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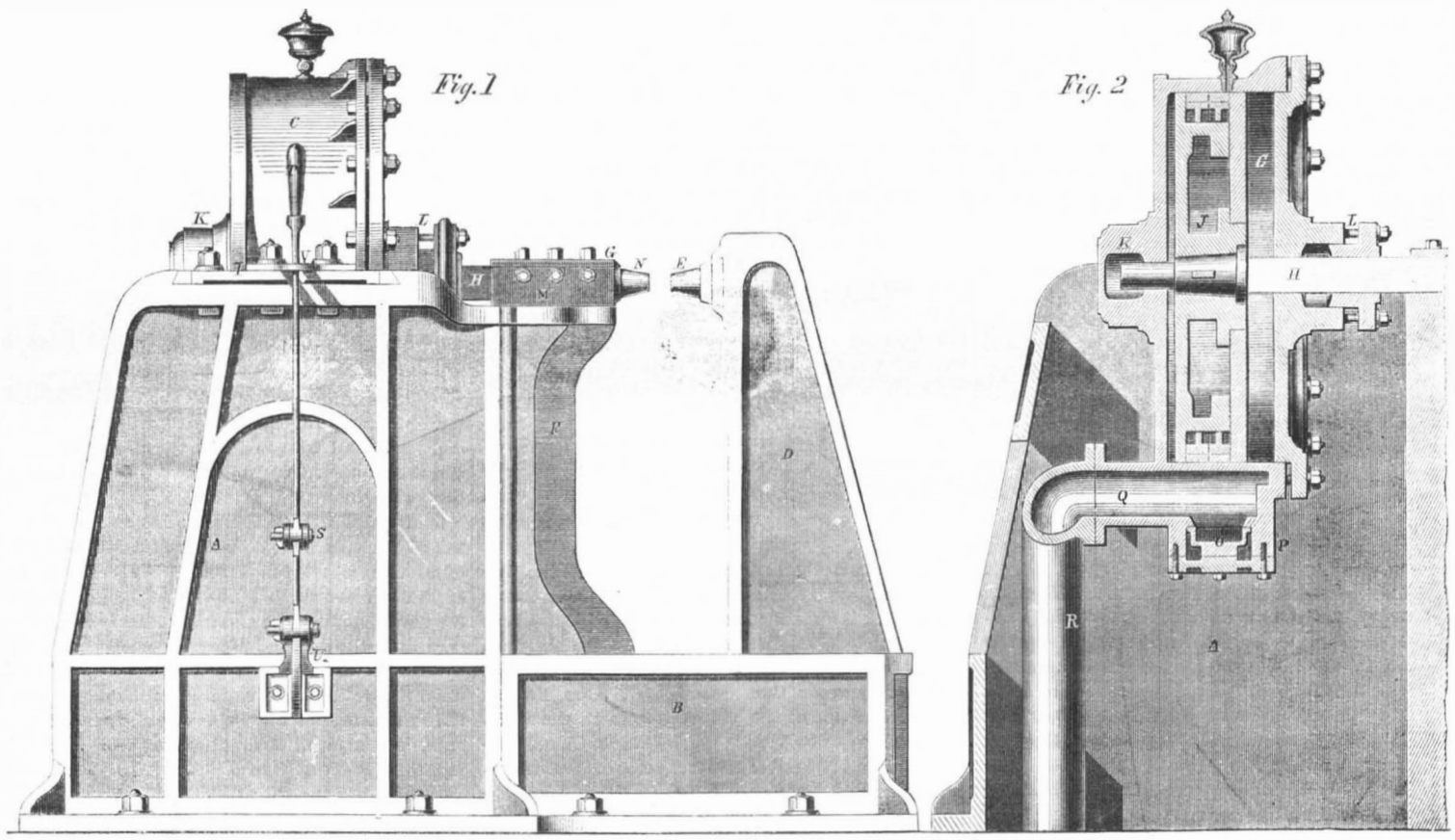
Improved Steam Riveting Machine.

From remarks in the English mechanical papers we judge that in all the very large Steam-engine manufactories in Britain the riveting of boiler plates together is done by steam power, instead of by the hand process, which still prevails in those of our large establishments with which we happen to be acquainted. As the noise produced by hand riveting is a nuisance to the neighborhood in which it is carried on, we hope that those of our engine manufacturers whose works are located in cities will, partly from consideration for others, as well as a regard for their own interests, be induced to supersede hand labor by the cheaper, more perfect, and silent operations of machinery. We have had engraved from the plates in "The Imperial Cyclopedia of Machinery" the accompanying illustrations of an exceedingly simple and powerful riveting machine, invented by W. J. and J. Garforth, of Dunkinfield, England.



GARFORTH'S STEAM RIVETING MACHINE.

This is an example of the application of the direct action of steam to mechanical operations, in which a rectilinear motion, combined with great pressure, is required. The machine in question is for riveting iron plates together in the construction of boilers, and other similar fabrics. In this operation, the rivet being placed in the holes punched out for it at the overlapping edges of the two plates to be riveted, the latter are brought between a pair of dies formed with concave faces, and on these dies being driven forcibly together, not only are the plates brought into perfect metallic and steam-tight contact, but the rivets are also made to perfectly fill up the holes, and, by the formation of expanded heads at both sides, to retain the plates in position. One of the dies is stationary, whilst the steam drives home the counter-die through the simple intervention of a piston of large area, working in a very short steam cylinder.

