dish within his reach.

REVOLVING SCREEN FOR CLEANING GRAIN.—Daniel Loeffel, Mount Vernon, Ind.—This invention has for its object to furnish an improved revolving screen for separating small seeds from wheat, or other grain, which shall be simple in construction and effective in operation.

COMBINED DRILL AND SEEDER.—John E. Buxton, Owatonna, Minn.—This invention has for its object to furnish a simple and convenient machine, which shall be so constructed and arranged that it may be quickly and conveniently adjusted, to operate as a drill or as a broadcast seeder, as may be desired, even while the machine is in motion.

SCROLL SAWING MACHINE.—William H. Dobson, Medina, N. Y.—This invention has for its object to furnish an improved tension strain scroll sawing machine, simple in construction, and convenient, effective, and reliable in use.

SEED SOWER.—J. G. Thompson, Stockton, N. Y.—This invention has for its object to furnish a simple, convenient, and effective machine for sowing different kinds of seeds, which is designed to be carried by the operator, and operated to sow the seed by hand.

ICE PLANER.—Samuel Lewis, Williamsburgh, N. Y.—This invention has for its object to improve the construction of the improved ice planer, patented by the same inventor, March 3d, 1868, and numbered 75,929, so as make it more convenient in use, more easily adjusted, and more effective in operation.

CORN PLANTER.—Robert Forman, Normal, Ill.—This invention has for its object to furnish an improved automatic corn planter, simple in construction, accurate and effective in operation, and easily operated.

CHURNING MACHINE.—W. A. Rhoades, Lincolnville, Pa.—This invention has for its object to furnish an improved machine, by means of which the churning may be done easily, quickly, and conveniently.

TOY VELOCIPEDE.—H. C. Alexander, New York city.—This invention has for its object to furnish a toy velocipede, provided with a toy rider, and so constructed as to operate automatically upon a circular track.

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; beside, 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 advertisemets at $1·00 a line, under the head of "Business and Personal."

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

J. C. C., of Miss.—The smell in the collected rainwater standing exposed to the air in an open wooden vessel does not probably arise from the wooden vessel in which it stands, but from the accumulation of organic matter in it. You can purify it by leaching it through charcoal dust, which, placed in a cask, will make a good filter. When the charcoal loses its deodorizing power it can be renewed by heating it in a closed vessel.

E. A. D., of Va.—The resisting power of a non-conductor is not diminished by its relative position in regard to other conductors. So if a non-conducting substance be placed between heated gases and the walls confining them, it will not cease its action though another better conductor should afterward be placed between it and the hot gases.

J. C. K., of Iowa.—While we have no doubt that a locomotive with six-feet driving wheels, having a train attached, may have, at times, attained a speed of a mile per minute on down grades, we do not believe it ever drew a train at that rate. The highest speed at present attained upon any railway, is from London to Liverpool, where trains run at the rate of 50 miles per hour.

C. A. P., of Ill.—To make tragacanth mucilage take of tragacanth, a troy ounce, and boiling water a pint. Macerate with occasional stirring 24 hours. Then rub the mucilage together thoroughly to produce uniformity, and strain forcibly through linen. Add creasote until the odor is faintly perceptible in order to prevent mold and decomposition. If you wish to make a thick mucilage for sealing envelopes, etc., it will be sufficient to put some lumps of the gum in a small bottle and put in cold water. Let it stand until it softens. If too thick add water, if too thin add gum.

L. L. VanD., of Neb.—The pressure of a liquid on any portion of a lateral wall is equal to the weight of a column of liquid which has for its base this portion of the wall, and for its hight the vertical distance from its superficial center to the surface of the liquid. A column of water 144 feet high weighs 62½ lbs. for each square inch of base, if of uniform size throughout.

A. A. C., of Mich.—The moisture which accumulates upon the outside of a pitcher containing cold water is condensed moisture from the air. The temperature at which water thus deposits upon cold surfaces is called the dew-point, and is higher or lower, according to the amount of moisture held in suspension in the atmosphere.

Business and Personal.

