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.

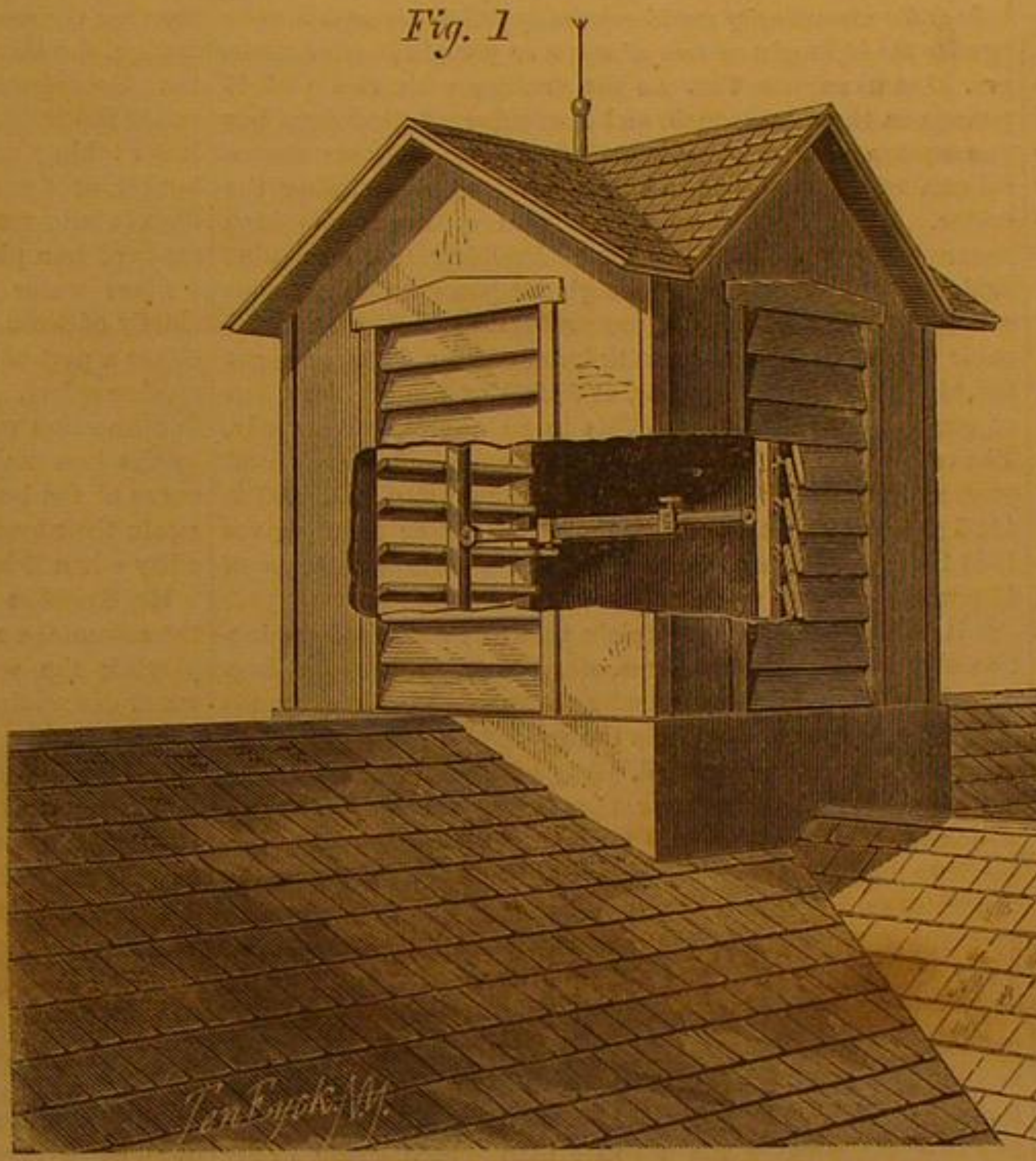
Fig. 1 represents this improvement as applied to the cupola of a brewery, malt house, or barn. A connection is established between the slats of the blinds placed on opposite sides of the cupola by means of bars, each having a collar and a set screw on its inner end, which slides on the other bar, so 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.