The machine represented in our illustration is capable of striking three rivets at each blow. Fig. 1 is a side elevation; Fig. 2 is a vertical longitudinal section through the center of the steam cylinder.

The framing of the machine consists of two substantial castings, A B, bolted down by flanges upon a foundation of solid masonry. The casting, A, although of great strength, is hollow, and serves to support the steam cylinder, C. The casing, B, is heavy and solid, and has cast upon it the resisting head, D, of the stationary rivet dies, E, and the support, F, of the guide, G, of the moving die holder, H, which is forged in one piece with the piston rod of the steam cylinder, C. The steam cylinder, C, is placed with its axis horizontal, and has flanges, I, cast on each side, by which it is firmly bolted down to flanges cast upon the top sides of the frame, A, the cylinder flanges being dovetailed into the frame. The steam piston, J, which is thirty-six inches in diameter, is fitted with metallic packing, and is firmly cottered on to the piston rod and die carrier, H. This piston rod projects behind the piston, and enters a recess, K, cast in the cylinder bottom, in which it takes a bearing so as to secure steadiness of action. In some instances, the constructors make the piston rod pass out through a stuffing box in the bottom of the cylinder, thereby giving it a still longer bearing. The piston rod and die carrier, H, is oblong and rectangular in cross section, and emerges through a stuffing box, L, of a corresponding form, and immediately in front of this it passes through the guide, G. This guide, which consists simply of a horizontal groove formed in the casting, B, is fitted with side pieces which are accurately adjusted by the lateral screws, M, so as to keep the piston rod and die carrier, H, perfectly steady, without, at the same time, interfering with the freedom of its motion. A cover piece is bolted down across the guide. The end of the piston rod, H, is formed with sockets to receive the three dies, N, of hard-tempered steel. These dies, N, are directly opposite to the stationary dies, E, made of the same material, and socketed into the resisting head, D. The faces of the dies are spherically concave, so as to produce spherical heads upon the rivet on both sides.

The admission of steam to the cylinder, C, is regulated by hand. The cylinder is provided with the usual ports, and the side valve, O; but in consequence of the shortness of the cylinder, the traverse of the valve is across the cylinder, being in a horizontal direction below it, and the steam passages are curved to suit this arrangement. In Fig. 2 the section is taken through the valve casing, P, valve, O, and the exit passage, Q, which communicates with the pipe, R. The steam pipe is immediately behind the pipe, R, and is therefore not seen. The slide-valve rod is connected by a link, S, to the hand lever, T, jointed at its lower extremity by a pin to a double-eyed bracket, U, bolted to the framing, whilst the

upper extremity of the lever works in a slot in a plate, V, projecting laterally from the cylinder flange, I.

In operating with this machine, the plates to be riveted are suspended by an over-head tackle, in such a manner as to bring them between the dies, N and E. Then, on the plates being accurately adjusted, the attendant draws out the lever, T, which action admits the steam behind the piston, J, causing it to drive home the die carrier, H. On returning the lever to its original position, the steam enters in front of the piston, forcing it back in readiness for another stroke.

By means of this machine the work is done with greater regularity and without the disagreeable noise which is unavoidable in hand riveting. And the immense saving in time and cost will be apparent when it is stated that whereas, by the common process of hand riveting, three men and one boy can rivet only twenty-three three-quarter-inch rivets per hour, with this machine, one man and three boys can rivet with perfect ease and in the firmest manner, at the rate of six per minute, or three hundred and sixty per hour.

M. Lemaitre, of Paris, was the first to employ an independent steam cylinder for actuating riveting dies without the intervention of rotary movements, but in his machine a system of levers is interposed between the steam piston and the die, so that the action was far from being direct and simple as in the machine of the Messrs. Garforth.

M. Lemaitre's machine embodies an arrangement for holding the plates together during the riveting action; this consisting of a tubular presser, which descends in advance of the rivet die inside it. The object of this is, to prevent the metal of the rivet from spreading between the plates, and thereby rendering their contact imperfect; this defect has not, however, shown itself in the action of Messrs. Garforth's machine, which recommends itself both for its extreme simplicity and accurate action, and the consequent non-liability to get out of order.

NOTES ON MILITARY AND NAVAL AFFAIRS.

AN AVALANCHE OF GOOD NEWS.

As we go to press we are overwhelmed with the most cheering news from every direction. The vigorous preparations of the government seem to be at last completed, and we have begun to smite this rebellion with the whole power of the nation. We hear of the successful attack of the great naval expedition upon the forts at the entrance of Port Royal and the passage of a number of the vessels up to the town of Beaufort. In Eastern Kentucky a victory has been won by the Union forces under Gen. Nelson the most brilliant that we have obtained since the commencement of the war. The Union men of Eastern Tennessee are making war on the secessionists by breaking up the railroad and telegraph communications, burning the bridges, cutting the wires, &c. We also have reports, not yet fully confirmed, that General Price has been driven entirely out of Missouri into Arkansas, and that the privateer *Sumter* has been at last really captured.

