

Place. We certainly cannot ask instruction of more reliable authority.

In his "Celestial Mechanics," in the chapter on the "Sources of Heat," he says:—"The mathematical expression for *work* done—that is to say, a measure of this work—is obtained by multiplying the height expressed in feet or other units by the number of pounds lifted to this height."

No *time* is mentioned, nor is it ever in speaking of the measure of work. Work cannot be done without occupying time, but the *measure* of work is as independent of time as is the equally indispensable length of shaft through which that work may have been done. When time is introduced, the expression becomes one of *power*.

The performance of Cornish, or pumping engines generally, is measured in units of work performed by a unit of coal. The unit of work is the foot-pound—that of coal, the bushel of 112 pounds. We say that the Cornish engine of East London has performed work amounting to more than a hundred millions of foot-pounds with a bushel of coals, saying nothing of the time occupied in doing that work, or the power exerted by the engine. Work is, therefore, measured independently of time, say the best authorities and common usage. R. K. T.

Providence, R. I., Sept. 10, 1865.

[The relation of ideas to sounds is arbitrary. The sense in which any word is to be employed is that in which it is generally used by the community speaking the language; and this is to be determined by the recognized authorities. The authorities for the meaning of technical terms are the masters of the science or art to which the terms belong. With this citation of Rankine and Mayer, in addition to Morin, we rest the discussion. It is a small and simple matter, and we have given up to it quite enough of our space.—Eds.]

#### Dipping a Razor in Hot Water.

MESSRS. EDITORS:—Having seen in your valuable paper the question asked, "Why does a razor cut better for being dipped in hot water?" I venture upon what seems to me to be a reasonable explanation.

That wonderful little instrument, the microscope, reveals to us the fact that the edges of all tools, instead of being perfectly smooth, are really toothed like a saw. Now when the razor is dipped in hot water, it causes these little teeth to expand, thereby rendering the distance between them smaller, and, consequently, giving the razor a smoother edge.

At first thought it might seem that the teeth would expand the same distance in every direction, thereby leaving the edge in exactly the same condition as it was before its "hot-water bath." But when we consider that the base of the tooth is thicker than the edge, the explanation is clear; for the former will expand in a greater degree than the latter, thus making the distance between the teeth small; or, in short, making a finer saw. We all know that the finer the work to be done, the finer must be the saw employed; hence, when we wish to saw off our whiskers (how few are conscious of doing such an act), we resort to the last means of sharpening the instrument—dipping it in hot water.

Is not this explanation the most reasonable that can be given? P. DuBois.

Philadelphia, Sept. 23, 1865.

[On placing a well-strapped razor under one of Smith & Beck's microscopes, with a lens of four-tenths focus, we find the edge—not indeed formed of fine teeth—but irregularly notched, and perhaps sufficiently so for our correspondent's explanation. In this case, as in all others, the first step should be to ascertain, by honest, careful and repeated comparison, whether there is any foundation in fact for the prevalent opinion. Does a razor cut any better for being dipped in hot water?—Eds.]

#### Eyesight.

MESSRS. EDITORS:—In your issue of 30th ult., a correspondent, "C.," advises people to rub their eyes in the manner stated, to prevent flattening of the eyeball. He says "the pupil becomes flattened," by which he betrays a want of correct knowledge on the subject. Like recommendations from unscientific men have been published frequently for many years past, and based upon an alleged habit of

John Quincy Adams—that of rubbing his eyes from without, inwardly, while washing. If the eyeball flattens with age, it occurs from a lessening of its contained fluids, or from other structural changes, which pressing of the ball with the finger has no tendency whatever to relieve. Eyes may be permanently injured by the practice, as all the delicate portions of the organ are strained and violently distorted each time. To preserve the sight, carefully avoid straining the eyes, use bright, steady lights, with good green shades over them, and, when necessary, use glasses of low-magnifying power. R. F. S.

#### The Vortex Question.

MESSRS. EDITORS:—Can you tell me the cause of the little whirlpool often noticed above an orifice from which water is escaping? Also, whether the commonly received idea, that the direction in which it turns is dependent on the rotation of the earth, is correct? I have made several observations on them, and find that, although they may be made to turn in either direction, if undisturbed they usually turn in the opposite direction from the hands of a watch, thus agreeing with theory. Still, I cannot understand how the rotary motion is kept up, even if it is once imparted to the water. E. C. P.  
Boston, Oct., 1865.