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92,138.—SEWING MACHINE.—John Q. Adams, North Brookfield, Mass.
92,139.—HARROW AND MARKER COMBINED.—Wm. Addleton, Mottville, N. Y.
92,140.—HORSE RAKE.—F. M. Allerton, Alliance, Ohio.
92,141.—PAPER CLIP.—W. A. Amburg, Chicago, Ill.
92,142.—SHIELD FOR PROTECTING HORSES FROM SUNSTROKE.—John Anderson, Brooklyn, N. Y.
92,143.—PLOW.—W. J. Arrington, Jefferson county, Ga.
92,144.—COTTON-SEED PLANTER AND DRILL.—W. J. Arrington, Jefferson county, Ga.
92,145.—METHOD OF BENDING CHAIR RIMS, ETC.—S. M. Barrett, Cincinnati, Ohio.
92,146.—KNITTING MACHINE.—Dana Bickford, Boston, Mass.
92,147.—HAND DATING STAMPS.—Edward Bierstadt (assignor to himself and J. M. Tower), Jersey City, N. J.
92,148.—AXLE GAGE.—Joseph Birkett, Tazewell county, Ill.
92,149.—CARD CLOTHING.—A. F. Bishop and John H. Aiken, Norwalk, Conn., and John M. Pendleton and A. W. Gates, New York city.
92,150.—HINGE.—Etienne Boileau and Charles Mesnier, St. Louis, Mo.
92,151.—KNOB LATCH.—A. T. Brooks (assignor to Russell & Erwin Manufacturing Co.), New Britain, Conn.
92,152.—KNOB LATCH.—A. T. Brooks (assignor to Russell & Erwin Manufacturing Co.), New Britain, Conn.
92,153.—KNOB LATCH.—A. T. Brooks (assignor to Russell & Erwin Manufacturing Co.), New Britain, Conn.
92,154.—SCRUBBING BRUSH.—G. W. Brown, Providence, R. I.
92,155.—TWO-WAY RAIN-WATER CONDUCTOR.—F. M. Buckles (assignor to himself and J. A. Stuckey), Altona, Ill.
92,156.—HORSE RAKE.—Daniel Bull, Amboy, Ill.
92,157.—CARRIAGE JACK.—J. O. Burch, Buffalo, N. Y.
92,158.—TRUSS.—John Burnham, Batavia, Ill.
92,159.—CORN PLANTER.—Walter Caldwell, Bryan, Ohio.
92,160.—WHEAT DRILL.—R. W. Campbell, Spurgeon, Ind.
92,161.—MACHINERY FOR MANUFACTURING COMPOSITE PAPER.—Wellington Campbell, Millburn, N. J.
92,162.—BAND CUTTER FOR THRASHING MACHINES.—Sanford Cartmel, Henry, Ill.
92,163.—SAFETY ATTACHMENT FOR BREASTPINS.—Frederick Catlin, New York city.
92,164.—CHURN.—J. I. Cheatham, Athens, assignor to C. A. Mitchell and R. W. Smith, Greensborough, Ga.
92,165.—MILKING STOOL.—D. D. Chittenden, Baldwinsville, N. Y.
92,166.—HAY SPREADER.—D. B. Clement, Brighton, Mass.,assignor to himself and D. H. Nash, New York city.
92,167.—CIRCULAR KNITTING MACHINE.—C. G. Cole, Bennington, Vt., assignor to Dana Bickford, Boston, Mass.
92,168.—WAGON BRAKE.—L. T. Conant, New Lisbon, Ohio.
92,169.—BRICK MACHINE.—Jacob Cooke, Muncy, Pa.
92,170.—OIL AND TALLOW CUP.—R. A. Copeland, Brooklyn, N. Y. Antedated June 22, 1869.
92,171.—COMBINED SEED PLANTER, DROPPER, AND CULTIVATOR.—C. M. Cornell, Ionia, Mich.
92,172.—COAL STOVE.—David B. Cox and Albert Brown, Troy, N. Y.
92,173.—PLATE FOR PARLOR STOVES.—Joseph Cox, Philadelphia, Pa.
92,174.—BASKET RACK FOR RAILROAD CARS.—W.G. Creamer, Brooklyn, N. Y.
92,175.—HORSE HAY FORK.—W. E. Derrick (assignor to himself and G. B. Garrison), Jordan, N. Y.
92,176.—METHOD OF OBTAINING BENZOLE AND ITS HOMOLOGUES FROM COAL GAS.—Fritz Engelhorn, August Clemm, Heinrich Caro, Carl Clemm, Mannheim, Germany.
92,177.—LUMBER SLED.—Geo. Engle, Patch Grove, Wis.
92,178.—CONSTRUCTION OF SAFES.—John Farrel, New York city.
92,179.—MODE OF CLEANING SHEEP AND OTHER SKINS FOR TANNING.—August Fau and Eugene Fau, Castres, France.
92,180.—PACKING PUMP PISTONS.—E.T. Ford,Stillwater,N.Y.
92,181.—MACHINE FOR MANUFACTURING BRUSHES.—W. A. Foskett and H. B. Tyler, New Haven, Conn.
92,182.—RAILWAY CAR SPRING.—Perry G. Gardiner, New York city.
92,183.—RAILWAY CAR SPRING.—Perry G. Gardiner, New York city.
92,184.—COMBINED CORN DROPPER AND CULTIVATOR.—P. P. Gardner, Stoneborough, Pa.
92,185.—MACHINE FOR MAKING EYELETS.—Thos. Garrick, Providence, R. I.
