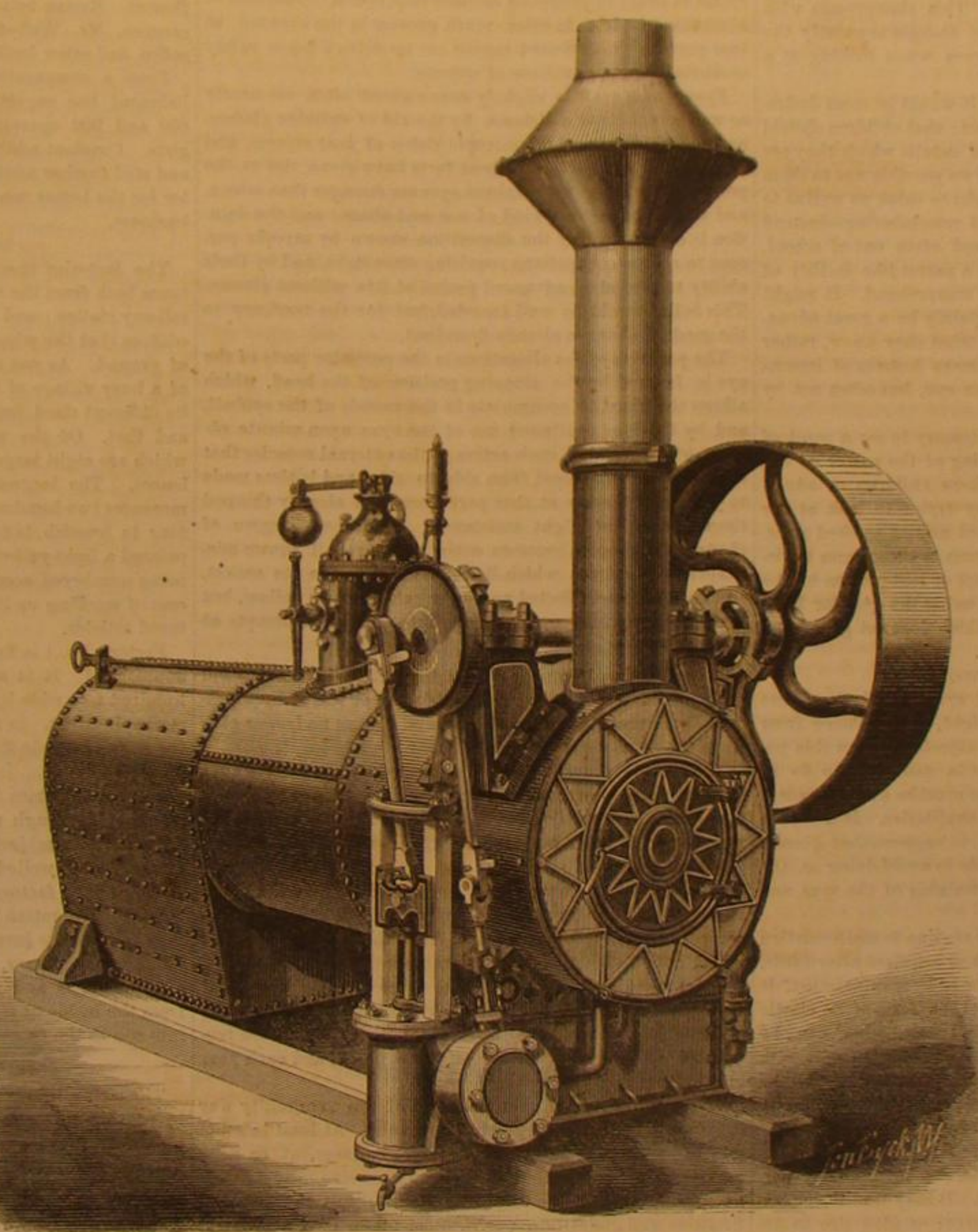
SCIENTIFIC AMERICAN

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

Vol. XXIV.—No. 5. [NEW SERIES.] | NEW YORK, JANUARY 28, 1871. | $3 per Annum. [IN ADVANCE.]

Improved Vertical Portable Engine.

This engine differs from other portable engines, in that the cylinder is placed in an upright instead of a horizontal position. The cylinder of the engine is attached to one end of a base or box, in which is placed the water heater, this box being furnished with bearings to support the front end of the boiler, directly under the tube sheet. Within this box is placed a succession of pans. The cold water being deposited on the upper pan, flows down, over the lower ones, to the bottom, by which means it becomes heated by part of the exhaust steam passing into it. This steam becomes condensed and is pumped back into the boiler. The box or base is cast with an opening at one end to admit the pans, and the open end is covered by a cap, which also forms the foot of the force pump. This force pump, which is not shown in our engraving, is furnished with ball valves, seats, and cages, of the best composition metal, and all fitted with ground joints. The force pump is driven by an eccentric placed immediately over it on the main shaft. On the side of the eccentric is cast a small pulley, which belts on to a larger pulley attached to the boiler by means of a stud, and which carries a crank wrist from which power is transmitted to the pump; the crank pin is also made square at the end so that by the application of a crank it can be worked by hand to fill up the boiler. This pump is attached to the fire box and is open at the top. Its plunger is furnished with hemp packing, and can be repacked by an inexperienced hand, without the necessity of sending to a machine shop to have a new plunger fitted. The saddle, together with the two pillow blocks for the main shaft to run in, as well as the smoke stack base, are all cast in one piece, which makes a strong and uniform casting. This saddle is bolted to the boiler over the tube sheet, and is connected to the lower box or base by means of a flat bar. This bar receives part of the strain between the saddle and base, and also forms the bearing for the guide yoke. The steam chest is placed in such a position on the cylinder that the valve motion is direct without the use of a rock shaft. The piston head, piston rod, cross head, wrist, and crank pin, are all made of steel, which enables lightness to be combined with strength. A weight cast at the back of the crank plate counterbalances the weight of the parts described. This enables the engine to be run at a high rate of speed with steadiness At the Cincinnati Exposition, where it was run on trial, we are informed it made 428 revolutions per minute on twenty-four pounds of steam, and took a large medal for "novelty and meritorious construction." One of the advantages claimed for this engine is the attachment of the machinery to the strongest part of the boiler, the saddle being placed immediately over the tube sheet, and the base immediately under, doing away in a great measure with the strain of the machinery through the expansion and contraction caused by the varying heat of the boiler. It will be seen that by placing the machinery below the waist of the boiler, it is not so likely to upset in transportation. The throttle is placed at the top of the steam pipe, in the steam dome, and the pipe passing through the boiler and smoke arch is protected from the cold atmosphere, thereby preventing condensation in the pipe.



THE GRIFFITH & WEDGE VERTICAL PORTABLE ENGINE.

Letters patent have been issued covering all the main features in the construction. Date of patent, Nov. 29, 1870.

Address for further particulars, Griffith & Wedge, manufacturers of engines, boilers, and saw-mill machinery, Zanesville, Ohio.

The Place of the Mitrailleur in War.

It seems to us quite clear that the mitrailleur cannot take the place of field artillery. To say nothing of the fact that the field guns have thus far generally beaten it more or less decidedly in actual effect, even at short known ranges, there is the important consideration that the field guns are effective also at ranges to which the bullets of the mitrailleur could not even reach. Those who have compared the mitrailleur with field artillery have apparently been ignorant of the effects capable of being produced by a well-directed shrapnel fire. Shrapnel fire, indeed, is not really understood in any country except England; and until lately very few English artillerymen were aware what a formidable projectile the rifled shrapnel shell really is. The case-shot of the service have also been recently made more effective. The result is that the field guns, especially the capital little 9-pounder bronze muzzle-loading Indian gun, have exhibited a power which the supporters of the mitrailleur had not anticipated. Guns, too, possess other advantages. The moral effect of a bursting shell is greater than can be produced by any mitrailleur fire, however formidable. The fact that a gun can fire a great variety of projectiles—shot, shell, shrapnel, segment, aud case—and that it is available at all ranges, gives it a position and importance which the mitrailleur can never hope to attain. Further, when the range is unknown, the mitrailleur fire is often entirely thrown away. Thus, on Tuesday last, the Gatling in 270 rounds only hit a large cavalry column 16 times, and the Montigny in 367 rounds only hit the same column 3 times. The supporters of these weapons would, therefore, do wisely if they were at once to withdraw from their pretensions to take the place of field artillery.

Nor can the mitralleur ever effectively take the place of infantry in the field. It can neither skirmish nor charge; it is difficult to see how it could be usefully employed for the attack of an entrenched position, or generally as an offensive weapon at all; the men who serve it are also debarred from taking the offensive. However light it may be made, a wheeled carriage is always necessarily more hampered in its movements than an infantry soldier; if disabled, the effect is tantamount to the placing *hors de combat* of as many infantry soldiers as the machine may be supposed to represent; its effect is of too uniform, unvarying a character—there is, so to express it, too little intelligence and discrimination in its volleys, to enable it ever usefully to replace the infantry soldier in field warfare.

But short of this—short of superseding artillery and infantry—it is impossible not to recognize in a good mitrailleur a useful auxiliary weapon. The lightness of the machine and of the ammunition required to produce a particular effect will enable it to compare favorably with field guns under certain circumstances. Theory and practice alike point to the necessity of keeping your artillery as much as possible outside the range of infantry fire. Within those ranges the mitrailleur, requiring, as it does, fewer men and horses, and being able to take up and withdraw from a position more promptly than a gun, may often be usefully employed to save the artillery; while in all those positions where it is necessary to multiply infantry fire over a small front, the mitrailleur can hardly fail to produce good effects. Such positions are numerous enough, though they are to be found more often on the side of the defense than on that of the attack. Among positions of this class we may mention the defense of the unflanked spur of a hill, the defense of a narrow gorge, of a street, roadway, or *tête de pont*, or for the flanks of short ditches, to sweep breaches, etc. It is a very distinct and important advantage of the mitrailleur that it has no recoil. This in a fixed position, or where the weapon is under cover, is a point in its favor which every one must recognize. In such positions as these the mitrailleur, skilfully handled, ought to be able to accomplish nearly all that either field guns or infantry could do, at a less cost of *matériel*, and a less exposure of horses and men; and for use in such positions it may be fitly introduced.

There are other uses to which these machines may also be probably applied; such as to accompany cavalry upon occasion, when it is necessary promptly to bring a hot fire to bear for a short time upon some one point. It has often been suggested of late years, that the cavalry soldier ought to be more like the old dragoon—a mounted infantry soldier, in fact. To the suggestion answer has generally been made, that if this were attempted the result would probably be a "Jack of all trades and master of none." It is not impossible that the mitrailleur may offer a solution of this difficulty, by enabling the cavalry to carry with them a means of swiftly establishing a rapid and effective infantry fire upon a certain point, without themselves abandoning their character as cavalry soldiers. If the mitrailleur is to be used in this way, it would be better, we think, to separate the limber from the carriage, attach a third wheel to the latter, and employ lasso harness.

The mitrailleur, it is hardly possible to doubt, will also have certain naval uses. It may be advantageously employed for the tops of men-of-war; it would be effective in repelling boat attacks; and some of these instruments might perhaps be advantageously supplied for use on board ships' boats.

In short, the rôle which we would assign to the mitrailleur, although it may fall far short of the hopes and anticipations of its supporters, is not an inconsiderable one. The instrument will not bring about a revolution in tactics. It will accomplish no real change in the art of war. It is not, in the broad sense of the word, a new arm or a new power. But it may often save and assist both our artillery and our infantry, and it may serve so to intensify the fire on critical points as to earn for itself a reputation which it would certainly not acquire in general field fighting.—*London Saturday Review.*

Whosoever is afraid of submitting any question, civil or religious, to the test of free discussion, is more in love with his own opinion than with truth.

OUR EYES, AND HOW TO TAKE CARE OF THEM.

[Condensed from an article by Henry W. Williams in the Atlantic Monthly.]

Every normal eye is capable of a great variety and amount of use. It sees near or far with the same ease and with equal clearness. But these powers, extensive as they are, may be overtasked. Because the eyes can see minute objects without difficulty, it does not follow that they should be kept almost constantly looking at small objects. They were intended for varying use, and, like any other organ of the body, they may be enfeebled or injured by having their most delicate powers continually and exclusively employed in one manner.

One of the first rules laid down by a teacher to his pupils should be, *not* to keep their eyes fixed upon their books. Apart from the probable injury to the eye itself by too close application, I am satisfied that lessons, especially those requiring thought, cannot be as well committed to memory when the eyes are fixed upon the page, as when they are permitted to wander. The eyes must of course look at the book often and long enough to take in the idea, but if they be too steadily kept there, the perceptive power seems to occupy itself with the visible objects to an extent which is unfavorable to other mental processes. A distinguished engraver once said to me, "I know now how to make a face think." And he explained that the secret lay in giving a certain expression to the eyes by causing their axes to have a very slight divergence from each other. This corresponds with my observation; and this *position of thought* is exactly the opposite of that assumed by the eyes when looking at a book.

For the sake of even normal eyes, it would be most desirable that education should be simplified; that children should not be required to learn an infinity of details which they are sure to forget, and which could be of no possible use to them if retained; that they should be taught to think as well as to remember—and in fact as a means of remembering—instead of giving all their time in school, and often out of school, and by artificial light, to acquiring a parrot-like facility of repeating lessons which they do not comprehend. It might require more pains, but it would certainly be a great advantage if teachers would *teach* children what they know, rather than content themselves with being mere hearers of lessons which may have been learned by the eye, but often not by the understanding.

It would scarcely seem to be necessary to say a word of warning in regard to imprudent testing of the power of the eyes; but instances are not rare where children or adults have done their eyes serious harm by trying to look at the sun, or by observing an eclipse without using a smoked glass. The direct solar light and heat seems in these cases to destroy the perceptive power in a greater or less portion of the retina. Injury may also result from using the eyes for looking at small objects by moonlight, which does not give sufficient illumination for such purposes.

SOME POPULAR ERRORS.

There comes a time when normal eyes find their powers grown limited, and require more light, or assistance from glasses, when looking at small near objects. When this period arrives it is an error to persist in endeavors to do as formerly with the eyes; but much use must be avoided except in a clear light or with the required auxiliaries. It is also a mistake, as will hereafter be shown, to suppose that glasses should not be worn while it is possible to avoid doing so. On the contrary, they serve to prevent straining of the eyes, and preserve rather than injure vision.

Certain defects of refractive power are due to malformation of the eye, either existing from birth or acquired afterwards, and are not to be removed by remedies or by manipulation. It is a mischievous error to suppose that the form of an elastic globe, filled with fluid or semi-fluid substances, can be changed, except for the moment, by pressing upon it with the fingers, as has been recommended by charlatans. All the theories that the eye can have its form favorably modified by rubbing it always in one direction, or by any other manipulation, have no foundation in facts. But while persistent squeezing, according to these methods, can never do any permanent good, it involves great risks. It may lead to congestion and hemorrhage within the eyes; or give rise to destructive inflammation or the formation of cataract by dislocating the crystalline lens; or cause almost immediate loss of sight by separation of the retina from its neighboring parts; or increase the giving way of the back part of the globe, which is already often begun in near-sighted eyes.

The same warnings will apply with equal force against the use of the eye-cups fitted with rubber bulbs, to alter the form of the eyeball, as is asserted, by suction. Valueless and dangerous as they are, persons are often persuaded to purchase and try them—sometimes to their sorrow.

NEAR-SIGHTEDNESS.

Myopia, or "near-sight," is by far the most important, as it is also one of the most common of the refractive defects of the eye. In the other forms of abnormal refraction we have merely a defect of construction, giving rise, it is true, to annoying disabilities, but having no tendency to further changes of structure or function. Near-sightedness, on the contrary, where it exists in a high degree, is not simply an infirmity, as is usually supposed, but in many cases is associated with grave disease of the posterior parts of the eyeball, having progressive tendencies, and not seldom resulting in loss of all useful vision. It has, furthermore, a strong disposition to hereditary descent.

The defect in form, in short-sighted eyes, does not consist, as was formerly supposed, in an undue prominence of the front part of the eye, but in an elongation of the whole globe rom before backwards, so that it assumes an olive or egg shape, instead of being round. This lengthening mostly occurs at the back part of the eyeball, and is not to be observed at first sight; but in many cases we may see that the eye has this altered form, and extends back further than usual in the socket, by drawing the lids apart at the side next the temple, the eye being at the same time turned towards the nose.

All the coats of the eye are implicated in these changes, which take place, sometimes by gradual expansion at every point, but usually by a more considerable giving way around the entrance of the optic nerve. In examination of such eyes after death, a positive bulging of the sclera is seen at this point. During life we can observe these changes and watch their progress by means of the ophthalmoscope. This instrument, by which we are enabled to illuminate and explore the interior of the eye, has thrown new light upon the whole subject of near-sightedness. By its aid we are able to follow the morbid changes as they are successively developed.

As the retina expands with the general enlargement, the nerve tissue, in that layer of the retina which is the seat of its especial function, is of course extended over a larger surface, and its perceptive power is proportionally weakened. Many such eyes are therefore unable to see distant objects with normal clearness, even with the glasses which most completely correct their myopia, although they see small near things perfectly well. It seems to be necessary that a larger number of rays should fall upon a given area of the retina in order to produce a distinct impression. This lack of acuteness of vision is often much greater in the evening, so that persons thus affected cannot see to drive a horse safely or distinguish the outlines of objects.

Eyes which are but slightly near-sighted often see nearly as well as others at a distance by the aid of suitable glasses, and they have almost microscopic vision of near objects, and can read in a dim light; these facts have given rise to the popular belief that near-sighted eyes are stronger than others, and able to bear every kind of use and abuse; and the delusion is encouraged by the disposition shown by myopic persons to choose occupations requiring close sight, and by their ability to read at an advanced period of life without glasses. This belief would be well founded, but for the tendency to the gradual changes already described.

The progress of the alterations in the posterior parts of the eye is favored by the stooping position of the head, which allows the blood to accumulate in the vessels of the eyeball, and by too long-continued use of the eyes upon minute objects, which requires such action of the external muscles that the globe is compressed from side to side, and is thus made to yield still further at that part where the already thinned tissues offer but slight resistance. With each degree of change the process becomes easier, the eyeball grows misshapen to a degree which limits its motions in the socket, and the eye most affected no longer acts with its fellow, but is disposed to turn outwards, and to give up attempts at vision.

With increased implication of the retina in the morbid changes, its perceptive acuteness is more or less reduced, especially as regards distant objects, and glasses no longer give them the same clear outlines.

The morbid processes may be arrested at the early stages of their development, and by good fortune and prudent management the eyes may retain through life nearly the normal powers; or if even considerable changes have taken place, these may remain stationary and give rise to little inconvenience. But if they are not recognized, and means taken to avert their progress, they may go on till the retina becomes useless, being separated from the choroid by fluid which collects between these membranes.

After reaching a certain degree, there is little hope that further changes will be averted by any care or skill. The conditions have become so unfavorable that the morbid tendencies can no longer be successfully opposed, and each year sees a downward progress.

It is quite time that the attention of the community was drawn to a matter of so much importance. At least in some classes of society, the possibility of blindness, at or near middle life, from changes incident to excessive near-sightedness, as well as the predisposition to transmit the same infirmities and liabilities, ought to be taken into account in forming matrimonial alliances, like any other impending disability from incurable ailment. The fact of its being frequently inherited once understood, parents should watch for any early manifestations of its presence in their children, and take measures to prevent its progressive increase. Teachers should impose upon near sighted eyes as little as possible of studies requiring close application, even though at the time the child makes no complaint. It is questionable if our system of education, augmenting as it does the frequency and degree of near-sightedness, is an advance in civilization. It would be better to go back at once to the oral teachings of the schools of Athens, than to go on creating our favorite type of educated men and women, at the expense of their own and their children's eyesight.

No medical skill can bring back these delicate tissues, once distended, to their former healthy condition, or even in some cases prevent the steady onward march of the disease. But prevention is in a measure within our power. Near-sighted eyes should not be used continuously for small objects, and especially with the head bent forward; fine and bad print should be a fatal objection to a school book; the use of lexicons, or close mathematical work, should be limited and interrupted; written exercises should be almost dispensed with; and the child should be spared search upon the map for unimportant places. The book should be held up when possible, and the pupil should not keep his head leaned over his desk, nor be allowed to study by a feeble light.

If by these precautions the child reaches adult age without any considerable development of his myopia, he will thenceforth be comparatively safe, as changes are less likely to occur after this period. But if, from thoughtless mismanagement, large and progressive structural alterations of his eyes have been brought on during his years of study, he may not only find himself disabled from pursuing such other occupations as he may desire, but may be in a condition foreboding further misfortune.

THE RATTAN FACTORIES AT WAKEFIELD MASS.

[Condensed from the Boston Commercial Bulletin.]

Among the industries of the town of Wakefield, formerly South Reading, Mass., are several boot and shoe manufactories, razor-strop factories, etc.; but by far the most important enterprise is the great rattan factory owned and carried on by Cyrus Wakefield.

Mr. Wakefield commenced in life without any other capital than Yankee energy, pluck, and brains. Fifteen years ago he started the business of manufacturing in this country articles from rattan, which he imported from India.

With the exception of a rattan factory at Fitchburg, in which also Mr. Wakefield has a large interest, this is the only establishment in the United States engaged in this manufacture. The rattan used at the factory is all imported by its proprietor from Singapore, who has in his employ no less than fifteen vessels sailing constantly between India and Boston. Rattan being too light and bulky to comprise entire cargoes, Mr. Wakefield also imports spices, tin, gambia, coffee, and other Indian productions.

From a comparatively modest commencement, this establishment has rapidly grown until now it employs between 800 and 900 operatives, including men, women, boys, and girls. Constant additions of large buildings have been made, and still further additions are contemplated by the proprietor for the better convenience of different departments of the business.

THE GREAT FACTORIES.

The factories themselves are situated at a convenient distance both from the main street of the village and from the railway station; and comprise so many and such spacious edifices that the whole establishment covers over seven acres of ground. As you approach them they have the appearance of a busy village of factories, with its streets and open plots, its different sized buildings, and its roads passing this way and that. Of the main buildings there are four, besides which are eight large storehouses, offices, and other conveniences. The largest factory is one recently built, which measures two hundred and eighty-five feet in length by fifty-four in breadth, is four stories high, substantially built and painted a light-yellow. This is factory No. 3; the factories being numbered according to the different stages of the process of working up the rattan into finished stuff or manufactured articles.

Factory No. 1 is first reached as the group of buildings is approached. It is a very large, solid-looking building two hundred feet wide by two hundred and fifty long, and three stories in hight. In this building the first processes by which the rattan is made fit to be fashioned to its various uses, are performed.

The rattan comes from India in large bundles, the various pieces being rough and of irregular thickness and length. The first is to subject it to a washing, by which it is at once cleansed and swelled; for this purpose there are, on the lower story of the factory No. 1, a series of revolving "wash boxes." The rattan is then assorted according to its size, and then follows the interesting operation of scraping down the joints by machinery, and splitting the rattan, separating by a very curious and rapid process, the outside, or bark part, from the inside or pith. Both of these parts of the cane come into use in the establishment.

HOW RATTAN IS WORKED.

The strips, into which the outer part is quickly fashioned by passing through a machine, which, as it were, peels and separates them, are used for chair seatings, which, in its finished state, is sold to furniture manufacturers. This is naturally considered the most useful part of the rattan. The processes of cleansing, soaking, scraping the joints smooth, splitting and separating the outside from the pith, and the making the different strips of uniform thickness and width, being completed, the rattan is carried to the various other departments of the factories, to be devoted to a great variety of other processes, and to many various uses.

The strips of enamel are all sorted, measured and tied up in bundles of one thousand feet, one hundred of which compose a bale.

At first, the pith, shavings, and other refuse of the rattan, after splitting and trimming the strips which are formed of the outer bark or covering, was carted away and burned as useless. But a man of Cyrus Wakefield's Yankee thrift, ingenuity, and perseverance, soon perceived that this was a waste of stuff that might be turned to many valuable uses. Now none of the rattan whatever is regarded as waste, but additions have been made to the establishment purposely to accommodate the work that is done upon it. The machinery rounded pith is woven into baskets, tables, chairs, etc., in a thousand fanciful shapes and forms.

UTILIZING WASTE.

The shavings, with which the rooms in this factory, No. 1, are covered, are spun by women into roping and fashioned into matting—the kind of matting so much used in offices, railway stations, etc. This is done on machinery; and it is astonishing to observe how rapidly, and apparently easily, neat and substantial articles of this sort are made out of the confused mass of shavings on the floor. The mats which are made are curiously sheared by machinery with lightning rapidity; and are woven with astonishing skill and precision by the men who are to be seen hard at work at the hand looms in one of the rooms.

In the lower part of factory No. 1 is the machine shop, where all the machinery used in the establishment is not only manufactured but is repaired and set to rights. Everything can thus go on like clock-work, without any of that delay which usually occurs from dependence on others.

The two factories not yet mentioned—Nos. 2 and 4—are respectively one hundred feet by one hundred and twenty, and one hundred and twenty by forty feet, three and two stories high. One of them is the dye and finishing house, and is used for dyeing and finishing off the various rattan strips and shavings. It contains large vats and machinery, and the processes here, as in other parts of the factories, are very rapid and curious, as showing how comparatively useless material may be rendered a serviceable, popular, and even a tasty and elegant article.

In the large new building, factory No. 3, are long weaving rooms and finishing rooms, where the weaving of mats and mattings is done by power. Here also, in an upper room, may be seen the men and women fashioning arm chairs, baby chairs, work tables, and large round tables, baskets, lounges, and many other articles, some of them made in very fancy and handsomely ornamental styles, and others substantial and plain.

Testing Machine for Building Stone.

The testing machine used at the St. Louis Bridge, the design of which was made by Colonel Henry Flad, assistant engineer, has been in operation for several months, and has given the greatest satisfaction. By means of a very simple little instrument, suggested by Chancellor Chauvenet, and matured by Colonel Flad, the most delicate changes in the length of the specimen can be accurately recorded, with a degree of minuteness never before obtained or even approximated, in any testing machine, so far as my information extends. By this instrument it is perfectly easy to detect a change, in the length of the piece, equal to the two hundred thousandth part of an inch.