#### A Novel Joint Stock Company.

An English journal contains the announcement of a new "dodge" in the organization of a joint stock company. It appears that a number of gentlemen who are interested in the elevation of the working classes have commenced a company, called "The Clayton Forge Company," for the manufacture of boiler plates and bar iron, on the principle of dividing profits with the workmen and the customers. The scheme, shortly described, is as follows:—All profits up to 10 per cent will belong to the shareholders; all above 10 per cent, after providing for repairs and renewals of plant, is to be divided into three equal portions, the first of which will belong to the shareholders, the second to the workmen, and the third to the customers. The subdivisions among the workmen are to be in accordance with the wages earned by each, and the subdivisions among the customers according to their purchases. Thus the scheme says to the shareholders, "We hope to pay you something more than 10 per cent for your investments;" to the workmen it says, "You shall no longer have reason to complain that your employers get an undue share of the profits, for if they earn more than 10 per cent, you shall share it;" and to the customers it says, "Our best exertions shall be at your service, and you shall not pay too much for your iron, for if we earn more than 10 per cent, you shall have a share of the excess as extra discount." Messrs. Briggs, the colliery proprietors of Normanton, have already tried the division of profits among the workmen with good effect, and there is every reason to believe that the principle will spread not only in that but in other employments. The division among the customers is a new idea, and is of course intended to secure orders in all states of trade, and we hope and believe will be found to answer the purposes of the promoters.

It will be observed that 10 per cent clear first goes to the concern. Then, and not till then, a fund is struck off for renewals and repairs—which would amount, at least, to 5 per cent, which ought to be charged before profits are estimated. Then a third of the subsequent profits each—first, to shareholders; second, to workmen; third, to customers; but to what do these divisions of profit really amount? extra wages and extra discount—that is, a higher rate of wages and lower rate of prices to insure workmen and customers. If not these, the scheme is fallacious—but if these, why not carry on the business plainly and directly upon that system without the mystification of shares to retain workmen or customers?

#### The Great Mont Cenis Tunnel.

I am in a position to send you some recent special information with respect to this important work. On the Italian side, the average daily advance was 6 feet 6 inches in the first half of 1863; and in the second half of that year 4 feet 7 inches. In the first quarter of 1864, the average daily advance was 4 feet 6

inches; in the second quarter, 5 feet 2 inches; in the third quarter, 6 feet 4 inches; in the fourth quarter, 6 feet 7 inches; in the first quarter of 1865, 7 feet, and in the second quarter, 6 feet, 10½ inches. In 1863 the average daily advance at the French side was 3 feet 10½ inches; in the first quarter of 1864, 4 feet 0½ inch; in the second quarter, 3 feet 9 inches; in the third quarter, 4 feet 5 inches; in the fourth quarter, 4 feet 9 inches; in the first quarter of 1865, 5 feet 6 inches; and in the second quarter, 7 feet 1 inch. At the close of June a total distance of 16,012 feet had been pierced, and by January, 1870, the whole tunnel is expected—if no unforeseen difficulties arise—to be carried out.—Correspondent of the London Engineer.

#### A Poisonous Tomato Worm.

The Port Byron (N. Y.) *Times* says that several persons near Auburn have recently been fatally stung by a large worm that infested tomato vines, death ensuing within a few hours. A lady in Port Byron discovered one of these monsters on her tomato vines one day last week, and narrowly escaped being stung. The worm is described as about three inches long, of a green color, and armed with claws and nippers, with a black horn protruding in front some three-fourths of an inch long. A writer in the Rochester *Express* states that a few days since he took one of these worms from his tomato vines, and confined it about a week in a glass jar, awaiting its change into the chrysalis state. Upon being released it burrowed its way into the ground nearly a foot, or as far as the thread by which it was held would permit. Under the impression that it might resurrect itself another season in the milder form, and become the parent of a numerous and destructive progeny, it was killed.