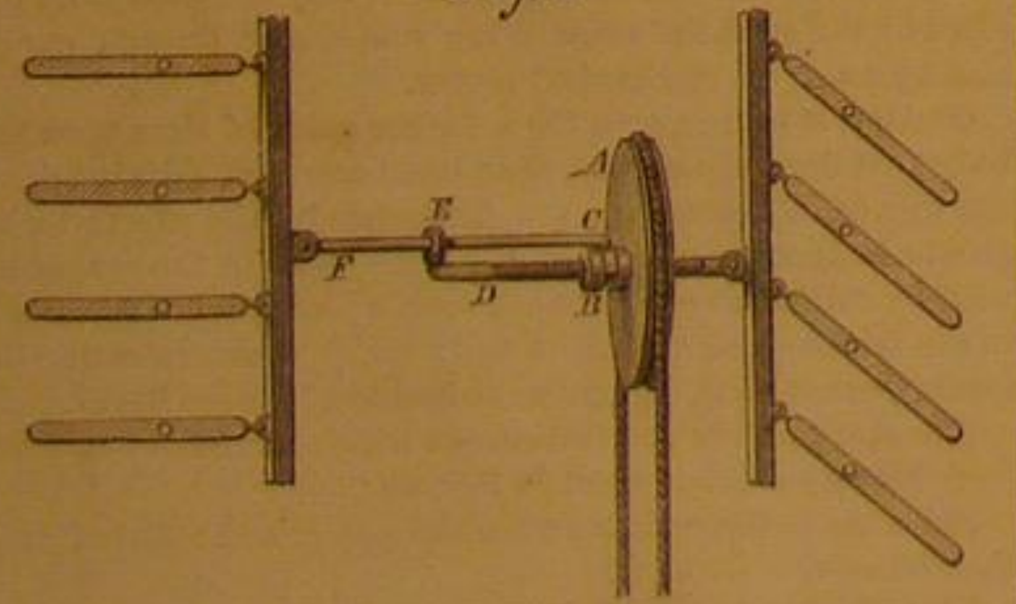
Fig. 1



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 diamonds, 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.

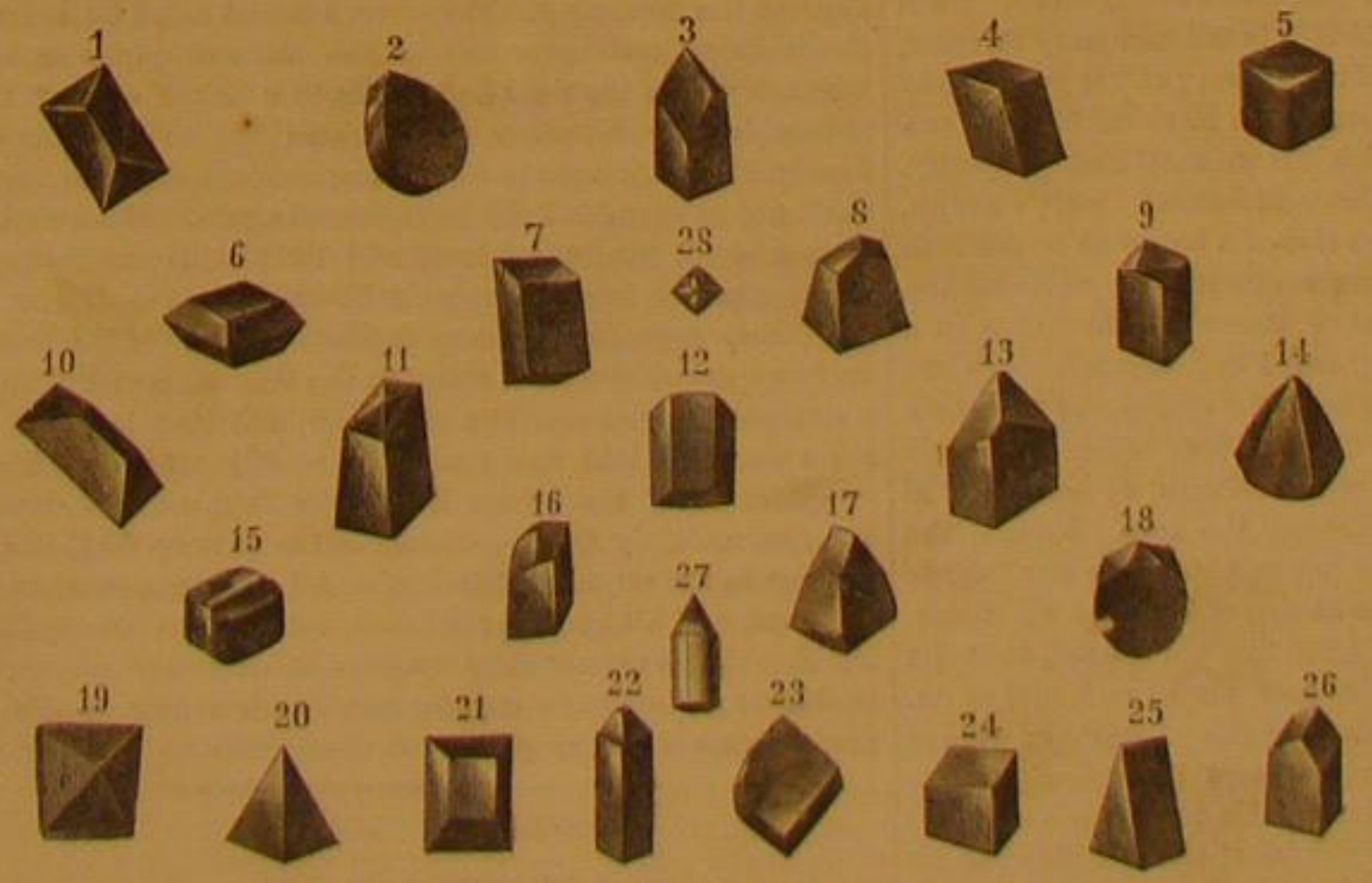
The increased use of these diamonds in the arts, of late years, and their successful applications in dressing mill stones, and drilling and working other hard substances, for which numerous patents have been granted in America and Europe, realizing to the patentees large fortunes, have created much curiosity 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 samespace 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 has 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 strowed 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.