THE NAVAL EXPEDITION.

Beaufort, which has been selected as the point of attack of the great naval expedition, is situated on the coast of South Carolina, about midway between the cities of Charleston and Savannah which are 104 miles apart. A low swampy tract of land borders the sea at this point, and a network of bayous extending inland from the ocean, divides the land into a number of islands, upon the largest of which, Port Royal Island, the town of Beaufort is situated. The town is on Beaufort river, some ten miles inland from the coast, and the heads on both sides of the inlet had been fortified by the secessionists to prevent the entrance of our fleet.

The account derived from the Charleston *Mercury* is that the fleet made its appearance off the entrance on Thursday, Nov. 7, and while some of the ships engaged the batteries at the entrance, others pushed on up to Beaufort, and preparations were being made to land the troops. The attack of our vessels was completely successful, soon silencing most of the guns in the batteries. One of our vessels was burned, forming a magnificent spectacle. The guns were successively discharged as the fire reached them, sending their shells ashore. The crew escaped through a hot fire from the enemy. A vessel has arrived at Fortress Monroe direct from the fleet fully confirming the news of the success of the expedition.

THE VICTORY IN KENTUCKY.

The following is the brief telegraphic account of this brilliant affair:

CINCINNATI, Nov. 12, 1861.

General Nelson met the rebels under General Williams at Pikeville, Pike county, Ky., on Friday last, and gained a glorious victory. Colonel Luke Moore attacked the rebels in the rear with 3,800 men, while Colonel Harris, of the Second Ohio Regiment, with 600 men, attacked them in the front, Colonel Harris falling back and Colonel Moore pressing forward, until the enemy were brought into the midst of General Nelson's brigade, when our forces pressed them on all sides, killing 400 of them and taking 2,000 prisoners. The balance scattered in all directions. The Union loss is small. Generals Williams and Hawes are among the prisoners.

Pike county is the most easterly county in Kentucky, about in the middle of the border running north and south.

THE DESTRUCTION OF GUYANDOTTE.

We have the following horrible account by telegraph from Cincinnati, dated Nov. 12th:—

The defeat of the Union forces at Guyandotte was accomplished by trickery on the part of the inhabitants. It seems that a force of rebel cavalry, variously estimated at 500 to 1,000, had concentrated in the country back of the town. These proposed, with the assistance of the rebel inhabitants of Guyandotte, to annihilate the Union forces in the town. This force consisted of 250 Virginians belonging to a Virginia regiment, and a few of Colonel Zeigler's Fifth Virginia Volunteers.

It was arranged between the rebel cavalry and the rebel citizens to massacre our troops in cold blood. Accordingly, the rebel citizens were very kind to our troops last Sunday evening, and invited them to their houses on various pretexts, and all who were off duty accepted the invitation. While they were being entertained, at about half-past eight o'clock, the rebel cavalry dashed into the town. Signals were displayed from every house where the Union troops were, and into these the rebels rushed, murdering the unarmed soldiers in cold blood. The rebel citizens—men, women and children—rushed to arms, and aided the cavalry in the slaughter. The Union troops in camp prepared as soon as possible for defence, but were overpowered, and had to break. Very few men were killed in the engagement with the cavalry, nearly all being murdered in the houses.

When Colonel Zeigler arrived, and on learning the particulars of the affair, he ordered the destruction of the town. The buildings were immediately fired, and the whole town is now reduced to ashes.

MISCELLANEOUS.

Important changes are officially announced in two of the military departments. Major-General Henry W. Halleck is appointed to command the department recently under Gen. Fremont. It consists of Missouri, Iowa, Minnesota, Illinois, Arkansas and that portion of Kentucky west of Cumberland river. Gen. Halleck is considered one of the ablest officers in the army. General Don Carlos Buell is appointed over Ohio, Michigan, and that portion of Kentucky east of the Cumberland river, and the State of Tennessee. Gen. Hunter is appointed to command the department of Kansas, to include the State of Kansas, the Indian territory west of Arkansas and the Territories of Nebraska, Colorado and Dacotah. The Department of New Mexico, to consist of the Territory of New Mexico, is to be commanded by Colonel E. R. S. Canley, United States Army

Advices from the Kanawha state the secessionists, who had been shelling the camp at Tompkins from Cotton Hill, had retired upon the approach of a force under Col. De Villiers. Nine of the enemy's pickets were killed; but no loss on our side. Col. De Villiers has taken possession of the hill.

The people of Maryland, at their recent election for State and judicial officers, have shown their devotion to the Union in a most unmistakable manner, by giving immense majorities for the Union candidates. At the last accounts Maryland had organized already, or was in process of completing, twelve regiments; a result really gratifying to think of after the desperate efforts made on all sides to cause her to abandon the Union.

Casper D. Schubarth, of Providence, R. I., has been awarded a contract for the manufacture of 20,000 Springfield rifles, at an aggregate cost of $400,000. A factory is being fitted up in Providence for their manufacture. Our readers will find an engraving of Schubarth's breech-loading rifle on page 136 of the present volume.

