## Correspondence

### The Quicksilver Mines of California.

Messrs. Editors:—The following is an account of the quicksilver mines of California, taken from my journal of a recent voyage through that country. Among the inexhaustible resources of California quicksilver is one of the most interesting and profitable, for the simple reason that the cost of mining and extracting the metal from its ore, the cinnabar, is the least expensive of all the valuable and costly ores, such as gold, silver and copper. The yield of quicksilver is from 70 per cent down to 25 per cent, and the mode of separating is very simple.

The new Almaden mine has sixteen furnaces, containing 20,000 lbs. of the cinnabar, and two larger ones, containing 90,000 lbs. of the ore, and producing daily 100 flasks of 75 lbs. of quicksilver each. Having visited many localities in the month of May, 1862, I feel satisfied that quicksilver will, ere long, form an important item of export to every part of the world, for the steamer on which I left San Francisco had a considerable number of flasks for China, Mexico and England, and with the increased demand in the Washoe district for the extraction of silver, the new gold placers of Victoria and Cariboo, and all the other cinuabar mines of the Sonoma and Napa valleys will likewise be put in requisition. The new Almaden mine has long been known to the Mexicans and Indians, the cinnabar, when ground fine, being called vermilion. It was made an article of traffic by the Indians along the coast as their red paint. From them the early white settlers of California learned the locality, and a Captain Castillero, of the Mexican service, registered the lands as his property and formed a company for the purpose of extracting the quicksilver. Messrs. Bolton & Barron now hold the Castillero title, and an injunction which had been laid upon the mine for several years has been removed this year and the mine is now their rightful property. From the magnitude of the mine as well as of the smelting works and the proper manner of operating, I feel satisfied that a more prolific mine does not exist anywhere. Along the range of these mountains, only three miles distant, is another quicksilver mine, called the Guadaloupe, which yielded considerable quanities a year ago, and the new Price & Enriquets mines, belonging to the same range of mountains, yielded 14,007 flasks of quicksilver in 1860.

A very rich and extensive deposit of cinnabar, called the Aurora Quicksilver Mine, occurs in the quartz of Monterey. In Sonoma county, in the vicinity of Mount St. Helena, near the famous Geyser Springs, a range of mountains about 10 miles in length, is found quicksilver ore in great abundance. The Pioneer mine is nearest the Geysers, and the pure metal may be detected every where running out from the rocks. Next comes the Pacific mine, which has likewise fair prospects for a solid and regular vein of the cinnabar. The Denver mine and the Dead-Broke mines have also the strongest indications of regular veins. In Knight's Valley, in Sonoma county, in Santa Clara county, in El Dorada county, are also found indications of regular mines; and in Mariposa county, at Phillips Ferry, near the Stanislaus river, in the Mono diggings, a lead of cinnabar thirty feet in width and seven miles long, has been discovered. At the Rogue and Klamatts rivers rich leads of quicksilver have also been discovered.

The geological and metallurgical parts I will be pleased to given in a more extended article.

Dr. L. Feuchtwanger.

New York City, Aug. 19, 1862.

### Force.—Laws of Motion.

Messrs. Editors:—Under this head, the Scientific American of the 16th of August, contains an extract from a lecture by Professor Tyndall, at the Royal Institute, London, stating the descent of a weight 16 feet in one second, and then having attained a velocity of 32 feet, and that a force imparted to a weight upward of 32 feet would impel it to the same hight (16 feet) in the same time (1 second). And proceeds: "If instead of 32 feet we impart a double velocity or 64 feet, it might be supposed the weight would rise to twice 16 feet only, but it would rise to four times or 64 feet."

From the above truisms the Professor deduces this rule: "Therefore the mechanical effect or work done is as the square of the velocity." The rule would be correct if the weight would rise 64 feet in 1 second, but 2 seconds are required for the ascent. Then the true and practical mechanical effect on a given expenditure of force, is as the squares of the velocity *minus* the time, or as the velocity multiplied by the time. We cannot throw time out of the estimate, or all degrees of force would become equal. For war projectiles we may disregard time and look only to the final effect, which under double velocity would be quadrupled. T. W. B.