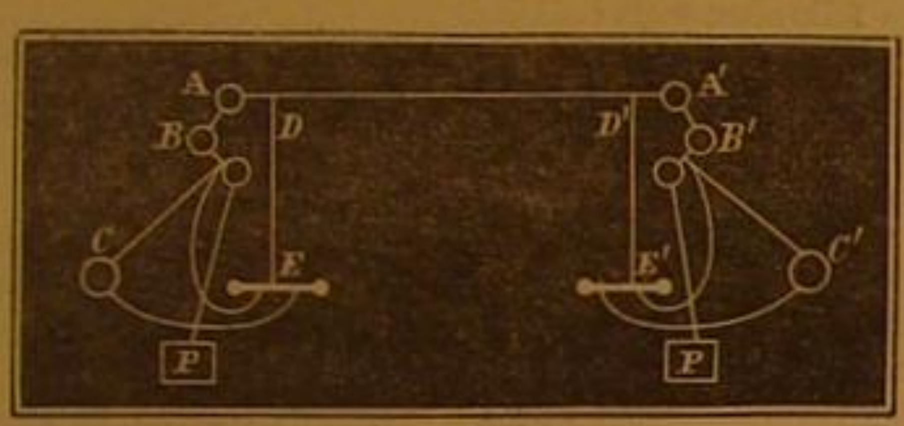
THE SIMULTANEOUS TRANSMISSION OF MESSAGES OVER A SINGLE WIRE IN OPPOSITE DIRECTIONS.

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 not 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. 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. 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.

Fig. 1

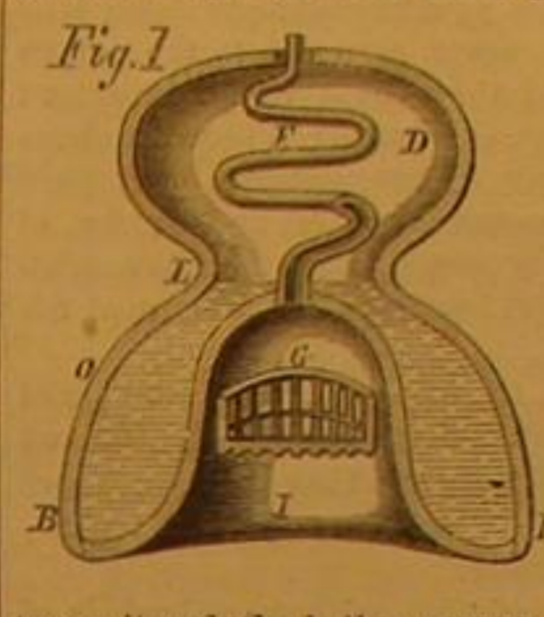
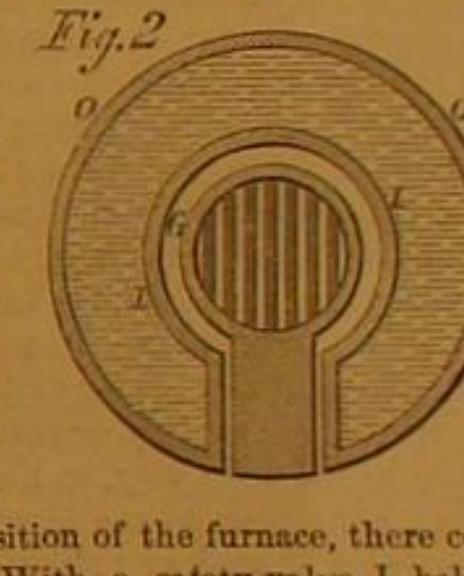