92,186.—COMBINED SEEDER, ROLLER, AND CULTIVATOR.—W. S. Grover, Oconomowoc, Wis.
92,187.—MACHINERY FOR BENDING WOOD.—James Hann, Frenchtown, N. J.
92,188.—HARNESS.—G. M. Harnisch, Chicago, Ill.
92,189.—SKEWER FOR SPEEDER BOBBINS.—Cyrus Harris, River Point, R. I.
92,190.—SELF-CLOSING COCK FOR WATER CLOSETS.—Chas. Harrison, New York city.
92,191.—SAW MILL.—J. R. Hoffman, Fort Wayne, Ind.
92,192.—MECHANICAL MOVEMENT.—Jas. M. Johnson, Northcutt's Store, Ky.
92,193.—LOCOMOTIVE STEAM ENGINE.—G. G. Jones, Rushsylvania, Ohio.
92,194.—SPRINKLING CAN.—H. Kaiser and A. Kaiser, Columbus, Ohio.
91,195.—SHREDDING AUGER FOR BARRELS.—Archibald Kelley, Sharpsburg, Pa. Antedated June 19, 1869.
92,196.—KNIFE-HANDLE BOLSTER.—W. P. Lathrop, West Winsted, Conn.
92,197.—NAVIGATORS' BEARING INDICATOR.—J. D. Leach (assignor to himself, Sabin Hutchings, and Sewell Leach), Penobscot Me.
92,198.—TRANSPLANTING AND WEEDING MACHINE.—A. E. Lyman, Northampton, Mass.
92,199.—METALLIC GROMMET.—John Mair (assignor to himself and H. W. Cramer), Philadelphia, Pa. Antedated June 22 1869.
92,200.—CORN PLANTER.—Wm. H. McCormick, Munice, Ind.
92,201.—CHEESE PRESS.—Samuel B. McCollough, Rock Spring, Md., and John R. West, Lancaster county, Pa.; said West assigns to said McCollough.
92,202.—PRUNING SHEAR.—S. A. McFarlane, Grand Rapids, Mich.
92,203.—METALLIC FLOWER STAND AND HOLDER.—Henry Miller, Cranston, assignor to himself and G. O. Miller, Johnston, R. I. Antedated Jan. 6, 1869.
92,204.—SHIP'S BERTH.—Joshua Monroe, New York city.
92,205.—METALLIC DOOR OR SHUTTER.—A. B. Mullett and Bartholomew Oertly, Washington, D. C.
92,206.—CLOTHES LINE HOLDER.—Harrison Ogborn, Richmond, assignor to Samuel Watson, Lewisville, Ind.
92,207.—IRONING TABLE.—Wm. P. Patton, Harrisburgh, Pa. Antedated June 26, 1869.
92,208.—COTTON GIN.—W. F. Pratt (assignor to the E. Carver Co.), East Bridgewater, Mass.
92,209.—MEDICAL COMPOUND.—Mary H. Ramsaur, Lincolnton, N. C.
92,210.—MACHINE FOR DRYING YARN, ETC.—George Richardson, Lowell, Mass.
92,211.—BOILER FLUE BRUSH.—P. H. Ryan, Cincinnati, Ohio.
92,212.—FURNACE FOR GENERATING STEAM GAS.—J. Milton Sanders, New York city.
92,213.—WASHING MACHINE.—M. J. Sanford, Fredonia, N.Y.
92,214.—POST AUGER.—S. S. Sherman and J. G. Sherman, McHenry, Ill.
92,215.—APPARATUS FOR FILTERING LIQUIDS UNDER PRESSURE.—T. R. Sinclaire, New York city.
92,216.—ROOFING.—C. T. Smith, Nyack, N. Y.
92,217.—POCKET CUTLERY.—D. E. Smith, Bronxville, N. Y.
92,218.—YARN EVENER.—G. S. Smith, Bozrahville, Conn.
92,219.—RAILWAY CAR TRUCK.—W. M. Smith, Augusta, Ga.
92,220.—PROCESS OF TREATING CAST IRON FOR THE MANUFACTURE OF HORSESHOES AND OTHER ARTICLES.—James R. Speer, Pittsburgh, Pa. Antedated June 26, 1869.
92,221.—MODE OF TREATING PIG IRON FOR MAKING STEEL AND MALLEABLE CAST IRON.—Jas. R. Speer, Pittsburgh, Pa. Antedated June 26, 1869.
92,222.—WATER METER.—Monroe Stannard (assignor to Pratt, Whitney & Co.), Hartford, Conn.
92,223.—COOKING STOVE.—G. W. Swett, Troy, N. Y.
92,224.—EXCAVATOR.—J. W. Swickard, Galva, assignor to himself and W. H. Howell, Altona, Ill.
92,225.—MANUFACTURE OF TARPAULINS.—N. C. Szerelmey, Belgrave road, Pimlico, assignor to W. H. Valpy, No. 8 Craig's Court Charing Cross, England. Patented in England, Jan. 23, 1869.
92,226.—CARPET SWEEPER.—G. F. Taylor, New York city.
92,227.—RETAINER FOR TOBACCO PRESSES.—Enoch Thomas, Craigsville, Va.
92,228.—REFLECTING GALVANOMETER.—William Thomson, Glasgow College, Scotland.
92,229.—PROCESS OF TREATING VEGETABLE SUBSTANCES TO OBTAIN FIBER.—B. C. Tilghman, Philadelphia, Pa.
92,230.—RAILWAY CAR BRAKE.—Frederick Townsend, Albany, N. Y.
92,231.—BALANCE PISTON VALVE FOR STEAM ENGINES.—C. W. Tremain, Chicago, Ill.