Cincinnati, August 18, 1862.

[If we wish to express merely the mechanical effect, or "work" as it is technically called, the element of time is not considered; but in stating "power" the time in which the work is performed is material, as power is measured by the amount of work done in a given time. The raising of 33,000 pounds one foot is 33,000 foot-pounds of work, whether ten seconds or 10,000 years are occupied in the labor, but to raise 33,000 pounds one foot high in one minute requires 1 horse power. Professor Tyndall, doubtless, understood these elementary truths, and his language is precisely accurate.—Eds.

### Dead Black for Rifle Sights.

Messrs. Editors:—A rifle sight is usually made of German silver, and unless it is shaded with a small tube it dazzles the eye in clear sunshine and prevents the marksman from taking accurate aim. As an open-sighted rifle should always be used by a person who wishes to become expert in the use of the musket rifle for army purposes, could you give a gunsmith instructions how to make a dead black sight for a rifle, one that will absorb and not reflect, the rays of light? W. B. S.

New York, August 24, 1862.

[A dull black varnish may be made with lampblack mixed with gum shell-lac. Such a varnish is used for the interior of telescope tubes. Applied to the sight of a rifle with a camel's hair pencil and allowed to become dry, it will remain a considerable time under the care of a sportsman but not a soldier. With rough service this varnish will not last longer than a few days. Some chemical compound that will act upon the metal of a rifle sight and make it a permanent dead black would be most suitable. The French makers of spyglasses coat the interior of their brass tubes with a chemical dead black by a process not yet made public. It is the secret which would give a dead black for rifle sights. A mixture of nitric acid and the nitrate of silver will render brass black, but not the dead black required for rifle sights and the tubes of spyglasses. Some of our readers may be acquainted with the mode of producing the French chemical dead black, and may give the information desired for the benefit of those who manufacture rifles and rifle muskets for army and hunting purposes.—Eds.

### On the Conservation of Force.

Messrs. Editors:—Since the experiments of Mr. Joule in obtaining a mechanical equivalent for a unit of heat, by proving that the temperature of a pound of water will be raised 1° by the same quantity of power that will raise a weight of one pound 772 feet high, the theory that heat is a condition of matter, and not a substance, is more generally admitted than formerly. But the popular idea of a material heat is one from which it is very difficult to disembarrass the mind. A few instances of the action of force therefore will be presented, to show how heat may be viewed as the effect upon the senses which is caused by the changes matter undergoes.

Plunge a piece of hot iron into water, and it hisses, changes color, and becomes cool. That is, the motion or change of the particles affects the senses of hearing, sight and touch, but it no more follows that some matter called heat is gone from it because it affects the feeling than because it affects the hearing or the sight, and unless we had been taught otherwise it would be much more natural to say that by contact with the water some change is produced amongst the particles of iron by means of which it affects at the same time the hearing, sight and feeling. Take another instance of change of particles of matter, and follow the force resulting from this change through its action in giving motion to other particles. Kindle a fire under a steam boiler the results are as follows. An intense activity of movement amongst the particles of fuel and the air, forming new combinations. This movement is imparted to all things in contact, setting them in agitation so that they are only kept from moving by the cohesion which prevents the iron of the boiler from flying apart, and the force transmitted to the iron is in turn transmitted to the water above, which is slightly held together by cohesion and atmospheric pressure. When the intensity of the forces acting on the water equals the resistances it will not move, just as when a pound weight equipoises another weight in a balance, or a pressure on one side of a piston a resistance on the other. The particles of water, moving with the force impressed upon them, transmit that force to the sides of the boiler and to the air and, being condensed fall at rest again. But if a piston is exposed to them, they transmit their force to it and it is then obtained in the form of useful mechanical effect. As the mind becomes familiar with the idea of heat as a sensation, the various changes of matter daily occurring in nature can all be satisfactorily viewed without recurring to the notion that any invisible substance is entering or leaving the particles.