Quartermaster-General Meigs has come to the manufacturing districts to contract in person for army cloths. A very large amount of red tape will be cut in pieces by this arrangement. The presence of this faithful and capable officer will prove of equal advantage to the manufacturers and to the government, and will simplify and improve the arrangements for supplying the army. Gen. Meigs is unquestionably one of the ablest and best men in the government service. He knows his business without advice from others, and faithfully performs it. Gen. Meigs is a thorough military man, and had he been in command of the western department instead of Fremont we should not have had the disgraceful exhibit that now stares us in the face from that department.

We understand that Gen. McClellan approves the proposition for an exchange of prisoners. This has been his sentiment from the start, and declares that "the principle of an exchange of prisoners is demanded by the highest considerations of policy and humanity." This is sound logic, and would be carried out with a recognized government at war with us. If the government consents to an exchange of prisoners the Confederacy isthus far recognized, and would place us in a position toward the rebellious States similar to that occupied by England and France, against which several of our sensation daily papers protested in severe language, thereby injuring the course of our government very materially. We, however, favor some system of exchange.

The allowance of clothing to our soldiers is much greater than to soldiers in European armies. Our troops get one uniform coat and two sack coats a year, and a pair of trowsers every five months. In the French army the allowance for three years is only one tunic and three pairs of trowsers, while a shell-jacket is given every two years. In the Sardinian and Belgian armies, the great coat is expected to last eight years. But the great durability of the clothing of European armies is easily accounted for when we consider the care which is taken to insure good materials. Every yard of cloth is subjected to very minute and distinct examinations by boards of officers, assisted by experts who weigh it, shrink it and examine it inch by inch, against a strong light. They also apply chemical tests to detect the quality of the dye, and the manufactories are at all times open to inspectors, who watch the fabrication at every stage.

Shortly before his retirement, Lieut. Gen. Scott obtained positive information that his entire estate, all of which is situated in Virginia, had been seized and sequestered for the benefit of the so-called Confederate government. The current monthly pay, subsistence and allowence of Lieut. Gen. Scott, were, and by order of the President continue to be, while he is upon the retired list, as follows:—pay, per month, $270; rations, per month, $360; allowance for servants, per month, $90; allowance for horses, per month, $50. Total monthly pay, $770—which makes an annual income of $9,240.

It is understood that the necessary documents were taken out in the Naval Expedition to form, in the places occupied by the Federal troops, Territorial governments, to be in force until the authority of the United States is restored over an entire State, when the old State form will be reëstablished.

The Norfolk (Va.) *Day Book* is now printed on brown wrapping paper, and the character of its editorials seems to have suffered corresponding degradation. Its last stroke of wit is this: that it has seen some candles made from the tallow and fat of dead Yankees, and that they are as bad as candles as the New Englanders are as men.

There are between two and three thousand people on that part of Hatteras banks extending for forty-five miles north of the Inlet. These are true to the Union. Many have come to our forts, and taken the oath of allegiance. By the action of the rebel forces they have been deprived of their means of subsistence, and are suffering great privations. A great public meeting was held in this city on the 7th inst to give aid and comfort to these devoted people. George Bancroft, the eminent historian, presided. Any one disposed to aid them can remit to J. M. Morrison, President of the Manhattan Bank, New York.

Cannonade.

In a general sense a cannonade is the act of firing artillery during a battle or a siege. Technically, a cannonade means an engagement between two armies in which the artillery alone is active, while other arms are either passive or do not, at best, overstep the bounds of mere demonstration. The most celebrated instance of this kind is the cannonode of Valmy, between the Prussians and the French, in 1792. The French general, Kellermann, awaited the attack of the Prussians on a range of hights, his artillery placed in front of his troops. The Prussians drew up on the opposite range of hills, brought forward their artillery and the cannonade began. The Prussian infantry formed several times for the attack, advancing a little, but, on the French remaining firm, withdrew before coming within musket range. In this way the day passed, but the next day the Prussians army began their general retreat. In most general engagements such cannonades occur. In the Sikh war, for instance, as we were recently informed by a British officer at present in this city, who had been through the India campaign in 1842–5, the course of the British army was to pour a few volleys of artillery into the enemy, then charge, and wind up with cold steel. But, generally speaking, cannonading serves to fill up the intervals between a repulsed attack and another attempt to dislodge the enemy; and they form the *finale* of most drawn battles. A cannonade, however, is most frequently used for purposes of demonstration, rather for moral support on the side using it than for physical destruction against the enemy. A cannonade, unless in very exceptional cases, causes greatly disproportionate results compared to the amount of ammunition used. In the battles about to be fought in this country, especially between the armies on each side of the Potomac, artillery will play a more important part than in any wars recorded in history.

Iron Sides and Big Guns—Experiments.