#### Early Radishes.

A writer in Galignani's *Messenger* states that radishes may be grown in a very few days by the following method:—

Let some good radish seed soak in water for twenty-four hours, then put them in a bag and expose it to the sun. In the course of the day germination will commence. The seed must then be sown in a well manured hot bed, and watered from time to time with lukewarm water. By this treatment they will, in a very short time, acquire a sufficient bulk, and be good to eat. If it be required to get good radishes in winter during the severe cold, an old cask should be sawed in two, and one half of it filled with good earth. The radish seed beginning to shoot as before, must be sown in it, and the other half of the barrel put on the top of the full one, and then placed in the cellar. For watering, lukewarm water should be used as before. In the course of a few days the radishes will be fit to eat.

#### SPECIAL NOTICES.

William Alford and John D. Spear, Philadelphia, Pa., have petitioned for the extension of a patent granted to them on the 13th day of May, 1852, for an improvement in iron safes.

Parties wishing to oppose the above extension must appear and show cause on the 30th day of April next, at 12 o'clock, M., when the petition will be heard.

Rebecca C. Wheeler, administratrix of the estate of Thomas B. Wheeler, deceased, of Albany, N. Y., has petitioned for the extension of a patent granted to him on the 16th day of December, 1851, for an improvement in grain sieves.

Parties wishing to oppose the above extension must appear and show cause on the 27th day of November next, at 12 o'clock, M., when the petition will be heard.

A SMALL lead shot weighing .072 gramme was found to cause 192 times its own volume of air to penetrate beneath the surface of water by being thrown into it from a height of 1½ feet at an angle of 60 degrees.

THE refuse of horn used in the manufacture of combs is used in the manufacture of prussiate of potash, and from the waste in this process is obtained the delicate pineapple flavor used by confectioners.

A SOLAR eclipse will take place on Thursday, the 19th inst. Prepare your smoked glass.

**Improved Hilling Plow.**

Those persons who have, early or late in life, been obliged to bend their backs over a hoe, know what fatiguing work it is, and how it tires every muscle in the body. Those who are *not* obliged to do it themselves, but have to pay others for it, know what an expensive and unsatisfactory piece of business is sometimes made of it. The ends of the rows, where the eye of the farmer naturally falls, are fair to view, but in the middle the slothful laborer has made a beggarly account of his time. The plow here illustrated is designed to expedite the labor and make it more thorough. The patentees say of it:—

"Being practical farmers ourselves, we think all will agree with us in saying that improvement in double mold-board plows has been very much needed. In this plow, which we have spared neither time, labor nor expense to perfect, and which is adapted to every kind of soil in which cast-iron plows are used, we have succeeded beyond our most ardent expectations. It will run as deep as may be desired without any extra exertion in holding; it holds easy and runs steady, and is not liable to clog; it will work different widths of rows by using it either with or without the long or short wings, A and B, thus making a large or small hill, as may be desired. It will allow a portion of the loose soil, and also lumps and stone, instead of being thrown upon the plants, to fall in the center of the furrow, leaving the ground perfectly loose and mellow between the rows, which is very necessary to allow the fibrous roots of plants, and especially of corn, to penetrate from one row to the other; and, also, very important in a drouth, as it allows the moisture to be absorbed more readily during the night. By using the plow with the center piece in it will prevent any soil from falling in the center of the furrow, and leaves the bottom clean and smooth, very suitable for ridging, surface draining, or for nursery purposes.

"In sections of country where quack grass is to be overcome, the guard colter, D, is used. The center piece, the wings and guard colter are held firmly in their places by means of wooden wedges behind. The wings are taken off, as required, and the others substituted, the lines, *a*, showing the place where they fit.

"By using this plow in the cultivation of the potato, hand-hoeing can be entirely dispensed with; this is no experiment, but an established method, which has been very successfully pursued by farmers, who prefer this way of working their potatoes to any other, believing that a better crop can thus be realized, and with less labor than by other management.