A brass collar is slipped over each end of the specimen, and these are secured by three-pointed set screws in each collar. Any shortening or lengthening of the piece will of course alter the distance between the two collars. One collar has on the side of it a small flat surface or vertical table. Against this table is placed a little vertical steel cylinder, which is held against the table by the end of a little flat horizontal bar that is secured at its other end to the other collar. This bar is held against the steel cylinder by a spring, having sufficient strength to keep the cylinder from falling. It is evident now that if one collar be brought nearer, or is moved farther away from the other, the steel cylinder will be rotated, as one side of the cylinder is pressed against the table, which is attached to one collar, while the other side is pressed by the little bar that is fastened to the other collar. If the specimen be subjected to pressure it will be shortened, and the collars will approach each other. If tension be applied to the specimen, the piece will be stretched according to its intensity, and in either case the rotation of the little steel cylinder will indicate the measure of the disturbance that has occurred between the two collars, and it will give it absolutely without any element of error entering into it from any change of the dimensions of parts of the machine under strain. By placing on the top of this little cylinder a small vertical mirror, the extent to which the cylinder has been rotated may be determined in the following manner: Twenty-five feet from the mirror, an arc of a circle is struck, the little steel cylinder being the center of the arc. On this arc is erected a scale of inches with decimal subdivisions. This scale, being illuminated by gaslight, can be easily read in the mirror by means of a small telescope placed immediately above the scale. The angles of incidence and reflection at the surface of the mirror being equal, it follows that one fourth of a complete rotation of the mirror would be equal to a half circuit of the circle of which the arc is a part; or, in other words, a movement of the mirror of but one degree would be shown on the scale, by the reading of a space equal to two degrees, or the one hundredth part of an inch on the scale would really be only half so much, or the two hundredth part of an inch, when seen in the mirror.

The diameter of the little cylinder is so proportioned to the radius of the arc as to make the smallest subdivision of the scale equal to the twenty thousandth part of an inch, but the observer, after a little practice, can subdivide these divisions, which are magnified by the telescope, so as to observe the two hundredth part of an inch.

The power is applied to the specimen under trial by means of an hydraulic press, the ram of which moves horizontally. The ram has a steel rod extension passing through the rear end of the cylinder. Specimens for testing by tension have one of their ends secured to this steel rod, and the other to the end of a scale beam. Specimens for crushing are placed at the other end of a cylinder, and are compressed between the end of the ram and a crosshead. This crosshead is attached to the end of the scale beam before mentioned, by four powerful rods of steel surrounding the cylinder and leading back to a crosshead attached to the beam. This latter crosshead is detached from the beam when tensile experiments are being made.

It will be obvious, on reflection, that when a piece is being crushed by the thrust of the ram, the four bolts sustaining the crosshead against this thrust must stretch in proportion to the power applied, and hence the specimen will be moved bodily in the same direction, and that this will affect the accuracy of the readings of the mirror, as it too will be moved horizontally with the specimen to which it is attached. To correct this minute error in the readings, a second mirror and scale are used to ascertain the extent of this horizontal movement. The table holding the second mirror, against which the little cylinder rotates, is secured to the frame of the testing machine, which has no strain on it, and the little bar for rotating the cylinder is attached to the crosshead; of course, any movement of this head causes a rotation of this second mirror by which the extent of the movement can be at once ascertained.

It is equally important to know the exact weight applied to the specimen as well as the change of form assumed by it when subjected to the weight. Having no faith in the accuracy and durability of the ordinary mercury and spring gages for such high pressures as are required in a hydrostatic testing machine, I determined that the absolute strain on the piece must be weighed on the balance. This, Colonel Flad has very ingeniously accomplished by a system of levers, balanced on hardened chrome steel knife edges and boxings, sufficiently powerful to stand a strain of 100 tuns and yet so delicate as to be turned by the weight of one half an ordinary cedar-covered drawing pencil when placed in the balance. One pound weight placed in the balance equals a tun of 2,000 pounds weight on the specimen.

I feel safe in asserting that the company have a testing machine which can scarcely be excelled in the accuracy, delicacy, and minuteness of its results.

It has been placed in charged of Mr. Paul Dahlgren, C.E., by whom a carefully tabulated record is kept of all tests made with it. A great variety of these have already been made upon specimens of steel, iron, woods of various kinds, granite, brick, limestone, concrete, cement, models of tubes, trusses, etc. Much valuable information having direct reference to the work in hand, has been already obtained by these experiments.—*Report of the Chief Engineer, Capt. James B. Eads.*

Sugar from Melons as Compared with Sugar from Beets.

Mr. W. Wadsworth, in a letter to the *Sacramento Union*, maintains that sugar can be made more profitably from melons than from beets. He says:

The sugar from cane, maple, beets, parsnips, the sweet-gourd, and all the varieties of melons, when manufactured perfectly pure, are chemically identical. In Hungary and Italy there are numerous large establishments for the manufacture of melon sugars. The cost of melon sugar as compared with beet sugar, is in favor of the melon. Every German or French authority on the culture of beets for sugar, admits the necessity of two, and recommends three, deep and thorough plowings of the land to properly fit it for the culture of beets. With melons it is quite otherwise. To secure the largest yield and best beets, the seed should be planted in rows two feet apart and from eight to ten inches apart in the row. For beets, all the land—for illustration say fifty feet in width—must be plowed at least twice. For melons, only four beds, twelve feet apart and each only four feet wide, or sixteen feet in width of plowed land, against fifty for beets will need plowing.

The great expense of beet culture is in the hand-hoeing and weeding of every row, and in most lands as many as three of these weedings are required in a season, before the leaves are large and spreading enough to keep down the weeds. The difference between the weeding of four rows of melons and twenty-five rows of beets is very considerable; whilst the exhaustion of the fertility of the soil is in the same proportion. With both crops the land between the rows is kept free from weeds with the horse-hoe or cultivator, at the same expense. Young melon plants are not as tender and delicate for the first eight days as beets. It is evident, therefore, that the expense of culture is largely in favor of melons, it being less than one third the cost of beets per acre.

In gathering the two crops the difference is again in favor of melons, for they only have to be picked from the vine and thrown into carts; then, without washing or any other process are ready for the mill. Beets must be first pulled, thrown into heaps to protect them from the sun, then each beet must be handled in having its crown of leaves and rootlets cut off, and then, before it is ready for the rasp or cutter, must be washed thoroughly clean.

The gathering and handling of melons is an agreeable and cleanly operation compared with that of beets. Large quantities of melons in certain localities can be sold for direct consumption in the early part of the season, or whenever worth more in that way than for sugar, spirits or vinegar; it is not so with beets. Sugar making can commence a full month earlier from melons than from beets, and with winter water melons, as in Hungary, continued as late as with beets. Melons yield their seed every year with no extra expense for cultivation. Beets require a second year, with land, and careful culture and gathering of the seed. Melon seeds will yield sixteen per cent of their weight of excellent table oil. Beet seeds, beyond what are needed for seed, are of no value. The oil from the surplus seeds of melon sugaries in Hungary pays one half the cost of cultivating the entire melon crop. The yield of melons per acre, in favorable soils, is equal to that of beets. The yield of sugar is as seven per cent from melons to eight per cent from beets; but the cost of manufacture is decidedly in favor of melons; they require less time, less bone black, less machinery, less power, and less fuel, because no water is added, which cannot be said of beet juice by the ordinary process of extraction.

The natural purity of the juice of melons is so superior to that of beets, that whilst the melons furnish an agreeable "food and drink," and a delicious sweet, the juice of beets is so acrid and herbaceous as to be wholly unpalatable. The defecation and refining processes for melon juice and sugar are therefore attended with far less trouble and cost. That part of the beet which in many instances grows above ground, exposed to the sun, is of little or no value for sugar, whilst the hotter the sun and the drier the air, the better and sweeter the melon. The larger the sweeter, generally, whilst the reverse is true of beets.

Beet juice and pulp exposed to the air, will turn black in fifteen minutes, and fermentation commences immediately from the rasp. Melon juice and pulp will not blacken at all, and will not begin to ferment in the open air before the third day from the melon. Beets are remarkable for their power of extracting alkaline and saline substances from the soil, which injures their value for sugar. Melons are equally remarkable for letting these salts entirely alone in the soil.

No centrifugals or presses are required to separate the juice from the pulp, as with beets; but all except the rinds and seeds go into the defecating kettles together. Cloth filters, concentrators, and a vacuum pan are as necessary as for beets. The buildings are less costly, because requiring less strength to hold in position the centrifugals and other necessary machinery for beet sugaries. The chemical processes of melon sugar making do not differ materially from those for the making of beet sugar, except in their simplicity. Spirits in large quantities can be extracted from the fermented juice of melons and the refuse of the sugarie, and "pure cider vinegar" is made therefrom in ten hours, that cannot be distinguished from the genuine article. The melon rinds, with dry grass or straw, make an excellent food for milch cows.

Whereas a beet sugar establishment is a costly concern, a melon sugarie costs comparatively but little, whilst both can be made exceedingly profitable. A small beet sugarie that will pay an annual dividend of 30 per cent upon the entire investment, will cost $75,000. A melon sugarie that will pay 24 per cent per annum on its cost, can be put in operation for $20,000.

A beet sugarie to pay a dividend of 35 or 45 per cent per annum, will cost from $100,000 to $150,000.

In-growing Toe Nails.

This most painful of the diseases of the nails is caused by the improper manner of cutting the nail (generally of the great toe), and then wearing a narrow, badly-made shoe. The nail beginning to grow too long, and rather wide at the corners, is often trimmed around the corner, which gives temporary relief. But it then begins to grow wider in the side where it was cut off; and, as the shoe presses the flesh against the corner, the nail cuts more and more into the raw flesh, which becomes excessively tender and irritable. If this state continue long, the toe becomes more and more painful and ulcerated, and fungus (proud flesh) sprouts up from the sorest points. Walking greatly increases the suffering, till positive rest becomes indispensable.

Treatment.—We omit all modes of cutting out the nail by the root, and all other cutting or torturing operations. Begin the effort at cure by simple application to the tender part of a small quantity of perchloride of iron. It is found in drug stores in a fluid form, though sometimes in powder. There is immediately a moderate sensation of pain, constriction, or burning. In a few minutes the tender surface is felt to be dried up, tanned, or mummified, and it ceases to be painful. The patient, who before could not put his foot to the floor, now finds that he can walk upon it without pain. By permitting the hardened, wood-like flesh to remain for two or three weeks, it can be easily removed by soaking the foot in warm water. A new and healthy structure is found, firm and solid, below. If thereafter the nails be no more cut around the corners or sides, but always curved in across the front end, they will in future grow only straight forwards; and by wearing a shoe of reasonably good size and shape, all further trouble will be avoided.—*Bostwick's Medical and Surgical Journal.*

On the Air in Workshops.

The *Bowdoin Scientific Review* contains an article from Dr. Sigerson, in which he says of the air of iron works:

Although a quantity of this iron, carbon, and ash, must daily pass in and out of the lungs, and besides, although a certain percentage must remain in them (as shown by Ponchet's dissections and Professor Tyndall's experiments), it is difficult to find a healthier body of men than those who work in such factories. Dr. Sigerson observed one exception, a young man whose lungs were weak, and who had suffered from blood spitting, with cough, contracted in an American foundery, where the heat was excessive. He inquired whether the atmosphere heavy with dust did not affect him injuriously. The artisan replied in the negative; he said that he found himself well in it; his cough came on at home on rising and lying down. These facts seem to indicate that the carbon poured into the air of cities from gas lights and fires may not have so injurious an effect as is sometimes fancied.

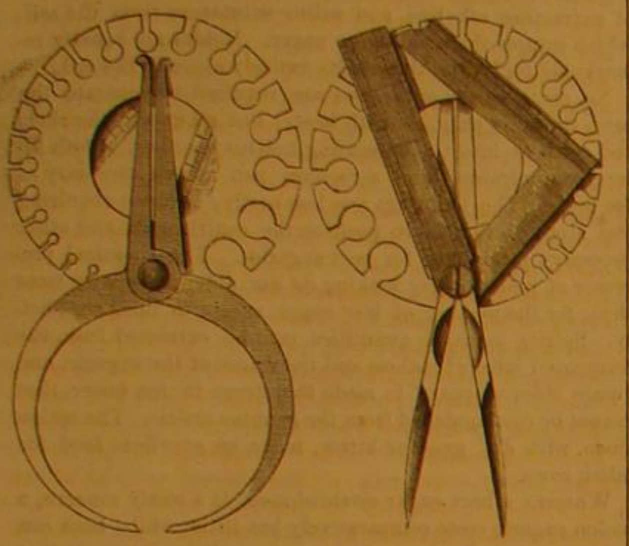
A New Chinese Composition.

Dr. Scherzer, an Austrian official at Pekin, has sent to his Government some specimens of a Chinese composition called "Schioicao," which has the property of making wood and other substances perfectly water-tight. He says that he has seen in Pekin wooden chests which had been to St. Petersburg and had come back uninjured, and that the Chinese use the composition also for covering straw baskets, which are afterward employed for carrying oil long distances. Cardboard, when covered with the composition, becomes as hard as wood, and most wooden buildings in Pekin have a coating of it. It consists of three parts of blood, deprived of its fibrine, four of lime, and a little alum.

COMBINED TOOL.

Of late many useful combinations in tools have been invented and patented, many of which have found much favor with the public, and met with an extensive sale. Our engraving shows a neat combination of this kind patented November, 1868, by John D. Wilkinson and E. O. Boyle, of Plattsburg, N. Y.

It is, as will be seen, a combined wire gage, dividers, rule, square, and calipers, making a very convenient and useful tool for the machinist's lathe and work bench. All the parts



are pivoted together by a single screw pivot, as shown, making a device tasty in appearance, compact, and capable of all the uses to which the elementary tools composing it are applicable.

American Zinc Ores.

Though the ores of zinc are abundantly concentrated in very many of the other States, yet, says the *American Exchange and Review*, Pennsylvania and New Jersey (with perhaps the addition of some amount from Missouri) furnish almost all the zinc and zinc oxide produced in this country. The Lehigh Zinc Works, at Bethlehem, Pennsylvania, and those of the New Jersey Zinc Company, at Newark, are both extensive establishments, the first drawing its supply of ores from the Saucon valley, in its immediate vicinity, and the last from the remarkable and peculiar deposits of mixed oxide of zinc and franklinite of northern New Jersey. Spelter, or metallic zinc, is produced at both establishments, the first manufacturing it directly from the ore, and the last having an intervening process of production of artificial oxide, which is subsequently densified, and then reduced to the condition of metallic zinc. The residue from the oxide production is a highly ferruginous mass, containing considerable manganese, which is adapted for treatment for metallic iron. Both companies manufacture oxide of zinc, or zinc white, for purposes of the painter. The same substance is produced at the Keystone works also, though it is here contaminated by the presence of some plumbic-sulphate, from the galena in the original ore.

At Mineral Point, Wisconsin, and near La Salle, Illinois, are zinc works, though we believe those at the last-named place are not at present in operation. In Southwestern Virginia and in Eastern Tennessee, in Arkansas and in Southern Missouri, ores of zinc are abundant, and generally of excellent quality and high percentage. Few of these deposits are, we believe, utilized at present, or, if wrought, contribute but a small quota to the zinc and oxide product of the country, if those of Missouri be excepted. The last-named State is rapidly developing into the position of the chief among the zinc centers of the country. The total consumption of the metal in the United States, during the year 1869, reached 62,000,000 pounds, of which 7,000,000 pounds were of home production, and 55,000,000 pounds were imported.

Remarkable Gas Wells in Ohio.

Mr. J. S. Newberry, in the *American Chemist*, writes as follows:

"In June, 1866, I visited two remarkable gas wells, bored by Mr. Peter Neff, in the valley of the Kokosing, a few miles east of Gambier (where Kenyon College is located) in Knox county, Ohio. I wrote a description of them, which was published in the Cleveland *Herald*. As gas wells are just now attracting some attention as sources of supply of gas for illumination and fuel, I have thought it might not be uninteresting to your readers to have this description repeated for their benefit.

"It will probably add to the interest with which it will be read to say that the wells described below have been flowing gas in apparently undiminished volume to the present time.

"From Gambier our route lay down the valley of Kokosing, some twenty miles, to the junction of that stream with the Walholding. Within this interval the valley has nearly an east and west course, and is excavated in the 'Waverley' (lower carboniferous) formation, in the direction of the dip of the strata, which is here, eastwardly, about twenty-two feet to the mile. Near Millwood, however, a few miles below Gambier, we crossed a belt of a mile or more in width, in which the rocks are much disturbed, the dip being increased to 30° with the horizon. Such disturbances are hopeful signs in an oil region, as they indicate the existence of subterranean fissures. When liberated, after confinement of a few minutes, and ignited, the gas formed a volume of flame as large as a house. At night, an exhibition similar to that witnessed by us at midday is said to be wonderfully impressive, the gas illuminating the whole country like a conflagration.

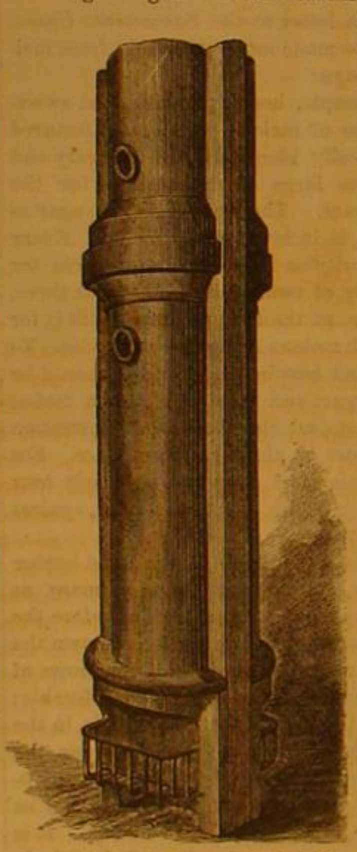
"The gas from these wells seems to be pure, having no other smell than an agreeable one of naphtha, and has high illuminating qualities. Its volume is sufficient to light a large city, and, if differently situated, the value of the material thus wasted, for lighting or heating, would be greater than the product of the best oil-well known."

Remarkable Cure of Aneurism.

The present Lord Mayor of London, Mr. Alderman Dakin, whose term of office was postponed from last year on account of ill health, was cured of an aneurism of the carotid artery by the ingenuity of a London surgeon. The position of the carot'd, and the impossibility of reaching it for the purpose of tying without disturbing the jugular vein and other vital centers, rendered the task of stopping the flow of blood, to give rest to the artery, one of extreme difficulty; and the seat of the disorder prevented the application of pressure by mechanism. Mr. Dakin's surgeon arranged for a number of students from a London hospital to attend in rotation, and keep a manual pressure on the proper part of the patient's neck. This was continued for several weeks, the operators, of course, knowing the exact spot requiring pressure to restrain the flow of blood and so rest the artery until it recovered its tone and contractile power. The device was completely successful, and the patient, whose life was despaired of, and who was convinced that a few weeks would bring him to an end, is now in perfect health. The simple and scientific remedy was devised by Mr. Buxton Shillitoe, a surgeon whose skill in diagnosis has already raised him to the foremost rank of the profession in Europe, and to whom the arrival of the highest honors is only a question of time.

CAST IRON CHIMNEY.

Our engraving illustrates a cast iron chimney for dwelling houses and other buildings, patented a couple of years ago.



A chimney of this kind may be made to occupy much less space than the ordinary brick chimney. The casting is done in semicircular sections with flanged edges and shoulders at the joints, and with apertures for inserting the ends of stove pipes. The lower end may be adapted to an open grate, or to a stove, or heater.

It is not necessary to cover such a chimney with plastering, as it may be made of ornamental form, and painted to match the finish of other parts of the rooms through which it passes. The action of the gases would corrode the metal gradually, but such a chimney, if properly made, would probably last many years.

AUTOMATIC TOY.

The ingenuity and skill displayed in providing for the amusement of the little ones, is truly wonderful. One may derive pleasure as well as instruction by an inspection of the displays in the toy-shop windows during the holiday season. Whoever takes the time to inspect these displays will see much that is really interesting, especially in the line known as automatic toys.

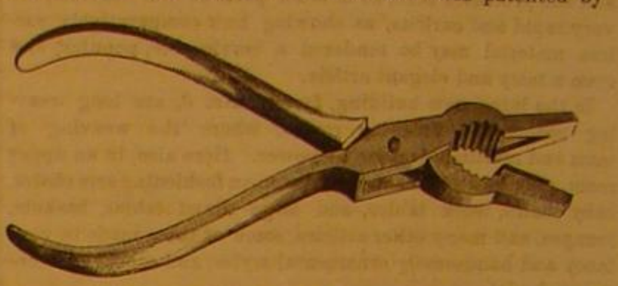
Our engraving shows an ingenious toy of this kind, and illustrates the method by which the movements of walking in automatic figures of men and animals are simulated.

The engraving represents a toy-horse, patented by William F. Goodwin, Jan. 22, 1864.

The legs are flexed by the motion of the compound levers shown, operated by a spring and trains of gearing, the articulations of the joints and the natural movements being thus imitated in appearance, and the automaton being caused to progress whenever the train of clockwork is wound up and set in motion.

IMPROVED PLIERS.

Our engraving illustrates an improved form of pliers, its construction being calculated to greatly increase the general usefulness of the instrument. This tool was patented by



Sylvanus Walker, of New York, January 8, 1867. The engraving shows so plainly the form of the pliers that we need only remark that the jaws are plain at the ends, and have opposing grooves for holding a bolt longitudinally, and serrated transverse hollows for use as a wrench.

Camels in Washoe.

A Nevada paper gives the following interesting account of the acclimation and use of camels in that State:

"On a ranch on the Carson river, eight miles below the mouth of Six-mile Canon, and about seventeen miles east of the city, is to be seen a herd of twenty-six camels, all but two of which were born and raised in this State. But two of the old herd of nine or ten brought here some years ago are now living. It would seem that the original lot fell into the hands of Mexicans, who treated them very badly, overloading and abusing them. The men who have them now are Frenchmen, and men, it seems, who had formerly some experience with camels in Europe. They find no difficulty in rearing them, and can now show twenty-four fine healthy animals, all of Washoe growth. The camel may now be said to be acclimated to Nevada. The owners of the herd find no more difficulty to breed and rear them than would be experienced with the same number of goats or donkeys. The ranch upon which they are kept is sandy and sterile in the extreme, yet the animals feast and grow fat on such prickly shrubs and bitter weeds as no other animal would touch. When left to themselves, their great delight, after filling themselves with the coarse herbage of the desert, is to lie and roll in the hot sand. They are used in packing salt to the mills on the river, from the marshes lying in the deserts, some sixty miles to the eastward. Some of the animals easily pack 1,100 pounds."

A New Cement.

In the specification of a recent French patent granted to Mr. A. Warner, of London, he claims a new cement composed in part of silicate of iron (preferably obtained from the scorious product of iron manufacture), or of oxides of iron or iron ore combined with sulphate of lime in proper proportions. To the latter, silex can be added. To give the cement the greatest durability for out-door work, Mr. Warner employs the determined proportions of the soluble phosphates, acids, or other chemical equivalents.

Practically the manufacture of this cement consists in reducing to fine powder, *laitier*, (dross) or scoria, and thoroughly blending it in an ordinary flour mill with sulphate of lime, which has been mixed with a previously certain quantity of soluble phosphate. The proportions should be varied in accordance with the intended use of the cement. The following are suggested: 700 parts calcined sulphate of lime, 200 silicate or oxide of iron or iron ore; 2½ soluble phosphate of lime.

Superphosphate of lime may be used in place of soluble phosphate, and in this case equal quantities of superphosphate and silicate or oxide of iron must be employed. Phosphoric or boric acid may be substituted for the soluble phosphate in the proportion of 6, 10, or 14 parts (according to strength) to 300 silicate of iron. And again, any phosphoric or boric salt, or indeed any chemical equivalent capable of forming a cementing substance when combined with silicate of iron, with or without the addition of sulphate of lime, may be substituted for the phosphoric or boric acid. When the cement is made without sulphate of lime it is well to use a larger proportion of soluble phosphate of lime.

The above mentioned substances being intimately mixed in powder, there only needs sufficient water to make the cement of the necessary consistency for the purpose.—*Translated from Le Génie Industriel de Paris.*

Returning to the subject of the Oakes-Ames catastrophe, we quote from the Boston *Times*: "We are able to state that the Ames company will, after its debts are liquidated, find itself enjoying a surplus of at least $8,000,000. The idea of insolvency as connected with this company, is simply absurd." We hope the vision will become reality.

Something about Fresh Air---What we Breathe.

We have all heard of the Black Hole at Calcutta. It was a room eighteen feet square. In this room one hundred and forty-six persons were confined. It had but one window, and that a small one. Dr. Dungilson, in his "Elements of Hygiene," says—"In less than an hour, many of the prisoners were attacked with extreme difficulty of breathing; several were delirious, and the place was filled with incoherent ravings, in which the cry for water was predominant. This was handed to them by the sentinels, but without the effect of allaying their thirst. In less than four hours many were suffocated, or died in violent delirium. In five hours, the survivors, except those at the grate, were frantic and outrageous. At length, most of them became insensible. Eleven hours after they were imprisoned, twenty-three only of the one hundred and forty-six came out alive; and those were in highly putrid fever."

There are many "black holes" like this used for sleeping rooms, says the London *Co-operator;* the difference between them and the one at Calcutta is—that they are not crammed quite so full of human beings. In a word, then, we may say a sleeping apartment should be large, lofty, and airy. It is a poor economy for health to have large and spacious parlors, and small ill-ventilated bedrooms. Fashion, however, is a reigning deity in this respect, and will (no doubt) continue to bear sway, notwithstanding our protest against her dominion.

You will scarcely drink after another person from the same glass, yet you will breathe, over and over, the same air, charged with all the filth and poison of a hundred human bodies around you. You cannot bear to touch a dead body, because it is so poisonous and polluting; but you can take right into your lungs, and consequently into your body, your system, those poisonous particles and noxious exhalations which the bodies around you have refused, and which have been cast into the atmosphere by their lungs, because the health of their bodies required them to be thrown off. If the "timorously nice creatures who can scarcely set a foot upon the ground," who are so delicate that they run distracted at the crawling of a worm, flying of a bat, or squeaking of a mouse, could see what they breathe at the midnight carousal, the very polite ball, and the bright theater, they would never be caught in such company again. Nay, if they could see what they breathe in their own dwellings, after the doors and windows had been closed a little while, they would soon keep open houses. More sickness is caused by vitiated air than can be named. It is one of the most prominent causes of scrofula, which is but another name for half the diseases that attack the human body. It vitiates and destroys the whole fountain of life—the blood.