A series of experiments have been completed at Shoeburyness, England, with a target, constructed like the side of the iron frigate, *Warrior*, in order to afford a practical test of its qualities in resisting the shot of the most powerful rifled guns. The target was 20 feet wide, and in hight equal to the frigate's side above the water line. The firing occupied two days, and at a distance of 200 yards from the target. Three shells, filled with sand, were fired from a 100-pounder Armstrong; two shells from a 68-pounder cannon gun; the same number of shells, with percussion fuzes, were fired from the same guns. Three solid cast-iron shot were then fired with the 100-pounder Armstrong; one from a 120-pounder (called a shunt gun); two solid shot from a 68-pounder, and one 200 lb. shot from a shunt gun. A great number of shots were fired on the second day, from the same guns, with the same charges of powder. With the two days' firing not a breech was made in the target, and only one bolt was started. The most of the shot and shell were fired with 12 lb. charges of powder—some with 10 lb charges; the 60 lb. shot were fired with 16 lb. charges, and the shunt gun, with 120 lb. shot, was fired with a charge of 20 pounds of powder. This one penetrated 3½ inches into the plate, but did not break it. Two shot of a novel form were fired, from which it was expected the target would be pierced like a piece of pasteboard. These were solid, having steel cylindrical punches projecting. Each of these cost $35, and was fired with a charge of 16 pounds of powder. One missed, the other penetrated three inches, and stuck fast close to a spot where the target had been previously struck with five shot and shell. The results of this firing have been very gratifying to the British naval authorities. They consider that the sides of the *Warrior* are invulnerable to the shot of the most powerful artillery in the world.

The English Rotten Army Blankets.

The editor of the Boston *Commercial Bulletin* states that he went into the United states depot for army clothing, at the corner of Mercer and Howard streets, and examined the army blankets which have been imported from England. He pronounces them to be rotten and asserts that they are made of rags taken from the cast-off garments of the paupers of the United Kingdom. He says, "we took hold of one of these blankets in order to pull it out from under five or six for examination, when the piece in our hands parted company from the main body." This piece he took to Boston, and it is now in the sanctum of the *Bulletin*. These imported blankets are gray, and are not at all like the army blanket of the British soldier, which is white, and made of excellent long wool; and is capable of enduring two years' hard service. Has the government been swindled in the purchase of these shoddy foreign blankets, and who is responsible for the fraud?

Hot Shot.

Col. Scott, in his able military dictionary, gives the following account of the manner of using hot shot, and the peculiar destructiveness of this missile. The reader will remember that it was hot shot which made Fort Sumter untenable for our gallant garrison; and it would be a curious retribution if, after Charleston is destroyed, the insurgents were in turn driven out of the forts in the bay by hot shot fired from the shore.

The charges for hot shot are from one-quarter to one-sixth the weight of the shot. With small velocities the shot splits and splinters the wood so as to render it favorable for burning. With great velocity the ball sinks deep into the wood, is deprived of air by the closing of the hole, and chars instead of burning the surrounding wood. It should not penetrate deeper than ten to twelve inches. Red-hot balls do not set fire to the wood until some time after their penetration. They retain sufficient heat to ignite wood after having made several ricochets upon water. The wads are made of clay or hay. Clay wads should consist of pure clay, or fuller's earth, free from sand or gravel, well kneaded, with just enough moisture to work well. They are cylindrical, and one caliber in length. Hay wads should remain in the tub to soak at least ten or fifteen minutes. Before being used, the water is pressed out of them. When hay wads are used, vapor may be seen escaping from the vent on the insertion of the ball; but as this is only the effect of the heat of the ball on the water contained in the wad, no danger need be apprehended from it. With proper precautions in loading, the ball may be permitted to cool in the gun without igniting the charge. The piece, however, should be fired with as little delay as possible, as the vapor would diminish the strength of the powder. Furnaces for heating shot are erected at the forts on the sea coast. These furnaces hold sixty or more shot. The shot being placed, and the furnace cold, it requires one hour and fifteen minutes to heat them to red heat; but after the furnace is once heated, a twenty-four pounder shot is brought to a red heat in twenty-five minutes; the thirty-two pounder and forty-two pounder shots require a few minutes longer. Three men are required to attend the furnace: one takes out the hot shot and places them on a stand to be scraped; another scrapes them and puts them in the ladle; and the third supplies cold shot and fuel.

Promotion in the French Army.

Up to the rank of captain inclusive, two vacancies in each regiment are filled by seniority, and the third by choice; and on the colonel rests the responsibility of these latter promotions, since he takes the initiative in presenting the officers he deems worthy of advancement, and without his consent it is impossible, no matter what interest may be employed, to secure the promotion of any subaltern under his command. Each year he makes a list of those officers in the different grades whom he considers most deserving and capable; he names four captains for the rank of *chef-de-bataillon*, or major, seven lieutenants for captains, and as many sous-lieutenants for lieutenants, together with any number of sous-officers he thinks fit for commissions. This list he submits to the inspecting general, who, after having personally examined the candidates, has the power of rejecting any of them whom he may consider unqualified, or of changing their respective numbers of merit, by placing No. 4 first, and No. 1 last; but he can neither add to nor travel out of the list presented to him by the colonel. The amended or sanctioned list is submitted by the inspecting general to the marshal commanding the district, accompanied by his own opinion and by him again it is laid before the Minister of War; and it is in this stage only that interest can be made available, as the minister may select any one, even the last upon the list for the step, though even he is without power to promote any officer not upon it.

ANCIENT CANNON.—Mr. James Bruce writes to say that in the arsenal of Dresden are to be seen several "organ cannon," one consisting of 64, and another of 100 tubes. That which was used before Gremenstein consists of twenty similar tubes; six of which form the lowest row; five the second; four the third; three the fourth, and two on the top. Each row turns on a swivel separately everywhere. It is proposed to construct similar guns for the martello towers, in England, to be fired by electricity or steam.