McD.

### A Cork Ring on a Jet of Water.

Messrs. Editors:—I noticed in Nos. IV. and V. current volumes of the Scientific American the question and explanation of a ball balancing on a jet of water. I would ask if the same explanation applies to a ring supported by a jet of water? I have repeatedly seen in the yard of the late Dr. Comstock, of Hartford, Conn., a cork ring placed at the side of a jet of water, which would be immediately carried up to within four or five inches of the top of the jet and there remain without rising or falling, but revolving rapidly for hours without changing its position, except moving around on another or even on the opposite side of the jet by the slightest breath of air. It is evident the ring does not sit on top of the jet, as it continues on above the ring without deviating from the perpendicular, while the ring continues rapidly revolving on the side of the jet. Let those who wish to try the experiment make a cork ring of about two inches in external diameter; the rim of the ring round and about three-eighth of an inch in diameter, as smooth and perfect as cork will admit of being cut. The ring must be very perfect, equally balanced, and the experiment tried when there is very little air moving. A. P. P.

Hartford, August 18, 1862.



Messrs. Editors:—You are interested in all new improvements, and I send a notice of one of the latest. This slip is cut from the Springfield *Republican* of to-day. Is not it a little too bad that when good mechanics abound, and good officers are so much needed on the battle field, that the mechanics should not be found in the shop, and the men who have been educated at the expense of the nation for military purposes, be found at the head of our armies, or in the ranks if they are unfitted to command "Old leather boots and shoes for annealing?" That will do for a man in charge of a great national army, employing 2,500 men, and making 16,000 guns per month. How many could the same number make with a practical mechanic to direct the work? Common Sense.

Springfield, August 16, 1862.

### Grooved Friction Gearing.

Messrs. Editors:—Messrs. Dougherty and Bement have given their experience with grooved wheels; mine also may perhaps be of some service. I made a pair with the V of 60°; that is, with the entering wedge less than a right angle by 30°. The diameters were such that the parts in contact at the middle of the faces did not come together at two successive revolutions; that is, one main diameter was not a multiple of the other. One bearing was elastic, so that when jammed it allowed a little play, but not enough to slip the faces of the wheels. They were

so arranged that the weight that was hoisted jammed them, and a light weight pressed them more slightly together than a heavy one. They did the following duty :—For two years almost daily they hoisted stone of one to six tun weight, sixty feet in hight, in all between 20 and 30,000 tuns of stone, running from one up to 250 revolutions per minute, with a fourfold purchase. In about the first week they glared over, wore a little, and at the end of two years were still fit for service and noiseless.

T. McDONOUGH.

Middletown, Conn., August 10, 1862.

### Explosive Bullet.

MESSRS EDITORS :—Recently it was my privilege to examine in the hands of a man just from Fortress Monroe, an explosive bullet, such as was used by the rebels in the six days' battle. It is conical in shape, about an inch long, made of lead, and consists of two parts, viz., a solid head piece and a cylindrical chamber, which are united together by a screw. From the point of the bullet, projects a little rod, which passes down through a small hole in the head piece, into the chamber below, where it is connected with a percussion cap. The chamber contained about a table spoonful of powder. You can readily perceive that if the bullet should encounter a bone or other hard substance, when entering a man's body, it will explode, and thereby produce a fatal wound.

F. J. C.

Philadelphia, August 23, 1862.

[Explosive bullets are old and well known, but for some reason, probably owing to their expense, our Government has not used them. They were used in the Chinese war to set fire to baggage trains.—EDS.