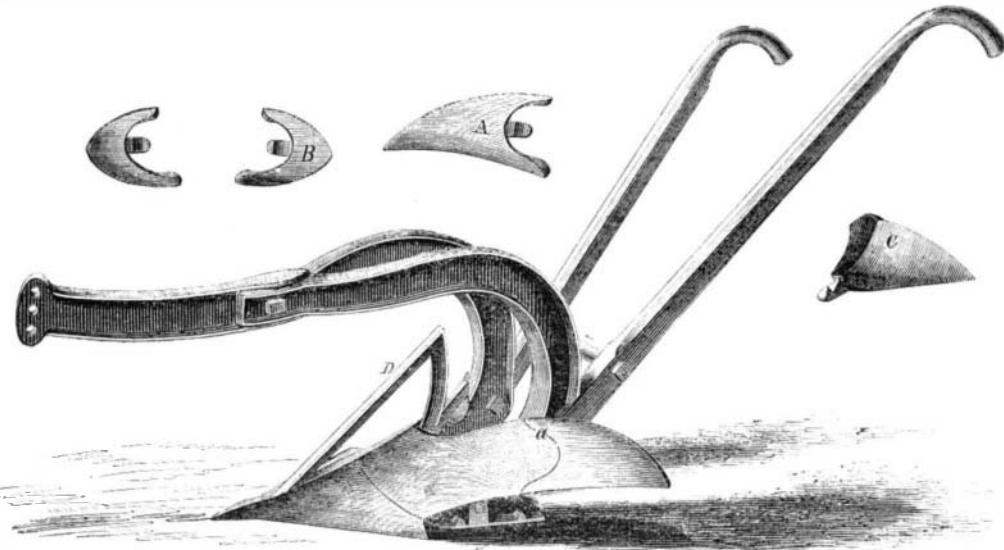
"After the ground is plowed and thoroughly harrowed, let the furrows be made deep and at equal distances apart; when the potatoes first make their appearance, or when they are one or two inches high, use this plow, arranged wide enough, and, if necessary, with the center piece or guard colter in, to bury the potatoes entirely under by passing once between the rows; then, with the harrow, drag over the same way (no danger of injuring the potatoes), which will leave the ground freshly plowed and harrowed. Very soon the potatoes will again make their appearance, free from grass, and with as much ground on the hill as is necessary, after which they may be cross-plowed with this plow as often as desirable.

"For a great variety of work, and thoroughness in it, we assert this plow stands pre eminent. It has been awarded the highest premium at every county fair at which it has been exhibited, and elicited the highest encomiums from the farmers present."

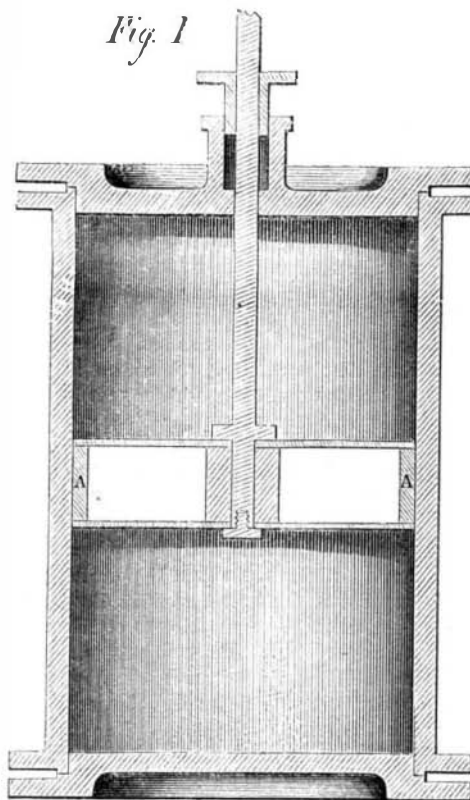
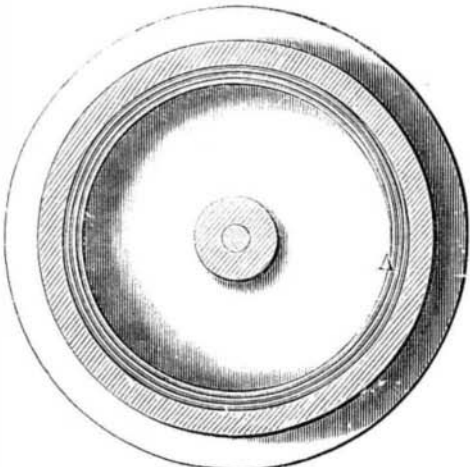
It was patented by Messrs. A. C. & R. L. Betts, of Troy, N. Y., May 17, 1864, to whom all communications in regard to town, county or state rights should be addressed.