92,232.—WASHING MACHINE.—D. J. True and E. Fairfield, Portland, Me.
92,233.—CLOD BREAKER AND PULVERIZER.—J. B. Turner, Jacksonville, Ill., assignor to himself and Bronson Murray, New York city.
92,234.—SEEDER.—M. L. Utter, Rockford, Ill.
92,235.—FRUIT PICKER.—S. W. Valentine, Bristol, Conn.
92,236.—RUBBER SPRING.—George Weaver and H. N. Allen (assignors to themselves and E. B. Cheney), Boston, Mass.
92,237.—LOW-WATER INDICATOR FOR BOILERS.—P. D. Wesson, Providence, assignor to himself and James Phillips, Central Falls, R. I.
92,238.—CARRIAGE HUB.—J. W. Weston, New York city.
92,239.—WINDOW AWNING.—James B. Wheeden, Baltimore, Md.
92,240.—APPLE PARER.—G. H. Wilde, Aurora, Ill.
92,241.—NUT-LOCKING WASHER.—Wm. H. Williams, Canton, Ohio.
92,242.—TRUING GRINDSTONES.—C. E. Wilson, Boston, Mass. Antedated June 19, 1869.
92,243.—TOY VELOCIPEDE.—H. C. Alexander, New York city.
92,244.—TEACHER'S TOY.—E. F. Anderson, Mansfield, Conn.
92,245.—THRASHING MACHINE.—H. K. Averill, New Oregon, Iowa.
92,246.—PRESERVING ANIMAL AND VEGETABLE SUSTENANCES ON SHIP-BOARD.—J. F. Baldwin, Provincetown, Mass.
92,247.—BILLIARD COUNTER.—Harvey Ball, Walpole, N. H.
92,248.—MEDICAL COMPOUND FOR TREATING HOG CHOLERA.—S. S. Barger, Golconda, Ill.
92,249.—CAR COUPLING.—R. F. Baughn, Lexington, Miss.
92,250.—HOISTING APPARATUS.—John Beattie (assignor to Wm. Baker), Chicago, Ill.
92,251.—PAPER FILE OR BINDER.—B. J. Beck, Brooklyn, N. Y.
92,252.—TURBINE WATER WHEEL.—S. A. Bell, Newtown, O.
92,253.—FIRE PLATE FOR STOVES.—Etienne Boileau, St. Louis, Mo.
92,254.—EYELET-MAKING MACHINE.—H. C. Bradford, Providence, R. I.
92,255.—LIFTING JACK.—Wm. Brady and C. H. Brady (assignors to themselves and H. A. Brady), Mount Joy, Pa.
92,256.—LAMP CHIMNEY.—Homer Brooke, New York city.
92,257.—APPARATUS FOR OPERATING SCRAPERS.—James F. Brooks, Stafford Springs, Conn.
92,258.—PROCESS FOR SOLDERING THE JOINTS AND SEAMS OF METALLIC VESSELS.—S. D. Brooks, Baltimore, Md.
92,259.—DIE FOR MAKING HORSESHOE TOE-CALKS.—P. F. Burke, Worcester, assignor to Thomas Dooley, Boston, Mass.
92,260.—ELECTRO-MAGNETIC ALARM.—John G. Butler, New York city.
92,261.—COUNTERSINK.—R. P. Buttles, Mansfield, Pa.
92,262.—COMBINED DRILL AND SEEDER.—John E. Buxton, Owatonna, Minn.
92,263.—POWER PRESS.—Daniel Campbell, Elizabeth, N. J., assignor to Charles Parker, Meriden, Conn.
92,264.—HAND STAMP.—E. D. Chamberlain, New York city.
92,265.—ATMOSPHERIC CAR BRAKE.—William L. Chambers, Pleasant Unity, Pa.
92,266.—SAW-FILING MACHINE.—C. P. Case, Troy, Pa.
92,267.—RAILWAY CAR SPRING.—J. W. Cochran, New York city.
92,268.—MACHINE FOR BENDING AND HARDENING SPRINGS.—C. A. Coggeshall, Bridgeport, Conn., assignor to himself, R. T. Clarke, and S. T. Nickerson.
92,269.—WATERPROOF FABRIC FOR THE MANUFACTURE OF HATS AND OTHER ARTICLES.—D. A. Conner (assignor to himself, Chas. Roder, and R. E. Wirsching), Milford, Conn.
92,270.—BRICK MACHINE.—A. E. Cooke, Philadelphia, Pa.
92,271.—GAFF CHOCK FOR VESSELS.—J. C. Cottingham, Philadelphia, Pa. Antedated June 24, 1869.
92,272.—COOKING STOVE.—D. B. Cox, Troy, N. Y.
92,273.—VELOCIPEDE.—B. P. Crandall, New York city.
92,274.—PRESERVING FURS, CLOTHES, AND THE LIKE ARTICLES FROM INJURY BY MOTHS, ETC.—Jason Crane, Bloomfield, N. J.
92,275.—AUTOMATIC SIGNAL BOX FOR FIRE-ALARM TELEGRAPHS.—M. G. Crane, Newton, and Edwin Rogers, Boston, Mass.
92,276.—LITHOGRAPHIC PRESS.—John Crawley, Brooklyn, N. Y., assignor to R. E. Manger, New York city.
92,277.—PLOW.—A. G. Cummins and J. R. Cummins, McKinney, Texas.
92,278.—MEDICINE SPOON AND BOTTLE STOPPER COMBINED.—Susan C. Currie, New York city.
92,279.—POTATO WASHER.—I. J. Currier and Joseph Hawse, Wolcott, Vt.