### A Pictorial on Big Guns---Erroneous Description.

The following is from the Pittsburgh *Dispatch* of the 19th ult. *Harper's Weekly*, of August 23d, gives a series of cuts purporting to represent the Fort Pitt Works in this city, and the operation of casting heavy guns as carried on there. The descriptive accompaniment occupies just twenty lines and contains almost as many blunders. It says :—

"On page 587 we give a series of illustrations representing the manufacture of the guns with which the *Roanoke* and new *Monitors* are to be armed. They are what are called Rodman guns, having been first made by Captain Rodman, of the artillery, who afterward turned traitor and is now in the rebel service. Their peculiarity consists in their size, which is far greater than that of any other guns in existence. After being cast, a stream of water is poured through the muzzle, coming out at the vent, so that the gun is cooled from the inside, thus obviating flaws. There are being cast of these guns at Pittsburgh, Pennsylvania, quite a large number, some 15-inch, some 20-inch and we hear of some even larger in the bore. The 20 inch guns will throw a solid ball weighing 1,500 pounds, which would go through the side of any vessel ever constructed, or batter down almost any wall. It is intended to arm the new *Monitors* and all our coast fortifications with these guns."

We give the entire description that our readers may judge of its accuracy. The guns with which the navy is armed are not Rodman but Dahlgren guns. Capt. Rodman, whose name is given to the former class of guns, was not even the "first" to improve the Columbiad, but his plans for casting such guns and his improvements of the model have been generally adopted. He has not turned traitor, nor gone into the rebel service, since he is in active service in the Ordnance Bureau of the War Department. The peculiarities of the guns made on his model does not consist in their size, but in the peculiar massing of the metal and the "water circulating core" on which they are cast. The water is not "poured into the muzzle," however, neither does it come "out of the vent, "after being cast." The water enters and escapes from the core barrel, during the casting, and in casting Dahlgrens a modification of the plan has been adopted, by which water is run into the bore after the barrel is removed ; but there is no "vent" in the gun until it has been turned and finished in other respects, so that no water can escape through it. There has never been a twenty-inch gun cast at the works, and those "even larger in the bore" may have been heard of by the writer but certainly were never seen by him. The twenty-inch guns will not "throw a solid ball weighing 1,500 pounds;" the solid ball twenty inches in diameter weighs about one thousand pounds. It is no wonder our pictorials are not looked upon as furnishing information for either friend or foe.

[A description of the large 15-inch guns with the mode of cooling them upon Capt. Rodman's principle was given on page 393 of our last volume.—EDS.

### London Exhibition---Propellers of Steamers.

The following is condensed from *Mitchell's Steam Shipping Journal* on this subject ; and the information is of great importance, as propellers for sea-going vessels are now fast superseding paddle wheels :—

There are thirteen different sorts of propellers exhibited in the International Exhibition. From the first introduction of the screw as a propeller there have been some thousands of so-called improvements, the majority of which have been patented, but the one now most in favor is Griffiths's.

Mr. Robert Griffiths, of Regent's Park, exhibits a full-sized model of his propeller (illustrated page 352, Vol. XII. (old series) SCIENTIFIC AMERICAN), so fixed as to show its action. It consists of a boss, which is keyed on to the screw shaft in the usual manner, and two blades, having turned shanks fitting into bored recesses in the boss. The blades are retained in their position, respectively, by a cotter, which is adjusted into its place after the blades have been inserted, and turned in their sockets about 90°, or until an arrow mark on the flange points to the pitch which it is desired the screw shall have. The pitches are all accurately measured on each screw, allowing a sufficient range of pitches to meet all practical requirements. To alter the pitch, the glands or covering caps are taken off, the wedges taken out, and exchanged for others corresponding to the altered angle. This screw, having such a large round boss to receive the arms, does not strike a spectator as a likely one for obtaining speed, yet practice has demonstrated the correctness of Mr. Griffiths's theory. He has devoted some years in experiments, and finds that the extremities, or outer parts of the blades, do not propel, but act as feeders for the supply of water to the inner, or central, part of the screw. A screw propeller is a fan, which drives a column of water through its disk when in operation ; and to obtain its supply it has to draw it from all around and each side of its periphery.