In the sick room it often augments the disease, or renders it incurable. If the physician comes in and opens the window, or a door stands ajar for a moment, the good nurse, or the tender mother, or the kind wife, or the loving sister, will fly up and close it, as though the life of the sick were at stake. All this is well-meant kindness, but really cruel. If you would have health, breathe fresh air, throw open your windows every morning, and often during the day; leave off your mufflers from the chin. For 20 years, I was accustomed to never going out without a handkerchief tied closely around the mouth, and for nearly that period have left it off. I have had fewer colds, and suffered far less, from changes of climate than previously. Let air into your bedrooms; you cannot have too much of it, provided it does not blow directly upon you.

Many students are injured by vitiated air in their studies. These are small and when the doors and windows are closed, the atmosphere soon becomes loaded with noxious vapors. The man is intent upon his subject; he scarcely knows whether he breathes or not, much less does he think of what he breathes. Many, also, are seriously injured by the manner of heating their studies. All closed stoves should be avoided. The good old-fashioned, open, large chimney, with a fireplace sufficiently capacious to receive the wood with but little chopping, is much preferable to the stoves and grates, and the whole paraphernalia of modern fuel-saving inventions, which have racked the brains and tortured the intellect of many laymen, and some clergymen.

PERPETUAL MOTION.

NUMBER IX.

Innumerable are the devices by which men have sought to make wheels permanently retain an excess of weight on one side of their centers, while revolving. Our engraving, Fig. 20, illustrates one of these absurd attempts. An endless chain, A, passes over pulleys, B, over the idler pulley, D, and under the idler pulley, C. It is expected that the increased weight of the greater length of chain on one side of the upper pulley, B, will more than counterbalance the weight of the chain on the other side, and also compensate for friction created by the pulleys, and so impart a constant rotation to the pulleys and fly wheel.

The device described is, however, outdone by the one shown in Fig. 21, prepared in 1829, by a correspondent of the *Mechanics' Magazine.*

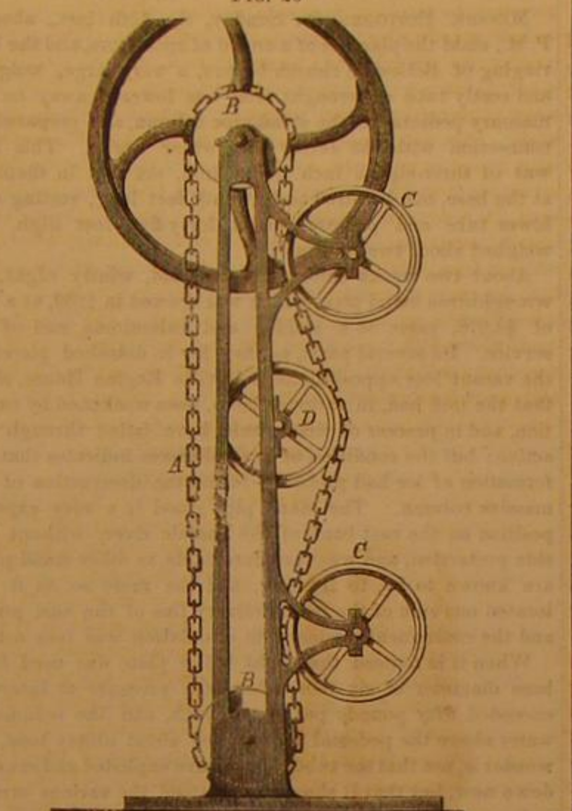
This was to be a self-moving railway carriage. The genius who devised this machine thus writes in regard to it:

"In treating of perpetual motion—'that grand secret for the discovery of which those dictators of philosophy, Democritus, Pythagoras, Plato, did travel unto the Gymnosophists and Indian priests'—it would add considerable interest to give some account of its early history. Regarding the fallibility of every contrivance hitherto planned or experimented upon, we may gather sufficient from the writings of Bishop Wilkins alone. The 'little world' of Paracelsus and his followers—the planetarium invented by Cornelius Dreble, for King James—the 'magnetical globe of Terella,' suggested by Pet. Peregrinus, with the wheel that he, Taisner, and Cardan thought might be kept in motion by 'pieces of steel and loadstones'—are, like the Bishop's own wheel and plummets, and his application of Archimedes' screw, inadequate to the grand end for which they were designed.

"Without enlarging on this head, we shall proceed with the description of a machine which, were it possible to make its parts hold together unimpaired by rotation or the ravages of time, and to give it a path encircling the earth, would assuredly continue to roll along in one undeviating course till time shall be no more.

"A series of inclined planes is to be erected in such a manner that a cone will ascend one (its sides forming an acute angle), and, being raised to the summit, descend on the next (having parallel sides), at the foot of which it must rise on a third and fall on a fourth, and so continue to do alternately throughout.

FIG. 20

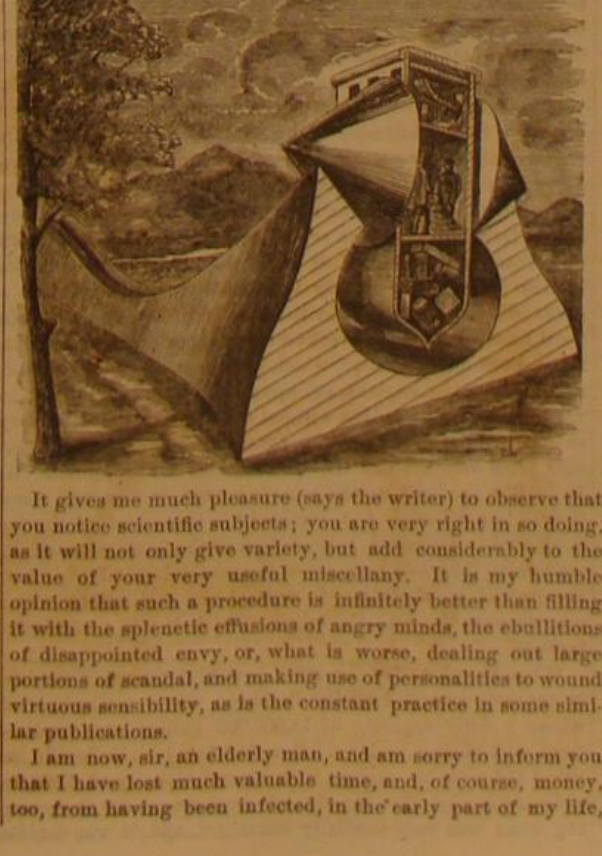


"The diagram is the section of a carriage, with broad, conical wheels, resting on the inclined plane. The entrance to the carriage is from above, and there are ample accommodations for goods and passengers. The most singular property of this contrivance is, that its speed increases the more it is laden; and when checked on any part of the road, it will, when the cause of stoppage is removed, proceed on its journey by mere power of gravity. Its path may be a circular road formed of the inclined planes. But, to avoid a circuitous route, a double road ought to be made. The carriage not having a retrograde motion on the inclined planes, a road to set out upon, and another to return by, are indispensable.

"I am indebted to a much-respected friend for the hint of this means of effecting a veritable perpetual motion."

"The Perpetual Motion Hunter" is the title of an article in the *Imperial Magazine*, vol. 6, 1824:

FIG. 21.



It gives me much pleasure (says the writer) to observe that you notice scientific subjects; you are very right in so doing, as it will not only give variety, but add considerably to the value of your very useful miscellany. It is my humble opinion that such a procedure is infinitely better than filling it with the splenetic effusions of angry minds, the ebullitions of disappointed envy, or, what is worse, dealing out large portions of scandal, and making use of personalities to wound virtuous sensibility, as is the constant practice in some similar publications.

I am now, sir, an elderly man, and am sorry to inform you that I have lost much valuable time, and, of course, money, too, from having been infected, in the early part of my life, with the vanity of hunting after that *ignis fatuus* called the "perpetual motion." Common report informed me that it would immortalize the name of the inventor; that by it the longitude would be discovered; and that, on this account, the British Parliament had offered a premium of ten thousand pounds for its discovery! This was something like assailing a man at all points at once; the acquirement of such prodigious fame flatters his vanity; and the "ten thousand pounds" could be looked upon in no other light than as the reward of distinguished genius!

Under these impressions I began my career, and pursued it with an ardor which, in any other case, could not have failed to ensure me success. I read with the greatest avidity all the accounts of such machines I could anywhere meet with. For a short time I was amused with the ball of iron and the magnet, mentioned in Bishop Wilkins' "Mathematical Magic." I afterwards studied the properties of Orffyreus' wheel, which, as Gravesande informs us, continued in rapid motion for two months; and the end of which period it was stopped, he says, to prevent the wear of materials. This astonishing wheel was, you know, destroyed by the inventor, soon after the time of the above-mentioned experiment. I endeavored with all my might to recover the long-lost secret, and success partly crowned my efforts; for, after a great deal of wearisome labor, I constructed a machine which I then believed would amply compensate the loss which the crazy philosopher had occasioned, when, in a fit of frenzy, he dashed it to pieces. The delight which Newton felt, on discovering the law of gravitation, did not exceed mine when I found that my machine would answer the intended purpose. 'Tis true, it would not put itself in motion—but what then? It was sufficient for the purpose if it would move perpetually when put in motion; and at that time, like many others, I did not quite understand how many requisites were necessary in order that a machine might become a "perpetual motion."

You can scarcely imagine how my heart palpitated when I sent off a description of this, my first invention, to the Board of Longitude. It was a machine which I had no doubt would determine the longitude, both at sea and land, with the greatest ease and accuracy. During the first week, my nightly slumbers were frequently broken by the violent perturbations of my mind; and my day dreams almost continually represented to me the postman knocking at my door with the wished-for letter, that was to crown all my hopes. So certain was I of success, that I actually began to look about for an estate which the ten thousand pounds were to purchase; for, in my mind's eye, I had it already in my grasp. The humble occupation I had till then followed, I now looked upon with disgust; and I saw myself at once elevated to opulence and fame. I waited with patience—yes, Mr. Editor, with all the patience I could muster—but no letter arrived. However,

> "Day presses on the heels of day,
> And moons increase to their decay."

After a few weeks, my mind recovered its wonted serenity, and in about three months more my machine was as free from any violent perturbations as my mind, for, at the end of that period, it had completely lost all power, either of perpetuating or continuing its motion. This circumstance occasioned me some uneasiness; and I was not much amused with the taunting remark of one of my friends, who, on viewing it, exclaimed, "Well! it is a perpetual motion *still!*" At the end of nine months, I received a letter from the Secretary of the Board of Longitude, informing me of what I already knew—namely, that my machine would not answer.

It is now carefully stowed in my brother Jonathan's garret, at Brigg, in Lincolnshire, where it may be seen by all who are curious in such matters.

I now turned my mind into a different channel. I thought it possible that the object of my search might be accomplished by means of some of the fluids. I considered, with care, the almost continued oscillation of the mercury in the tube of the barometer; but I could deduce from this motion no practical result. I afterwards endeavored to turn the tides to some account; but I failed here also. At length, after turning my mind in a variety of ways, as I was one day reading an account of the rise of water in capillary tubes, it at once occurred to me that, as the water rises in such a tube to more than an inch above the surface of the water in the vessel in which the tube is immersed, if I placed the tube in an inclined position, the water would run over its top; and as it would fall into the same vessel, the motion thus produced would be perpetual. At this moment my mind was again agitated; I exclaimed, like Pythagoras, "I have found it! I have found it!" I now supposed myself to be as great a man as any Pythagoras that ever lived. I did not, however, run out, like him, naked into the street; but I remember the discovery was made in the winter season, when I was warmly and comfortably clothed. Had it been in the summer, I cannot tell what might have happened.

I soon procured a capillary tube, and proceeded very carefully to make the experiment; but the water did not flow! Well, said I, this is curious; but a syphon will run: that the water does not run from the top of the tube is owing to the pressure of the atmosphere upon it. I now ordered a capillary syphon, and was again disappointed; for the sluggish water, as if envious of my fame, still refused to move.

Having recovered a little from the stupor into which I had been thrown by the failure of another of my schemes, it occurred to me that if I employed a syphon to carry water over the bank of a river that communicated with the sea, the syphon would run if the outer leg on the outside of the bank was longer than the inner leg; and because the water would find its way into the ocean, and be brought back by the process of evaporation, which is constantly going on, the motion would be perpetual. I could not, however, employ this method to discover the longitude, either at sea or land, and of course, I was not entitled, from this invention, to the ten thousand pounds.

Another of my machines consisted of two wheels, A and B: the wheel A had a number of buckets, at equal distances, round its outer rim. These buckets were so placed that they would each contain a ball of iron. Seven such balls were always on one side of the wheel A, urging it downwards; and one was in the inside of the wheel B. When the wheel A had arrived in a certain position, the lowest ball fell out of its bucket, and rolled down an inclined plane, placed for that purpose, into the interior of B; and then it rolled down another inclined plane into the top bucket of the wheel, A, and so on. This machine had a very specious appearance, and was mistaken for a perpetual motion by thousands of well-informed persons. I need scarcely add that the persons I mention were ignorant of the laws of motion and the theory of mechanics. A similar machine was lately exhibited for a perpetual motion, and a great deal of money made by showing it to the good people of New York, in North America.

My last invention of this kind consisted of an iron wheel and four magnets, similar to the one exhibited some time back in Edinburgh, and other places. As the wheel did not move uniformly, and as the power of the magnets soon began to diminish, I suspected it would ultimately fail, and abandoned it altogether. It is necessary to inform you that my modesty—or, rather, my honesty—would never permit me to exhibit any of my inventions for money, as I had always very strong grounds of suspicion that they would not answer, and my suspicions were always verified in a short time. It was only after a great number of disappointments that I began seriously to think on the subject. I at first wondered how it happened that my schemes should always prove abortive; but I soon discovered that I was entirely ignorant of the theory of mechanics. Not long after, I had also the mortification to perceive that I had totally mistaken the specific nature of the machine which had been so long the object of my search; so that it would have been next to a miracle if I had found it. I now began in earnest to acquire a knowledge of the principles of natural philosophy, and I very soon found that I had begun at the wrong end of my business.

My misfortunes had created in me serious musings. Yes, said I, in all ages mankind have had some favorite object to pursue—a something bordering on the limits of impossibility. Astrology, or the foretelling of future events, was once the grand charm that led men astray. People are fond of prying into futurity. All men are naturally delighted with what is wonderful; and what pains do they take to deceive themselves! Astrology ruled with despotic sway during the reign of ignorance; but, as knowledge advanced, the chimera retreated; and the few votaries it has now left are ranked either among the most ignorant or the most knavish of all the human race.

Alchemy was another favorite pursuit. To be able to transmute the baser metals into gold, was certainly an object of the greatest consequence, and now the discovery would be particularly desirable. There is no doubt that it would be liberally patronized by the Ministers of State and the members of the British Senate; because, if properly managed, it would enable them to pay off the national debt, and ease the good people of England of the intolerable burden of taxation. In case of such an event taking place, what joy would be diffused throughout the whole of this great empire! The people would be wealthy, and the Ministers again able to create places and to give pensions *ad infinitum*. But I must return to my subject. The search after the perpetual motion is of the same nature as those of astrology and alchemy. It has long amused the ignorant and deceived the credulous; but men of science, properly qualified to judge of its merits, look upon it as a nonentity, and laugh at its proselytes as deluded creatures, who are pursuing a phantom of their own creation.

I have not much hope of being able to convince those persons who are in search of this shadow of a shade that their labors will be fruitless. I will proceed, however, to describe the machine they are endeavoring to construct. The perpetual motion is a machine which possesses within itself the principle of self-motion; and because every body in nature, when in motion, would continue in that state, it follows that every motion, once begun, would be perpetual, if it were not acted upon by some opposing force, such as friction, the resistance of the air, etc. In order, then, to produce a perpetual motion, we have only to remove all the obstacles which oppose that motion; and it is obvious that if we could do this, any motion whatever would be a perpetual motion. But how, let me ask, are we to get rid of these obstacles? Can the friction between two toucning bodies be entirely annihilated?—or has any substance yet been found that is void of friction? Can we totally remove all the resistance of the air, which is a force continually varying? And does the air at all times retain its impeding force? They cannot be removed, then, so long as the present laws of nature continue to exist, and who will attempt to destroy them? Besides, it is a well-known principle in mechanics, "that no power can be gained by any combination of machinery, except there be at the same time an equal gain in an opposite direction;" and must there not be some absolute loss arising from opposing forces, as friction, etc.? How, then, can a perpetual motion be found by any combination of machinery? Another necessary circumstance is, that the motion of any such machine be uniform; for, if it accelerate, it will in time become swift enough to tear itself to pieces; if it retard, it will at length stop. Now, among all the numerous forces acting on machines—forces, too, which are continually varying, according to known causes, and to the influence of which every machine is constantly liable—who is there so hardy as even to imagine that a machine can be constructed, the motion of which shall be constant, and uniformly the same?

There is one perpetual motion, and but one—that is, I know of but one—and that was constructed by Infinite Wisdom. The Divine Creator of the universe has balanced this earth with such exquisite art, that its diurnal revolutions are performed so precisely in the same time that it has not varied the hundredth part of a second since the time of Hipparchus, which is now more than two thousand years.

All that we can hope is, that the beams of science will diffuse truth more generally through the world; for, otherwise, dreamers of every kind will continue to dream to the end of time.

Correspondence.

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

The Jersey City Stand Pipe.

MESSRS. EDITORS:—On Sunday, the 14th inst., about 4 P. M., amid the plaudits of a crowd of spectators, and the bell-ringing of Belleville church towers, a very large, weighty, and costly tube of wrought iron was lowered away on the masonry pedestal of the stand-pipe column, and prepared for connection with the Jersey City water works. This tube was of three-eighth inch boiler iron, six feet in diameter at the base, one hundred and twenty feet long, resting on a lower tube and pedestal, about forty-five feet high, and weighed about twenty tuns.

About two weeks before this, one cold, wintry night, the wrought-iron stand pipe, which was erected in 1859, at a cost of $4,076, came to a sudden and calamitous end of its service. Its several parts, as they lay in detached pieces on the vacant lots opposite the Belleville Engine House, show that the iron had, in various places, been weakened by oxidation, and in process of time would have failed through this action; but the condition of several pieces indicates that the formation of ice had probably forced the destruction of the massive column. The stand pipe stood in a very exposed position on the east bank of the Passaic river, without outside protection, and was therefore liable, as other stand pipes are known to be, to freezing, and the more so, as it was located one side of the main delivery line of the east pump, and the consequent tendency to circulation was less active.

When it is noticed that light boiler plate was used for a base diameter of six feet, where the pressure at intervals exceeded fifty pounds per square inch, and the column of water above the pedestal represented about ninety tuns, the wonder is, not that the tube should have exploded and crushed down now, but that it should have stood the various strains so long.

As Jersey City, and its suburbs, with a large population and manufacturing interest depended on the Belleville works for water supply, and the main engines were virtually shut down by this accident, the papers have daily represented the manifold inconveniences, and actual losses sustained by this community, which have amounted in the aggregate to an enormous sum, and attracted attention from all parts of the country.

There has been a very severe and important practical lesson taught here, which cannot be too closely studied; a lesson which the occurrence of a large fire might have made much more impressive. It is a lesson for those who assume the management of city affairs, for those who invest in insurance stocks, for those who use and depend upon water supply, and particularly for civil engineers who take the much underrated responsibility of such public constructions.

Among the visitors attracted to Belleville by this public disaster, probably the great mass accepted, without study, the stoppage of the engines, and the delay consequent on the construction and erection of another stand pipe, as inevitable conclusions.

Possibly no spectator in the gratified crowd of Sunday failed to acknowledge in the successful erection of the massive tube, the one and the only fact which could ensure a renewal of an adequate and customary supply. Yet, in the opinion of more than one quiet looker on, during all this delay, the very conditions of this accident made this new erection doubtful in expediency; and granting this, the Belleville engines might have been set to work in full power *within ten hours* from the fall of the stand pipe.

The stand pipe, as it has been used in this country, is borrowed from the European school, where there are important differences in the method of water supply. In London, for instance, where the supply is intermittent, being let on a given district for a certain time in each day, or at certain fixed intervals of time, overflow stand pipes are used to maintain a head on the pumps, which could not otherwise be had, as the pumping engines are operated. Here, however, in various cases, stand pipes without overflow are used, simply to regulate the condition of a constant delivery to a reservoir from which alone the water mains are supplied. At Belleville, the head on the pumping main is constant, since it rises in a reservoir to a level within three feet of the top bank, and is, therefore, independent of the fluctuations of the reservoir. The sole purpose of the vertical stand pipe near the pumps, is, therefore, to control the oscillations which may occur in the pumping main, which is also a stand pipe inclined.

When the plans for the most powerful pumping engines in use were arranged for the Brooklyn water works in 1856, where a daily capacity of 15,000,000 gallons was required from each engine, under a lift of 163 feet (the Belleville lift being 156 feet, for engines with a usual capacity of 3,300,000 gallons per day), this question of government for the pumping main was very carefully examined, and it was decided not to use stand pipes, from the various objections as to cost, exposure to gales, liability to decay, risk of freezing, but more particularly because properly proportioned air chambers attached to the pump mains, in obviating these objections, also furnished a more perfect system of government to the mains, in smoothness and elasticity of action. The air chamber provided for the No. 1 engine was 6½ feet in diameter and 25 feet high, and under trial it fully settled any doubts as to its superior advantages.

At the Belleville engine house, in the stand-pipe pedestal, there was an uninjured cylinder, six feet in diameter, attached to the pump main, and about twice the hight of the Brooklyn air chamber. If this had been capped and connected with a small auxiliary air pump, which could have been done in a few hours, the inhabitants of Jersey City and suburbs could have been spared all the expenses and losses of the delay in supply, the action of the engines would have been improved, and the annual coal account reduced. This is not said as a criticism on the engineer department, the chief of which, probably, would not have felt authorized to adopt a radical change of this kind, but rather as a comment on the conflicting practice in hydraulic design and construction.

If the history of these works be examined, it appears that from 1854 to 1859 the pumping main itself was used as the stand pipe, and in the report of Feb. 26, 1856, a singular experiment on air cushions is thus recorded:

"About 300 feet north of the reservoir there is a summit in the rising main, from which the pipe descends on one side towards the engine house, and on the other it falls regularly about 18 inches to the level of the bottom of the reservoir. At this high point a tap was inserted for the purpose of discharging the air, and the engine was worked at first with the air drawn out of the summit, and the pipe filled with water. But a difference in the discharge was soon observed by retaining the air in the pipe, which, being compressed whilst the pump is forcing water, acts on the return stroke by its elasticity, like a flat, extended air chamber, producing a constant discharge; and at times, when the pipe is well charged with air, with scarcely any variation.

"The effect of this accidental air chamber, although within 15 feet of the level of the discharge of the reservoir, is visible in the improved working of the pump; since by means of it, it is relieved of about one eighth of the recoil."

It is to be regretted that the experience of 1856 was not developed in 1859 in such a way as to obviate the disaster of 1871.

SAMUEL MCELROY,
48 Pine St., New York city. Civil Engineer.

Spurious Champagne.

MESSRS. EDITORS:—An article in the New York *Times*, of December 17th, in regard to spurious champagne making, induces me to submit to your judgment some remarks relative to the merits of different modes of making sparkling wines. Not taking into consideration artificial wine, made of substances composing wine, there are, to my knowledge, three methods of producing sparkling wines. First, the "old method," in which the wine is allowed to ferment and to clear in bottles, and is afterwards separated from the sediment. This process requires from five to six months. The second way is the "new method," which consists in charging pure carbonic acid gas into already cleared wine. The third method alone is entitled the term "spurious champagne making," and consists in filling bottles with clear wine, and corking the same instantly, after administering salts containing carbonic acid, and also adding tartaric acid in solution. This method is cheap, simple, and quick, and wine so made may be sold at a low price.

My remarks will refer to the relative value of the two first methods. It is known that by both ways, the new and the old method, an "artificial sparkling wine" is produced. Neither is natural. The *Times* says that the "genuine wine" obtains its carbonic acid gas "by the decomposition of vegetable matters remaining in the wine." This statement is incorrect, as the saccharine matter in the wine is far too insufficient for the production of the required quantity of carbonic acid, and to retain, also, enough unchanged to give the wine a sweet taste. For this reason, it is a condition of the "old method" to administer a certain amount of sugar sirup. Consequently, the material for the generation of carbonic acid is artificially supplied, even in the old way. Besides the sirup, some cognac is added to the wine, and generally a few drops of some extract, to impart an agreeable flavor. These additions would be termed "doctoring," if they were not a part of the "old method." All these facts show that the "old method" is an artificial way of making champagne, as well as the "new method."

The manufacture of sparkling wines in the new way requires good wines. The best sort is selected for this purpose in California. This is subjected first to the clearing process, in the usual way, as done with all wines, till it appears of a brilliant clearness, the process requiring from three to five months. The wine is now ready to be charged with carbonic acid gas; but here, as in the old method, a certain amount of sugar sirup must be added, in order to counteract the sour taste of the carbonic acid. No cognac is used in this process; but, if used, it would be for exactly the same reason, and to produce the same effect as in the old method.

Now I think that carbonic acid gas, if pure, must be always the same compound, possessing the same properties, no matter how or wherefrom it is obtained; whether by fermentation, by combustion of fuel, or from limestone, just as silver is always the same metal, whether it is extracted from a sulphuret, from a chloride, or some other compound. Taking further into consideration the facts that champagne, or sparkling wine, made in both ways, has the same amount of carbonic acid dissolved in the wine, under the same pressure, exactly in the same chemical condition, and that the wine is equally pure in both cases, what specific difference is there between sparkling wines produced in the old and in the new way?

Not all champagne made after the old fashion must be necessarily pure on that account. There are factories which find it in their interest to go on with this process, in order to deceive the public, combining, however, with it the admixture of bicarbonates, shortening thereby the usual time of five or six months to so many weeks, or less.

Why is the new method in this country considered an "imitation," or artificial product, if it be exactly the same product, only produced in a different way? People who write about champagne ought to know that the new method, impregnating the wine with carbonic acid, is a legitimate business in France, Germany, and all Europe; that more than three fourths of the whole production of champagne is manufactured in the new way; and that wines of this kind received premiums in the great Paris Exposition. The question is there, not "How is it made?" but "What quality is it?" Nobody in Europe would start at this time a champagne establishment on the old plan.

The *Times* evidently considers the impregnation of carbonic acid as producing "imitation wine." It says, also, "Large quantities of white wine are purchased and mixed with California hock, or other native still wines, the fermentation of which has been artificially arrested, or has naturally ceased." As to mixing of different wines, it is never done by those employing the new method, but it is usually the case in the "old way," and is known under the name of "marriage." A wine with suppressed fermentation would give, if charged with carbonic acid gas, a muddy, horrible liquid, of no service to human beings.