The French Telegraph on the Field of Battle.

A letter from Chalons, in the *Nord*, describes various improvements in the adaptation of the electric telegraph to the exigencies of active campaigning The writer says:—"We have had experiments with the telegraph, which succeeded perfectly, and which are very curious. Means have been discovered to establish a portable telegraph. A carriage is constructed for that purpose, in which several cylinders or enormous bobbins are fixed, round which is rolled a quantity of iron wire of the thickness of a strong cord. This wire is passed by machinery into the box of one of the wheels, and according as the carriage moves the wheel turns and unrolls the wire. A platoon of cavalry soldiers follows. Two men alight at every fifty paces to raise the wire on a slight stick. Four others do the same while the first are moving forward, and raise the wire with a forked pole, which they fix in the ground, and which is fastened with cords strengthened with iron plates. The horses in the carriage go forward at a gallop, and the telegraph is fixed with extraordinary rapidity. The apparatus is worked in the carriage, which serves as an office. When it is intended to return, the action of the cylinders is reversed, and the carriage is turned round preceded by the men, who take down the poles, replace them in a light wagon, and wind up the bobbins."

An Extraordinary Compliment.

At the meeting held at the Cooper Institute on the 7th inst. in behalf of the North Carolina loyalists, Gen. Burnside, in his address, paid the following extraordinary compliment to Major-General McClellan:—

I do ask your forbearance for, your patience with, your confidence in, the young chief who has now assumed the command of our armies. [Great and enthusiastic cheering and waving of handkerchiefs. "Three cheers for McClellan," which were given, the audience rising and waving their hats.] I have known him most intimately, as students together, as soldiers in the field, and as private citizens. For years we have lived in the same family, and I know him as well as I know any human being on the face of the earth, and I know that no more honest, conscientious man exists than Gen. McClellan. I know that no feeling of ambition beyond that of the good and the success of our cause ever enters his breast. All that he does is with a single eye, a single view to the success of this government, and the breaking down of this rebellion. I know that nothing under the sun will ever induce that man to swerve from what he knows to be his duty. He is an honest, Christian-like and conscientious man, and now let me add one thing, that he has the soundest head and the clearest military perception of any man in the United States.

THE PNEUMATIC POST.—The London *Engineer* says that on the 15th ult. further experiments were made at Battersea for the purpose of showing the action of the pneumatic principle for the conveyance of passengers and parcels for the purpose of experiment. Two carriages only are used, each weighing about one tun, and loaded with 10 bags of gravel, each containing one cwt. These vehicles were drawn, or rather propelled, through the tube over a quarter of a mile long by the pressure of the atmospheric air in rather less than 30 seconds. At other trips a mattress was placed over the bags of gravel in each carriage, and some of the visitors passed through the tube. The journey was of course made in perfect darkness, but beyond this there was no unpleasant sensation whatever.

FRUIT PRINTING.—A German journal, the *Agronomische Zeitung*, publishes the following:—"At Vienna, for some time past, fruit dealers have sold peaches, pears, apples, apricots, &c., ornamented with armorial bearings, designs, initials, names, &c. The impression of these things is effected in a very simple manner:—a fine fruit is selected at the moment it is beginning to ripen, that is, to take a red color, and paper in which the designs are neatly cut out is affixed. After a while the envelope is removed, and the part of the fruit which has been covered is brilliantly white. By this invention the producers of fruit may realize large sums."

BY the latest arrival from England we are informed that there were only 300,000 bales of American cotton in Liverpool against 550,000 bales at the same period last year. The consumption of cotton in England has been greatly reduced, owing to the demand for manufactured cotton goods having fallen off to a very large extent. Many thousand barrels of flour that would otherwise be required for making starch and paste for cotton cloth will not be required.

THE GEOLOGICAL HISTORY OF NORTH AMERICA.

BY DR. STEVENS.

Second Lecture.

I stated last week that at the commencement of the geologic record the only portions of the continent of North America that were above the water were Labrador and a few rocky knobs, including the Adirondack Mountains, the peaks of the Alleghanies and others which I described. These formed barren islands in the midst of the lifeless ocean. The rocks that were formed before the creation of animal and vegetable life upon the earth are called the azoic rocks from the Greek negative, *a*, and *zoe* life. I purpose this evening to describe more particularly the constitution of the azoic rocks.

The oldest of all rocks is granite. When the first islands raised their heads above the level of the sea, the bed of the ocean between and around them was a mass of granite. As the waves dashed against the base of the hills they wore the rocks away, and fragments fell down into the sea, forming the second rock in our series. We find that the rocks next above the azoic granite are slates; mica slate, clay slate, chloritic slate, &c. From the fact of these rocks being formed in layers or strata, we believe that they were deposited from water. Those at the bottom and nearest the hills are generally, and I believe always, composed of coarse fragments of the hills, the fragments becoming finer as the distance from the hills increases. The strata too becomes thinner as we receded from the hills. The upper slates are finer than those beneath them. Those at the immediate foot of the hill generally conform to the slope of the hill, and as the formation extended into deep water it was deposited upon the level floor of the ocean.

