ers are working below the market, a strike by them would be certain of success.

The reason why the fifteen hundred car drivers of this city lost their situations by their strike, instead of getting increased wages, was, that there were plenty of other men able and willing to fill their places at the old wages—in other words, they were getting the market rates for their particular kind of service.

We may denounce the natural laws of supply and demand, if we have a fancy for empoying our tongues or pens in that way, but the power of these laws is irresistible—like death, they are something that we must all yield to. Whether a strike for higher wages will succeed or not, depends wholly upon the fact whether the wages being paid at the time are or are not below the market.

THE DECIMAL SYSTEM OF WEIGHTS AND MEASURES.

On the 17th inst., the House of Representatives passed laws which legalize the use of the metrical or decimal system of weights and measures in the United States. The important movement met with no opposition, and it is probable that within a few days the action of the House will be confirmed by the Senate, when the metrical system will become the law of the land. In the beginning the use of the system is not to be compulsory but optional with the people. As soon, however, as it becomes well enough understood, it will entirely supersede the present system. In order to make the system familiar to the people it is proposed to issue one or more new coins which shall represent some weight in grams and measure in a simple fraction of the meter. The post offices are also to be supplied with gram weights, and mailable matter is to be estimated in grams, and a set of standards of the new weights and measures are to be supplied to each of the State capitals. It will be remembered that in the new system all weights and measures are deduced from a single unit, the meter, which is nearly equivalent to the ordinary yard.

WAGES IN PITTSBURG.

The matter of wages is an interesting one. The merchant turns quickly to the markets in the morning paper to see how he stands, and to know what the ruling prices are, and we are sure that our readers will be glad to know the state of the market that regulates their affairs. According to the *Mining and Manufacturing Journal*, published in Pittsburg, the following rates are those now paid to some trades:—Puddlers, $8 per tun; bar rollers, $3 25; bar heaters, $1 25; plate rollers, per day, $7 50; plate heaters, $6; guide rollers, $4 75 per day; sheet rollers, $11; laborers, $2—an average increase of 10·54 per cent over the rates of 1865. Glass blowers are paid highly, it would seem. Vial blowers receive $55 per week, and window-glass blowers $63 per week—their wages have increased 33·23 per cent in one year. At that time the average rate of good workmen (of all trades, we presume) was $2 50 per day—it is now $3 50. Apprentices receive $5 per week. The wages of first-class machinists have advanced 10 per cent in one year.

NEW PUBLICATIONS.

BRASS AND IRON FOUNDING.—D. Van Nostrand, 192 Broadway, New York.

Every person whose interests are in any way connected with the manufacturing arts, must have felt the want of such a work as this. One man cannot carry all the minute details of a trade in his head, and if he does not have recourse to books for the information he needs he will obtain it from friends. We have had many and frequent inquiries from our readers for recipes like those contained in this book, and we hope they will avail themselves of it. Many who are experimenters, with a view to improve certain parts of machines, others who are merely amateurs, and dabble in metallurgy from a pure love of it, will find in this work full details as to the method of procedure in all cases.

Besides the usual formulæ for the compositions of zinc, tin and copper, and other metals used in common work, the author introduces some instructions and recipes, not generally known, as to molling, facing, and similar processes. We extract one recipe which will be useful to many:—

TO CAST IN BREAD PASTE.—Take the inside of fresh bread, and work it up well with vermilion—the longer the better, until it becomes viscid and tough. It is then to be worked well into the mold. After having obtained the mold, it must be fastened down upon a piece of wood, by wetting it so as to prevent it from warping as it dries. After it has been thoroughly dried you may oil it, and then obtain as many casts as you please from it, in plaster, wax or sulphur.

By means of bread paste a traveler may always take a model of any small object of interest he meets with on his journey; and thus a proper knowledge of its mode of use becomes invaluable. Scrolls, ruins of tombs and temples, etc., have often thus been copied and brought home at a trifling cost.

The author is Mr. Jas. Lakin, at one time foreman of the brass foundery in Messrs. Reanie & Neafie's works, Philadelphia, Pa., which is a guarantee for the practical value of the book.

NOVELTIES IN INVENTION.