It is not at all my intention to defend "spurious champagne making." I wish only to draw a line between a method recognized by the scientific world in Europe as correct and legitimate, and the really spurious process, and to correct the blunders of the *Times* article.

If the imitation of sparkling wines create so much attention as to raise the question of imposing a tax of six dollars per dozen, with the purpose of suppressing a legitimate branch of industry, as well as petty humbug factories, how is it, then, that, excluding the innocent carbonic acid gas, all other imitations made "from native wines" are considered to be all right? There are Port, Sherry, Malaga, and other imitations, made in very different ways from our own wines. There seems to be just as good a prospect for internal revenue in this line as in the former. H.

Ballooning.

MESSRS. EDITORS:—You must excuse my intrusion at this time on the subject of ballooning, as it is one of some moment in the present European war. Ballooning has been attended with considerable success, but there seems to be a point or two in which it fails. I think I can suggest a few ideas that would in a great measure overcome the difficulties.

We see by the papers that balloonists are unable to maintain a desired hight, and sometimes fall among the enemy. To overcome this difficulty I would suggest a reservoir composed of a number of folds of silk or paper (as is proposed for reservoirs in compressed air engines, which no doubt you have noticed in print), able to resist the pressure of a sufficient number of atmospheres, and provided with a pump, by means of which the balloonists could draw from the balloon the gas and concentrate it in the reservoirs, which would cause the balloon to be compressed and lose some of its buoyancy; at the same time throwing some weight into the reservoir when the balloon was desired to be lowered; and conversely, the gas could be let out of the reservoir into the balloon, which would cause it to ascend at will.

I believe it is an established fact that the atmosphere flows in currents or strata, in different directions at the same time. By means of the above contrivance advantages could be taken of these currents to go in a desired direction. In order to find these currents I would suggest the idea of providing little balloons or bags, some filled with hydrogen gas, which could be sent up and their direction watched, and others made somewhat heavier than the atmospheric air, and let down and also watched. This would enable the balloonists to take advantage of these currents.

Another idea suggests itself, but I fear it would not be practicable; that is, the upward and downward motion of the balloon could be taken advantage of to propel it forward by using a helm or rudder horizontally. Probably, however, the gas could not be withdrawn from the balloon sufficiently fast to give it any considerable downward motion. This forward motion of course would be similar to the progression of a sea vessel, being a mean direction between the force and resistance. WM. M. COWLEY.

Salt Lake City.

Poisonous Stings of Insects.

MESSRS. EDITORS:—A correspondent of the SCIENTIFIC AMERICAN refers on page 20, present series, to pressure made with the pipe of an ordinary lock key in relieving the pain resulting from a bee sting, and explains the effect by declaring that the annular compression, close to the puncture, forces out the poison.

I remember that, when a youth, a similar effect was produced by making firm pressure upon the seat of inju... ...y for a short time with the flat surface of a silver ... ...on; the effect was invariably to diminish or prevent ... pain, and reduce the subsequent swelling. This eff... ...t the youthful imagination was wont to class among ... ...ings magical and unexplainable, but as Paget in ... his "Pathology" affirms that continued pressure ... ...ves rise to absorption, I have since then understood that the prevention of pain by this means was due to the fact that pressure caused absorption of the poison into the general circulation, and thus prevented it from acting as a local irritant.

If by annular compression the virus be actually drawn from the wound, the cupping glass would, in the graver forms of poisoned wounds, be a most simple, speedy, and effectual remedy. But if I do not mistake, general experience upon this point will convince us that such is not the fact. G. W.

Baltimore, Md.

Steam Plowing.

MESSRS. EDITORS:—In looking over a recent copy of the Report of the Agricultural Department for the year 1869, we were painfully struck with the following paragraph in an article entitled "The American Steam Plow", page 305.

"As a people we are wont to boast of our great strides in the field of progress. In one hand we hold up the certificate of the infancy of our years, and in the other, with becoming pride, we unroll to the gaze of the world a voluminous scroll, setting forth our wonderful achievements in all that makes a nation great and powerful; and yet, with all our amazing progress, there is no such implement known as a practical American steam plow. American sod is successfully turned by a steam plow, but that plow is of foreign origin. We are compelled, at an immense outlay, *even after Congress remits the duties*, to send our orders three thousand miles across the ocean to procure a steam apparatus which will do all that is claimed for it. True, we may say that this same apparatus was first invented and patented in the United States, by E. C. Bellinger, of South Carolina, November 19, 1833, and was *improved* upon by John Fowler, of England, in 1854—twenty-one years after Bellinger had created the infant Hercules. So Columbus showed others how to discover unknown worlds; and as the Spaniard lost foothold in territory of his own discovery, so have we, by like supineness, lost the glory of successfully introducing to the admiration of the world what should have been known as the American steam plow."

We confess that the above is quite a damper to our American pride, and "pity 'tis, 'tis true." But it is fact, and therefore stubborn. Verily it looks as though a hidden sarcasm lurked under this act of Congress evincing so much liberality in remitting the duties upon foreign steam plows imported by wealthy planters who can even afford to purchase several sets of these expensive foreign tackle, while it ignores the duty it owes to the men of genius of our own country, men who, in the majority of instances, are too cramped in resources to develop and prove the source of wealth, either locked up in their brain or lying upon paper.

What hope can our own inventors have of ever successfully introducing an American steam plow, while the misplaced liberality of Congress invites the foreigner to bring in his engines free of duty? Does the Government doubt that there is sufficient inventive talent at home to produce a practical machine? Let the challenge be proclaimed only, and we have faith enough in our people to believe that the American mind will develop itself in practical form and means, at least equalling, if not excelling, all foreign examples. If the attempt of Fawkes and others proved anything, it only proved that they were wanting in means to prosecute their costly experiments to the final goal of success. How different is the course of the Governor General of India, who offers a prize of $25,000 for a successful Ramie machine! Suppose our Congress puts the matter of steam tillage to the same test, and, in view of the immense national importance of the subject, makes a no less liberal appropriation than the above. Let the amount be an appropriation to the Agricultural Department; to be offered by the Hon. Commissioner of Agriculture as a premium for the most practical steam plow and farm engine of American invention. Let a time be appointed for an exhibition of steam plows and all other agricultural implements, to be held at some suitable locality; and thus, if steam tillage is to be an institution in America, as it certainly ought to be, let us give it a fair trial.

It may be objected that reapers, etc., have worked their way to public favor, and why not steam plows? Simply because a steam plow, like an ocean steamer, is a "big thing" in its way; and if Congress have a right to develop ocean travel, by liberally subsidizing ocean steamers, for the same reason it ought to exert a similar right to develop the highest form of agriculture. This is to be accomplished only by promoting steam tillage, which is acknowledged, by the use of 3,000 of these machines abroad, to be the highest form of agriculture, increasing the productiveness of the soil at least one fourth, and rendering the country at large a substantial benefit, shared in by all; even the barbarous (?) Arab cultivates the banks of the Nile by steam tillage!

We apprehend, unless some such encouragement be offered, that the day of the birth of the American steam plow is yet far in the future. It is quite possible that Bellinger, with his great wealth of brain, which could origin... ...e the steam tackle, was poor in purse, which m... ...y very reasonably account for the still birth of hi... great invention. And it is also more than probabl... that had John Fowler enjoyed the privilege of bei... ...g one of the American sovereigns, instead of having be... ...en the humble subject of her Majesty the Queen, hi... "improvement," like Bellinger's, might doubtless have been to-day nothing more than a curious toy lying idly upon the shelves of the Patent Office in equal obscurity with its less fortunate predecessor,

"Where many a flower is born to blush unseen."

But living as he did in a kingdom where almost boundless agricultural wealth is constantly looking out for the opportunity of still further augmenting fabulous incomes, he was thus able, gradually to improve, by numerous and costly experiments, and finally reduce to practice, a system which, under different circumstances, would inevitably have been assigned to the tomb of the Capulets.

We repeat, then, let Congress lend a fostering hand to what may be justly called a national enterprise, and thus develop this mighty agent of agricultural prosperity, in which every true American must naturally feel the deepest interest. If left to individual effort, we have all the experience of the past to convince us that the present generation will, more than likely, not see its realization. For, as we have said, the inventors, as a class, are too poor to undertake more than mere spasmodic attempts, and the wealthy manufacturers are too timid to touch anything, however promising, that is not already fully developed and an assured success. TRIPTOLEMUS.

An Appeal from Russia.

MESSRS. EDITORS:—Can any of the numerous readers in your well-known journal give us the names and addresses of the principal engineering, architectural, scientific societies, etc., in America? We have received so many communications from Russian Societies and their members respecting copies of the reports and proceedings of the American institutions, that we feel compelled on behalf of our Russian friends to make public appeal, trusting that the lovers of science and art in America will not refuse to help in disseminating a little of their knowledge. We shall be only too glad to act as a humble medium in translating such proceedings for the benefit of our friends, and, we trust, by mutual exchanges, to guarantee and bind that friendship, at present so cordially and lovingly existing between Russia and America. We feel assured that to all lovers of science and art, Modern Russia has a kindred scientific relation to America in the endeavors now being made to develop its hidden resources, and in its laudable desire to secure for itself a future prosperity and greatness. It is, therefore, with feelings of more than ordinary interest that we request America and her scientific circles to help in a great work. We shall be most happy to aid by all means in our power, and shall feel flattered, and spare no pains to transmit the kind desires and good wishes of the American scientific interest to the anxious lovers of science and art in Russia; and we have every faith that the greatest and most energetic nation in the world will not turn a deaf ear to our call. The result of such a generous diffusion of ideas and facts as is daily developing in the fatherland of invention, will, we are sure, tend to mutual exchanges that cannot but help to assist in the future welfare of either nation. Any communications or reports from secretaries or others, addressed to Mr. James V. R. Swann, Senr. of this firm, will be gratefully received, and Mr. S. will at all times be happy to act as correspondent to the best of his ability, and forward mutual exchanges in copies and translations of the proceedings of such Russian societies as may interest his correspondents.

SWANN & CO., *Engineers and Architects.*

Sverskoy Boulevard, Nos. 26 to 181, Moscow.

The Plains of Kansas.

MESSRS. EDITORS:—In the SCIENTIFIC AMERICAN of Nov. 26, 1870, you say: "There are probably 50,000,000 acres of sterile plains between the Mississippi River and the Rocky Mountains. Some of them are too barren to produce anything, while some could be made productive by irrigation." Permit me to state—

1. Flourishing settlements in Kansas now extend 225 miles west of Kansas City, along the line of the Kansas Pacific Railway; say 98° 30' west longitude.

2. Wheat sown in April, 1870, matured in July, at Carlyle Station, 376 miles west of Kansas City, and 2,948 feet above the level of the sea; near or west of the meridian 101°.

3. Wheat, rye, and barley are sown, with prospect of success, at Pond Creek, 422 miles west, 3,200 feet above the sea, and near meridian 102.

4. The great plains are arid in climate, and sterile in soil; but no part between the Canadian and the Platte is barren. Natural grasses and herbage sustain ponderous animal life in the buffalo herds.

5. Given irrigation, and there is no region of our country with a less proportion of unproductive lands than the great plains.

6. The plains differ greatly from the alkali deserts of the great basin between the Rocky and Sierra Nevada Mountains; but even the latter are found to be unexpectedly productive in many places.

7. The extension of settlements over the plains is only a matter of time, and of necessity. As fast as needed for homes of increasing population, and to supply food, they will be brought into use. R. S. ELLIOTT.

St. Louis, Mo.

The Opinion of a Veteran Inventor.

MESSRS. EDITORS:—I am in receipt of my patent for sewing machine. It is but just that I bear testimony to your uniform promptness and thoroughness in all your extended transactions with me.

Some seven or eight patents have been secured for me by your agency, including all my knitting machine patents, and in every case you have given most perfect satisfaction. I shall continue, as in the past, to recommend your agency to all inventors. ISAAC W. LAMB.

Novi, Mich.

THE recently published statements of statistics for the year ending June 30, 1870, exhibit $408,000,000 as the amount of our exports. Cotton furnishes more than half this amount, and tobacco a sum of about $21,000,000.

Improvement in Car Brakes.

Perhaps no one field of mechanical invention has attracted greater attention than that of car brakes. The safety of human life, depending as it does upon the perfection of the car brake, renders this problem one of great importance. The promise of profit which successful invention in this field offers, has also been powerful in attracting to it the first inventive talent of the age. That so many devices have proved worthless does not seem to deter inventors from further attempts, and every year produces a greater or less number of inventions designed to approach that ultimatum of perfection in car brakes which is the ideal of every inventor.

Our engravings illustrate a new device, which, as it may be combined with the ordinary hand-brake, is not open to an objection which lies against many inventions of this kind. It also is not open to the objection that it offers inconvenience in the making up of trains.

That it is simple, and can easily be applied to the present style of brake, is apparent.

Through its use great power can be brought to bear upon every wheel in the train, dead-locking them, it is claimed, if desired, in a single revolution. It can be worked with ease and certainty, the power coming directly from the speed of the train, so that it is really self-acting, each car being acted upon alike, thus obviating the unpleasant jamming together of cars; and finally, that it is entirely under the control of the engineer, who can brake as light or as heavily as he wishes, and can check the speed of the train in the time it takes now to signal the brakemen.

Fig. 1

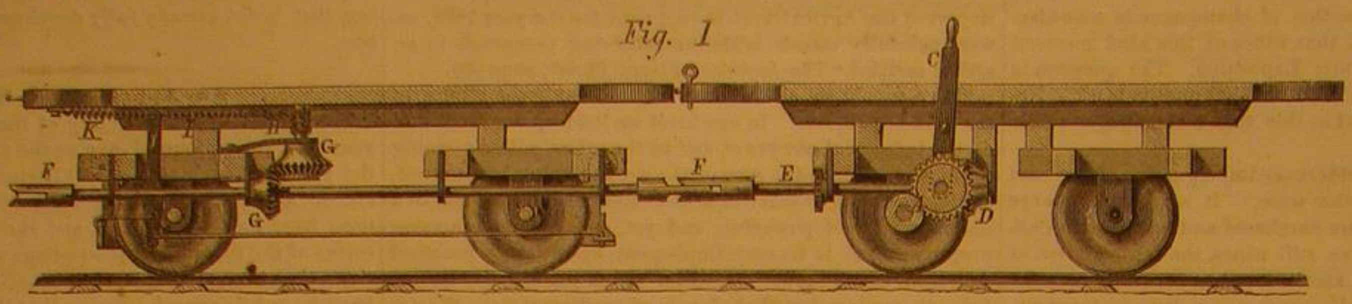
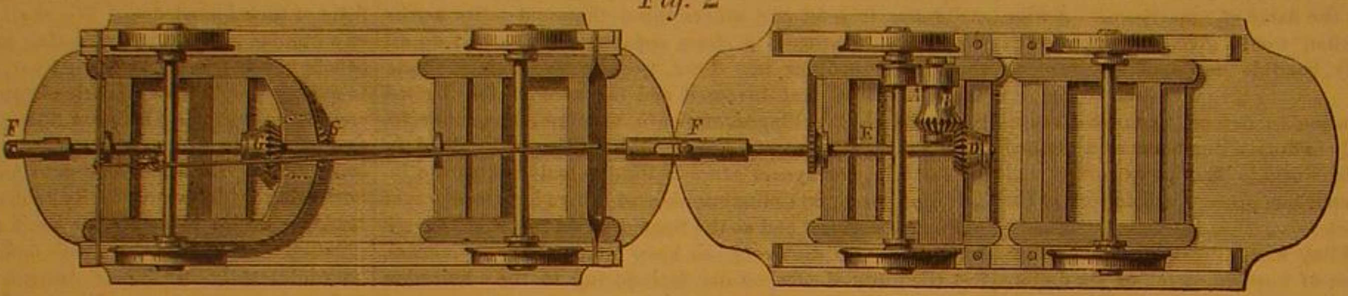


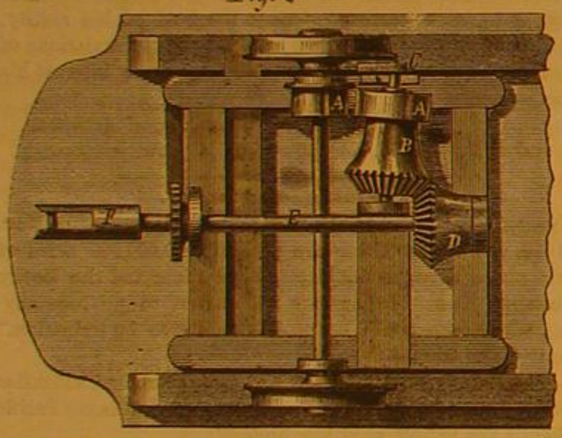
Fig. 2



FOSTER'S IMPROVED CAR BRAKE.

The operation of the brake will be readily understood by reference to the engravings. Fig. 1 is a side elevation and partial section. Fig. 2 is a bottom view, and Fig. 3, a detail showing more plainly the operation of the friction gearing, A.

Fig. 3



This friction gearing consists of a friction wheel keyed to the axle of the truck-wheels, and another keyed to the axle of the bevel wheel, B. The short axle of the bevel wheel has its inner journal either loosely fitted in a bearing attached to the truck frame, or it may have instead a spherical bearing, to allow the opposite end which rests in a bearing at the bottom of the pivoted lever, C, to swing laterally, so as to bring the friction wheels, A, into contact or to separate them according as the lever, C, is moved one way or the other.

The friction wheels being thus brought together, the bevel wheel, B, revolves the pinion, D, which is keyed to the shaft, E. Each car is provided with one of these shafts connected with the shafts of the cars next to it by universal joints, F.

All the cars, except the one on which the lever is placed—which, in ordinary cases, would be the tender of the locomotive—are provided with bevel gears, G, one of which is keyed to the shaft above described. Its fellow revolving on a vertical axis, as shown, winds up the chain, H, which chain is connected by the spring, I, to the brake lever, J, the latter operating the brakes through a system of rods or links in the usual manner. This action takes place whenever the friction wheels, A, are brought in contact with each other while the train is in motion, the spring, K, drawing back the brake-lever, J, and releasing the brakes as soon as the friction wheels, A, are separated by the action of the lever, C, which lever is under the control of the engineer.

Patented February 1, 1870, by W. G. Foster. For further information, or for the purchase of a portion or the whole of the patent, address the patentee at Dansville, N. Y.

How to Make Coffee.

A correspondent traveling in Sweden was immensely delighted with the coffee served on the steamboats and in the hotels. "At Upsala," he writes, "we determined to find out just how they made such perfect coffee as we had just drank, and stepped into the neat kitchen of the little hotel; and this was the report: Take any kind of coffee-pot or urn, and suspend a bag made of felt or heavy flannel, so long that it reaches the bottom, bound on a wire just fitting the top; put in the fresh-ground pure coffee, and pour on freshly boiled water. The fluid filters through the bag, and may be used at once; needs no settling, and retains all its aroma. The advantage of this over the ordinary filter is its economy, as the coffee stands and soaks out its strength, instead of merely letting the water pass through it. 'Do you boil it?' inquired the learner. 'Na-a-a-a-y,' said the maid, in simple astonishment that any one should be so wasteful as to send away the precious aroma in steam; should rob that prince of food of that evanescent something which constitutes his nobility, and reduce him to mere aliment. As soon would one think of throwing away that drop of sunshine, charged with all the summer's gold, which lies at the throat of a bottle of Johannisberger."

Combined Section Roller and Marker.

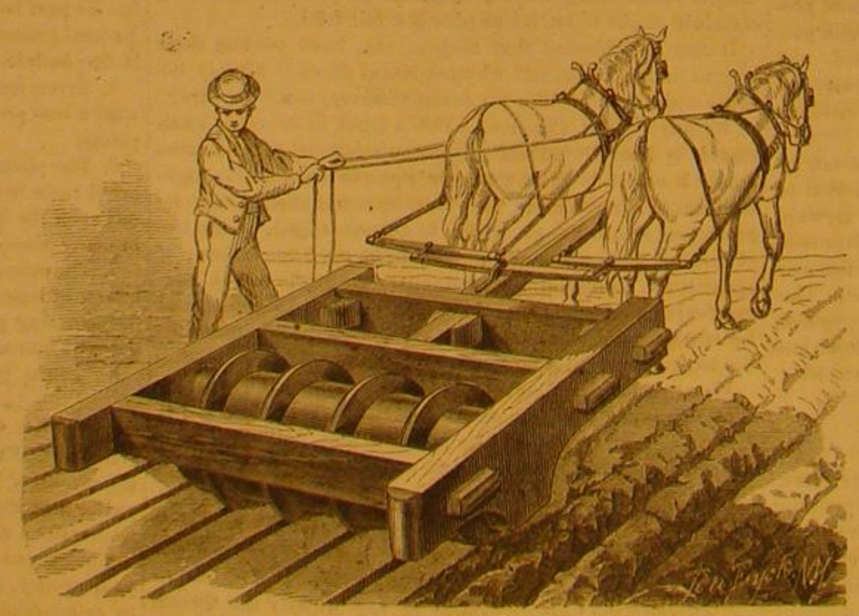
The object of this invention is to provide a farm implement, by the use of which land may be prepared for irrigation more rapidly and perfectly, so that the water may be more uniformly and effectively distributed than heretofore.

The implement is designed for, and specially adapted to, use in lands lying along the eastern slope of the Rocky Mountains, the Cordilleras in Colorado and New Mexico, and lands similarly situated, which require irrigation nearly every season.

The device consists of sectional rollers with section markers interposed, as shown in the annexed engraving. The markers project beyond the section rollers, having cuneiform edges, which, when the machine is drawn over the ground, are pressed into the soil, imprinting thereon well-defined drills or channels for the flow of the water in the subsequent irrigation.

The distance between adjacent channels may be varied by using longer or shorter rollers.

The land, in the regions of country referred to, is slightly inclined. By making the channels so that they lie parallel to each other—as is done by this machine—and inclining with the slope of the land, the water, when introduced at the upper end of the channels from a canal or small trench, may be made to flow uniformly over the field, all parts of which will be thoroughly irrigated.



EVANS' COMBINED SECTION ROLLER AND MARKER.

The rollers and markers move independently on their common axis, which renders turning at the ends of the channels easy, and, if desired, the markers may be taken out, and the implement can then be used for all purposes to which the ordinary farm roller is applied.

Patented September 14, 1869, by Elihu Evans, of Denver City, Colorado Territory, through the Scientific American Patent Agency. Address as above for further information.

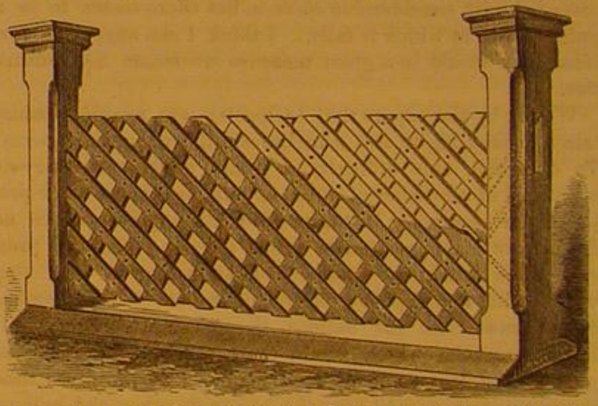
Most Delicate Color Test for the Detection of Strychnia.

Mr. W. T. Wenzell, after referring at some length to the great variation of the precise limit of the sensibility of the color tests usually applied for the detection of strychnia, and also discussing the best form of using and manner of applying these tests, says: "In testing for minute portions of the alkaloid, it is a desideratum to use a reagent the proportionate relations and superior sensitiveness of which will admit of the successful demonstration of traces of the poison. In experimenting towards that end, I have found that a solution of one grain of permanganate of potassa in 2,000 grms. of sulphuric acid, is, *par excellence*, the test for that purpose."

The author gives, further, a lengthy account of a series of experiments, instituted with various reagents, for the purpose of testing the delicacy of each of these for the detection of strychnia, the result being that the limit of positive recognition, by the bichromate of potassa and sulphuric acid test, may be placed at 1-100,000th, that of the chromic acid test at 1-600,000th, and that of the permanganate at 1-900,000th. As regards the use of the permanganate, the author distinctly states that the honor of its discovery belongs to Dr. Wm. A. Guy, of London.

IMPROVED GATE.

Swinging gates are not only liable to sag on their hinges, and render them difficult to latch and unlatch, but they are also often impeded by snow. The gate shown in the accompanying engraving is constructed on the lazy tongs principle,



and opening endwise on pivoted bars attached to the gate-post, is not interfered with by sagging, or by accumulations of snow. It is the invention of J. R. Breese, of Middletown N. Y.

Why Lace is Costly.

Many people wonder why what is termed real lace—as lace made by hand is called, to distinguish it from that made by machine, which is called imitation—is so costly. The following paragraphs from a foreign exchange explain the reason:

The manufacture of lace is carried to its highest perfection in Belgium. The finest specimen of Brussels lace is so complicated as to require the labor of seven persons on one piece, and each operative is employed at distinct features of the work. The thread used is of exquisite fineness, which is spun in dark underground rooms, where it is sufficiently moist to prevent the thread from separating.

It is so delicate as scarcely to be seen, and the room is so arranged that all the light shall fall upon the work. It is such material that renders the genuine Brussels so costly. On a piece of Valenciennes not two inches wide, from two to three hundred bobbins are sometimes used, and for the larger width as many as eight hundred on the same pillow. The most valuable Valenciennes is determined by the number of times the bobbins have been twisted in making the ground; the more frequent the twists the clearer and more beautiful will be the lace. Belgium annually sells off this lace alone to the value of over $4,000,000. Chantilly lace is always black, and is chiefly used for veils and flounces. It is very fine, and extensively worn. Mechlin lace is made at Mechlin, Antwerp, and other localities.

PHILADELPHIA consumes 2,000,000 tuns of coal annually, and the demand constantly increases.

Scientific American,

MUNN & CO., 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 Co.," Agents, 121 Nassau street, New York.

☞ "The New York News Co.," 8 Spruce street, New York.

☞ Messrs. Sampson, Low, Son & Marston, Crown Building, 188 Fleet street, Trubner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill, London, are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.

☞ A. Asher & Co., 20 Unter den Linden, Berlin, Prussia, are Agents for the German States.

VOL. XXIV., NO. 5 . . . [NEW SERIES.] *Twenty-sixth Year.*

NEW YORK, SATURDAY, JANUARY 28, 1871.