Fig. 2



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_3), 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 $C_{28} H_8 O_2$.

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 $C_{28} H_6 O_2$.
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 $C_{28} H_6 O_2$.
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 $C_{28} H_8 B^2_8$, 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 $C_{28} H_6 O_2$. 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 $C_{28} H_6 O_2$. 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 $(C_{28}H_6O_4 \atop Cl_2)$ 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

$$(C_{28}H_6O_4 \atop Cl_2) + 2\,KO\,HO + 2O = 2KCl + (C_{28}H_8O_8)$$

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 $[2\,\overbrace{C_{14}H_8}^{\text{toluen.}}] = \overbrace{C_{28}H_{10}}^{\text{anthracen.}} + 6H$.

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:

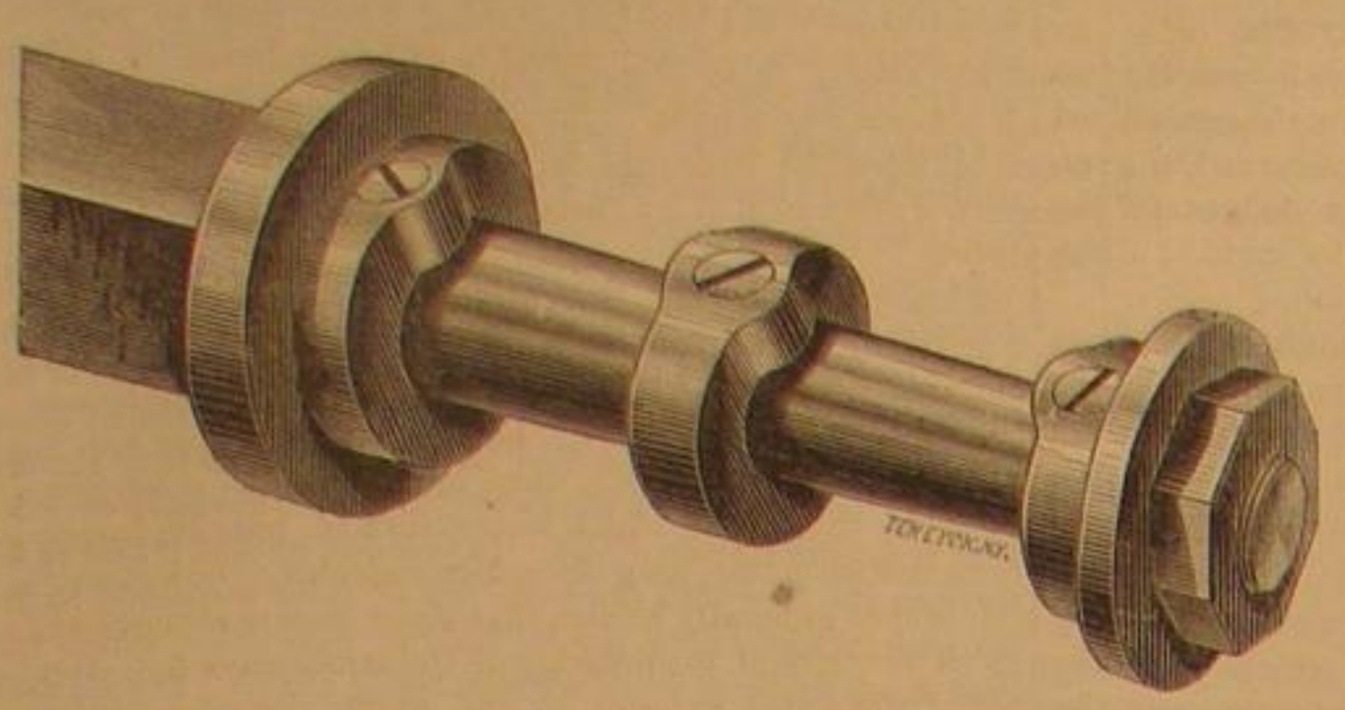
1. White lead ground in turpentine, and best white lead in oil.
2. A clear, quick, and hard-drying varnish, such as best copal, Manders Brothers' white coburg, and white enamel varnish, etc., etc.
3. Ground and lump pumice stone, or putty powder.
4. Rotten stone, ground in water or oil.
5. Some white 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.