One day, two years ago, we walked through the outer office of our premises, adjoining the editorial rooms, and saw an interested group about a novel affair. On closer inspection this novelty proved to be a doll that walked. In its body was a train of gearing that through the intervention of eccentrics lifted the feet and propelled the little mockery across the floor. This proved a great success as an invention, and thousands of them were sold.

Soon after this a man brought in a figure of a Sambo suspended by a wire proceeding from his back, and put together, as to his limbs, with great freedom. The feet of Sambo rested on a spring board. When this was played upon by nimble fingers the image danced in a most natural and life-like manner; the heels and toes kept time and raked down "Ole Virginny" in the most approved manner.

This also was a good thing from a pecuniary point of view. Wherever one went the face of Sambo met the eye, with his everlasting grin, and hat like a wash basin crowning the summit of his uninteresting countenance.

Again our attention is requested to another novelty. This time to no black dancing dervish; to no handfull of flowers and lace, but to a cock that crows in the morning, or at eve, when you blow in his tail. The streets resound with the noise of Chanticleer, and one is constantly reminded of that mighty feathered warrior—the bantam—who almost splits his throat in attempts to out do the Shanghai.

This new toy is a little affair, made out of tin, not larger than half a dollar. By a little practice one is able to imitate the crowing of a cock very accurately, and if we may judge by the quantity in the hands of the juveniles, the invention is likely to prove a success.

And all this introduction brings us to the point: There are no inventions which are more successful than those which afford amusement. People like to be tickled, and they flock by thousands to the circus, the theater and the comic lectures, where hundreds go to hear "the weightier matters of the law" expounded. So it is with novelties in the way of invention. A new toy for children sells quickly, and turns into money as rapidly as anything we know of. As the holidays approach we find great activity prevailing in this branch of the Patent Office.

BAIRD'S SIMPLIFICATION OF THE SCREW ENGINE.

In a report to the Secretary of the Navy, dated Nov. 28, 1864, Mr. Isherwood stated that in the machinery designed by him for the navy, "the governing principles have been fairness of parts; strict connections without articulations; simplicity of combination, with such arrangement of the essential organs as to admit of easy access and constant observations; great extent of wearing surfaces in guides, journals, etc., and a strength of parts insuring against fracture from bad materials, workmanship, bad management, and the greatest possible abnormal strains." If we add to these "governing principles" the Isherwood point of cut-off, viz., seven-tenths of the stroke of the piston, we have reduced to a short and convenient rule, for practical men, the results of six years of continued coal-burning experiments. It is very remarkable that the contents of two quarto volumes (compiled at an expense of thousands of dollars of the public money) can be thus clearly condensed into practical shape. Notwithstanding the fact that Mr. Isherwood's "governing principles" are so plain, and have been so completely demonstrated by the extraordinary economy (in some of the screw engines, a horse-power is actually attained with five lbs. per hour per horse-power) and the wonderful speed of screw steamers fitted with his engines, marine engineers refuse to be convinced, and still plod along in the beaten track. No doubt this is caused by that absurd professional jealousy which, unfortunately, exists more or less in all professions; but we are happy to be enabled to chronicle one exception at least to this rule. The eminent engineer, Mr. John Baird, the constructor of the machinery of the U. S. S. *Quinsigamond* and class, appears to have been guided, in planning this machinery, by Mr. Isherwood's teachings in relation to screw-engine construction. In the *Quinsigamond* engines, the bold conceptions of our steam Galileo have been carried into practice by Mr. Baird, the most celebrated constructing engineer of the time, who, on account of the tastefulness of his planning, has been appropriately called the Michael Angelo of steam engineering. Having shown why it is that these engines are regarded with so much interest by the profession, no apology is necessary for what follows.

The *Quinsigamond* is fitted with two independent propellers, each actuated by a pair of engines attached to a right-angled crank shaft, the cylinders of the port propeller are placed on the starboard side, and *vice versa*. They are spread apart sufficiently fore and aft to allow the cast-iron framing, which carries the main bearings of one engine, to be placed between them. This frame for the other engines is, of course, placed on one side, forward, and on the other, abaft, of the two cylinders. Bolted directly to the head of each cylinder are two condensers, with openings cast in them, through which passes the main shaft of the next engine on the opposite side; they also support the main cross-head guide. As the two cross heads are placed between the two condensers, with the ample space of some 20 inches of space between them, the upper guide bar partially covering the opening, they are of course very easy of access.