Contents:

(Illustrated articles are marked with an asterisk.)

*Improved Vertical Portable Engine.... 63
The place of the Mitrailleur in War.... 63
Our Eyes, and how to take care of them.... 64
The Rattan Factories at Wakefield, Mass.... 64
Testing Machine for Building Stone.... 65
Sugar from Melons as compared with Sugar from Beets.... 65
In-growing Toe Nails.... 65
On the Air in Workshops.... 65
A New Chinese Composition.... 65
*Combined Tool.... 66
American Zinc Ores.... 66
Remarkable Gas Wells in Ohio.... 66
Remarkable Cure for Aneurism.... 66
*Cast Iron Chimney.... 66
*Automatic Toy.... 66
*Improved Pliers.... 66
Camels in Washoe.... 66
A New Cement.... 66
Something about Fresh Air—What we Breathe.... 67
*Perpetual Motion.... 67
The Jersey City Stand Pipe.... 68
Spurious Champagne.... 68
Ballooning.... 69
Poisonous Stings of Insects.... 69
Steam Plowing.... 69
An Appeal from Russia.... 69
The Plains of Kansas.... 69
The Opinion of a Veteran Inventor.... 69
Exports of the United States.... 69
*Improvement in Car Brakes.... 70
How to make Coffee.... 70
*Combined Section Boiler and Marker.... 70
Most Delicate Color Test for the Detection of Strychnia.... 70
*Improved Gate.... 70
Why Lace is costly.... 70
The Annual Consumption of Coal in Philadelphia.... 70
Narrow and Wide Gages.... 71
Hints to Mechanics.... 71
The conveyance of various Fluids through Pipes.... 71
International Industrial Competition.... 72
Naphthaline and its Uses.... 72
Railroad Litigation.... 72
New York Photograph Galleries.... 72
The Present and the Past.... 73
Obituary—Henry Burden of Troy, N. Y.... 73
Acid and Alkali Works at Titusville, Pa.... 73
The "Scientific American" goes everywhere.... 73
The Production of Coal-Tar Colors.... 73
A Cheap Breakfast for Eight Persons.... 73
The New Commissioner of Patents.... 74
The Present and the Past.... 74
Queries.... 74
Business and Personal.... 74
Answers to Correspondents.... 74
Applications for the Extension of Patents.... 74
New Books and Publications.... 74
Recent American and Foreign Patents.... 74
List of Patents.... 75

NARROW AND WIDE GAGES.

This subject, which in its scientific bearings belongs exclusively to the domain of railroad engineering, has still some points of general interest, and the purpose of the present writing is to place in review such bearings of the question as are important to the public at large. The railroad interest now exerts a very wide influence upon all branches of industry, both directly and indirectly, and the discussions which have been in progress for some time past, in journals specially devoted to railroading, have shown that the question of narrow gages as opposed to wide gages is one of fundamental import.

We have in this country a conspicuous example of a wide gage railway—the Erie. The fact that this road has never been a paying investment to its stockholders cannot, under existing circumstances, fairly be saddled upon its wide gage. Its notorious mismanagement has never permitted it to be a fair experiment in so far as it relates to the "battle of the gages."

So far as the comfort of the traveling public is concerned, there can be no question as to the superiority of the wide gage. The question narrows down to one of economy to the owners and lessees of roads, and if narrow gages shall be decided to pay best, the public will have to put up with them.

Which, then, will pay best under general and ordinary circumstances? The trials of extremely narrow gages have all been made under exceptional conditions. The success of such experiments cannot, therefore, be conclusive in deciding the question. The extra wide gages have also been tried under exceptional conditions. It is clear therefore that the decision of this question must be based upon general principles rather than on the results of experiments.

Now in examining into the elements of cost and expense which enter into and attend the working of railways we find so many of them depending upon the fundamental one of gage that it has been even maintained that the decrease in these items is nearly in proportion to the narrowing of the gage; but a closer examination shows this to be a very erroneous conclusion. The right of way costs nearly as much for a narrow gage road as for a wide one. The expenses of survey, grading, ties, and construction would not be reduced one half; nor anything approaching it, by reducing the grade one half, and between the three feet six inch gage and the two feet six inch gage, *Engineering* has shown that the difference in cost of construction is only £104 per mile in England. The difference in cost of construction between the gages is therefore seen to be utterly out of proportion to the difference in carrying capacity. In the comparison of current expenses with carrying capacity, or more properly speaking, with the earnings of a road supposed to be worked to its full capacity, we find a similar disproportion in favor of the wide gage.

If, however, a narrow gage be ample to do the carrying trade of the section through which it runs, the interest on the difference in first cost and in current expenses will be saved to its owners, and it is therefore more economical for that particular route. The construction of two narrow gage railways to do the work of one wide gage road would be, however, absurd in the extreme as a measure of economy.

The whole matter appears to us to lie in a nutshell. The gage of a road should be adjusted within practicable limits to the estimated traffic, so far as is consistent with the necessities of running upon other roads the gages of which are already established. We do not believe any standard width can be selected that will be found adapted to produce maximum economy in all roads alike; and so, though the gage is a fundamental element in the question of economy, it must always be considered in relation to the attendant circumstances under which the road must be constructed and operated.

HINTS TO MECHANICS.

Civility costs nothing, but is worth a great deal. We sometimes meet with persons who are either unaware of this aphorism, or put very little value upon it. Mechanics have it in their power to make themselves very disagreeable to their employers, and they may rest assured that no departure from the established rules of politeness, on their part, can be made with impunity. Many good contracts have been forfeited, and profitable jobs lost, by derelictions of this character. We are led to make some remarks on this topic, on account of occasional complaints of correspondents, who assert that manners have changed as well as moons, and that certain good customs have strangely gone out of fashion. They assert that mechanics come to their houses to do odd jobs, and sometimes by their behavior frighten the ladies and insult the servants, and thus do discredit to their occupations. They go thundering through a private residence as if it were a barrack; they never take off their hats; they neglect to clean their boots; they dirty up the floor or coal scuttle with their tobacco juice; they litter up the whole place with their tools, and make themselves so disagreeable that they are certain never to have a second job from the same person.

We are aware that our correspondents put the case pretty strongly, and do not believe that any of the enlightened readers of the SCIENTIFIC AMERICAN are ever guilty of such misdemeanors; but as they may some of them be acquainted with mechanics upon whom the coat will fit, they would do well to give such persons a hint that they make nothing by rudeness, but, on the contrary, risk the loss of their situations and of their support. It is just as easy to take off one's hat in the presence of the ladies of the household as it is to rudely keep it on. Tobacco chewing is a dirty habit, under any circumstances; but if a mechanic, in an evil moment, have acquired the appetite for tobacco, let him practice a little self-denial and leave his quid at home. It is a great feather in the cap of a mechanic to establish such a good reputation that the family will be particular to say, when they leave an order at the shop, "Please send the same young man who did the last job, he was so neat and civil!" The employer is much more apt to keep such a hand than he would be if an opposite request were to be made.

Some correspondents also complain that in repairing a piece of work the mechanic occasionally does more harm than good. He brings with him an ignorant, boorish apprentice, and the patching and mending is so bunglingly made that it has to be taken out and done over again, often at no inconsiderable expense. Now this is simple dishonesty. It is stealing the money of the person who has the job done, and is hardly less reprehensible than it would be to take money out of the till. No person ever has more than one job of this character, so that he is sure to lose in the long run more than he can gain by a little temporary dishonesty.

It is sometimes asserted that there are no longer apprentices, but that even the beginner claims to be a journeyman workman before he is out of his teens. This may account for the bad work that is sometimes charged to the account of the mechanic, when, in fact, it is due to the bungling of persons who claim to be what they are not. "There is cheating in all trades but ours," which accounts for false representations on the part of a few mechanics, who would be condemned by their mates if they could be found out. We recommend the example of George Washington as worthy of imitation, who, when he took off his hat to a negro who saluted him on the street, on being asked why he did so, replied, "You would not have me outdone in politeness by a negro!"—and the honesty of the father of his country is quite as worthy of imitation as his politeness.

We therefore repeat: Civility costs nothing, but is worth a great deal, and honesty is notoriously the best policy.

THE CONVEYANCE OF VARIOUS FLUIDS THROUGH PIPES.

For a long time pipes have been employed to distribute water and gas to dwellers in cities and villages, steam from boilers to engines, and smoke from stoves to chimneys; and their use for these common purposes has become so familiar that people in general have almost come to consider them as about the only legitimate uses to which pipes could, to any great extent, be put. We are, however, beginning to learn that they are capable of other applications. The Mont Cenis and the Hoosac tunnels, and the use of the caisson in bridge building have shown that pipes can be used for transmitting power to great advantage under certain circumstances, where it is desirable to place machinery at long distances from prime motors. It is demonstrated that compressed air may be passed through tubes, and employed to drive engines miles away from the primary compressing power without the loss from friction which the hitherto accepted formulæ led engineers to expect; not that the results obtained are necessarily irreconcilable with the accepted formulæ, but they show that there is yet something to learn practically in regard to the transmission of air through tubes.

We are in receipt of a statement of experiments made by Mr. Horace H. Day, of Passaic, N. J., in compressing air and transmitting it through tubes for the purpose of driving machinery, the statement being an account of observations of these experiments, made by Mr. Wm. S. Henson, Mechanical and Consulting Engineer, of Newark, N. J.

The length of the tubes (of which there were two) was one mile each. The pipes were of lead, one and one-quarter inches in diameter. Both pipes ran over very uneven ground, and were full of crooks, bends, and angles in each case conforming to the profile of the ground, their extremities being brought together so as to form circuits.

Each pipe had an air compressor and receiver, the compressors being horizontal cylinders five inches in diameter, provided with suitable valves, and pistons driven by cranks and pulleys. Each receiver was made of boiler iron, strongly riveted, and was thirty feet long and sixteen inches in diameter.

The compressed air was employed to drive a vertical cut-off engine of A. K. Ryder's patent, illustrated and described on page 363, Vol. XXII., of the SCIENTIFIC AMERICAN. The cylinder of this engine was 8″×10″. The pipes were so arranged that either could be used separately, or both simultaneously; or the air could be transmitted throughout the entire length of both combined.

Mr. Henson states that "the theoretical power required to drive one of these compressors 100 revolutions per minute, when compressing to 75 pounds above the atmosphere, or six atmospheres altogether, is estimated at 5·87-horse power, plus the friction. This calculation is based on the well-known law of Mariotte; namely, that with equal temperatures the pressure is inversely as the volume, as although there is generally a considerable increase of temperature in the act of compressing air, yet with good compressors this heat can be so nearly all absorbed that Mariotte's law will practically hold true."

From the results of preliminary experiments, made by order of the Italian Government previous to the commencemen of the Mont Cenis Tunnel, the following laws governing the resistance to the passage of air through tubes were established:

1. The resistance is directly as the length of the tube.
2. It is directly as the square of the velocity of the flow.
3. It is inversely as the diameter of the tube.

The experiments of Mr. Day give results coinciding with the two first laws, and seem to show, that in the practical transmission of, and the application of the power of compressed air through long pipes, the loss per cent of the whole power resulting from friction in transmitting a given *weight* of air diminishes inversely in a geometrical progression, having 2 as its ratio, for every increase of ten pounds in the pressure.

We append the following table of results. The water power employed to drive the compressor was regulated to deliver the same weight of air at each experiment, and the velocities were calculated from the volumes due to the pressures, according to Mariotte's law. The pressures were determined by approved steam pressure gages, placed at the ends of each circuit mile section of pipe, these ends being brought together in the same room so that the gages could be readily compared. The second table was obtained from the first by calculation.

FIRST TABLE.

No. of strokes of compressor per minute.	First gage. Pressure in pounds.	Second gage. Pressure in pounds.	Velocity at beginning of pipe in feet per second.	Velocity at end of pipe in feet per second.	Mean velocity per second.	Loss from friction in pounds.	Loss per cent, of the whole power delivered by compressor.	Percentage of loss calculated from last column.
120	22	10	21	32	26	12	51·50	54·50
120	28	20	18·06	22·6	20·6	8	28·57	27·25
120	35·25	30	16	17·8	16·9	5·25	14·89	13·67
120	43·25	40	13·66	14·33	13·99	3·25	7·51	6·83
120	51·75	50	13	12·26	13·13	1·75	3·38	3·41

SECOND TABLE.

	61·03	60		10·66		1·03		1·70
	79·396	70		9·38		·396		·852
	80·341	80		8·46		·341		·426
	80·192	90		7·62		·192		·213
	100·000	100		6·93		100		·106

These results show that, in transmitting air through long pipes, the greater the pressure under which it is transmitted the less will be the loss from friction, the latter becoming so much reduced at high pressures that great economy of power is secured.

Mr. Day now proposes to transmit through a large pipe five thousand-horse power from Niagara Falls to the city of Buffalo, the experiments under consideration having been made to test the feasibility of the project.

Another use for pipes was proposed by Mr. Silber in a paper read before the Society of Arts in London at a recent meeting; namely, the distribution of illuminating oils through towns, factories, public and private buildings, as water is now distributed.

In this system the flow is regulated by little cisterns provided with a novel and well-constructed tap, regulated by a ball-cock or self-acting float, the lights being as nearly as possible on a level with the distributing cisterns. When the lamp is lighted, the oil is, by the ball-cock movement supplied automatically as fast to the wick as it is consumed, and a very perfect combustion is effected. During the evening practical experiments were made with lights supplied in the manner described, and there seemed a general concurrence in the opinions of those present, that the system was a great improvement on the present method of burning the light petroleum oils. It is said that this system also entirely obviates the unpleasant odor of portable lamps, but we hardly see how this can be possible.

Still another use for pipes has been found by our enterprising friend, Mr. Robert Rennie, of the Lodi Chemical Works, Lodi, N. J. This gentleman is about erecting a mammoth acid and alkali manufactory at Titusville, Pa. We understand it is his intention to supply, through leaden conduits, acid and alkali, to all the oil refineries now in operation at Titusville, or which may hereafter be erected there; thus saving the loss, labor, and expense attending the transportation of those substances in the ordinary way. A description of this establishment will be found in another column of this issue.

INTERNATIONAL INDUSTRIAL COMPETITIOM.

In a paper read before the American Social Science Association at its general meeting in Philadelphia, October 27, 1870, Mr. Joseph Wharton discussed the above subject. The paper has now been issued in pamphlet form by Henry Carey Baird, and has found its way to our table for notice. We propose in the present article to briefly review this essay, which is far above the average character of the harangues usually delivered at the meetings of so called Social Science Associations.

Mr. Wharton starts out with the fundamental proposition that all trade is in its character essentially antagonistic. Nations are regarded by him as "competing organisms," which is undoubtedly the correct view. When the interests of nations cease to conflict, and the interests of all become common, the plural of the word nation will be superfluous except in historical records; there will be but one nation, which will comprise the entire human race.

Much, remarks Mr. Wharton, is said, upon the one hand, of the higher wages which the protective system affords to the producer; and, upon the other hand, much concerning the cheaper goods offered to the consumer by unshackled commerce; but if either the free trader or the protectionist could prove to demonstration that his policy insured to either class a large allotment of personal comforts during the current year, with a larger surplus at its end, than under the opposite policy it could enjoy, the question as to which course is most expedient for the state would still not be exhausted. The statesman must look beyond individuals or classes, and beyond the immediate present; not content with noticing that certain parts of the body politic are properly nourished, he must see that the body as a whole possesses vigor and symmetry; that development and robustness attend upon nutrition; that the whole organism enjoys fair play and good guidance in its strife with similar artificial bodies, and above all, that its present course is leading on to future health and power.

The advocates of unrestricted commerce, are, in Mr. Wharton's opinion, prone "to disregard the existence of nations" and "to look upon men merely as individuals." The "Manchester school of political economists persistently entreats mankind to regulate their commercial affairs upon the assumption that the entire race is but a band of brothers," ignoring the fact that since the race is grouped into nationalities, the interest of each group demands that it should produce that which it can best produce, and, if possible, render itself independent of commerce with other groups. And here the pertinent question is asked: Would universal and unrestricted trading and division of labor among the nations be founded upon the deepest instincts and interests of our race, or are they so contravened by ineradicable human characteristics as to be merely sentimental and illusory?

Sentimental and illusory they are most undoubtedly. And beautiful as appears the time in the distant future when "there shall be neither wars nor rumors of wars," when all men shall be banded together in one common brotherhood, if that period shall ever bless the world, it will be when a state of things, very different from that existing at present, prevails.

If then this grouping into nations be considered as permissible, and as a necessary consequence of the present character of the race, such nations must also of necessity constantly struggle for commercial independence. Good policy will dictate that governments should seek to encourage and foster, by all authorized means, home production, and to develop national resources.

On this point it is remarked that a broad distinction is, however, presently apparent between large and small nations as to the degree of completeness and independence attainable, and among the smaller nations, between those which are contentedly small, and those which have the intention of becoming large. The small nation, such as Switzerland or Denmark, which has but a slight range of habitable climate, and consequently slight range of organic products; from whose territory nature has withheld many of the minerals that, like coal and salt, are themselves indispensable, or, like the metallic ores, yield indispensable substances; and which is surrounded by nations so great and powerful that expansion is not to be thought of—such nations may perforce be obliged to content themselves with an imperfect development, and with perpetual reliance upon foreigners for very many of the necessaries of life. It may at last be true, as was said by Gortschakoff, that "Russia and America are the only nations whose grand internal life is sufficient for them," but if these two really great nations stand in such lofty isolation, the less excuse has either of them for relying upon the mercenary and precarious support of a competitor.

We cannot however extend this review to a length which would do justice to all the points made in the able paper of Mr. Wharton. Its general drift is that trade between nations is in the aggregate exhaustive, and should be as limited as possible, while each nation should as much as possible become self-centered and reliant upon its own resources.

In other words, transportation adds to the cost of every article transported, increases the burden of living to all, and is hence to be avoided as much as the natural resources of a nation will admit. Now without denying the truth of much that is urged in this pamphlet, we think too great stress is and has been laid by the advocates of protection upon the advantages of limited trade with foreign countries. There is in this, no doubt, as in all other things, a golden mean, to go above or below which is to affect disastrously the interests of the country at large. There is no doubt this country has suffered and is still suffering from excessive importation, but, if we understand Mr. Wharton aright, he would deal a death blow to commerce and trade.

These are views of an extremist, and though they are confessedly strongly backed by argument, yet we fail to be convinced that commerce is *per se* "piracy," or anything approaching it. On the contrary, we believe a healthy commerce will greatly benefit any nation who can cultivate and sustain it. While we advocate a protective policy our views are moderate. Nothing prohibitive enters into our views of a proper tariff, which should in its operation only so far regulate trade as to enable our labor to compete at good wages with cheap foreign labor.

But we are digressing into a discussion which is foreign to our present purpose, and will close by recommending both the advocates of free trade and protection to read the pamphlet in question, as it certainly contains much worthy of careful consideration.

NAPHTHALINE AND ITS USES.

On page 40, Vol. XXIII, we gave a short account of this interesting compound, and predicted for it many useful applications. Since that time, although six months have barely elapsed, we observe that our predictions have been fulfilled in a very remarkable manner; and this substance that very few persons have ever seen, and that manufacturers of coal-tar products were in the habit of neglecting, has now obtained the front rank of important chemical preparations. It may be well, therefore, to give the present state of our knowledge of the subject.

Naphthaline has been known since 1820, in which year it was discovered by Garden. It is produced by the dry distillation of a large number of organic bodies, such as bituminous coal, fatty oils, resins, and animal substances; also, when the vapors of acetic acid, alcohol, ether, volatile oils, camphor, paraffine, carbolic acid, olefiant gas, marsh gas, hydrocarbon gases generally, mixtures of benzole, sulphuretted hydrogen, bisulphide of carbon and hydrogen, and chloride of carbon, etc., are transmitted slowly through red-hot tubes.

In the process of gas manufacture it sometimes clogs the pipes in consequence of this decomposing action of the red-hot retorts upon the gaseous products of distillation. It can be stated in general terms that naphthaline is the product of the decomposition of organic substances at a red heat in the same way that oxalic acid is derived from the oxidation of this class of bodies.

Messrs. Warren and Storer have detected naphthaline in specimens of petroleum from Burmah, but this is the only instance of its occurrence ready formed in nature; it appears to be always an artificial product.

The crude material for the manufacture of naphthaline is usually coal tar, but it is also to be met with in wood tar. The best method for its manufacture is the one proposed by Vohl. That portion of coal tar which solidifies in the cold is left six or eight days in a cool place, and the liquid portion is then decanted and drained off, and the cakes entirely freed from adhering oil by centrifugal filters, and finally by a hydraulic press. The mass is next melted by steam in a retort provided with a stirrer, treated with soda lye, and well mixed; the lye drawn off and added a second time, and finally the liquid naphthaline is rinsed and washed with hot water until there is no longer any reaction. In this way many impurities, such as carbolic acid, creosote, etc., are removed.

The still fluid material is intimately mixed with a few per cent sulphuric acid, well stirred, washed with hot water for the removal of the acid, and finally digested at 212° Fah. for two or three hours with strong soda lye, and allowed to settle.

The naphthaline mass thus obtained is distilled in cast-iron retorts of a capacity of 2,200 to 2,500 pounds. At first small portions of water go over mixed with naphthaline, but at 410° Fah, there is a continual stream of naphthaline, and in such quantity that 110 pounds of the pure material can be obtained in 20 minutes.

The condensation of the naphthaline vapor is produced by water at 176° Fah., and the closed receiver also stands in a water bath of the same temperature.

The naphthaline obtained in this way is poured into conical cylinders of glass, or moistened wood, in which it rapidly sets, and from which it can be readily removed, as it contracts on cooling, and separates from the walls of the mold. It is sold in commerce in the same form as brimstone, and has a pure white crystalline appearance.

Vohl also gives a method of testing a liquid to determine whether any naphthaline is present, which may be of value to refiners; a ready method for determining the amount of naphthaline, however, has not been published.

The qualitative test may be made made as follows: The liquid to be examined is treated with fuming nitric acid, the nitro product washed to remove the acid and then introduced into a boiling mixture of one part sulphide of potassium and one part caustic alkali; if naphthline be present be present, even in traces, the solution will exhibit a beautiful violet-blue color.

Napthalind forms white, flaky crystals, consisting of rhombic plates of peculiar odor and aromatic taste. Its specific gravity is variously stated at 1·04 to 1·15, and its melting point at 174° Fah.; it boils at 428° Fah. It is insoluble in cold water, slightly soluble in hot water, rapidly dissolved in warm alcohol, ether, benzole, and the volatile and fixed oils and hydrated acetic acid. The alkalies are fortunately without action upon it, otherwise they could not be employed in its purification.

Melted naphthline absorbs air copiously (the same is fused silver) and becomes richer in oxygen than the atmosphere, and gives it off on solidification. The solvent properties of naphthaline are considerable. It dissolves indigo, phosphorus, sulphur, the sulphides of arsenic, tin, antimony, etc., and separates them on cooling, usually in crystalline forms, also dissolves oxalic, succinic, and benzoic acids, iodine and iodide of mercury.

Chlorine, bromine, nitric acid, and concentrated sulphuric acid readily attack naphthaline, and it enters into composition with picric acid. Upon the lower forms of life the action of naphthaline appears to be analogous to camphor and carbolic acid, and it has been successfully employed as a remedy against moths. It is probable that it would keep meat from putrifying, and if its smell and bitter taste were not an objection it could be used as a flesh preserver. By combining it with wax, spermaceti, or stearine, so as to raise its melting point, it could probably be molded into candles and burnt without smoke. In its pure state it gives rise to copious clouds of lamp-black.

There is sometimes associated with naphthaline another body, to which the name of anthracene has been given—it usually goes over in the last stages of the distillation of coal tar. By treating naphthaline with alcohol the greater part of it is dissolved while the anthracene remains untouched, and can thus be separated.

The uses of anthracene have hitherto been too few to admit of its economical separation from the tar, but of late years hopes have been expressed that artificial colors could be made from it, and it is now proposed to save it for that purpose.

The number of colors made from naphthaline is nearly as great as that of the better known derivatives of aniline. It would extend our article too far to enter into full details of them, and we may recur to the subject hereafter. We can only mention a beautiful yellow, a fine brown, a variety of nitrogen and china colors, many of them much used and preferred to aniline pigments. There are manifestly other and important uses to which naphthaline and its compounds can be applied, and we shall probably some day become as familiar with it as we now are with paraffine.

RAILROAD LITIGATION.

If any commentary were needed on the evils of an elective judiciary it would be found in the history of railroad litigation in the State of New York, in which courts of co-ordinate jurisdiction now stand arrayed against each other, on the one hand to protect stockholders in their rights, and on the other to protect those who seek by high-handed fraud to enrich themselves at the expense of honest men. Never before in the history of this country have the rights of property been so utterly disregarded as in these litigations.

In a single year the directors of the Erie Railroad have expended over three hundred thousand dollars in the defense of actions brought against them by aggrieved stockholders. By this enormous expenditure they have been enabled to retain the best legal talent throughout the State, and by the facility with which they have been enabled to obtain injunctions to defeat that justice, which, if properly administered, would long ago have brought upon them the humiliation and punishment their conduct has richly merited.

The legal agents of foreign stockholders sent to this country to watch these proceedings, and, if possible, to guard the interests of their clients, find themselves not only unable to obtain redress at the hands of the courts, but are publicly subjected to insult; while the organization of mobs, to seize and hold possession of property under pretense of legal authority, has been inaugurated as the readiest means to avoid delay in the furtherance of the nefarious purposes of unscrupulous men.

There is certainly something radically wrong in a system under which such a state of things can exist as renders the tenure of all property uncertain. Following the precedents furnished by the Erie litigations any unscrupulous scoundrel may, upon some trumped up complaint, obtain authority to interrupt honest business, and to seize and hold property of any kind. In short, a premium is offered to roguery, and honesty is browbeaten and bullied with impunity.

In such a state of things the wonder grows that men can be found willing to invest money in the stock of railroad corporations, where the big fish eat the little ones with as little compunction as a pickerel swallows minnows.

The recent upright and manly decisions of Judges Rosekrans and Brady avail nothing against the counter action of coordinate courts of infamous notoriety, the judges of which would, under the old system of appointments, long ago have been impeached and removed from the seats they have disgraced.

The condemnation of the course of the trustees, managers, and counsel of the Erie railroad administered by Judge Rosekranz is one which finds its echo in the heart of every honest and intelligent man in the country, yet from this scathing rebuke they march into another court, and unblushingly ask and are unblushingly granted what they knew they would get beforehand—a stay of proceedings. A *final* stay of the proceedings of this corrupt clique must come soon or late, and we hope it may not long be delayed.