92,280.—Door Latch.—Jos. O. Curryer and Wm. C. Young, Thorntown, Ind.
92,281.—Sausage Stuffer.—Henry Curtner, Anna, Ohio.
92,282.—Hot-Air Furnace.—M. A. Cushing, Aurora, Ill.
92,283.—Lubricator.—H. A. Daniels, Thomaston, Conn.
92,284.—Telegraph Sounder.—W. E. Davis, Jersey City, N. J.
92,285.—Telegraph Key.—W. E. Davis, Jersey City, N. J.
92,286.—Rotary Steam Engine.—J. F. DeNavarro (assignor to Emery Rotary Machine Company), New York city.
92,287.—Measuring Faucet.—J. F. DeNavarro (assignor to Emery Rotary Machine Company), New York city.
92,288.—Scroll Sawing Machine.—W. H. Dobson (assignor to himself, and Homer Belding), Medina, N. Y.
92,289.—Shaft Coupling.—W. B. Dunning, Geneva, N. Y.
92,290.—Match Safe.—J. W. Durham, Ripley, Tenn.
92,291.—Automatic Tong.—R. M. Eastman (assignor to himself and F. L. Boyd), Boston, Mass.
92,292.—Composition for Staining Glass.—H. V. Edmond, Norwich, Conn.
92,293.—Railway-Car Coupling.—John Elbertson, Kirksville, Mo.
92,294.—Harvester.—Geo. S. Ellard, Westerly, R. I.
92,295.—Corn Husker.—Elihu Field, Geneseo, Ill.
92,296.—Marline Spike.—Fred. Fisher, Rockland, Me.
92,297.—Corn Planter.—Robert Forman, Normal, Ill.
92,298.—India-Rubber Tooth Brush.—Samuel W. Francis, New York city.
92,299.—Telegraph Insulator.—J. W. Fry, Elizabeth, N. J.
92,300.—Knitting Machine.—Fred. Gardner, Hamilton, Canada.
92,301.—Physiological Battery.—A. C. Garratt, Boston, Mass.
92,302.—Armor-Plating for Vessels.—Domenico Giambastiani, Washington, D. C.
92,303.—Papier Mache Compound.—G. F. Goetze, New York city.
92,304.—Potato Digger.—I. C. Groom, Albany, N. Y.
92,305.—Let-Off Mechanism for Looms.—Wm. Hall, North Adams, Mass.
92,306.—Apparatus for Propelling Carriages.—Thos. A. Hares, New York city.
92,307.—Lubricator.—A. W. Harris, Providence, R. I.
92,308.—Churn.—B. N. Harris, Talbotton, Ga.
92,309.—Cleaning and Polishing Attachment to Sheet Metal Rolls.—J. B. Hastings (assignor to himself and L. T. Dean), Ironton, Ohio.
92,310.—Railway Rail Splice.—W. E. Henry, Joliet, Ill.
92,311.—Windmill.—Jas. M. Hill and Hen'y C. Hill, Fairfield Post Office, Ill.
92,312.—Rope Molding Machine.—Noah W. House, Adrian, Mich.
92,313.—Injector.—Christian Hughes, Niles, Ohio.
92,314.—Railway-Car Truck.—G. H. Jones (assignor to himself and H. L. Wise), Grand Rapids, Mich.
92,315.—Dog Muzzle.—Hermann Kaempf, Newark, N. J.
92,316.—Oil-Can from Paper Stuff.—E. G. Kelley, New York city.
92,317.—Gas Generator.—Pat. Kelly, Dayton, Ohio.
92,318.—Clod-Fender for Plows.—R. A. Kelly, Hope, Ind.
92,319.—Shaft Coupling.—Wm. Kennedy, New London, Pa.
92,320.—Harrow.—Jay Knickerbocker, Dunning, Pa.
92,321.—Funnel.—H. F. Lawrence, Vallejo, Cal.
92,322.—Gas Heater.—H. Y. Lazear and J. L. Sharp, New York city.
92,323.—Machine for Washing Dishes, Knives and Forks, etc.—C. M. Leland, Central City, Colorado Territory.
92,324.—Portable and Convertible Coffer Dam.—Sam. Lewis, Williamsburgh, N. Y.
92,325.—Ice Planer.—Samuel Lewis, Williamsburg, N. Y.
92,326.—Clover and Flax Thrashing Machine.—Sam. H. Lintan, Burrows, Ind.
92,327.—Revolving Screen for Cleaning Grain.—Dan'l Loeffel, Mount Vernon, Ind.
92,328.—Device for Holding Thread while Doffing in Spinning Machine.—T. L. Luders, Olney, Ill.
92,329.—Gate.—Christain Mack, Leipsic, Ohio.
92,330.—Magic Lantern.—L. J. Marcy, Newport, R. I.
92,331.—Vise.—A. Z. Mason, Adrian, Mich.
92,332.—Process and Apparatus for Manufacturing Composition Pipes, Tubes, Barrels, etc.—J. K. Mayo, Williamsburgh, N. Y.
92,333.—Device for Detaching Horses from Carriages.—C. McElroy, New Baltimore, Mich.
92,334.—Fence.—Jas. McKee, Mount Vernon, Ohio.
92,335.—Car Brake and Starter.—J. M. McMaster, Rochester, N. Y.
92,336.—Ruling Pen.—Rob't McVeen, Cleveland, Ohio.
92,337.—Nickle-Lined Culinary Vessels.—S. C. Moore, Boston, Mass.
92,338.—Pipe Leak Stopper.—Stephen Moore (assignor to himself and Homer Rogers), Sudbury, Mass.
92,339.—Horse Rake.—C. H. Mosey, Mansfield, Ohio.
92,340.—Hat Ventilator.—Geo. Munro, Philadelphia, Pa.
92,341.—Chimney.—Wm. Musbash, and C. R. Smith, Middletown, N. Y.
92,342.—Straw Cutter.—F. B. Newton, Bouckville, N. Y.
92,343.—Device for Securing Covers to Jars for Transportation.—M. H. Nichols, Hancock, N. Y.
92,344.—Locking Wardrobe Hook.—Oscar Nicholson, New York city.
92,345.—Mode of Hardening and Working "Ransome Concrete Stone."—Richard Norris, Jr., Baltimore, Md.
92,346.—Illuminator for Stoves, Ranges, etc.—Benj. Nott, Albany, N. Y.
92,347.—Bag Filler.—A. J. Olney, Van Buren, Ind.
92,348.—Beehive.—J. A. Paddock, and J. S. Estep, Cass county, Ill.