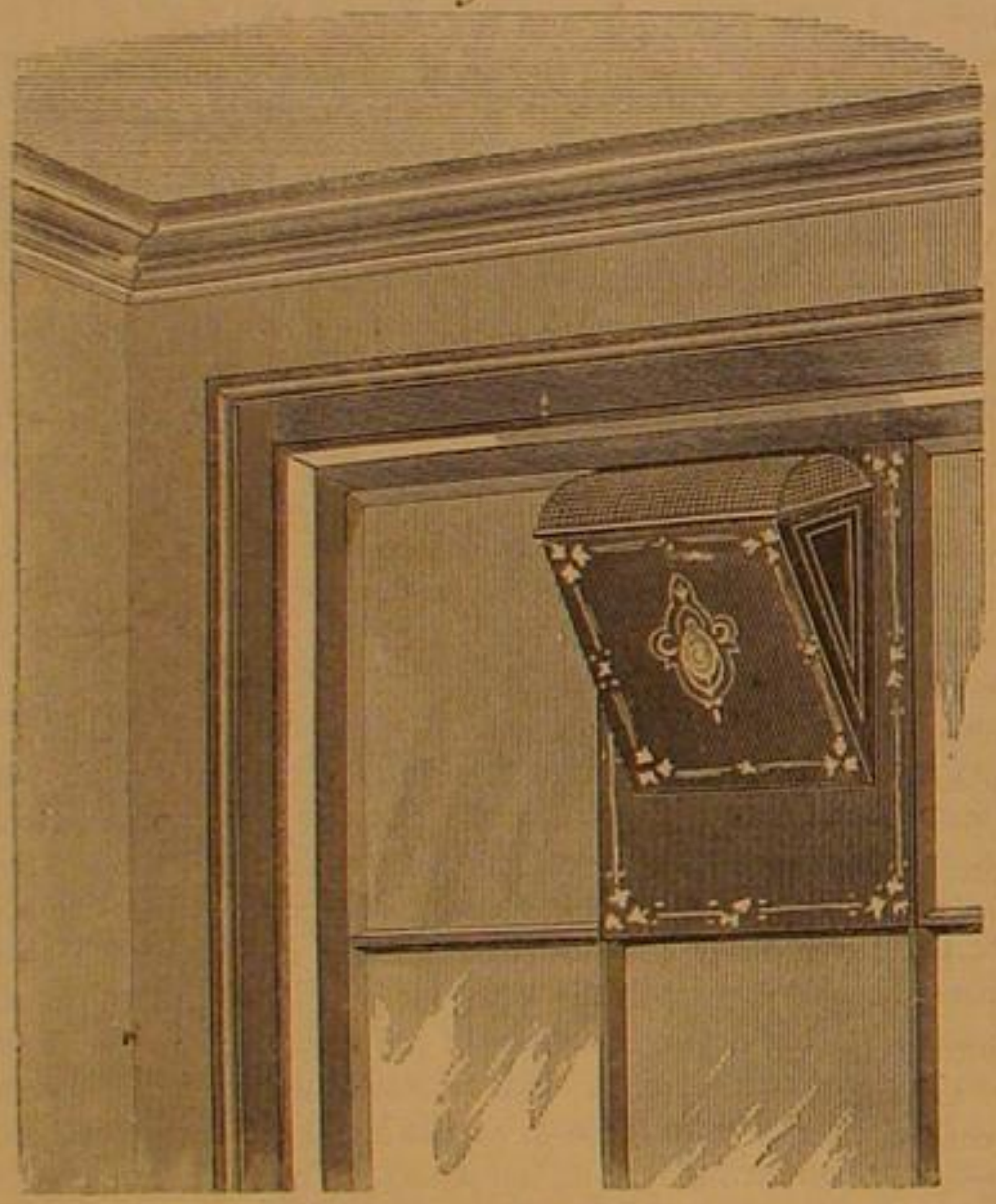
These washers receive the weight of the vehicle, and when worn may be easily replaced. Washers have been heretofore used as bearings for carriage wheels, but securing them in the manner indicated and reinforcing them as described, must increase their utility. The washers or collars are made of hardened 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

Fig. 1



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,

Fig. 2

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.