**KENDALL'S PISTON PACKING.**

The engraving represents a plan for packing pistons to render them steam or water-tight. Instead of the usual metallic rings, the inventor provides a brass spring coiled in continuous circles and inserts

**BETTS'S HILLING PLOW.**

it between the heads or flanges of the piston, as clearly shown in the engraving. It is claimed that this method of packing a steam piston is cheaper,

**Fig. 2**

more expeditions and less liable to get out of order than that generally used, and that it requires no attention after it is put in until it is worn out.

The invention was patented through the Scientific

American Patent Agency on July 11, 1865, by Edwin Kendall, of New Lebanon, N. Y. For further information address him at that place. It is on exhibition at the Fair of the American Institute.

**Rifle Trial.**

A very interesting trial of rifled arms for one of our colonial governments took place at the Rifle Range, Woolwich Arsenal, on the 7th September, in the presence of Major Parley, R. E., the Military Commissioner for the colony, and other officers. The rifles, which were selected by chance out of 1,000 arms, were in pattern precisely similar to that known as the "oval-bore sapper rifle," except that the mountings are of iron instead of brass, and the caliber of the minor axis is .565 to suit the .550 ammunition; ratio of spiral, one turn in 36 in. The range chosen was 1,000 yards. Each rifle

was fitted into the machine rest and fired without altering the elevation or direction of the rest. Diagrams of twenty shots with each rifle were taken. These diagrams, which we have inspected, are really so extraordinary that we have great pleasure in giving to them the publicity they deserve. The rifles were "Lancasters," oval-bore, the bore being .565, quantity of powder  $2\frac{1}{2}$  drams, R. F. G. The bullets were .55 boxwood plug, and the lubrication wax. The cartridges were rolled one cut outside, and the rifles were fired from a fixed rest. The hits made were 20, the misses 0, with each rifle; total, 100 rounds, the range being 1,000 yards. The deviations were as follows:—No. 1 rifle, mean absolute deviation 30.35 inches; No. 2 rifle, 28.35 inches; No. 3 rifle, 33.15 inches; No. 4 rifle, 26 inches, and No. 5 rifle gave a mean absolute deviation of 30.5 inches.—*London Mechanics' Magazine.*

**NEW BOOKS AND PUBLICATIONS.**

**THE CADET ENGINEER.**—This is an unpretending volume of 165 pages, treating of simple matters in engineering likely to be useful to neophytes or young engineers. It is illustrated with drawings of different details of marine engines and one or two examples of boilers. If we were to criticise any portion of this work it would be that which speaks of boilers. Generally speaking young engineers know (or think they do, which is perhaps the same thing) all about engines, while the boilers are something to put coal in. Of the benefit to be derived from the proper proportions; of the faults to be avoided in design; of the amount of fire surface per inch of cylinder and foot of stroke, much may be said, and we should have been glad to have seen some discussion of these things. It is well to make the calculations examples in simple arithmetic, for it renders the book more useful to those who have never pursued the higher branches of mathematics. Published by J. B. Lippincott, Philadelphia, Pa.

**RAYS OF SUNLIGHT FROM SOUTH AMERICA.**—This is a volume of 70 large photographs, representing places of resort, sites, public buildings, monuments, tombs, etc., in the city of Lima, with a number of panoramic views of the guano fields in the Chincha Islands. The book forms a magnificent collection of South American views never before published. Philip & Solomons, publishers, Washington, D. C. Baragwanath & Van Wisker, agents, No. 200 Broadway (up stairs), New York.

**ELECTRICITY** is distributed on the surface only of bodies; the conducting power of a wire or ribbon, however, is not in proportion to its surface but to its size—to the area of its cross section.

Don't stand near a rope under heavy strain; a man was recently killed in Connecticut by the breaking of a steamboat's hawser—the loose end flying over and striking him with great violence.