92,349.—Plate for Plowshare Blanks.—Wm. Parlin, Canton, Ill.
92,350.—Cultivator.—D. H. Paul, De Witt, Iowa.
92,351.—Grate Bar.—B. F. Penny, and Jas. Jones, Rochester, N. Y.
92,352.—Reversible Stovepipe Shelf.—John Perham, Beloit, Wis.
92,353.—Rubber or Gutta-Percha Hose.—E. L. Perry, and Chas. Manheim, New York city.
92,354.—Reversible Knob Latch.—F. P. Pfleghar, New Haven, Conn.
92,355.—Method of Making Horseshoe Nails.—A. M. Polsey, Boston, Mass., assignor to F. H. Fuller.
92,356.—Stairs.—Niels Poulson, New York city.
92,357.—Steam Water-Elevator.—W. E. Prall, Washington, D. C., assignor to himself, and A. C. Rand, New York city.
92,358.—Artificial Stone.—A. Quesnot, Bloomington, Ill.
92,359.—Farm Fence.—C. W. Reeder, Trenton, Mo.
92,360.—Churning Machine.—W. A. Rhoades, Lincolnville, Pa.
92,361.—Head for Screws.—T. C. Richards, New York city.
92,362.—Yard Mark and Knife.—E. D. Richardson, Chardon, Ohio.
92,363.—Oscillating Steam-Engine.—F. C. Richer, Gilmer, Texas.
92,364.—Portable Bath Tub.—J. P. Rider, Brooklyn, N. Y.
92,365.—Railway Car Coupling.—Jas. Riley, Chicago, Ill.
92,366.—Toy Game.—Chas. Robinson, Cambridge, Mass.
92,367.—Weather Strip.—H. A. Robison, Cleveland, Ohio.
92,368.—Apparatus for Cutting and Shearing Metal.—Thomas A. Robinson, Boston, Mass.
92,369.—Mill-pick Handle.—Nathan Rose, Belmont, N. Y.
92,370.—Picks.—Nathan Rose, Belmon, N. Y.
92,371.—Plow.—Geo. W. Russell, Rockford, Ill.
92,372.—Whip.—Anthony Scharff, Philadelphia, Pa.
92,373.—Pump.—Christian Schmidt, Rock Island, Ill.
92,374.—Fluting Machine.—Carl Schortau (assignor to himself and A. L. Bogart), New York city.
92,375.—Spring Bed Bottom.—D. A. Scott, Cincinnati, Ohio.
92,376.—Beverage.—Samuel B. Shaw, West Randolph, Mass.
92,377.—Fly-string Cutter and Rounder.—S. W. Sheller, Mount Carroll, Ill.
92,378.—Oiling Device.—Andrew M. Shoonfelt and Joseph M. Shoonfelt, Waterside, Pa.
92,379.—Rocking Chair.—Charles Singer, South Bend, Ind
92,380.—Invalid Bedstead.—Franklin H. Smith and Wm. F. Wood, North Hebron, N. Y.
92,381.—Process of Making Suction Rubber Hose.—Geo. C. Smith, Matteawan, N. Y.
92,382.—Mule for Spinning.—John Burns Smith, Cohoes, N. Y.
92,383.—Railway Car Coupling.—J. C. Smith, Stoughstown, Pa.
92,384.—Water Gate.—Vernon E. Smith, Lancaster, N. H.
92,385.—Grain Cleaner.—Wm. B. Smith (assignor to himself, Reid Wallace, and Cyrus Finley), Clayton, Ill.
92,386.—Railway Car Coupling.—D. G. W. Snyder, Williamsport, Md.
92,387.—Railway Car Replacer.—Enos Snyder, Providence, Pa.
92,388.—Device for Turning and Loading Logs.—Samuel Snyder, Delaware, Ohio.
92,289.—Cotton Seed Planter.—A. V. M. Sprague and R. F. Osgood, Rochester, N. Y.
92,390.—Concrete Pavement.—Harvey B. Steele, Winchester, Conn.
92,391.—Apparatus for Generating and Carbureting Gas for Lighting Railroad Cars.—John H. Stiner, St. Louis, Mo.
92,392.—Harvester Dropper.—George Stevenson, Zionsville, Ind.
92,393.—Breech-loading Firearm.—John T. Stoakes, Champlain, N. Y. Antedated June 29, 1869.
92,394.—Compound for Cure of Dropsy.—John R. Strickland, Sayville, N. Y.
92,395.—Boring Tool.—Charles Carrol Strong, Defiance, Ohio.
92,396.—Folding Mattress.—M. Sulzbacher, New York citp.
92,397.—Railway.—Wm. Allen Sutton, New York city, and Eugene Crowell, San Francisco, Cal.
92,398.—Gun Cap.—John Talbott, Albany, Ga.
92,399.—Lubricator.—Hugh Thomas, New York city.
92,400.—Clothes Rack.—Hugh Thomas and Robert Wallace, New York city.
92,401.—Seed Sower.—J. G. Thompson, Stockton, N. Y.
92,402.—Potato Digger and Picker.—Wm. J. Thompson, Normal, Ill.
92,403.—Coating Hoop-skirt Wire.—Wm. Henry Towers, Boston, Mass.
92,404.—Stove Drum.—Marshall Turly and J. D. Bayliss, Council Bluffs, Iowa.
92,405.—Manufacture of Hydrate of Magnesia.—Carl Wandel, Waldau, near Bernburg, North German Confederation, assignor to F. O. Matthiessen and W. A. Wiechers, New York city.
92,406.—Manufacture of Granulated Sugar.—Carl Wandel, Waldau, near Bernburg, North German Confederation, assignor to F. O. Matthiessen and W. A. Wiechers, New York city.
92,407.—Window Sash Balance.—R. A. Warner, Columbus, Ga.
92,408.—Plow.—George Watt, Richmond, Va.
92,409.—Clevis Attachment for Plows.—George Watt, Richmond, Va.
92,410.—Corn Sheller.—Theophilus Weaver, Harrisburg, Pa.
92,411.—Churn.—Daniel Widmaye, Lansing, Mich.
92,412.—Velocipede.—Albert Oliver Willcox, Jr., Port Richmond, N. Y.
92,313.—Revolving Dining Table.—R. Wilson, Rees Corners, Md.
92,314.—Lock for Handcuffs.—James A. Wisner and Monson Hoyt, East Saginaw, Mich.