You may ask me how I know this. These ocean beds have been raised up and have become dry land, rivers have run across these formations for ages, and have cut their way hundreds of feet down through all the strata to the granite bed. It is only necessary to ride along the valleys of these rivers to see the exact order in which the several strata were deposited one upon another.

I will describe briefly the valuable minerals which are found in the azoic rocks. The most important of these is magnetic iron ore. This peculiar ore of iron is found in the azoic rocks in great abundance, and it is found in no other formation. Red hematite, or the sesquioxide of iron is found in this formation and in several others. The same is true of plumbago. I have specimens here of these minerals, all taken from the Adirondack Mountains. The plumbago and the magnetic iron both came from the same farm. These three are the only valuable metals which are found in the azoic rocks in sufficieut quantity to pay for working. Gold, silver, lead, and, indeed, nearly all of the metals are found in small quantities, but none of them in sufficient abundance to be profitably mined.

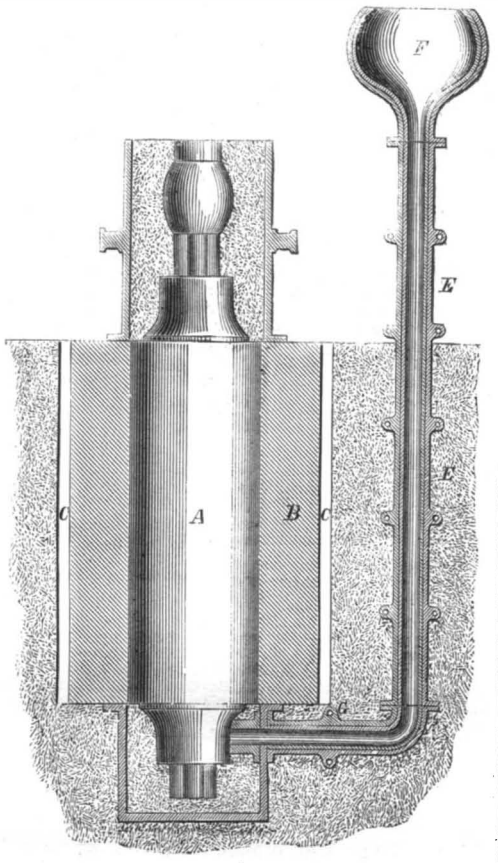
This finishes our hurried survey of the desolate portion of the history of our continent. In the next lecture I shall come to that great epoch when the Spirit of God brooded upon the waters, and life was born.

Not too Much at Once.

Sir Edward Bulwer Lytton, in a recent lecture in England, said:—"Many persons seeing me so much engaged in active life, and as much about the world as if I had never been a student, have said to me, 'Where do you get time to write all your books? How on earth do you contrive to do so much work?' I shall surprise you by the answer I make. The answer is this: 'I contrive to do so much by never doing too much at a time. A man, to get through work well, must not overwork himself; or, if he do too much work to-day, the reaction of fatigue will come, and he will be obliged to do too little to-morrow.' Now, since I began really and earnestly to study, which was not till I had left college, and was actually in the world, I may perhaps says that I have gone through as large a course of general reading as most men of my time. I have traveled much, and have seen much; I have mixed much in politics, and the various businesses of life; and in addition to all this, I have published somewhere about sixty volumes—some upon subjects requiring much research. And what time do you think, as a general rule, I have devoted to study—to reading and writing? Not more than three hours a day; and when Parliament is sitting, not always that. But then, during these hours, I have given my whole attention to what I was about."

IMPROVEMENT IN CASTING ROLLERS FOR ROLLING MILLS.

Le Génie Industriel says that in casting the cylinders for rolling mills, the mold is frequently broken in consequence of the unequal transmission of heat through its different portions. To remedy this evil the Society John Cockerill has invented the plan illustrated in the annexed cut, for which they have obtained a patent in Belgium.



The mold, B, with the space, A, for the casting, is placed in a vertical position as usual, and round the outside of the mold is formed the annular space, C, to be filled with cast iron immediately before the casting of the cylinder. This heats the mold from the outside as well as from the inside, and thus prevents it from breaking. The metal is poured into the funnel, F, and passing through the vertical pipe, E E, and horizontal pipe, G, enters the mold by the lower journal, D.

Dropping the Final Vowel.

[From the American Journal of Photography.]

Voltaire used to say that language was invented to conceal the thoughts of men. Lawyers, politicians, and many theologians practically illustrate the dictum. Mathematicians, and other men of science, however, who have ideas worth communicating, and moreover have a policy and practice of telling precisely what they conceive to be true, look upon the matter in quite a different light. They have seen the unsuitableness of ordinary language for their purpose, and have found it worth while to create a speech for their peculiar use. The botanists, conchologists and ologists generally, have adopted a great deal from the dead languages, for the reason no doubt that what is so very dead as Latin and Greek cannot change.

The chemists in the latter part of the eighteenth century made a new language for their new science—the nomenclature the most perfect of its sort of anything ever conceived. The most perfect, yet still in future to have its revision and finish. It has come only gradually into use. Even at the present day the doctors, who of all men know better and ought to set a better example, are still using some of the outlandish names of things coined in barbarian times, and they have been slower than most other men in adopting obvious improvements in the modern system.