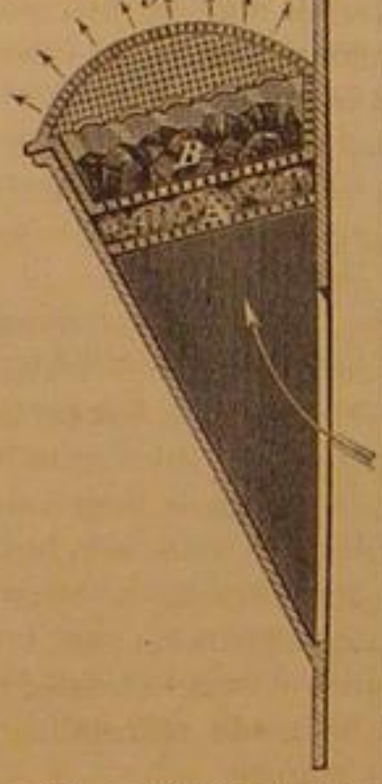
Its operation will be seen upon reference to the engravings. Fig. 1 is a view of the ventilator as seen from the interior of an apartment, Fig. 2 is an exterior view of it placed in a window, and Fig. 3 is a sectional view exhibiting its construction, which is extremely simple. A is the layer of sponge 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.

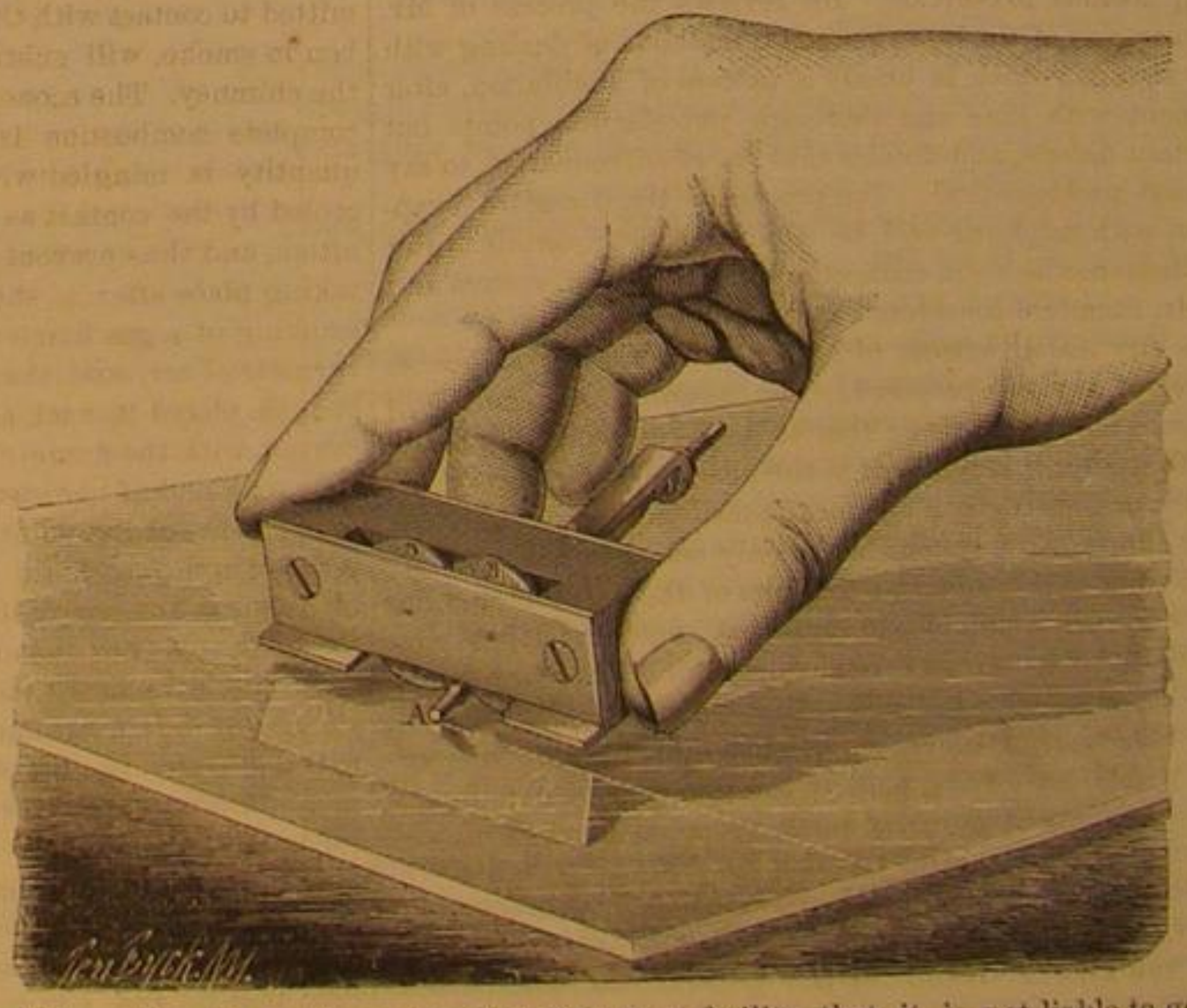
CUTTING GLASS WITH STEEL---THE MAGIC DIAMOND.