When a ship is underweigh there is a strong eddy under her quarters, which is caused by the water rushing in to fill the space the ship has left or displaced. The screw works in this eddy, which eddy is considerably increased when the ship is propelled by her canvas at a greater speed than by her engines. When the screw is in operation and the ship propelled by her canvas at the rate of ten or twelve knots per hour, the forward side of the blades, when they are on either side or below the ship, comes in contact with the eddy water, which takes off the thrust from the screw shaft and causes a back lash in the thrust block, so that the power that is exerted by the engines is lost. Mr. Griffiths confidently asserts that by curving the blades of the screw forward to the ship's quarters, commencing the curve at about the middle of the blades, he overcomes this defect entirely, and the eddy, instead of coming into contact with the back or forward sides of the blades, goes to the face or propelling side, and thus assists in propulsion. Mr. Griffiths claims for his propeller a saving of power in its central portion being filled up by a sphere, whereas other screws have their centers made as small as the necessary driving strength will allow. Their blades, consequently, at that part, are nearly at right angles with the line of motion, and force is lost by driving the water outward instead of astern, thus seriously disturbing the water upon which their more effective parts act. This central sphere also dissipates the flapping tendency, of ordinary screws, and the blades of his propeller assimilating to those which nature has supplied to swift birds and fishes, assist in doing away with tremulous motions and vibrations.

B. P. JOHNSON, Esq., in a letter to the New York State Agricultural Society from England, states that he attended the sale of a South Down flock at Babraham, which realized the large sum of £17,646 ($88,230), for 437 animals—149 bucks and 288 ewes.

### How Phosphorus is Made.

The following is an extract from a late lecture of Prof. Playfair before the Royal Institution in London :—

The earthy matter of bones consists of three equivalents of lime united with one equivalent of phosphoric acid. It is what chemists term "a tribasic phosphate of lime" Phosphoric acid, consists of one equivalent of phosphorus united with five equivalents of oxygen. In order to obtain the phosphorus, it is only necessary to take away those five equivalents of oxygen, which we can do by mixing the compound with charcoal after some preliminary operations, and heating them together. The charcoal takes away the oxygen and forms carbonic oxide with it, while the phosphorus distils over. In this way we get phosphorus in the condition in which you are very familiar with it. It is a wax-like substance, which I must handle with care, because if I allow it to dry, the heat of my fingers would be sufficient to inflame it. Now, observe what this substance looks like. It is semi-transparent ; it is soft ; you can cut it like wax. It is exceedingly poisonous, and in the making of lucifer matches it is found to be a very insidious poison. Lucifer match makers are apt at first to be subject to an affection which does not draw much attention. They complain frequently of toothache, but they do not know the insidious disease which is creeping upon them. The lucifer match makers who make lucifer matches from this phosphorus are subject to the most distressing of all diseases ; the jawbone becomes destroyed, and frequently disappears or becomes useless, and some of them spend the greater part of their lives in the wards of hospitals. It therefore became an important point for science to find some way by which this phosphorus should be deprived of its poisonous properties without losing those chemical characters which make it so useful in making matches for instantaneous light. Prof. Schrotter, of Austria, who is at present in London, as one of the jurors of the Great Exhibition, met this want of science in a very skillful way. Bodies are capable of assuming two conditions, and sometimes more, which the chemist calls "allotropic" conditions ; that is to say, they are, in fact, old friends with new faces given to them by some artifice, but still being the same body and not having gained or lost anything. Now, here is our old friend phosphorus with certainly a new face. By taking common phosphorus and exposing it for some time to a temperature of 47°, this yellow waxy transparent substance transforms into a dark brick like substance It is no longer so inflammable as to ignite spontaneously. It may be packed up in boxes without danger of spontaneous combustion ; but what is more important, it has lost all its poisonous properties. The phosphorus, which was poisonous before, is no longer poisonous in this allotropic condition, and it is still capable of being used for making lucifer matches. In passing into that allotropic state it has lost its power of dissolving in bisulphide of carbon, and if any of the old phosphorus remains in it, it may be dissolved out by this bisulphide of carbon. I have here some of this ordinary substance which is dissolved in bisulphide of carbon, and if I pour it now over this paper you will see the properties which it possesses in a very short time. It will ignite of itself as soon as it becomes sufficient dry by the passing off of the bisulphide of carbon. When this evaporation takes place the phosphorus is left in such a fine state of division upon the paper that it bursts into flame. The allotropic phosphorus is altered very considerably in its chemical characters.

