will allow of a slip of 16 per cent, which is considered ample for vessels having the lines, etc., of those under remark.

The engines, owing to their strength of detail, will be capable of working much beyond the speed mentioned with safety, should the boiler power be sufficient to allow of it. It should not be expected that a man-of war, which is necessarily of a fuller model than a clipper-built merchant steamer, and which, in addition to its large crew, with their provisions, etc., for many months, is obliged to carry a heavy battery, with ammunition, etc, can be propelled with the same economy of fuel as its rival in the merchant marine. But it cannot be denied that the sloops-of-war, which are the subject of these notes, will, when completed, compare favorably with any vessels of their class in the world. ENGINEER.

September 25, 1865.

[These engines are not of the class usually known as "back acting." They are direct acting horizontal engines, precisely similar to those used in factories every day.—EDS.

Correspondence

Steam in Long Pipes.

MESSRS. EDITORS:—In your paper of July 29th, in answer to a question from Mr. John C. Gardiner, in regard to length of steam pipes, you stated the case of the Gould and Curry Mine. Having been at that time the chief engineer and projector of the works in question, I will give you some facts.

The mine was worked through three tunnels—upper, middle and lower—with a respective difference in their levels of about 225 feet each. In consequence of a very heavy winter and the softening of the hanging wall of the mine, it became evident that the mine would cave or fall in; therefore it became necessary to project some other works which would secure the yield of the mine at a lower depth, outside or below the "cave." There was no shaft from the surface, so that there had to be put up temporary works in some secure part of the mine until a shaft could be put down from the surface. I then carefully considered the troubles arising from putting a boiler in the mine; and, on the other hand, the ease with which a steam pipe could be carried there from a boiler on the surface. In fact I had no other recourse as, if I put a boiler in the mine, I would have to use part of the old workings for a smoke-stack, but as that was going to "cave," I would then have had no smoke-stack at all, so I resolved to carry the steam 1,300 feet, which was the shortest available distance to the surface. I had no data to work on other than the knowledge that, in some coal mines in the north of England, they have carried steam six or seven hundred feet for accessory work, from lower levels than the main pumping level. It was "Hobson's choice" with me; but I was fully aware that I staked my reputation in the experiment.

The boiler was of the common Mississippi style—two flues of 42 inches diameter 26 feet long, and two flues 14 inches diameter, having also steam and mud drums. The steam was taken from the steam drum and passed through a superheater under the boiler—the same firing answering for both—and thence through a 4 inch gas pipe down an air shaft to the lower tunnel, where I had fixed an expansion joint and also an accumulator; this was a small boiler, 30 inches diameter and 5 feet long—its object being to catch water in case the boiler should foam, or to drain the pipe beyond. As the pipe raised gradually from this accumulator to the engine, with the grade of the tunnel, it was in just the right place. The length of the steam pipe in the air shaft was 201 feet. From the accumulator the pipe ran alongside of the tunnel, to a branch tunnel, to the engine room—600 feet long—in the branch tunnel—500 feet long—and up a slight incline to engine room, 40 feet more—making, in all, a steam pipe of 1,341 feet in length In the engine room was placed another accumulator, the same as the one at the bottom of the air shaft, but set on its end—the steam going in at its middle and out to the engine at the top. The object of this one was to catch whatever water might be carried with the steam, also scale from the iron pipes, and to form a kind of reservoir for steam; as the engine had a variable cut-off on, it acted as such to a considerable extent. On each of the accumulators, was placed one of Furman's steam and water traps, also a gage to note pressure.

The engine was made at the Vulcan Iron Works in San Francisco, and was a horizontal cylinder of 14 inches bore, 30 inches stroke, and was used cutting off at half stroke. It hoisted a bucket for sinking purposes, holding one tun of rock, in one shaft 200 feet deep; in another shaft a cage, with car and load weighing 3,000 pounds. The speed of hoist was 400 feet per minute; it also worked a pump of 8-inch bore, 4-feet stroke, with its machinery in the third shaft. The amount of water was not much—about half the capacity of pump, as the pump was going sucking about half the time. The trips of hoisting were made about every ten minutes, respectively—sometimes both were hoisting together. The hoisting apparatus was of the friction variety—the same as generally used in these mines; in all I think the engine had to do about 35 horse-power of work.

The steam pipe was 4-inch gas pipe screwed together with flanges at intervals of 100 feet For convenience of repairs, in every 400 feet there was an expansion joint. The pipe was anchored to the side of the tunnel in the middle of that distance, so that it expanded both ways from that point. The casing of the pipe was of wood, made of two by 12-inch plank—making a box of eight inches square inside, in the center of which rested the pipe on saddle pieces, the balance of space being filled with common wood ashes. The expansion of the pipe was very nearly two inches per 100 feet, from 60° to temperature of the steam at 80 pounds pressure. [325°, Eds., SCI AM.] The difference in pressure at the boiler from that at the engine, could not be detected; I changed the gages (Ashcroft's) from the boiler to the engine, but no difference could be found I even made two gages of gas pipe, half-inch, of common siphon shape, and filled them with mercury. I made them long enough to suit our working pressure, and still no difference in pressure between boiler and engine. I also made experiments without the superheater, and found no difference in pressures. The only loss was an increase in the amount of water trapped off from the pipes. The loss would then be one cubic foot per hour trapped off; with the superheater the loss was one third of a cubic foot per hour. The amounts trapped off were accurately kept; these figures are the average, and not the result of any one hour, although it never varied much from what is given. When the flow of steam through the pipes was rapid it was less; when slow, greater.