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 Beckman street, New York city.

Scientific American.

MUNN & COMPANY, Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW (PARK BUILDING), NEW YORK.

O. D. MUNN, S. H. WALES, A. E. BEACH.

"The American News Company," Agents, 121 Nassau street, New York.
"The New York News Company," 8 Spruce street.
Messrs. Sampson, Low, Son & Marston, Booksellers, Crown Building, 188 Fleet street, London, are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.

VOL. XXI., No. 4...[NEW SERIES.]....*Twenty-fourth Year.*

NEW YORK, SATURDAY, JULY 24, 1869.

Contents:

(Illustrated articles are marked with an asterisk.)

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 naturwissen schaflichen 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, 29 876 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 "$1,301·96." 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 $3,489,373.

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. Dayof 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 75,029, 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.

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.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING JULY 6, 1869.

Reported Officially for the Scientific American.

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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. 29, 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. R. 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 V. 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.
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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.
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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.
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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 New York city.
93,345.—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, Belmont, 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. Shoenfelt and Joseph M. Shoenfelt, 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' Pumps.—Almon Roff, Southport, Conn. June 14, 1869.

1,821.—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.

1,835.—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.

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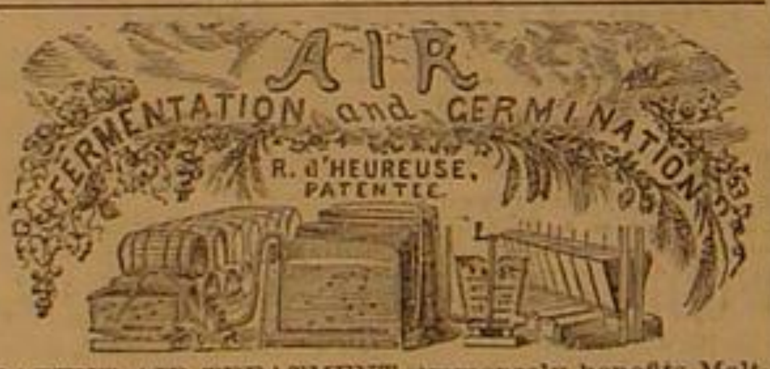

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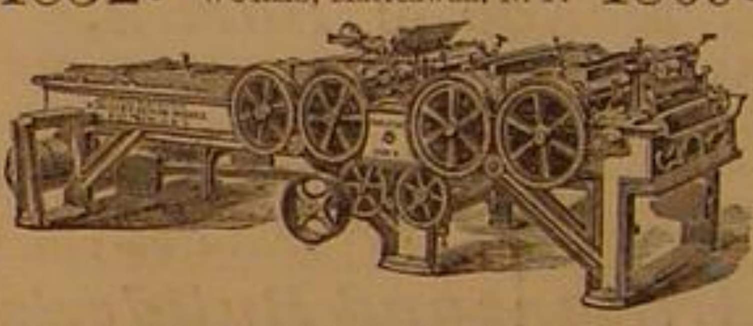

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