### Be Careful in Writing Proper Names.

Mr. T. E. M. White, of New Bedford, Mass., writes an unusually plain and handsome hand, but he makes a capital T so much like a Y, that it is impossible to determine for which letter the character is intended, and when we published the description of his invention of an artificial leg, that appeared on page 120 of the current year, after repeated examination of the signature, we concluded that the first initial was probably meant for a Y. But we are informed by a note from Mr. White that we did not guess right; his address is T. E. M. White. In writing proper names for publication, great care should be taken to make every letter so plain that it cannot be mistaken.

### Improved Index Scales.

Messrs. Editors:—Some two years since a notice appeared in the Scientific American, stating that a good domestic weighing apparatus was greatly needed, and having been previously impressed with the same idea, we turned our attention in part to that subject, and after much labor and not a little perplexity, we have produced the instrument which we now send you for your examination and opinion in the Scientific American.

Platt & Rosecrans.

Yellow Springs, Ohio, July 31, 1862.

Our opinion thus frankly asked shall be as frankly given. We think this is one of the most novel inventions, and one of the most promising for large profits of any that we have examined for a long time. While this instrument has the accuracy of steelyards or balances, it is free from the objections of loose peas or weights, and is remarkably compact and convenient; we have little doubt that it will meet with a large sale.

Fig. 1 of the engravings is a perspective view of the scale and Fig. 2 is a longitudinal section.

The pan, *a*, to receive the article to be weighed is supported upon one end of the lever, *b*, which has its fulcrum at *c*. The lever, *b*, supports two light tubes into which two heavy metallic rods, *d* and *e*, are loosely inserted, so that they may be partially drawn out. When the rods are pushed into the tubes as far as they can be, the lever, *b*, is just balanced on its fulcrum, while the farther the rods are drawn outward the greater weight will it take in the pan to restore the balance. Consequently by ascertaining the distance at which each rod must be drawn out to balance a pound weight in the pan, and then graduating the rods to correspond with this, a weighing instrument is produced.

The weight of the pan is balanced by a weight, *f*, turning on a fine screw by which means the instrument is readily adjusted.

For weighing fractions of pounds and ounces the rod, *e*, is furnished with a rack on one side meshing into a pinion which carries an index traversing over a graduated plate.

The inventor says: We have attached to this one only avoirdupois weight, but intend in future to mark a center line in the bar, and mark avoirdupois weight on one side and the French decimal system on the other, and put in double marking and indices in the same inclosure so as to weigh both systems at once.

The following are some of the advantages claimed for this scale:—First, it is entirely new and original in all its parts. Second, it weighs from one-eighth of an ounce to thirty pounds. Third, the weight of the machine is only six pounds. Fourth, it wholly dispenses with the use of weights. Fifth, It is light, strong, durable, compact and very simple. Sixth, it gives both net and tare weight simultaneously. Seventh, it is especially adapted to general domestic use. Eighth, the same machine will weigh according to avoirdupois weight and the French decimal system.