As there are four cylinders, there are of course eight condensers. This arrangement not only simplifies the machine, but at the same time it adds to its economic performance; for if a good vacuum can be obtained with one condenser, a better one can be obtained with two. Further, if one is fractured by a shot, or otherwise injured, another remains, which, no doubt, has sufficient capacity to perform double duty. If each condenser has, as usual, a bilge, as well as a sea injection, there will be no less than sixteen injection cocks or valves; this is of no importance, for by suitably arranged levers and bell cranks, three or four men can work the whole of them.

The condensers are of the ordinary jet variety. Surface condensers were not adopted, probably, because the cylinders are so proportioned relatively with the boilers that between 40 and 50 lbs. pressure must be carried in order to work off the steam. Surface condensation would no doubt add to the formation of scale; which experience has shown increases in a far higher ratio than the pressure.

In order to add as much as possible to the simplicity, durability, and reliability of the engines, as well as to insure a perfect vacuum, each condenser is fitted with two air pumps, or sixteen in all. Every one will perceive that these sixteen air pumps add greatly to the reliability of the engines, for if one is disabled, there will be fifteen left; if two, there will be fourteen, and so on. Some "uncanny" person may urge as an objection to such a number of air pumps, that it involves additional cost in the construction, and an unnecessary complication of parts, but even a cursory examination will refute this absurd idea. These pumps are operated by means of horizontal rock shafts, which obtain their motion from the main cross heads. By this arrangement, only sixteen pump levers and eight levers for the cross-head links, with their necessary connecting links, are required; thus there will be but 32 links, with 64 journals, for connecting the pump cross heads with their rock-shaft levers, and for connecting the main cross heads with the horizontal rock-shaft levers, but 16 links more, with 32 other journals, are necessary. The journals of the horizontal rock shafts (which are supported by a neat and elegant frame

work of wrought iron) are obviously not worth mentioning. The whole of this single air pump gear is so arranged as to admit of "easy access and constant observations," and the "simplicity of combination" is apparent. Each engine is fitted with 3 feed or bilge pumps, or only 12 in all, which are actuated by suitable rock shafts. These, through a dozen or more links, receive motion from the air-pump rock shafts. The pumps are arranged with greater simplicity than the air pumps, as all their "articulations" require but 64 journals.

As before mentioned, the main shaft bearings are fixed in cast-iron frames, which are placed opposite the respective cylinders, to the two condensers of which they are attached by 4 long bolts. The bearings are not made in the usual complicated and unhandy way, with binders and bolts, but consist of large rectangular openings cast in the frames, in which the brasses are placed, and the shafts inserted; and the cranks are then keyed on the shafts; this forms "a strict connection without articulations." If it becomes at any time necessary to remove the shafts, on account of fracture, or to bore out and line up the bearings, instead of going through the troublesome process of unscrewing bolts and removing binders, it is simply necessary to remove the cranks from the shafts (or if they stick, to cut them off) and hoist out the whole fix.

The valve gear of these engines merits particular attention. It is well known that such engineering enthusiasts as Maudslay & Sons, Penn & Sons, Randolph, Elder & Co., R. Napier, Humphreys & Tennant, and hosts of others, both in America and Europe, have wasted much time and ingenuity in so arranging their engines that they can be easily handled. These gentlemen, whose ingenuity appears to have run away with their judgment, did not reflect on the absurdity of providing means by which one man can start, stop, and reverse them, while there are thirty or forty men standing looking on in the fire-room. It is Mr. Baird who utilizes the wasted force by making them seize upon that part of the valve gear necessary to be moved. Then they can operate it without the intervention of such wretched contrivances as either steam or hydraulic cylinders.