The fuel was common pine wood, using from three and a half to four cords per twenty-four hours—which will compare with any engine having short steam pipe and doing the same amount of work with the same kind of fuel. The engine ran in the mine over one gear, during which time I made numerous experiments with it. It is now out of the mine, as they have no use for it in there. It was a complete success, as it did more than was ever expected of it, and enabled the company to declare dividends during the "caved" condition of their mine

In conclusion, I would state that, as far as my experiments went, I see no end to the distance to which steam can be carried—it being merely regulated, more by the amount of condensation than by difference of pressure. I would not hesitate to carry it one mile, if I could cover the pipe well—that being the great point to be looked after.

ROBT. G. CARLYLE.

Virginia, Nev. Ter., Sept. 1, 1865.

Galvanizing Cast Iron.

MESSRS. EDITORS:—At some time during the past year I have read a series of interesting articles upon galvanizing iron, in your paper, but I have not seen any method or process which will apply to common cast iron. I find no difficulty with wrought or malleable iron, but the process which succeeds with these fails with common cast iron—the zinc or tin will not adhere. I have used first a bath of dilute sulphuric acid, after cleaning a bath of muriate of zinc; then immersed in the tin or zinc. This process fails, as above stated. Knowing you to be interested in all that pertains to the arts, I take the liberty to inquire what is the common process in use, or best process for galvanizing cast iron. E. D.

South Dedham, Mass, Sept. 18, 1865.

[We have made repeated efforts to obtain this information, but without success; and we print the inquiry in hopes that some of our correspondents may be able to send the directions required.—EDS.

Wire Bolting Cloth.

MESSRS. EDITORS:—For the information of G. W. Waskey and others, I place at your disposal my experience in the use of wire cloth instead of silk for bolting. In 1860 I purchased one of D. C. Anderson's atmospheric wire bolts, and put it in operation immediately, and have been using it constantly up to the present time. Its dimensions are as follows:—Length of cylinder, 6 feet; diameter, 20 inches; one-third is covered with No. 64; one-third, No. 74, and the remaining one third with coarser iron wire. Bolting chest and frame for gearing, all occupy a space 9 feet long, 3 feet wide, and 6 feet high. I bolt 10 to 15 bushels per hour, make a No. 1 article of flour, clean the bran, middlings and shorts in good order, use no cooler or conveyer, and give every man his own grain to within one peck—something that cannot be done where it has to pass through 30 or 40 feet of reel and over the same amount of conveyer. Wire, as a material for separating flour from bran is not known or not appreciated, or I think it would supersede silk cloth altogether. I have been in the milling business for twenty years, and have found nothing to answer the purpose for bolting so well for the same amount of money as the bolt described above.

I first used Nos. 74 and 84, and found them too fine for all kinds of grain; 60 and 70 are fine enough for any cloth for ordinary business.

B. A. HAYCOCK.

Richland, Iowa, Sept. 3, 1865.

Suggestion for a Cast-iron Statue.

MESSRS. EDITORS:—Do you know of any iron foundery where they make a casting to resemble a soldier standing "In place, Rest!" that is, the butt of the gun on the ground, one foot on the alignment, and the hands folded in front? I think such a design would be very appropriate for the top of a soldier's monument. There are foundries which cast figures to resemble animals, and I should think such a design would pay for the trouble. A. R. B.

Cherry Valley, N. Y., Sept. 28, 1865.

Shooting a Candle Through a Board.

MESSRS. EDITORS:—It is a well-known fact that a candle can be shot through a board; now if the board could be impelled against the candle with a velocity equal to that of the candle when shot from a gun, so that the relations of the two should be the same as in the first instance, at the moment of contact, what would be the result? J. W. P.

New York, Oct. 2, 1865.

[Doubtless the candle would be smashed.—EDS.

The Definition of Work.

MESSRS. EDITORS:—Mr. Nystrom seems extremely anxious to convince some one of the correctness of his peculiar definition of the mechanical term "Work." After an unsuccessful attempt against the *savans* of the country in the *Journal of the Franklin Institute*, he now tries, through the columns of the SCIENTIFIC AMERICAN, to urge his confusing ideas upon your readers. Permit me to offer a correction to any who has taken Mr. Nystrom's dose. As the definition is one in mechanical *science*, we will ask it of men of universally acknowledged pre-eminence in the scientific world. Prof. W. J. M. Rankine, probably, now stands first in his specialty—mechanical science. In his work on "Prime Movers" I find that "the action of a machine is measured, or expressed, as a definite quantity, by multiplying the motion which it produces into the resistance—or force directly opposed to that motion—which it overcomes; the product resulting from this multiplication being called 'work.'"

The high scientific attainments of Dr. J. R. Mayer have won for him the respect and admiration of the first scientific men of our age, and his wonderful success in ascertaining the mechanical equivalent of heat by mathematical investigation has won for him a place in history by the side of Newton and La

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 hight expressed in feet or other units by the number of pounds lifted to this hight."

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 6¾ 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 begining 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 18th 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 hight 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.