Fig. 1

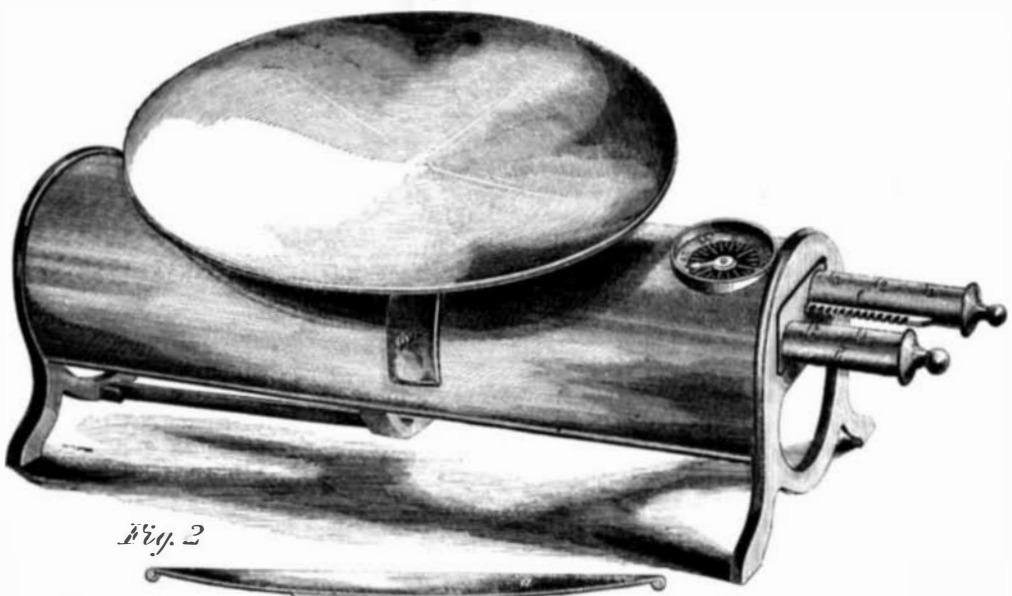
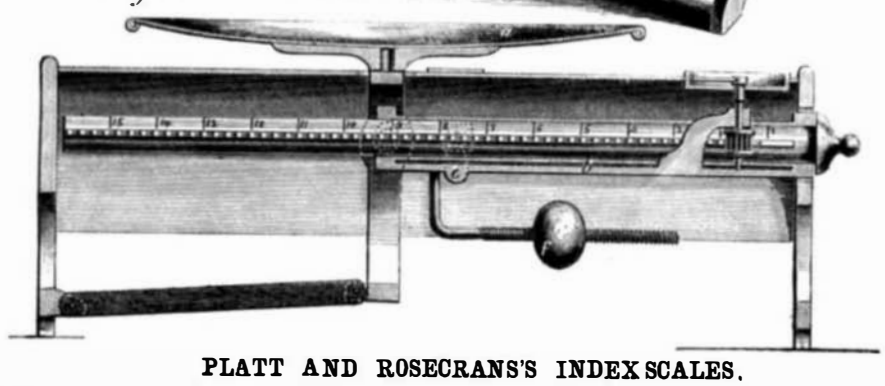


Fig. 2



## PLATT AND ROSECRANS'S INDEX SCALES.

This instrument was invented by Dr. A. H. Platt and Gen. W. S. Rosecrans, of Cincinnati, Ohio.

The American patent was granted Oct. 1, 1861, and the French and English patents have also been very recently secured. Further information can be obtained by addressing Dr. A. H. Platt, Yellow Springs, Ohio, or James McGinnis, Cincinnati, Ohio.