We are happy also to see that Mr. Baird has thrown such new-fangled traps as link-motion reversing cylinders, etc., to the winds, and used the old and reliable device known as the "gab." In fact, this engineer employs it almost exclusively on his screw engines, and has always expressed a decided preference for it. Each engine is fitted with three eccentrics, one for going ahead, one for backing, and one for working the cut-off valve. The two former are provided with "gabs" which, by properly arranged levers and bell cranks can be thrown in and out of gear. If the engines one stationary, and it is required to start them, all "gabs" being out of gear, long iron levers, called starting bars, are inserted in the valve rock shaft. Three or four men seizing the end of each of these bars, work the valves until the "gab" falls into gear, and away she goes. Of course the starting bars (4 in all) must be quickly removed, or the men must stand one side, or be hoisted by their own petard. It is thought that with 12 men, stationed at the starting bars, and 4 or 5 more to operate the "gabs" and injection valves, the engines can be promptly started, stopped, and reversed. Should the valves at any time stick fast, nothing is easier than to attach a tackle to the ends of the starting bars and lead the rope along the fire-room or the berth deck, which ever may be the most convenient.

The main cylinders are 46½ inches in diameter, by 60 inches stroke, and the boilers, which are of the ordinary English horizontal tubular variety, contain some 23,755 square feet of heating surface, and 893 square feet of grate surface. Hence it will be seen that although the engines cut off at seven-tenths, some 50 lbs. pressure must be carried in the boilers in order that the engines can begin to work off the great quantity of steam they will generate, particularly as they have a large area through the tubes for draft and are provided with enormous blowers.

The *Warrior* and *Black Prince*, English ironclads, have the same sort of boilers as the *Quinsigamond*, their boilers have 23,197 square feet of heating surface and 868 square feet grate, and the area for draft is nearly the same, but although the boilers of the English vessels are smaller, they have about 60 per cent more capacity of cylinders. These are two in number, with a diameter of 112 inches (effective 104 inches) by 48 inches stroke. The sad mistake of putting in cylinders so absurdly large has been abundantly demonstrated by the performance of these vessels. They have never been able to develop, even in service, but little over 6,000 horse-power. It is expected that owing to the cylinders being proportioned in accordance with the full-stroke theory, the *Quinsigamond* will develop at least 3,000 horse-power.

Hence it is seen that although Mr. Baird has fitted these engines with an independent cut-off valve, the cylinders are so proportioned that it can be dispensed with without detriment to the economical performance of the machine—this is quite important in case of derangement of the cut-off.

There are many other points which mark the "simplicity of the combination" of these engines, but we will mention but two more. The main cranks, which, we are sorry to say, many screw-engine constructors have of late made mere chunks of wrought iron, devoid of symmetry, are in this case charming to look at—there is no superfluous metal.

It is said that in one set of these engines, a stationary five-inch steel rod is to be introduced, passing through the center of the piston and secured to both heads of the cylinder. This simple and elegant device, it is expected, will keep the piston from jostling the sides of the cylinder; the spring of this rod by the weight of the piston when it is in the center of it, it is thought, will add to its proper action.

It will be only necessary to add, that for symmetry of proportions and "maximum maximorum" strength (as Mr. Isherwood would say), with minimum weight of materials, the *Quinsigamond* engines are surpassed by none and equaled by few. Their constructor has, in this case, surpassed himself; in a word, they are characterized in a marked degree by that stern Calvinistic simplicity, taste, and grace, for which Mr. Baird has long been celebrated.

We have thus seen what can be accomplished, when, on the one hand, one of the most distinguished constructors in the world makes his plans in accordance with the views of the chief of the Steam Bureau, and consults him freely in relation to them; and, on the other, the chief of the Steam Bureau, without any of that petty professional jealousy which is, alas, but too common among engineers, gives in return the benefit of his great learning, experience and constructive skill. That Mr. Baird has submitted to be guided by the demonstrations of Mr. Isherwood in proportioning the principal and "essential organs" of these engines, shows him at once to be a man of liberal views and sound understanding.

STARTING BAR.

Boston, May 10, 1866.

MISCELLANEOUS SUMMARY.