NEW YORK PHOTOGRAPH GALLERIES.

According to the *Photographers' Friend*, the formulas and processes used in the best photographic galleries in this city are about as follows:

CLEANING THE GLASS.—Immerse for several hours in a strong solution of common washing soda, rinse, and rub with alcohol and Joseph paper. Kurz varies from this a little. After the soda bath, he puts the glass into a nitric acid and water, equal parts, for 2 hours. Then wash under tap, and rub with a sponge, rinse, and coat with filtered albumen (white of one egg to 24 ounces of water, well beaten).

NEGATIVE BATH.—Forty grains of silver to the ounce of water, iodize slightly with iodide of silver; slightly acidulate with nitric acid.

TO RESTORE THE BATH.—Add fresh silver if required. Boil down one half. Add as much water as necessary, filter, and it is ready for use.

COLLODION.—All use ether and alcohol, equal parts. Fredricks uses iodide of ammonium, $4\frac{1}{2}$ grains to the ounce; bromide of potassium, 2 grains; cotton, 6 to 7 grains, washed in ammonia. Gurney uses 5 grains iodide of ammonium, $1\frac{1}{2}$ grains bromide of cadmium, $1\frac{1}{2}$ grains bromide of ammonium. Sarony uses $4\frac{1}{2}$ grains iodide of ammonium, 2 grains bromide of potassium, 5 to 7 grains cotton. Iodize the ether and alcohol, then add cotton. Kurz uses iodide of ammonium, 4 grains; iodide of cadmium, 2 grains; bromide of potassium, 2 grains.

DEVELOPER.—One ounce protosulphate of iron to 1 quart of water, to which add only enough acetic acid to make it flow well.

FIXING THE NEGATIVE.—Use a saturated solution of hyposulphate of soda. In some of the galleries they add 1 ounce of cyanide of potassium to 4 quarts of the hypo solution.

SENSITIZING THE PAPER.—Fredericks uses 35 grains silver to the ounce of water; to each $\frac{1}{2}$ gallon add $\frac{1}{4}$ ounce muriatic acid; neutralize with liquid ammonia; filter to remove chloride, float 30 seconds, fume 10 minutes. Gurney uses 40 grains silver, slightly alkaline, or with 1 drop ammonia added; float 40 seconds, fume 10 minutes. Sarony uses 50 to 55 grains silver, slightly acidulated with nitric acid; float 1 minute, fume 15 minutes. Kurz uses 60 grains silver, slightly acidulated with nitric acid; float 1 to 2 minutes, fume 15 to 20 minutes.

TONING BATH.—To $\frac{1}{2}$ gallon water add $\frac{1}{4}$ ounce solution of common washing soda saturated, or enough to make it feel slippery to the fingers, then add a suitable quantity of chloride of gold.

FIXING BATH.—Water, $\frac{1}{2}$ gallon; hyposulphite of soda, 12 ounces.

THE PRESENT AND THE PAST.

I. INTRODUCTORY.

"To paint the Past, yet in the Past portray
Such shapes as seem dim prophets of to-day,"

is the task of the geologist as well as of the historian. The latter depicts the steps of man's intellectual advancement; the former, the gradual development of that part of creation which has brought this earth and its inhabitants to their present physical condition. Did we not find in the records of nature everywhere evidences of a design infinitely more foreseeing, and endowed with means to accomplish itself infinitely more powerful than are to be discovered in the highest efforts of the human race, we might indeed admit the claims of history upon our attention as superior to those of geology. As it is, however, the least we can claim is, that the latter science is essential to the completeness of human history, and to the liberal training of the human intellect. If the study of man be man, that study cannot be accomplished by one who is ignorant of the long chain of antecedent circumstances that have slowly and inevitably, because by law, placed man amidst the conditions in which he finds himself, and which control him to an extent that he but slightly realizes. History in the future must acknowledge this influence of the distant past; it will recognize how physical geography in its widest sense has influenced political boundaries, and how the advancement or retardation of races in civilization has been the certain results of geological causes.

A chain of geological events culminated in the Anglo-Saxon power, physical and moral in the Old World; a similar chain of geological events has laid down the path that the same power must follow in the New; and whatever the future destiny of this country, that destiny was part of the plan that laid the foundations of this continent in Eozoic seas; that built it up stratum by stratum; that enriched it now with metalliferous deposits, and now with stored-up fuel; that slowly raised mountains on it to give variety to its climate, and, atom by atom, denuded valleys on its surface to furnish rich soil to the agriculturist, and to mark out lines of travel for commerce.

History thus inspired will be very different from much that has hitherto been written. The same age that has swept from its pages the mythical legends of ancient Rome, and that has reconstructed by induction the dim outline of a lost Aryan race, has given us, by the same process of thought, differently applied, the restorations of Playfair and of Lyell and of Cuvier, filling up unoccupied spaces of the past, and has led us unexpectedly to altogether new interpretations of old and familiar words. Creation now no longer means but a single act of unstinted power, taking up time, it is true, but time to be measured by the units of the created, and reaching but the few years of his supposed existence. Geology gives us a far nobler reading—æons of the Creator figured by the days of man, and a creation that has been continuous and still endures, unfolding a design which is as undefinable in its origin as its ultimate object is utterly inconceivable. A science so young and yet promulgating ideas so sublime, and, at the same time, so subversive of those hitherto received may well have met with opposition from minds of the same caliber as those that persecuted Galileo; minds "of little faith," who regard geology as an intellectual snare of the evil one, and its professors as little better than atheists. This was to be expected, but it needs some inquiry to account for the general apathy that prevails amongst less prejudiced minds regarding the great and elevating truths that this science makes known; and still more to explain the persistent disregard of it, as a part of our general educational system, by those who, of all others, boast of being practical men. It is acknowledged to be essential in he education of a mining engineer; surely it should be a complementary portion of that of a civil engineer, and certainly the political economist, who has all his life to deal with questions regarding the raw products of various regions, ought to know something of that science which gives us an insight into the conditions to which these products are due. And should not every intelligent member of the community have some knowledge of such elements of political economy? Nevertheless it is safe to affirm that geology is a subject practically ignored by the mass of the community. Not merely is its economic importance overlooked, but the elevating influence on the human mind of the truths it enunciates is utterly unrealized. We may well ask why is this? We believe that it is because the popularization of geology has been in many instances conducted on a wrong basis either by well-meant but premature and crude attempts to reconcile its truths with a literal interpretation of the Sacred Writings, or by an investment of its facts with a web of impossible theories.

Popular interpretations of geology have often about as much relation to the true science as historical novels have to history. A few striking facts are strung together upon fictitious hypotheses. As romances such geological writings have not succeeded, because they necessarily want a human element to attract our sympathies; as histories they fail to gain credence, because in this practical age past events must not merely be stated to be believed, but they must also be accounted for, not by mythical causes, but by such controlling circumstances as bring about similar events in our own times.

It would seem that comparatively few geologists have grasped in its entirety the spirit in which Lyell's "Principles of Geology" was written. There is still a hankering after violent, sudden, and universal catastrophes and cataclysms. It was all very well for the first observers of fossil shells on mountain summits to believe them to have been sports of nature or relics of a universal deluge; they had then no inkling that causes still in operation were sufficient to account for such phenomena; but now that we have learned this truth we ought also to have learned the folly of calling in unknown agencies to explain away our own temporary ignorance. Fortunately geology is a very progressive science, and within the last few years many fresh facts have come to light, and many new ideas have been broached, in elucidation and support of what has been derisively termed the Uniformitarian system of geology, a system that simply claims that the laws which control matter have always been the same, uniform, and unceasing in their action. It teaches that the geological scheme has been perfectly designed, and that in it, therefore, there never has been any necessity for, or in fact any possibility of, its laws being temporarily suspended, and that consequently if we wish to understand past effects and events, we must read them by the causes we see in operation around us at present. Such a system as this has consistency in it, and gives a charm of reality to the science far more impressive to the reasoning mind than all the semi-miraculous agencies invoked by its opponents.

OBITUARY—HENRY BURDEN OF TROY, N. Y.

As we go to press we are in receipt of the news of the death of Henry Burden, inventor and mechanic, who was born at Dunblane, Scotland, April 20, 1791. His father was a farmer, and it was when a youth engaged on the farm that the son gave evidence of inventive genius, by making with his own hands labor-saving machinery from the roughest materials, and with but few tools and no models. The first marked success was in constructing a thrashing machine. He afterwards engaged in erecting grist mills and making various farm implements. During this period he attended the school of William Hawley, an accomplished arithmetician; and afterwards, having resolved to try his fortunes in America as a machinist and inventor, he went to Edinburgh and entered upon a course of studies, embracing mathematics, engineering, and drawing. Arriving in this country in 1819, he devoted himself to the improvement of agricultural implements. His first effort was in making an improved plow, which took the first premium at three county fairs. In 1820 he invented the first cultivator in the country. In 1825 he received a patent for his machine for making the wrought spike, and in 1835 for a machine for making horseshoes. In 1840 he patented a machine for making the hook-headed spike, an article which is used on every railroad in the United States. In the same year he patented a self-acting machine for reducing iron into blooms after puddling. In 1843 he patented an improvement in his horseshoe machinery. In 1849 he patented a self-acting machine for rolling iron into bars. In June, 1857, he patented a new machine for making horseshoes. This may be considered his greatest triumph in mechanics; it is self-acting, and produces from the iron bars sixty shoes per minute. He has obtained patents for this machine from every prominent government in Europe. Mr. Burden's suspension waterwheel is another of his inventions. In 1833 he built a steamboat 300 feet long, with paddle-wheels 30 feet in diameter; from its shape it was called the "segar boat." It was lost through the mismanagement of the pilot. In 1836 Mr. Burden warmly advocated the construction of a line of ocean steamers, of 18,000 tuns burden. In 1845, when the steamer *Great Britain* was crippled by breaking one of her screw blades, Mr. Burden went to England for the especial purpose of inducing her owners to adopt the side wheel, but was unsuccessful. Since that time to the time of his death Mr. Burden was one of the most extensive manufacturers in the United States, and amassed a large fortune.

As our readers are aware, the portrait of this eminent inventor and manufacturer forms one of the group in our prize engraving, "Men of Progress." As death removes, one by one, of these remarkable men, this collection of lifelike portraits will become more and more valuable.

Acid and Alkali Works at Titusville, Pa.

The arrangements for building chemical works at Titusville, have lately been completed, and as the magnitude of the scheme renders it one of natural importance, we feel sure that the following particulars will interest most of our readers:

It is intended to build, at a cost of a quarter of a million dollars, a manufactory of acids, alkalies and other chemicals. The works will cover three acres of ground, and the extent of the operations to be carried on may be judged from the fact that two of the chambers, for the production of sulphuric acid, measure each 216 feet × 48 × 56. Two hundred tuns of sheet lead will be used in the linings of these rooms. Seven tuns of sulphur will be used here daily. The concentrating room for reducing the volume of the acid till it reaches 66 gravity, is nearly as large as the others. A neutralizing alkali, to supply the place of caustic soda, will also be made here.

The credit of the enterprise is due to Mr. Robert Rennie, proprietor of the Lodi Chimical Works, N. J. Mr. Rennie intends to fix supply pipes for acid and alkali to all the oil refineries in the town, that both chemicals may be constantly on service: the fluids will be measured by accurate meters. In addition to the two large factories mentioned above, Mr. Rennie has a recently-erected establishment at Charleston, S. C.

The Titusville Works will probably commence running in May next, under the guidance of Mr. Rennie's chief chemist, Mr. Butterworth. When complete, the factory will furnish employment to a large number of hands, and will add to the manufacturing reputation of Pennsylvania. We wish Mr. Rennie every success.

The Scientific Goes Everywhere.

In a recent business letter from Moscow, a correspondent writes as follows:

"Believing it will interest you, we state the following facts; they, however, only prove the interest felt by all parties in your really useful journal, the SCIENTIFIC AMERICAN. In 1869, we had occasion to forward several small parcels by overland route to the Amoor, and to the borders of Chinese Tartary; such parcels we wrapped in numbers of the SCIENTIFIC AMERICAN, knowing full well that our clients would read every scrap of English in those out of the way parts. Having done this once or twice, we were rather surprised to receive instructions from one of the gentlemen to forward him weekly, by letter postage, two copies; and from one other client we are now in receipt of positive instructions to wrap all parcels in your sheets, one client paying for one copy (in Moscow). In 1868, we sent a parcel of small wares to a merchant (an Affghan) in Bokhara, enclosed in one or two advertisement sheets of the SCIENTIFIC AMERICAN. The merchant had the same translated (feeling an interest in one or two small wood cuts), and through that simple agency we have received several good orders for American goods. (Why are American goods altogether out of the Russian market? Shame!) Our country clients find the SCIENTIFIC AMERICAN so suited to their wants that we find it very difficult to keep our office copy. We consider that to be without the SCIENTIFIC AMERICAN would be a positive and serious loss, and this in the face of the leading English, French, and German scientific journals. Accept our thanks, and we shall be only too happy to assist you, if we can by any means do so."

Production of Coal-Tar Colors.

One hundred pounds of tar will yield, on the average, 3 pounds of commercial, or $1\frac{1}{2}$ pounds of refined benzole, from which 3 pounds of commercial nitro-benzole can be made; this in turn will yield $2\frac{1}{4}$ pounds rosaline, which will produce $3\frac{1}{2}$ pounds rosaniline red, from which $1\frac{1}{2}$ pounds fuchsine can be manufactured.

As it takes 100 pounds of coal, on the average, to produce 3 pounds of tar, there are necessary to the production of 2 pounds of pure fuchsine 6,000 pounds of coal. The entire gas manufactories of Europe consume annually 16,000,000,000 tuns of coal from which 5,300,000 pounds of fuchsin could be made—enough color to dye a brilliant red nearly every object on the face of the globe.

There does not appear to be any immediate danger of a dearth of aniline colors, but, on the contrary, the temptation to deck ourselves in gay colors is greater than ever before.

A Cheap Breakfast for Eight Persons.

"A good breakfast for eight persons for about a dime. Put half a pound of rice and half a pound of Scotch barley into one gallon of soft water; stew them gently for four hours. Then add four ounces of molasses and a little cinnamon; boil another half hour. This will produce eigh pounds of good food."

The above quotation, clipped from a journal ostensibly d-voted to the promotion of health, is a fair sample of the teaching of many of these pseudo-medical publications. The entire amount of solid matter contained in this "mess" is twenty ounces, which gives each person of the eight two ounces of farinaceous food and one half an ounce of molasses for a breakfast. The writer of this recipe ought to be made to take three meals per diem of his "pap" for three weeks. If at the end of that time he should retain strength to write another, we will concede that six ounces of mixed rice and barley, and an ounce and one half of molasses are a liberal day's rations for an adult.

The New Commissioner of Patents.

The New Commissioner of Patents, Gen. Leggett, visited Washington on the 19th inst. He had an interview with Secretary Delano, and afterward, in company with the acting Commissioner, Gen. Duncan, and Chief Clerk Grinnell, visited all the rooms of the office. He expressed himself pleased with the condition and service of the office, and left a very favorable impression with the gentlemen now in the office. He will return shortly to Ohio, where he will be detained some time in closing up his private business. Meantime the administration of the office will continue, as at present, with Gen. Duncan, who has conducted its affairs with ability and general acceptance.

THE PRESENT AND THE PAST.—We this week commence the publication of an interesting series of popular articles on geology, under the above caption. These articles have been prepared especially for the SCIENTIFIC AMERICAN, by the author of the exceedingly popular, interesting, and useful illustrated articles on various insects, which appeared during the past year. Professor Day's happy style of treating the subjects upon which he occupies his pen, will render these articles interesting and attractive to both old and young. The first article is introductory in character, and we trust its perusal will induce our readers to follow the entire series v. :h that attention which the importance of the subject demands.

THE Assay office, New York city, recently received a piece of gold ore, which, on trial, assayed nineteen and a half dollars of gold to the tun. It was from Nelson Ledge, Ohio, and the discovery created some agitation among the farmers and lumbermen of Portage and the adjacent counties.

Queries.

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

1.—MILLSTONES FOR GRINDING CORN AND FEED.—Will some of your millwright readers inform me what burrs (kind, size, etc.), I shall purchase for grinding corn and feed? I have a 10-horse power engine, and wish a mill that will suit such power. Are any of the patent mills or iron mills any improvement upon the old-fashioned French burrs?—W. E. A.

2.—HARDENING SHEET BRASS.—How can I harden sheet brass without hammering or rolling?—W. E. A.

3.—SPEED OF CIRCULAR SAW WITH MORTISED GEARING.—I would be pleased to get the opinion of some of your readers as to whether I could run a circular saw 400 revolutions per minute with cog gear direct from the engine shaft by using a mortised gear on shaft and polished pinion on mandrel; engine portable.—E. O. T.

4.—PAINTING WHITEWASHED WALLS.—What is the best substance for filling the cracks of a whitewashed wall preparatory to painting it? Can such a wall be successfully painted to look well permanently, and if so, what is the best method?—H. P. T.

5.—STRAIGHTENING AND TEMPERING CIRCULAR SAW.—How may I temper and straighten a 30-inch circular saw gage 8 or 9 inches? It has been burnt and slightly warped.

6.—SOLDER FOR ZINC AND PLATINUM, AND IRON AND PLATINUM.—What kind of solder is necessary, and how should it be applied, in attaching the thin slip of platinum to the zinc in Grove's galvanic battery? Soft solder is inadmissible, as the lead therein alloys with, and eats, as it were, holes through the platinum. What solder will serve to unite iron and platinum?—J. Q.

7.—WOODEN TRAMWAYS.—Will some of the numerous readers of your valuable paper who have had experience please tell me what difficulties there are to be overcome in laying and running cars on a wooden tramway—no iron—say a narrow gage, thirty inches or so?—C. O. P.

8.—MARBLE SAWING.—There are many marble and hard stone sawyers (myself amongst the number) who are anxious to know the kind of sand which is best to use in sawing hard and brittle stone. Some old stone sawyers say large sand is best; others that sharp small sand cuts best. Please enlist the experience of your correspondents to give the desired information through your columns; and while they are about it, it would be very desirable for them to give a description of the best kind of stone saws suitable for sawing very hard stone; and other information respecting sawing slabs from hard stone blocks.—A. P.

9.—BORING PUMP LOGS.—Having formed the intention of trying to supersede iron pumps in a mine where the water destroys the metal, by wooden ones of the same size, say ten inches caliber, and having some difficulty in boring out the logs, I would like to get the best method of boring wood to the size of ten inches.—B. A.

10.—SMALL ELECTRICAL MACHINES.—Can any of your readers inform me if an electrical machine or a Leyden jar can be constructed so small as to be conveniently carried in the pocket, and yet exhibit the electrical spark about the size of a pin head? If so, I desire the directions for constructing such an apparatus.—J. T. P.

11.—LITHOGRAPHY.—Will some of your numerous correspondents give me information on the fellowing points relative to the art of lithography? I wish to know the kind of ink used to transfer the acid, and its proper dilution for etching, the kind of pencil used in drawing upon the stone, how to use the gum, etc.—T. P.

[Our correspondent may find some information on these points in an article published on page 15, current volume.—EDS.

12.—OILING LOOSE PULLEYS.—What is the best plan for oiling loose pulleys running at high speed?

13.—I wish a remedy to cure the itching and inflammation caused from frost bites on the feet.—S. F. C.

We will let the following correspondent speak for himself, and leave generous readers to give him the desired information:—I was serving our common country at Malvern Hill, Va., July, 1862, when I received an injury to my spine and hips which has confined me to my bed all the time in a sitting position night and day, causing me constant pains, at times severe. I use my hands and brains to make different kinds of fancy work in wood, ivory, beads, shells, etc. I have a most precious wife, who at every chance she gets, helps me about my work. Fret sawing by hand is what she does the most of. This leads me to my first question. Do you know of any foot power portable gig or fret saw, and its cost? Again, do you know of any power besides our feet to run a small saw or sewing machine suitable to use in any dwelling house or chamber? If a saw frame or a sewing machine were arranged before me on the bed near enough, I could use it. The work is now done by my dear wife by means of a little hand fret saw. It is only fine work; the stuff only one eighth of an inch thick. A good fret saw machine ought to saw three or four inches thick to as fine a pattern as could be done by hand.—FRANK L. KEYES 12 Tahanto street, Concord, N. H.

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.

Answers to Correspondents.

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

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

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

RENDERING BRICK FLOORS IMPERVIOUS TO MOISTURE.—In answer to J. M. K.'s query, I would advise him to have the cement removed, be it under the brick or on the same (which he does not state); and use a one-inch layer of good asphalt instead. The asphalt should be used as a bed for the brick or tile, and the outside bricks, along the walls of the rooms which are to be floored, must also have a coat of asphalt between them and said walls. If the asphalt be used as a covering coat only of flooring, the bricks under it will, nevertheless, attract moisture from the soil, rot in time, and, in consequence of their crumbling, the asphalt cover will also go to pieces, as its support is yielding. In point of expense, asphalt is indeed more costly than cement, but it will amply repay the outlay by its durability and perfect dryness. I have seen it used in a building where moisture ran up the walls to the third story, thus making the dwelling almost uninhabitable; in that case one row of brick was cut out throughout the building, at the hight of two feet above ground and a layer of asphalt inserted therein. A short time afterwards the house became perfectly dry and has remained so ever since.—C. M.

STEAM PUMP FOR HIGH PRESSURE ENGINE.—I herewith give you my plan for P. D. to fix his pump so as to give a variable supply of water to the boiler, which I think will be cheaper than his, and just as good. Let him connect his delivery (to boiler) pipe with the suction pipe, by a pipe of nearly the same capacity, midway on which, he should place a "relief valve," loaded with weight or spring just above his boiler pressure. Then he should fit his check valve at the boiler with a screw stem and hand wheel, which he can set to admit any quantity of water, large or small, and his weighted relief valve will work in proportion and automatically. The pipe with the weighted valve on it can be passed overboard if not convenient to get at the suction. Or, if his pump be double acting he can connect each end with a small pipe, and a simple globe valve in the middle, which can be opened or shut to vary the boiler supply. I give this for what it is worth, and as a form of pump I have seen and used a good deal. He may object to the first on account of working his pump all the time full capacity. But I think that is the way to work a pump that supplies a boiler.—M. H. K.

WIRE OF SOLDER.—I have made wire of solder for my own use for many years by the following simple process. Take a sheet of stiff writing or drawing paper, and roll it in a conical form, exactly like the cornucopias sold by confectioners, but broader in proportion to its length. Make a ring of stiff wire to hold it in, attaching a suitable handle to the ring. The point of the cone may be cut off to leave an orifice of the proper dimensions. When filled with molten solder, it is held just above the surface of a pail of cold water, the stream of solder flowing from it will congeal in the shape of a wire. If held a little higher, so that the stream breaks into drops before striking the water, it will form elongated "tears" of metal. By holding it still higher, each drop forms a thin concave cup or shell. As each of these forms has its peculiar use in my business, I found this simple instrument invaluable. A few experiments will convince any one that he can prepare solder in any convenient form by the aid of a sheet of paper and a bucket of cold water.—C. E. T.

SPEED OF MILLSTONES.—In answer to query No. 13, in the SCIENTIFIC AMERICAN of January 7th, I would say: Use a 35-inch burr. After thirty years' experience I have found nothing to equal a French burr. Let your correspondent buy an under runner; drive with belt, and have the pulley on the mill spindle as large as the mill burr. Let him run the skirt of the burr 2,700 feet per minute, and he will be surprised at the amount of work it will do.—C. C. E.

CHEAP MAGNETIC BATTERY.—Take a gallon stone jar, and place a sheet-zinc cylinder therein, and inside that a porous cup (a porous flower-pot will answer after a fashion). Inside the porous cup place a piece of sheet copper. Use a solution of common salt next the zinc; and a solution of sulphate of copper next the copper, if a strong current be desired. Dilute sulphuric acid (1 part of acid to 10 of water) makes a very constant, but weaker current.—A. G.

RECHARGING METAL CARTRIDGES.—C. W. H., on page 9, Vol. XXIV., wishes to know how to recharge old shells—breech loaders. I have done as follows: Use either fulminate of silver, mercury, or any of the chlorate of potash mixtures, and a little shellac varnish mixed to thin paste, then dry and fill with powder, and insert the bullet carefully. But *he* will find it cheaper, if labor is worth anything, to saw cord-wood, and buy cartridges.—A. G.

O. W. D., of Mass.—Your theory of solar emission is not very intelligible to us. So far as we can gather from your letter we infer that in your opinion there is a compensating principle in the correlation of forces, which maintains the heat of the sun, and will continue to maintain it. We think it probable this would be found true, provided we could see at once the whole of one of the tremendous cycles of existence. As it is, we only see dimly a small portion of a cycle, and all such theories as you propound are speculations, the truth or error of which is incapable, in the present state of science, of being determined.

D. D., of Mass., says: "I send you some specimens of stone taken from a ledge near here, will you inform me what they contain?" The minerals sent contain plumbago, sulphuret of iron, and copper. It is possible that considerable copper may be found in the vicinity. In North Carolina the same species of quartz yields gold; and we believe that in your own neighborhood gold, in small quantities, has been found.

J. L. N., of Ky., writes: "There is in your last issue an extract from the *Builder*, on diamonds, that has called my attention to a lot of crystals that I have in my possession, that I think are real gems, but not being posted in *gemology*, I send you a small sample, hoping you will favor me with your opinion. Diamond or not diamond, you can retain the sample. If they are gems they will benefit me, as I am only a working man; if they are not I have philosophy sufficient to smile on misfortune." Our correspondent will have to wear the philosophic smile. The gem sent is only quartz. Diamonds have been found in Georgia, South and North Carolina, but we are not advised as to Kentucky.

C. H. C., of Pa.—We cannot say without analysis of the water in your well whether you could safely continue the use of a galvanized iron pump to raise water for culinary purposes. The probability is that by always pumping off the water which has been standing in the pump before drawing for use, you would run little risk. Many writers attack galvanized iron pipes with great energy. In such cases there is great danger of more or less injury from their use. The oxide and salts of zinc are irritant poisons.

F. S. C., of Mass.—Your plan of boring out a segment of a hollow cylindrical ring by a bent bar with a screw thread cut upon it, the screw to carry a cutter, is wholly impracticable. No perfect job could ever be done in this way.