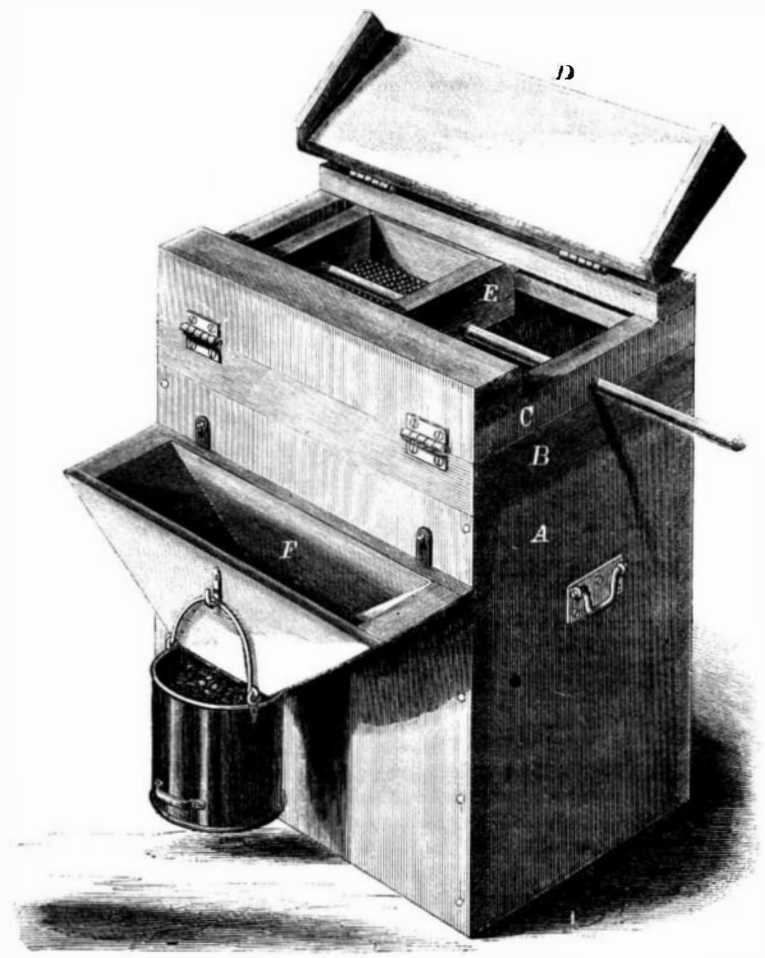
### Improved Coal Sifter.

There is an unusual amount of ingenuity displayed in the coal sifter here illustrated; the object of the devices being to produce an implement which will be very convenient and rapid in its operation.

Upon the ash box, A, the frame, B, is fitted tightly by a rabbeted joint; being held on by hooks. To the frame, B, a similar frame, C, is secured by hinges and closed by a hinged cover, D. Within the frame, C, the sieve, E, is fitted to slide back and forth, and is furnished with a rod protruding from the frame for imparting the motion. The ashes are placed in this sieve, and, the cover being closed, the sieve is shaken back and forth a few times; sifting the ashes through, and as soon as the dust has had time to settle, the cover is opened, when the cinders may be readily picked from the sieve and dropped among the ashes. The frame, C, is now turned over in such position that the edge of the cover may catch upon the outer edge of the hopper, F, when the flanges upon the side of the cover form a trough by which the good coal is guided into the hopper through which it falls into the scuttle suspended below.

It will be seen that the position of the hinges of the frame, C, and of the cover, D, upon opposite sides of the apparatus, causes the parts on the swinging over of the frame, C, to assume the positions by which the coal is emptied from the sieve and guided into the scuttle.

The patent for this invention was granted through the Scientific American Patent Agency, August 19, 1862, and further information in relation to it may be obtained by addressing the inventor, Chas. G. Austin, at Nantucket, Mass.




## AUSTIN'S COAL SIFTER.

### Effective Use of Mortars.

The navy department have just printed in a pamphlet the official reports of the naval engagements on the Mississippi, which resulted in the capture of New Orleans. These reports are accompanied by some very interesting maps and sketches, among which we observe one of very singular character. This is an accurate plan of Fort Jackson, made by some of the assistants of the Coast Survey, showing every hole made by a shell or shot. The entire work and its surroundings are dotted over with these marks, as if sprinkled from a pepper caster. A great deal of the ground near the fort and within the outworks was overflowed, and no less than three thousand three hundred and thirty-nine shells are computed to have fallen in these parts. Eleven hundred and thirteen, however, were counted in the solid ground of the fort and levees, and eighty-seven round shot; one thousand and eighty shells exploded in the air, about seven thousand five hundred having been expended in all. The casemates were cracked, and in some places broken through, and the outer walls cracked from top to bottom. This map exhibits something never before attained by the vertical fire of mortars.