WATER METERS.—A premium has been offered by the Industrial Society of Amiens, in the following terms:—The proprietors of steam engines are in want of a water meter which will indicate exactly the quantity of water injected into the boiler, whatever be the pressure. This apparatus must be one easily set up, not subject to get out of order, and capable of registering the quantity of water to within two per cent of the actual volume. It is not a memoire that the society wishes for, but an apparatus in working order on which experiments can be made; and if a water meter be presented appearing to be of practical utility, the society will use every effort in its power to promulgate the use of the contrivance. The meters to be experimented on should be sent to the office of the society before March 1, 1867.

SINCE 1862 the boot manufacturing business of Chicago has increased from one small establishment to fifteen, which turns out nine hundred cases per week, consuming three hundred dozen sides of upper leather, sixteen hundred sides of sole leather, and fifty dozen calf skins. About twelve hundred hands are employed in the business.

THE New York *Times* opposes the proposition to increase the tax on inventions, in an intelligent article which we republish in another column. It takes the same view of the subject that we have urged.

THE VOLTAIC PILE.—The Corps Legislatif o France has adopted the following projected law:—Art. 1 A prize of 50,000 francs to be awarded to the author of the discovery which will render the voltaic pile applicable, with economy, to the following purposes: To industry as a source of heat, to illuminating purposes, to chemistry, to mechanics, and to practical medicine. The rules to be adopted for the conditions and the judgment of the said competition will be determined by a decree. Art. 2. In case that no prize shall have been awarded at the period fixed by the above article, the competition can be prorogued, by a decree of the Emperor, for a new period of five years.

AN INVENTOR WHO LACKED FAITH.—At a recent meeting of the stockholders of the Atlantic cable project, Mr. Cyrus W. Field amused the assembly by several anecdotes of suggestions which had been made to him. One gentleman had gravely proposed to him to sink a hollow tube in which to go down and seek after the cable, and he was so annoyed by the continued calls at his hotel that one morning he told his visitor that it should be done, and that the author of the idea should make the first attempt. He had not seen him since.

A BUSINESS firm in Memphis detected a thief quite adroitly recently. They missed money from the till for some days, amounting to $250, but could not detect the guilty party. The cashier, as an experiment, emptied into the drawer some nitrate of silver. The thief went to the till to make his evening capital, and in abstracting the money covered his hands with the nitrate, which he was unable to get off. An examination of his paws in the morning proved the fact, and the guilty party was arrested.

A PRACTICAL and thorough agriculturist, backed by manufacturing skill and capital, has sent to this country from France a shipment of six tuns of the finest Silesian beet root. Illinois is the State chosen for his experiment, and upon the property devoted to the culture a large sugar refinery is to be immediately erected.

THE difficulty of making sound and valuable castings from old—and often remelted—alloys of copper and tin or zinc arises from the oxidation of the tin and copper, which Dussausoy has shown to take place in such proportions in gun metal that for one part by weight of the tin oxidized, from three to four of copper are so.

OF the total power developed by the engines of the *Warrior* 77½ per cent are applied to the screw and 22½ per cent expended in overcoming the friction of the machinery, while of the total power imparted to the screw rather more than ·771 per cent is expended directly on the propulsion of the ship; showing only ·6 for the resultant efficiency of engines and propeller combined.

AN extensive series of experiments, conducted by Mr. Mallet, upon the effects of additions, in minute but atomic proportions, of porous hard metals to the binary alloy of copper and zinc known as Muntz metal, embracing antimony, lead, iron, bismuth, arsenic, and silver, proved that, in every instance, the ductility, tenacity, flexibility, and resistance to torsion were seriously impaired by proportions under even 1 per cent.

THERE are in all, including steamboat piers and railway stations, fifty-two inlets to the city of London, through which in the course of each twenty-four hours no fewer than 706,621 persons enter, a number equal to one-fourth of the entire metropolitan population, or, added to the sleeping population, to more than the entire population of Dublin, Edinburgh, and Glasgow put together.

A MAMMOTH still covered with its skin and hair, and in an excellent state of preservation, has been recently discovered in the neighborhood of Taz Bay, Gulf of Obi, enveloped in ice. The Russian government has sent M. Schmidt to examine the animal.

RECENILY a torpedo, which was sunk in Charleston harbor over three years ago, exploded in eight fathoms of water. It is said to have lifted an immense volume of water, and presented a grand appearance.