N. D., of Me.—Valves often leak slightly under slight pressure, and become tight under increasing pressure, which springs them home to their seats. This is probably the case with the safety-valve of your steam-heating apparatus.

J. C. B., of Pa.—The Cornell University, at Ithaca, N. Y., is an institution of the kind you inquire about. By addressing the President of that institution, you will probably receive a catalogue with full particulars.

NEW BOOKS AND PUBLICATIONS.

Locomotive Engineering and the Mechanism of Railways. A Treatise on the Principles and Construction of the Locomotive Engine, Railway Carriages, and Railway Plant. With Examples Selected from the International Exhibition of 1862. Illustrated with Sixty Large Page Engravings and Woodcuts. By Zerah Colburn, Esq., Civil Engineer. New York: John Wiley & Son, No. 15 Astor Place.

As our readers are many of them aware, this is a work published in numbers. The numbers (15 and 16) now received bring the treatise up to the sixteenth number of the twenty, which were originally embraced in the design. When completed, it will be one of the most comprehensive as well as one of the most elegant works ever published. Its form (large quarto) gives ample scope for illustration, and the engraving, as well as the typographical execution, is really superb. The acknowledged genius of its gifted author has enriched its pages by a mass of facts which, perhaps, no other author could have so skillfully collated, and so ably condensed, into an exhaustive treatise. The work is sold only by subscription.

Hand-book of Mineral Analysis. By Friedrich Wöhler, Professor of Chemistry in the University of Gottingen. Edited by Henry B. Nason, Professor of Chemistry in the Rensselaer Polytechnic Institute, Troy, N. Y. Philadelphia: Henry Carey Baird, Industrial Publisher, 406 Walnut street. Price, by mail, free of postage, $3·00.

This is a translation of Wöhler's "Hand-book of Mineral Analysis," with some changes and additions. The editing of this work has fallen into able hands. Of the character of the original treatise it is unnecessary that we should speak, since it is a standard work in every chemical library. As a guide in mineral analysis it is one of the very best, easily understood, and in every way reliable in its methods. The work is specially adapted to the wants of mining engineers, and metallurgists in general; and will be found a valuable addition to those of Fresenius, and other standard authors, for the use of students of chemistry in the laboratory.

The Young Men of the West; or, A Few Practical Words of Advice to those Born in Poverty, and Destined to be Reared in Orphanage. By L. U. Revais, St. Louis, Mo. New York: S. R. Wells, Publisher, No. 389 Broadway.

This is a little pamphlet full of sound advice to young men, and should be widely read.

Man and Woman, Considered in their Relations to Each Other and the World. By Henry C. Pidder. New York: S. R. Wells, Publisher, No. 389 Broadway.

In the present state of the public mind on the "woman question," this work is timely, and will be read with interest.

The medical and surgical literature of this country is enriched by "Bostwick's Medical and Surgical Journal," intended to be a companion for the physician, and a family guide. The first number of this new monthly is on our table, and we find its contents interesting and instructive. Its editor and publisher, Homer Bostwick, M.D., is a physician and surgeon of thirty years' practice, and has given renewed evidence in this number of his magazine that his ability as an editor is equal to his admitted skill in the art of healing.

The Photographers' Friend is the title of a new quarterly magazine, published by R. Walzl, Baltimore, Md. $1·50 a year. Devoted to the photographic art. It is a very handsome and excellent periodical. In another column we give some extracts from its columns.

The American Journal of Microscopy is the name of a new monthly quarto, published at Chicago, by George Mead & Co. $1·00 a year.

Inventions Patented in England by Americans.

[Compiled rom the Commissioners of Patents' Journal.]

APPLICATIONS FOR LETTERS PATENT.

3,332.—Machinery for Shearing Metals.—Robert Briggs, Philadelphia, Pa. December 21, 1870.

3,344.—Apparatus for Preventing Nuts working Loose in Reaping and Mowing Machines.—Walter A. Wood, Hoosick Falls, N.Y. December 21, 1870.

3,345.—Weather Strip.—William Cook, Chicago, Ill. December 21, 1870.

3,366.—Engraving Blocks.—Claus Van Haugen, Philadelphia, Pa. December 24, 1870.

3,375.—Treadle Mechanism.—George Willey, Cleveland, Ohio. December 24, 1870.

3,376.—Breech-loading Fire-arms.—Charles E. Sneider, Baltimore, Md. December 24, 1870.

3,378.—Preserving Fruit.—S. E. Sewell, of Melrose, and J. G. Loring, of Boston, Mass. December 27, 1870.

3,381.—Wood Screws.—George C. Davies, Dayton, Ohio. December 28, 1870.

3,390.—Steam Generator.—S. Lloyd Wiegand, Philadelphia, Pa. December 29, 1870.

3,391.—Machinery for Manufacturing Metal Tubes.—S. P. M. Tasker Philadelphia, Pa. December 29, 1870.

3,392.—Paper-making Stock and Pulp.—M. L. Keen, Jersey City, N. J. December 29, 1870.

3,019.—Metallic Cartridge Cases.—Hiram Berdan, New York, now residing at St. Petersburgh, Russia. November 18, 1870.

3,260.—Wire Bands, or Fasteners, for Fastening Bales, etc.—E. S. Lenox, New York city. Dec. 13, 1870.

3,290.—Railway Car Springs.—Patrick S. Devlan, Jersey City, N. J., and Isaac P. Wendell, and S. P. M. Tasker, Philadelphia, Pa. December 15, 1870.

3,376.—Breech-loading Fire-arms.—C. E. Sneider, Baltimore, Md.

3,215.—Cartridge Box.—Henry D. Cooke, Washington, D. C. December 31, 1870.

3,294.—Device for Securing Clothes on a Line.—Henry A. Tweed, New York city.

3,401.—Felted Fabrics.—Robert Spencer, New York city. December 31, 1870.

5.—Carpet Beater.—W. H. Hankinson, New York city. January 2, 1871.

6.—Sewing Machine.—B. P. Howe, New York city. January 2, 1871.

7.—Harvester.—D. M. Osborne, Auburn, N. Y. January 2, 1871.

APPLICATIONS FOR EXTENSION OF PATENTS.

Automatic Lathes for Turning Irregular Forms.—William D. Sloan New York city, has petitioned for an extension of the above patent. Day of hearing, March 15, 1871.

Fluid Meters.—James Cochrane, New York city, has petitioned for an extension of the above patent. Day of hearing, March 15, 1871.

Machine for Cutting Slots in Clothes Pins.—John Humphrey, Keene, N. H., has petitioned for an extension of the above patent. Day of hearing, March 15, 1871.

Mills for Cleaning Castings.—Henry R. Remson, Albany, N. Y., has petitioned for an extension of the above patent. Day of hearing, March 22, 1871.

Blind Fastenings.—Horace Vansands, Middletown, Conn., has petitioned or an extension of the above patent. Day of hearing, April 19, 1871.

Recent American and Foreign Patents.

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

Auger.—Blase Walch, Frederick, Md.—The object of this invention is to improve the construction of augers, so that the cutters and center screw, besides being rendered adjustable, can be readily detached and sharpened when necessary; and the center screw or point, and cutters only, need be made of steel, all the rest of the augur being of iron.

Steam Boiler.—Adolph Brase and Lemuel Salladay, Sciotoville, Ohio.—This invention consists in combining with a steam boiler, a perforated tube with scrapers attached thereto, to which a longitudinal motion is given, and which perforated tube distributes the feed water, and through which the sediment is blown off.

Central Discharge Water Wheel.—Albert L. Moore and Norman S. Parker, El Dorado, Oregon.—This invention has for its object to furnish a simple and effective water wheel which shall be so constructed as to give fully one-half power at half gate, and which will receive and discharge the water in a smooth solid column.

Mowing and Reaping Machines.—Thomas J. Barnes, Corry, Penn.—This invention has for its object to furnish a simple, convenient and effective device for operating the cutter bar of a mowing or reaping machine by a direct motion in both directions.

Wagon Jack.—George H. Tule, Haddenfield, N. J.—This invention relates to a new wagon jack, which is of extremely simple construction, and readily adjusted to any desired hight. The invention consists in the application to the lifting lever of an elbow, pendant, which sustains the adjustable rest or slide whereon the axle or weight is to be held.

Fountain Paint Brush.—D. J. Kellogg, Toledo, Ohio.—This invention has for its object to furnish an improved paint brush, which shall be so constructed as to retain the paint in such a way that it will not incrust and become useless, and which will prevent the brush from drying, so that it will not need to be washed, thus saving much time and annoyance to the artist.

Machinery for Burring or Cleaning Wool, Cotton, and other Fibrous Materials.—Wm. Richardson, Oldham, England.—This invention relates to improvements in burring or cleaning machines, of that class in which a fine comb cylinder is employed, and from which burrs, seeds, and other impurities are stripped, while the cleaned material is carried forward to be removed by a revolving brush or similar apparatus.

Sewer Basin Trap.—Matthew K. Couzens, Yonkers, N.Y.—The object of this invention is to provide means for preventing the clogging of pipes which lead from basins or receptacles to sewers, and for consequently obtaining a constant outlet for such basins. The invention consists in the application to the end of the pipe within each basin, of a float valve, which is closed as long as the ordinary outlet is open, but will be raised off its seat to provide another outlet, if the former be clogged.

Coke Furnace.—Thomas Price, Steubenville, Ohio.—This invention relates to a new furnace for producing coke free from sulphur or other impurities, so that it may be used for the production of pure iron.

Clamp for Anti-rattling Shaft Connections.—John J. Dominic, Gallupville, N.Y.—This invention relates to a new and useful device to facilitate the operation of putting the shafts to buggies or other vehicles where rubber or other elastic material is used to prevent rattling or looseness in the connecting joints.

Churn.—A. & J. A. Gifford, West Somerset, N. Y.—This invention has for s object to improve the construction of churns, whereby it is enabled to furnish the public a cheaper and more convenient and efficient machine than those heretofore known, and one also adapted to operate as a butter worker; and the invention consists in so arranging three or more dashers in connection with a double-armed frame or socket, that when the latter is oscillated the dashers shall move alternately in opposite directions.

Seed Drill, Manurer, and Potato Digger.—Eugene C. Hopping and Eugene A. Ely, Madison, N. J.—This invention relates to a new and useful improvement in a combined seed drill and potato digger.

Cutter.—Joseph H. Bradley, Hillsboro, Ohio.—This invention relates to improvements in feed cutters, by the operation of which the degree of fineness to which feed is cut may be regulated at pleasure, the blade being one of the spokes of a fly wheel, and so arranged that the cutting begins at the outer extremity of the knife, where the speed is highest and the power least and draws inward toward the center, the power increasing as the speed diminishes, so that the two forces may operate complementarily.

Tile Machine.—Albert Moorhous, Indianapolis, Ind.—This invention consists in arranging screens and dies in connection with the doors of the plunger-box, so that the clay will be screened or freed from stones, or other unsuitable foreign material, and the latter may be readily and easily removed at suitable intervals of time without causing other than a momentary halt in the operation of the machine.

Fire Tongs.—Alfred M. George, Sand Fly, Texas.—This invention has for its object to prevent the legs of fire-tongs from lapping or crossing each other, as they incline to do soon as the joint is worn; and consists in a slotted guide attached at one end to the stationary leg, and extending beyond and inclosing the movable leg.

Seed Drill and Cockle Separator Combined.—J. Fletcher, Rectortown Va.—This invention consists of two parallel shafts, provided with rollers—those on the front shaft being covered with rubber—said shafts being placed beneath the seed-box, the rollers coming directly under the discharge orifices in the bottom of the box, and operated by gearing, arranged in such a manner that it can be thrown in or out of gear at pleasure; the object being to sedarate the cockle from the wheat and deposit it in a trough beneath the seed-box, and to permit the grain only to pass through the seed conductor into the ground.

Matting Machine.—James H. Reilly, Brooklyn, N. Y.—This invention has for its object to produce in metal ware of any sort an ornamental indented or "matted" surface, and consists in the use of jointed metallic needles articulated at one end to the periphery of a chuck whose rapid revolution causes the needles to stand out radially, so that the article of ware receives blows from their points, and its surface is thereby suitably "matted."

Running Gear of Wagons.—G. Doan, Wallis, and Morland, Fleming, N. Y.—This invention consists in forming both hounds and the sway bar of vehicles of one solid piece of wood bent into the desired shape; and also in forming the tongue-braces and cross-bar of vehicles in a single piece, on the same principle.

Oil-tank Discharging Apparatus.—W. J. Brunded, Oil City, Pa.—The object of this invention is to provide convenient and ready means for discharging oil from tanks, more especially designed for tanks on railroad cars or trucks, but applicable to tanks or oil reservoirs in other situations.

Car Ventilator.—William C. Betts, Brooklyn, N. Y.—This invention has for its object to furnish an improved ventilator for cars, which shall be so constructed as to introduce the fresh air freely, withdraw the foul air from the car, and, at the same time, prevent the entrance of dust.

Sinking Screw Piles.—W. S. Smith and William Reuschel, Chicago, Ill.—This invention relates to improvements in machines for turning screw piles for sinking them into the earth, and consists in an arrangement with the hub of the wheel or other device used for turning the shaft of the pile to screw it down, of friction rollers acting against a clamp made fast to the shaft, to impart the rotary motion and to turn on their axes by the downward motion of the pile, in a manner to avoid the great friction which exists between the pile and the part which imparts the rotary motion where the one has to slide on the other. The invention also comprises an improved mode of attaching the clamp on which the turning force is deliver

Paper-bed Bottom.—James B. Crane, Dalton, Mass.—This invention has for its object to furnish an improved paper-bed bottom, which shall be simple in construction, neat, clean, strong, and durable.

Churn and Butter Worker.—A. and J. A. Gifford, West Somerset N. Y.—This invention consists in a novel arrangement of oscillating paddles within a suitable box, whereby the machine is adapted to alternately perform both the functions of a churn and butter worker with equal efficiency

Water Wheel.—J. W. Truax, Essex Junction, Vt.—This invention relates to new and useful improvements in water wheels (constructed upon the turbine principle), whereby they are rendered more efficient, durable, simple, and less expensive than such wheels have hitherto been.

Siding Gage.—W. E. Lewis, Princeton, Iowa.—This invention has for its object to furnish an improved instrument for gaging and holding siding, weather, or clap boards while being scribed and nailed, which shall be simple in construction, reliable in operation, and convenient in use.

Plow.—Elias Halman, Columbus, Ga.—This invention has for its object to furnish a simple, convenient, strong, and durable plow, which shall be so constructed that the operating parts can be detached to allow of the attachment of a subsoil plow.

Connecting Rod.—W. G. Freeman, Richmond, Va.—This invention relates to improvements in apparatus for adjusting and tightening the brasses of connecting rods, such as are commonly known as "stub ends," and it consists in a broad wedge, the width of the bearing surface of the back of the brass arranged behind one of the braces, in a wedge-shaped cavity, and a screw connected therewith and secured through the cap, on the side of the "stub end," to work the wedge back and forth in, place of the gib and key now used, said screw being provided with a jamb nut to prevent it from turning.

Official List of Patents.

ISSUED BY THE U. S. PATENT OFFICE.

FOR THE WEEK ENDING JAN. 17, 1871.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT FEES

On each Caveat	$10
On each Trade-Mark	$25
On filing each application for a Patent, (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Examiners-in-Chief	$10
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (three and a half years)	$10
On an application for Design (seven years)	$15
On an application for Design (fourteen years)	$30

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

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

The full Specification of any patent issued since Nov. 20, 1866, at which time the Patent Office commenced printing them...$1·25

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

Full information, as to price of drawings, in each case, may be had by addressing

MUNN & CO.,
Patent Solicitors. 37 Park Row, New York.

110,948.—Padlock.—John H. Ames, Stamford, Conn. Antedated December 31, 1870.

110,949.—Harvester.—Thomas James Barnes, Corry, Pa.

110,950.—Railroad-Car Ventilator.—William C. Betts Brooklyn, N. Y. Antedated January 7, 1871.

110,951.—Back Center for Milling Machines.—Amos H. Brainard, Hyde Park, Mass.

110,952.—Clothes Drier.—Joseph L. Brigham, St. Paul, Minn.

110,953.—Device for Discharging Oil from Tanks.—Wm. J. Brundred, Oil City, Pa.

110,954.—Wood Pavement.—William Bushnell, Elizabeth, N. J.

110,955.—Belt Gearing.—James H. Butler, Hampden, Me.

110,956.—File-Cutting Machine.—Pehr Johan Carlsson, Andover, Mass.

110,957.—Gate Latch.—Calvin Cole (assignor to Moses Gilmor), Dayton, Ohio.

110,958.—Paper Bed Bottom.—James B. Crane, Dalton, Mass.

110,959.—Pen Cleaner.—Samuel Darling, Providence, R. I.

110,960.—Bit-Brace.—William P. Dolan, Charlottesville, Va. Antedated January 14, 1871.

110,961.—Clamp.—John J. Dominic, Gallupville, N. Y.

110,962.—Stamp Canceler.—Charles C. Egerton (assignor to Samuel E. Middleton and Daniel W. Middleton, Jr.), Washington, D. C.

110,963.—Electro-Magnetic Weighing Machine.—Henry Fairbanks, St. Johnsbury, Vt.

110,964.—Compression-Cock for Flexible Tubes.—Henry Fairbanks, Boston, Mass.

110,965.—Automatic Weighing and Distributing Scales—Henry Fairbanks, St. Johnsbury, Vt.

110,966—Saw.—Walter Lafayette Gage, St. Louis, Mo.

110,967.—Portable Camp Grate.—Lorenzo D. Gavitt, Los Angeles, Cal. Antedated January 7, 1871.

110,968.—Churn.—Alden Gifford and Zenas A Gifford, Somerset, N. Y.

110,969.—Harness Saddle.—Algernon Gilliam, Pittsburgh Pa.

110,970.—Mechanism for Opening and Closing Telegraphic Station Circuits.—Elisha Gray, Chicago, Ill.

110,971.—Endless-wire Ropeway.—Andrew Smith Hallidie, San Francisco, Cal.

110,972.—Machine for Mixing and Bleaching Sugars. Melancthon Hanford, Lexington, Mass.

110,973.—Animal Trap.—George L. Hart, New Britain, Conn.

110,974.—Wedge for Splitting Wood.—Albert Heusser, Ellington, Conn.

110,975.—Stair-Rod Fastening.—Robert Hutchison (assignor to William B. Gould), Newark, N. J.

110,976.—Pump.—Edward T. Jenkins, Brooklyn, N. Y. Antedated January 7, 1871.

110,977.—Attaching Door Knobs to their Spindles.—James N. Karr, Buffalo, N. Y.

110,978.—Fountain Paint Brush.—D. J. Kellogg, Toledo Ohio.

110,979.—Manufacture of Eyelet-Blanks.—William R. Landfear, Hartford, Conn. Antedated January 5, 1871.

110,980.—Mode of Forming Balls of Twine and Cord.—Hamilton B. Lawton, Cropseyville, N. Y.

110,981.—Machine for Molding Chair Bottoms.—John Lemman, Cincinnati, Ohio.

110,982.—Siding Gage.—William E. Lewis, Princeton, Iowa.

110,983.—Machine for Manufacturing Hinges.—William F. Lewis (assignor to Benedict & Burnham Manufacturing Company), Waterbury, Conn.

110,984.—Burial Case.—Ivory Lorde, Moline, Ill.

110,985.—Door Check.—Horatio Nelson Hicks Lugrin, Chelsea, Mass.

110,986.—Cutlery.—Myron W. Lyman, Chicago, Ill.

110,987.—Shoemakers' Tool.—Myron W. Lyman and Franklin C. Wyman, Chicago, Ill. Antedated January 14, 1871.

110,988.—Cotton Scraper and Harrow.—John M. P. Lyon Bellefonte, Ala. Antedated January 9, 1871.

110,989.—Earth Closet.—Patrick Malone (assignor to himself and Charles C. Landry), New Orleans, La.

110,990.—Producing Refined Cast Iron, Steel, and Malleable Iron.—John W. Middleton, Philadelphia, Pa. Antedated January 8, 1871.
110,991.—Lunch Box.—David Miller, Allegheny City, Pa.
110,992.—Attaching Knobs to their Spindles.—Charles Morrill (assignor to George H. Bidwell), New York city.
110,993.—Hoisting Apparatus.—Charles R. Otis and Norton P. Otis, Yonkers, N. Y.
110,994.—Material called "Ole-izerine," for Dyeing and Printing.—Alfred Paraf (assignor to Edward S. Renwick, trustee), New York city.
110,995.—Process of Extracting the Coloring Matter of Madder.—Alfred Paraf (assignor to Edward S. Renwick, trustee), New York city.
110,996.—Tree Protector.—Caroline Parks, Milan, Ohio.
110,997.—Apparatus for Distilling and Concentrating Liquids.—C. Chauncy Parsons, New York city.
110,998.—Apparatus for Extracting Essential Oils.—George Gilman Percival (assignor to Isabel B. Percival), Waterville, Me.
110,999.—Oil Paint for Coating Oil Cloth.—Thomas Potter, Philadelphia, Pa.
111,000.—Machine for Mixing Concrete, etc.—Silas Putnam and Thomas Burt, Rockville, Conn. Antedated January 5, 1871.
111,001.—Filter.—Louis Raecke, New York city. Antedated January 7, 1871.
111,002.—Let-off Mechanism for Looms.—Horatio A. Remington, Anthony, R. I.
111,003.—Burglar Alarm.—William Reynolds, Manchester, N.H.
111,004.—Machine for Burring Wool, etc.—Wm. Richardson, Oldham, Great Britain.
111,005.—Lock for Doors, etc.—Benjamin F. Roberts, Lacona, Iowa.
111,006.—Joint for Railway Rails.—Wm. W. Robinson, Ripon, Wis.
111,007.—Open Link for Coupling Double and Whiffletrees.—Newton C. Sample, Penningtonville, Pa.
111,008.—Case for Odometers.—Jacob D. Seipel and Cyrus B. Alsover, Easton, Pa.
111,009.—Fruit Picker.—Walter L. Shaw, Etna, Pa.
111,010.—Iron Viaduct.—C. Shaler Smith (assignor to the Baltimore Bridge Company), Baltimore, Md.
111,011.—Clothes Drier.—Horace Swan, Woodstock, Vt.
111,012.—Custard and Cake Baker.—Charles L. Sweatt and George A. Huntoon, Fishersville, N. H.
111,013.—Machine for Making Spikes.—James H. Swett, Pittsburg, Pa.
111,014.—Machine for Slitting, Beveling, and Bending Metal Tube-skelps.—Stephen P. M. Tasker, Philadelphia, Pa.
111,015.—Machine for Slitting, Beveling, and Bending Metal Tube-skelps.—Stephen P. M. Tasker, Philadelphia, Pa.
111,016.—Machine for Slitting and Bending Metal Tube-skelps.—Stephen P. M. Tasker, Philadelphia, Pa.
111,017.—Machine for Bending Metal Tube-skelps.—Stephen P. M. Tasker, Philadelphia, Pa.
111,018.—Faucet fot Beer or Other Barrels—Samuel Thompson, Schaghticoke, N.Y.
111,019.—Water Wheel.—Jacob W. Truax, Essex Junction, Vt.
111,020.—Window for Stoves.—Henry B. Van Benthuysen, Lock Haven, Pa.
111,021.—Wagon Box and Wagon Rack Lifter.—Izaak Van Kersen, Kalamazoo, Mich.
111,022.—Shank Piece for Boots and Shoes.—Jeremiah M. Watson, Sharon, Mass.
111,023.—Cotton Cropper.—Dwight F. Welsh, Nevada, Ohio.
111,024.—Pruning Hatchet.—Jerison White, Providence, Pa.
111,025.—Rock Drill.—George L. Williams (assignor to himself, Radcliffe B. Lockwood, and William A. Scott), Mine La Motte, Mo.
111,026.—Rotary Pump.—Irvin Williams, Baldwinsville, N.Y.
111,027.—Hot-air Furnace.—Charles Allen, Hartford, Conn.
111,028.—Reversible Knob Latch.—William H. Andrews (assignor to Burton Mallory), New Haven, Conn.
111,029.—Shingle Machine.—Holiday C. Babcock, Eureka, California.
111,030.—Hydro-atmospheric Elevator.—Cyrus W. Baldwin, Boston, Mass.
111,031.—Fire Bar.—William Batchelor (assignor to Edwin Russ and Thomas Shewell Morris), Winchester, England.
111,032.—Water or Steam Valve.—Robert Berryman (assignor to the Berryman Regulator and Alarm Company), Hartford, Conn.
111,033.—Plow.—Hiram R. Bowen and Lorenzo D. Robnett, New Washington, Ind.
111,034.—Cotton Seed Huller.—Horace C. Bradford (assignor to himself and N. H. Fenner), Providence, R. I.
111,035.—Feed Cutter.—Joseph H. Bradley (assignor to himself and Charles S. Bell), Hillsborough, Ohio.
111,036.—Steam Boiler.—Adolph Brase and Lemuel Salladay, Sciotoville, Ohio.
111,037.—Cultivator.—George Walter Bronson, Ottawa, Ill.
111,038.—Stamp Canceler.—Franklin W. Brooks, New York city.
111,039.—Boots and Shoes.—Franklin J. Burcham, Racine, Wis.
111,040.—Fluid Meter.—Leopold F. Buschmann, New York city.
111,041.—Hay Tedder.—William H. Butterworth, Trenton, N.J.
111,042.—Thrashing Machine.—Henry Russell Canine, Waveland, Ind.
111,043.—Hay and Cotton Press.—Nathan Chapman, Hopedale, Mass.
111,044.—Medical Compound Pills for Colds, etc.—Wm. E. Chilson, Troy, Pa.
111,045.—Preserving Wood.—Benjamin H. Detwiler and Samuel G. Van Gilder, Williamsport, Pa.
111,046.—Hound, Sway Bar, Tongue Brace, and Cross Bar of Vehicles.—Gerard Doan, Theodore Wallis, and George D. Moreland, Fleming, N. Y., assignors to Thomas M. Jones, Chicago, Ill.
111,047.—Grate Bar.—Albert Fickett and Charles C. Benton, Rochester, N. Y.
111,048.—Machine for Lining Straw Board, etc.—Benjamin F. Field, Beloit, Wis.
111,049.—Shirt Button or Stud.—Levi W. Fifield, Worcester, Mass., assignor to Thomas F. Arnold and Henry E. Webster, Providence, R. I.
111,050.—Seed Drill and Cockle Separator Combined. John E. Fletcher, Rectortown, Va.
111,051.—Papering Pins.—George Fowler, Seymour, Conn.
111,052.—Lightning Rod.—Joseph R. Fricke, Pittsburgh, Pa.
111,053.—Portable Chair.—George Gardner, Glen Gardner Station, Clarksville Postoffice, N. J.
111,054.—Fire Tongs.—A. M. George, Sand Fly, Texas.
111,055.—Plow.—Elias Haiman, Columbus, Ga., assignor to Blount, Haiman & Brother.
111,056.—Plow.—Thomas Harding, La Fayette, Ind.
111,057.—Emery Wheel.—Thomas Harding, La Fayette, Ind.
111,058.—Construction of Barrels for Beer, etc.—Matthew Hawe, Albany, N. Y.
111,059.—Sewing Machine.—Arthur Helwig (assignor to himself and Simon Collins), London, England.
111,060.—Water Meter.—Frederick G. Hesse, Oakland, Cal.
111,061.—Crushing and Hulling Attachment to Grinding Mills.—George C. Hohenstein and Charles T. Glaeser, Cincinnati, Ohio.
111,062.—Combined Seed Drill, Manurer, and Potato Digger.—E. C. Hopping and E. A. Ely, Madison, N. J.
111,063.—Beam or Girder for Fire-proof Structures.—W. W. Hughes, Philadelphia, Pa.
111,064.—Apparatus for Separating Oil from Grain and other Materials.—Elias S. Hutchinson, Baltimore, Md.
111,065.—Feed Cutter.—Cristoph Kemper, Hermann, Mo.
111,066.—Mode of Making Bricks.—F. Lambert, Los Angeles, Cal.
111,067.—Combined Steamer and Condenser.—George W. Lane, Portland, Me., assignor to himself and John Alles, Boston, Mass.
111,068.—Oiler.—Albert D. Laws, Bridgeport, Conn.
111,069.—Grain Binder.—Sylvanus D. Locke, Janesville, Wis.
111,070.—Hub for Vehicles.—W. I. Lyman, East Hampton, Mass.
111,071.—Embroidery Attachment for Sewing Machines.—W. A. Mack, Norwalk, Ohio.
111,072.—Lamp.—R. S. Merrill (assignor to himself, Wm. B. Merrill, and Joshua Merrill), Boston, Mass.
111,073.—Lamp Chimney.—R. S. Merrill (assignor to himself, W. B. Merrill, and Joshua Merrill), Boston, Mass.
111,074.—Lamp Burner.—R. S. Merrill (assignor to himself, W. B. Merrill, and Joshua Merrill), Boston, Mass.
111,075.—Manufacture of Safety Matches.—L. Otto P. Meyer, Newtown, Conn.
111,076.—Brick Press.—Jas. A. Millholland, Mount Savage, Md.
111,077.—Water Wheel.—A. L. Moore and N. S. Parker, El Dorado, Oregon.
111,078.—Tile Machine.—Albert Moorhous, Indianapolis, Ind.
111,079.—Hat Machine.—C. M. Osgood, Amherst, Mass., assignor to L. M. Hills & Sons, New York city.
111,080.—Window Frame.—Silas R. Owen, Stewartsville, Mo.
111,081.—Machine for the Manufacture of Paper Carpet Linings.—C. A. Pease, Astoria, N. Y.
111,082.—Machine for Making Bolts and Nuts.—George R. Postlethwaite, Birmingham, Great Britain.
111,083.—Track Cleaner for Mowing Machines.—B. F Power, McConnellsville, Ohio, assignor to Hugh M. Cochran and J. F Sonnanstine.
111,084.—Table for Drilling Machines.—Thomas Reaney, Chester, Pa.
111,085.—Reaming and Countersinking Tools.—Thomas Reaney, Chester, Pa.
111,086.—Matting Apparatus.—James H. Reilly, Brooklyn, N. Y., assignor to H. G. Reed, Taunton, Mass.
111,087.—Hot-air Engine.—Alexander K. Rider (assignor to himself, Cornelius H. Delamater, and George H. Reynolds), New York city.
111,088.—Air Engine.—A. K. Rider (assignor to himself, C.H. Delamater and George H. Reynolds), New York city.
111,089.—Cigar Filling.—Socrates Scholfield, Providence, R. I. Antedated Jan. 7, 1871.
111,090.—Fence.—W. W. Sherman, St. Charles county, Mo.
111,091.—Collapsing Core Barrel.—William Smith, Pittsburgh, Pa.
111,092.—Machine for Sinking Screw Piles.—W. S. Smith and William Reuschel, Chicago, Ill.; said Reuschel assigns his right to said Smith.
111,093.—Edging Machine.—E. H. Stearns, Erie, Pa.
111,094.—Extension Scaffold.—Asel Sweet (assignor of one half his right to G. W. Grisholm), Westfield, Pa.
111,095.—Lubricator for Axles.—Henry Thurlow, Skaneateles, N. Y.
111,096.—Railroad Spike.—Henry Fostrick, New York city, and Reinhold Boeklen, Brooklyn, N. Y. Antedated Jan. 6, 1871.
111,097.—Manufacture of Ornamental Bars or Rods of Metal.—Stephen Tuddenham, Lower Marsh, Lambeth, England.
111,098.—Wagon Jack.—G. H. Tule (assignor to himself and Samuel Wood), Haddonfield N. J.
111.099.—Auger.—Blase Walch, Frederick, Md.
111,100.—Manufacture of Artificial Leather.—Frederick Walton, Staines, England.
111,101.—Planter and Cultivator.—A. Q. Withers, Holly Springs, Miss.