REISSUES.

82,073.—Vise.—Dated September 15. 1868 ; reissue 3,530.—Thomas L. Baylies and Edwin Crawley, Richmond, Ind.
11,608.—Manufacture of India-rubber.—Dated August 29, 1854 ; extended seven years ; reissue 3,531.—James S. Carew, Norwich, Conn., assignee of Caleb Swan, executor of Daniel Hayward, deceased.
55,067.—Railway Car Brake.—Dated May 29, 1866 ; reissue 3,532.—John Davis, Allegheny City, Pa.
9,947.—Machine for Pegging Boots and Shoes.—Dated August 16, 1853 ; antedated February 18, 1853 ; extended seven years ; reissue 3,533.—Alpheus C. Gallahue, Riverdale, N. Y.
87,075.—Process of Repairing Crucibles.—Dated February 16, 1869 ; reissue 3,534.—Wm. F. Sherman, Bucksport, Me.
76,992.—Safety Valve.—Dated April 21, 1868 ; reissue 3,535.—Albert G. Buzby, Philadelphia, Pa.
82,267.—Striking Mechanism for Clocks.—Dated September 15, 1868 ; reissue 3 536.—John B. Mayer, Niagara Falls, and Tobias Witmer, Williamsville, N. Y., assignees of John B. Mayer.
19,442.—Harvester.—Dated February 23, 1858; reissue 3,537.—Division A.—C. H. McCormick, Chicago, Ill., assignee, by mesne assignments, of Hamilton A. Parkhurst.
19,442.—Harvester.—Dated February 23, 1858; reissue 3,538.—Division B.—C. H. McCormick, Chicago, Ill., assignee, by mesne assignments, of Hamilton A. Parkhurst.
49,799.—Plow.—Dated September 5, 1865; reissue 3,539.—Division A.—Wm. S. Spratt, West Manchester, Pa.
75,656.—Manufacture of Crushed Sugar.—Dated March 17, 1868 ; reissue 3,540.—Claus Spreckels, San Francisco, Cal.
82,191.—Cultivator—Dated September 15. 1868 ; reissue 3,541.—J. A. Woodward, S. S. Woodward, and Thomas Mason, Sandwich, Ill.
29,510.—Iron Railway Car.—Dated August 7, 1860 ; reissue 1,325 ; dated July 2, 1862 ; reissue 3,542.—Division A.—Richard Montgomery, New York city.
29,510.—Floor for Cars and Buildings.—Dated August 7, 1860 ; reissue 1,325, dated July 22, 1862 ; reissue 3 543.—Division B.—Richard Montgomery, New York city.
66,238.—Nut Machine.—Dated July 2, 1867 ; reissue 3,544.—David Howell, Louisville, Ky.