REISSUES.

4,232.—Horse Hay Rake.—N. M. Barnes, Tiffin, Ohio. Patent No. 105,542, July 19, 1870.
4,233.—Treadle for Sewing Machines.—J. A. Bradshaw, W. H. Brown, and Darius Whithed, Lowell, Mass.—Patent No. 92,786, dated July 20, 1869.
4,234.—Curtain or Shade Fixture.—William Campbell, New York city, assignor to Nathan Campbell.—Patent No. 44,602, dated October 11, 1864.
4,235.—Machine for Forming the Brims of Felt Hats.—W. A. Fenn, Rochester, N. Y.—Patent No. 17,033, dated April 14, 1857.
4.236.—Apparatus for Suspending Gas-oilers and Drop-Eights.—S. B. H. Vance (assignor to Mitchell, Vance & Co), New York city.—Patent No. 70,635, dated November 5, 1867.

DESIGNS.

4,567 to 4,584.—Dress Trimming.—John Cash and Joseph Cash, Coventry, England. Eighteen patents.
4,585.—Pump.—Leonard Egleston (assignor to Rumsey & Co.), Seneca Falls, N. Y.
4,586.—Show Case.—J. R. Gallegos, Havana, Cuba.
4,587.—Stem of a Tobacco Pipe.—John Watts (assignor to Harvey & Ford), Philadelphia, Pa.

TRADE MARKS.

135.—Cosmetics, Pomades, and Perfumeries.—Holbrook & Merrill, Boston, Mass.
136.—Worsted Goods.—Samuel McLean & Co, New York city.
137.—Gin.—I. D. Richards & Sons, Boston, Mass.
138.—Illuminating Oils.—J. D. Spang, Dayton, Ohio.
139.—Kerosene and Spirits of Turpentine.—Francis Spies, New York city.
140.—Boots and Shoes.—Elmer Townsend, Boston, Mass.
141.—Akron Cement.—The Union Akron Cement Co., Buffalo, N. Y.
142.—Whiskey.—H. Webster & Co., San Francisco, Cal.

EXTENSIONS.

Machinery for Weaving Shade Cord.—Thomas Nelson, of Troy, N. Y.—Letters Patent No. 16,248, dated Dec. 16, 1856.
Machine for Cutting Veneers from the Log.—J. H. Goodell, of Logansport, Ind.—Letters Patent No. 16,308, dated Dec. 23 1856.
Arrangement of Railroad Platform Scales.—S. G. Lewis, of Philadelphia, Pa., executor of Lea Pusey, deceased.—Letters Patent No. 16,286 dated October 28, 1856.
Horse Rake.—J. J. Squire, of De Soto, Mo.—Letters Patent No. 16,318, dated Dec. 16, 1856; reissue No. 3,303, dated Feb. 16, 1869.
Loom.—B. G. Dawley, of North Providence, R. I.—Letters Patent No. 16,306, dated Dec. 23, 1856.
Crib for Horses.—Henry Eddy, of North Bridgewater, Mass.—Letters Patent No. 16,357, dated Jan. 6, 1857; reissue No. 1,300, dated April 8, 1862.

Advertisements.

The value of the Scientific American *as an advertising medium cannot be over-estimated. Its circulation is ten times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading-rooms of the world. We invite the attention of those who wish to make their business known to the annexed rates. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. If it is worth 25 cents per line to advertise in a paper of three thousand circulation, it is worth $2.50 per line to advertise in one of thirty thousand.*

RATES OF ADVERTISING.

Back Page - - - - 1·00 a line,
Inside Page - - - 75 cents a line,
for each insertion.

Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

Receipts—When money is paid at the office for subscriptions, a receipt for it will be given; but when subscribers remit their money by mail, they may consider the arrival of the first paper a *bona-fide* acknowledgment of their funds.

City Subscribers.—The Scientific American will be delivered in every part of the city at \$3·50 a year. Single copies for sale at the News-stands in this city, Brooklyn, Jersey City, and Williamsburgh, and by most of the News Dealers in the United States.

Subscribers—Who wish to have their volumes bound, can send them to this office. The charge for binding is \$1·50 per volume. The amount should be remitted in advance, and the volumes will be sent as soon as they are bound.

Advertisements.

Advertisements will be admitted on this page at the rate of **\$1·00** *per line for each insertion. Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.*

HOME Insurance Company.

OF NEW YORK.

Office, No. 135 Broadway.

Cash Capital - - - - -	\$2,500,000 00
Assets, Jan. 1, 1871 - - -	4,578,008 02
Liabilities - - - - - - -	199,668 71

CHAS. J. MARTIN, President.
J. H. WASHBURN, Secretary.
New York, Jan. 10, 1871.

L. W. Pond---New Tools.

EXTRA HEAVY AND IMPROVED PATTERNS.

LATHES, PLANERS, DRILLS, of all sizes; Vertical Boring Mills, ten feet swing, and under; Milling Machines, Gear and Bolt Cutters; Hand Punches and Shears for Iron.
Office and Warerooms, 98 Liberty st., New York; Works at Worcester, Mass.
A. C. STEBBINS, New York, Agent.

SECOND-HAND ENGINES AND BOILERS for sale, 8 to 12 H. P. Address
C. A. DURFEY, Titusville, Pa.

WATER-PROOF
BUILDING PAPER

(No Tar), for Roofing, Sheathing, Ceilings, Oil-cloths, Shoe Stiffenings, Tags, Trunks, Cartridges, Blasting, Pass-book Covers, Grain and Flour Bins, etc., for sale by
HUNTER & POSTLEY,
Paper Warehouse, 59 Duane st., New York.

SAVE YOUR FUEL.

THE ORIGINAL L. B. TUPPER'S
Furnace Grate Bar.

Guaranteed to make from 5 to 10 lbs. more steam, with less fuel, than any other bar. Adapted to all kinds of fuel; no alteration of furnace required. Received Silver Medal at Cincinnati Industrial Exposition, 1870; Silver Medal at Worcester Co. Mechanics' Association, 1866; Medal and Diploma at American Institute Fair, 1870; Honorable Mention at Paris Exposition. Send for descriptive pamphlet.
L. B. TUPPER, 120 West st., New York.

Machinists' Tools.
NILES TOOL WORKS,

CINCINNATI, OHIO,

HAVE ON HAND ENGINE LATHES, 14, 18, 22, and 26 inches swing; IRON PLANERS, BORING and TURNING MILLS, GRAY'S PAT. UNIVERSAL RADIAL DRILLING MACHINES, CAR-WHEEL BORERS, AXLE LATHES, and other first-class Iron Working Machinery, at moderate prices.

CELEBRATED
25° TO 29° GALENA OILS.

ENGINE, CAR and MACHINERY OILS.
☞ Petroleum reduced to a desired gravity by Whale Oil admits of no superior as a lubricator. All oils warranted as represented. GALENA OIL WORKS, Franklin, Pa. Chas. Miller, Manager. R. H. Austin, Pres.

"Buckeye" Hominy Mill.

IN THE WORKING OF THIS MILL THE Corn requires no preparation except shelling. It has a regular feed and discharge, and needs but little attention. It is complete in itself. Hominy can be made from common as well as flint corn. It occupies very little room, and any miller can work it. There is nothing a miller can manufacture to a better profit than Hominy. Send for Circulars. BALTIMORE PEARL HOMINY CO., Baltimore, Md., Sole owners of Patent.

THE WOODWARD STEAM-PUMP MANUFACTURING COMPANY, Manufacturers of the Woodward Pat. Improved Safety Steam Pump and Fire Engine, Steam, Water, and Gas Fittings of all kinds. Also Dealers in Wrought-iron Pipe, Boiler Tubes, etc. Hotels, Churches, Factories, & Public Buildings heated by Steam, Low Pressure. Woodward Building, 76 and 78 Center st., cor. of Worth st. (formerly of 77 Beekman st., N. Y. All parties are hereby cautioned against infringing the Pat. Right of the above Pump. G. M. WOODWARD, Pres't.

Reynolds'

TURBINE WATER WHEELS.
The Oldest and Newest. All others, only imitations of each other in their strife after complications to confuse the public. We do not boast but quietly excel them all in staunch reliable, economical power. Beautiful pamphlet free. Geo. TALLCOT, 96 Liberty st., New York.
Gearing, Shafting.

BEST DAMPER REGULATOR for Steam Boiler. Send for Circulars. Agents Wanted. MURRILL & KEIZER, Baltimore, Md.

GRINDSTONES. FOUNDED IN 1810. J. E. MITCHELL, Philadelphia, Pa.

L. L. SMITH, 6 Howard st., New York.
Nickel Plater.

First Premium at the Fair of the American Institute, 1869. Licenses (under the Adams Patents), granted by the U. N. Co., 17 Warren st., New York.

Canadian Inventors,

Under the new Patent Law, can obtain patents on the same terms as citizens.
For full particulars address
MUNN & CO.,
37 Park Row, New York.

SCHLENKER'S PATENT
BOLT CUTTER
NEW INVENTION. ADDRESS,
HOWARD IRON WORKS, BUFFALO, N.Y.

PAT. SOLID EMERY WHEELS AND OIL STONES, for Brass and Iron Work, Saw Mills, and Edge Tools. Northampton Emery Wheel Co., Leeds, Mass.

McNAB & HARLAN, Manufacturers of Wrought Iron Pipe and Fittings, Brass Cocks, Valves, Gage Cocks, Whistles, Water Gages, and Oil Cups, Harlin's Patent Lubricator, Plumber's Brass Work, Getty's Patent Pipe Cutter, Getty's Patent Proving Pump and Gage. No. 86 John st., New York.

EMPLOYMENT.
\$250 A MONTH with Stencil Dies. Samples free. Address
S. M. SPENCER Brattleboro Vt.

THE
Tanite Emery Wheel.

Does not Glaze, Gum, Heat, or Smell. Address
THE TANITE CO.,
Stroudsburg, Monroe Co., Pa.

RUMPFF & LUTZ,

IMPORTERS and Manufacturers of Aniline Colors and Dyestuffs, Colors for Paperhangers and Stainers. Reliable recipes for Dyeing and Printing on Silk, Wool, and Cotton. All new improvements in the art of Dyeing, and new Colors are transmitted to us by our friends in Europe, as soon as they appear.
42 Beaver street, New York.

IRON PLANERS, ENGINE LATHES, Drills, and other Machinists' Tools, of superior quality, on hand, and finishing. For sale low. For Description and Price address NEW HAVEN MANUFACTURING CO New Haven, Conn.

FOR CIRCULAR OF TREMPER'S PATENT VARIABLE CUT-OFF, for high and low pressure Steam Engines, address
PUSEY, JONES & CO., Wilmington Delaware.

Trade-Mark Patents.

MUNN & CO. desire to call the attention of manufacturers and business men generally, to the importance of the law of patents, as applied to trade-marks for business purposes.

Any person, firm, or corporation, domiciled in the United States, or in any foreign country affording similar privileges to citizens of the United States, can obtain the right to the exclusive use, for thirty years, of any trade-mark, consisting of any new figure, or design, or any new word, or new combination of words, letters, or figures, upon their manufactures.

This protection extends to trade-marks already in use or any length of time, or about to be adopted.

Full information on this important subject can be obtained by addressing
MUNN & CO.
37 Park Row, New York.

HARD WOOD BOARDS
and Spanish Cedar

FOR CIGAR BOXES,
And a large and magnificent assortment of
VENEERS,

Comprising everything in their line, both Foreign and Domestic, to which they invite the special attention of all dealers. Send for Catalogue and Price List.
GEO. W. READ & CO.,
Factory { 291 Monroe st. } { 398 Madison st. } 168, 170, & 172 Center st., N.Y. city.

FOR CIRCULAR ILLUSTRATING A NEW and greatly improved TURBINE WHEEL, believed to be the best and cheapest in the market, apply to
PUSEY JONES & CO.,
Wilmington Delaware.

London.....................48 Cannon street.
H. KOHNSTAMM,
MANUFACTURER OF
ULTRAMARINE,

And Importer of English, French, and German Colors, Paints, and Artists' Materials, Bronzes, and Metals. No. 100 Chambers st. bet. Broadway and Church st., N. Y.

Newspaper Advertising.

A Book of 125 closely printed pages, lately issued, contains a list of the best American Advertising Mediums giving the names, circulations, and full particulars concerning the leading Daily and Weekly Political and Family Newspapers, together with all those having large circulations, published in the interest of Religion, Agriculture, Literature, etc., etc. Every Advertiser, and every person who contemplates becoming such, will find this book of great value. Mailed free to any address on receipt of 25c.
GEO. P. ROWELL & CO.,
Publishers, No. 40 Park Row, New York.
The Pittsburgh (Pa.) Leader, in its issue of May 29, 1870, says:
"The firm of G. P. Rowell & Co., which issues this interesting and valuable book, is the largest and best Advertising Agency in the United States, and we can cheerfully recommend it to the attention of those who desire to advertise their business scientifically and systematically in such a way: that is, so as to secure the largest amount of publicity for the least expenditure of money."

ENGINEERING, MANUFACTURING and BUILDING.—\$8.00 a year will procure the three best industrial journals in the country, viz: The Technologist, Van Nostrand's Engineering Magazine, and the Scientific American. For specimen copy (free) of The Technologist, containing Club Rates, address THE INDUSTRIAL PUBLICATION CO.,
176 Broadway, N. Y.

BUILDING PAPER

OF THREE GRADES.
SHEATHING BOARD.
For outside of Studding, under Clapboards. A non-conductor of cold, heat, and dampness.
PREPARED PLASTERING BOARD
a cheap and perfect substitute for lath and plaster; makes a smooth, substantial wall, at less than half the usual cost.
DOUBLE THICK ROOFING.
Made entirely of Wool Felt, a cheap and perfect article.
Sample and Circulars sent free, by
ROCK RIVER PAPER CO.,
Chicago; or,
B. E. HALE,
22 & 24 Frankfort street, N. Y.

DRILLS

DIAMOND POINTED
STEAM DRILLS.

FOR ALL KINDS OF ROCK DRILLING, Mining, Quarrying, Tunneling, Railroad Grading, Well Boring, Prospecting, etc. Fifty to Seventy-five per cent of cost and time of hand labor saved. "Test Cores," in form of solid cylinders of rock or mineral taken out of mines from any depth not exceeding one thousand feet, showing true value, stratification, etc. No percussion. Never require sharpening. FIRST PREMIUMS awarded in both American and Europe. Illustrated Circulars sent on application. Beware of infringements.
SEVERANCE & HOLT,
Proprietors and Manufacturers,
Office 16 Wall st., New York.

WIRE ROPE.

JOHN A. ROEBLING'S SONS,
MANUFACTURERS, TRENTON, N. J.

FOR Inclined Planes, Standing Ship Rigging, Bridges, Ferries, Stays, or Guys on Derricks & Cranes, Tiller Ropes, Sash Cords of Copper and Iron, Lightning Conductors of Copper. Special attention given to hoisting rope of all kinds for Mines and Elevators. Apply for circular, giving price and other information. Send for pamphlet on Transmission of Power by Wire Ropes. A large stock constantly on hand at New York Warehouse, No. 117 Liberty street.

American Saw Co., Manufacturers of

And Perforated Circular, Long, and Hand Saws. Also Solid Saws of all kinds. No. 1 Ferry st., cor. Gold street, New York. Branch Office for Pacific Coast, No. 606 Front street, San Francisco, Cal.

THE
Allen Engine Works,
THE ALLEN ENGINE.

Fourth avenue and 130th and 131st sts., New York city
Manufacturers of
Porter's Governor,
The Allen Boiler, and
Standard Straight Edges, Surface Plates, and Angle Plates.
Four first premiums were awarded to us at the Fair of the American Institute, 1870.
Send for our illustrated circular.

PATENT COLD ROLLED SHAFTING.

The fact that this Shafting has 75 per cent greater strength, a finer finish, and is truer to gage, than any other in use, renders it undoubtedly the most economical. We are also the sole manufacturers of the Celebrated Collins Pat. Coupling, and furnish Pulleys, Hangers, etc., of the most approved styles. Price Lists mailed on application to
JONES & LAUGHLINS,
120 Water street, Pittsburgh, Pa.
☞ Stocks of this Shafting in store and for sale by FULLER, DANA & FITZ, Boston, Mass.
GEO. PLACE & CO., 126 Chambers street, N. Y.

Patents on Designs.

Citizens and aliens can now secure design patents for three and a half, seven, and fourteen years. The law on this subject is very liberal. Foreigners, designers, and manufacturers, who send goods to this country, may secure patents here upon their new patterns, and thus prevent other makers from selling similar goods in this market.

These patents cover all novelties of form or configuration of articles of manufacture.

For further information address
MUNN & CO.,
No. 37 Park Row, New York.

SAW MILLS.

MORRISON & HARMS' IMPROVED MULEY Saw Hangings are the best in the world.
MORRISON & HARMS, Allegheny City, Pa.

A. S. & J. GEAR & CO., Boston, furnish every description of Wood and Iron Working Machinery and Supplies. The best in use, regardless of maker, at lowest possible rates.

No 716 CHEST. ST. PHILADELPHIA.
C. BENKERT AND SON
No 705 BROADWAY. N.Y.
BOOTS & SHOES

P. BLAISDELL & CO.,

BUILDERS OF A NEW PATTERN 12-in. Swing Lathe, designed for Sewing Machine Works, the "Blaisdell" Patent Drill Presses and other first-class Machinists' Tools Jackson street Worcester, Mass.

☞ T. V. Carpenter, Advertising Agent. Address hereafter, Box 773, New York city.

Harrison Safety Boiler.

First-class Medal, World's Fair, London, 1862.
And American Institute Fair, New York, 1869.
Over 1,000 Boilers in Use.

Weston's Patent Differential PULLEY BLOCKS.

75,000 IN USE.
Address
HARRISON BOILER WORKS,
Philadelphia, Pa.
or, JOHN A. COLEMAN, Agent,
110 Broadway, New York, and 139 Federal st., Boston.

DOYLE'S

PATENT DIFFERENTIAL
Pulley Blocks.

The celebrated **Doyle Blocks** have taken premiums over the differential Blocks of all other makers at every Fair where they have been exhibited at the same time. When you buy, see that the Blocks are marked J. J. DOYLE. Pat. Jan. 8, 1861. All others are infringements.
SAMUEL HALL'S SON & CO.,
SOLE MANUFACTURERS.
229 West 10th street, New York.

HEAVY CASTINGS For Forge and Mill Work. The M. & T. SAULT CO. Steam Engine Builders & Founders, New Haven, Conn.

Swain Turbine.

"Our Low-Water Wheel from this on"

WILL DO TEN PER CENT MORE WORK on small streams, in a dry season, than any wheel ever invented. Gave the best results, in every respect, at the Lowell Tests.
For Report of tests at Lowell, with Diagrams and Tables of Power, address
THE SWAIN TURBINE CO.,
North Chelmsford, Mass.

DOOLEY'S THE BEST YEAST POWDER
TRY IT, SOLD BY GROCERS

Prices Reduced.

LEFFEL'S DOUBLE TURBINE.—Best Water Wheel in Existence. Send for New Price List adopted June 1, 1870.
—Also, for large Wheel Book, for 1870 JUST OUT. Sent free by addressing the manufacturers.
JAMES LEFFEL & CO.,
Springfield, Ohio, and New Haven, Conn.

Working Models

And Experimental Machinery, Metal, or Wood, made to order, by J. F. WERNER 62 Center st. N.Y.

SELECTED Sperm Oil.—Warranted strictly Pure. For Sewing Machines and all fine machinery n bottles, cans, bbls., casks. W. F. Nye, New Bedford, Mass

WOOD'S HOUSEHOLD MAGAZINE contains in every number one complete prize story valued at \$100. Forty pages of other matter. Yearly \$1. Sold by news dealers at 10 cents per copy. Splendid Premiums. \$500 cash to be awarded for prize clubs. Specimen copy free. Address
S. S. WOOD, Newburgh, N. Y.

Scientific American For 1871.

TWENTY-SIXTH YEAR.

EVERY NUMBER is printed on fine paper, and elegantly illustrated with original engravings representing

New Inventions, Novelties in Mechanics Manufactures, Chemistry, Photography, Architecture, Agriculture, Engineering, Science, and Art.

Farmers, Mechanics, Inventors, Engineers, Chemists Manufacturers, and People of all Professions or Trades will find the

SCIENTIFIC AMERICAN

of great value and interest.

The Editors are assisted by many of the ablest American and European Writers, and having access to all the leading Scientific and Mechanical Journals of the world, the columns of the Scientific American are constantly enriched with the choicest Information.

An Official List of all the Patents Issued is published Weekly.

The Yearly Numbers of the Scientific American make two splendid Volumes of nearly One Thousand Pages equivalent in size to FOUR THOUSAND ordinary book pages.

SPECIMEN COPIES SENT FREE.

Terms—\$3·00 a year, \$1·50 half year; Clubs of Ten Copies for one year, at \$2·50 each, \$25·00,

With a SPLENDID PREMIUM to the person who forms the Club, consisting of a copy of the celebrated Steel Plate Engraving, "Men of Progress."

Address
MUNN & CO.,
Publishers of the Scientific American.
37 Park Row, New York.

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard sts. Philadelphia, and 59 Gold st. New York