DESIGNS.

3,567.—Photographic Portrait Holder.—Hans Bach, Paterson, N. J.
3,568.—Trade Mark.—Henry Brunner, Baltimore, Md.
3,569.—Top of an Oil Can.—T. W. Burger, New York city.
2,570.—Cast Iron Settee.—David W. Downs and Franklin P. Rand, North Providence, R. I.
3,571.—Window Fastening.—George Byron Kirkham, New York city.
3,572.—Table Knife.—B. Raven, Pleasantville, Pa.
3,573.—Barn Door Hanger or Roller.—Henry M. Ritter (assignor to M. Greenwood and Company), Cincinnati, Ohio.
3,574.—Sash Weight.—Julius Benedict, Brooklyn, N. Y.
3,575.—Scarf Pattern.—Conyers Button, Philadelphia, Pa.
3,576.—Air-chamber for Parlor Stoves.—M. B. Hudson, Canandaigua, N. Y.
3,577.—Cook Stove.—Isaac B. Resor (assignor to W. Resor & Co.), Cincinnati, Ohio.

EXTENSIONS.

Machine for Mitring Printers' Rules.—Wm. McDonald, Morrisania, N. Y.—Letters Patent No. 13,197, dated July 3, 1855 ; reissue No. 2,899, dated March 17, 1868.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

1,791.—Replacer for Railway Locomotives, and other Rolling Stock thrown off the Rails.—Robert Bustin, St. John, New Brunswick, June 10, 1869.

1,802.—Instruments for Dressing Stone.—I. E. Newton, Waterbury, Conn. June 11, 1869.

1,801.—Submarine Drilling Apparatus.—Samuel Lewis and William McFarlane, Brooklyn, N. Y. June 11, 1869.

1,811.—Steam Gage.—J. H. Miller, Cleveland, Ohio. June 12, 1869.

1,814.—Sewing Machine.—Daniel Mills, Brooklyn, N. Y. June, 14, 1869.

1,820.—Attachment for and Mode of Actuating Ships' Pump.—Almon Roff, Southport, Conn. June 14, 1869.

1,823.—Machine for Sewing Boots and Shoes.—Daniel Mills, Brooklyn, N. Y. June 14, 1869.

1,828.—Wood Planer.—John Richards, Philadelphia, Pa. June 15, 1869.

1,829.—Band-Sawing Machinery.—John Richards, Philadelphia, Pa. June 15, 1869.

1,839.—Holdbacks for Carriages.—J. B. Mackinnon and A. B. Halliwell, Cleveland, Ohio. June 15, 1869.

1,857.—Apparatus for the Manufacture of Paper.—James Turner, Robert Turner, Archibald Turner, M. C. Turner, T. C. Turner, and George M. Turner, New York city. June 16, 1869.

1,858.—Ventilating Apparatus.—Sylvester Harnden, Reading, Mass. June 16, 1869.

Apparatus for Counting the Stitches made by a Sewing Machine.—Gordon McKay, Boston, Mass. June 16, 1869.

1,868.—Process for Preparing Sulphates and Obtaining Fine Silver Therefrom.—Frederick Gutzkow, San Francisco, Cal. June 17, 1869.

1,869.—Culinary Utensil.—Sylvester Bowers, Pen Yan, N. Y. June 17, 1869.

1,879.—Permanent Way of Railways.—Benjamin Robinson, Boston, Mass. June 18, 1869.

1,884.—Compounds for Rendering Fabrics Water-Repellent.—R. O. Lowrey, Salem, N. Y. June 19, 1869.

Advertisements.