Photographers, however, may congratulate themselves that they have learned and used the most suitable names for the chemical substances with which they are concerned. While the doctor still talks of his hydriodate of potash, and hydrosulphuret of ammonia, the photographer with scientific preciseness knows only of iodide of potassium and sulphide of ammonium.

There are other improvements still to be made in the chemical nomenclature. Let us, photographers, be first to adopt or possibly to propose them.

One of the improvements some day, and we believe shortly to be adopted, is the dropping the final e in the words of which the last syllable is ide. The advantages of such a change are the securing a more uniform pronunciation, and the removing the ambiguity to the eye and ear, which is created by the present similarity to the common termination ite. There ought to be a greater distinction between sulphite and sulphide, chlorite and chloride, than the letters t and d. The dropping the e in ide easily and evidently cures the whole evil. Bromid, iodid, sulphid, &c., are comely to our eye and ear for there is a truthful reasonableness about them.

Now, what say you, brethren editors, and men of business? What says the editor of the Scientific American? If we all agree our agreement is law.

The subject of improvement is not original with us. It is already adopted in *Silliman's Journal*, and in some of the school books. It needs only the sanction of those who approach nearer to the practical affairs of life. Let us have an expression on the subject.

Tan-Bark Fuel.

How often do we not see spent bark in tan yards, piled up in heaps as useless? These masses not only rot and consume themselves by their internal decay and heat, but they communicate their corruption to the tubs, vats and barrels standing near to, or touching them, with other evils too numerous to mention. It has often been discussed, and many have racked their brains to discover how tan fuel might be converted into manure; this appears to me precisely like employing good wood shavings for manure, instead of using them as fuel. I am firmly convinced that the ashes of a lot of tan fuel are better, and give more manure, than the same quantity of tan employed as a manure immediately after having been used. In order to increase, or to obtain the entire heat of the tan, it should not be allowed to lie in large heaps, or to form into balls; in the latter case it becomes hard in the center and consequently is less easily consumed. Neither is tan, freshly taken from the ooze vat, of much burning power, even if immediately and carefully dried; it should be arranged in low heaps, from two to three feet high, and not large in area. In a large tannery these tan beds naturally require considerable space, as the tan must be piled loosely, and not packed together. Tan prepared in this manner, is perfectly adapted, without any admixture of wood, not only to furnaces, but also to heating stoves and fire places. Instead, however, of the ordinary bar grate, a grate perforated with holes like a sieve must be used. The heat of a flame is most concentrated at its extremity, and as the small holes allow it to expand uniformly, separate flames burn and fork through each of the grate openings or holes. In order to enable the necessary quantity of oxygen to be supplied, the fire place should be elevated at least two feet from the floor. This will heat a large-sized boiler in half an hour, while with wood fuel an hour and a half would be required.

[The above has been translated from the German by F. Reuchlin, for the *Shoe and Leather Reporter*. It is stated that the ashes of tan bark are superior to the bark itself as manure. We have seen an experiment tried to prove this, and the result accorded exactly with the above statement. Wet tan bark is used for fuel under boilers in most of the tanneries. We have seen the bark piled up in some cases upon the brick work of the furnaces. This is a bad practice, as it tends to keep the furnaces cool. Grates perforated with holes, instead of furnace bars, have long been used in America for burning sawdust and wet tan-bark. We have been informed by one tanner who has tried to economize fuel by using the tan bark as it came wet from the vats, that he failed to realize any benefit from it. The only saving which he was able to secure in burning spent bark, was by having it wheeled out into the yard and dried by the sun and wind. The solar heat which evaporates the water from bark costs nothing. The steam given off by wet bark in a furnace, we have been told, takes up as much heat as is obtained from it in burning, and that there is no economy in thus using it.—Eds.

It is stated that the Sheffield tool makers have lately turned their attention to manufacturing several tools that had been previously made in America for the Australian market, and that they have been successful in supplying that distant market. Some new improvements are wanted by American inventors to retake the Australian tool trade.

CHEMISTRY OF IRON.

Number IV.

IRON AND SULPHUR.

We very frequently receive from correspondents scattered over the country, some little yellow crystals looking very much like gold, with the inquiry of how much they are worth. These are simply a combination of sulphur and iron, the sulphuret of iron it was formerly called, but now generally written the sulphide. The termination *uret* is now obsolete, having been superseded in all cases, by *ide*, or, as some write it *id*. The crystals spoken of are usually the bisulphide of iron, the atom of which is composed of one atom of iron combined with two atoms of sulphur, Fe S_2 This substance is also called iron pyrites. There are other combinations of iron and sulphur which bear the same name, iron pyrites; but the bisulphide is the most common.

As many who may read these articles will neglect to make the balls to represent the atoms, we will represent them as well as we can by engravings. Let O represent the atom of hydrogen, and o the atom of oxygen. Then the atom of water will be represented by the two combined together, Oo, the symbol of which is H O. If we represent the atom of sulphur, S, by the black square at the left

hand, then the middle figure will represent the atom of sulphurous acid, S O_2, and the right hand figure the atom of sulphuric acid, S O_3. We will use a cross, ×, for the atom of iron, Fe, and the atom of the bisulphide of iron, Fe S_2, will be formed thus.

These figures do not make the matter so plain as the balls do, but they are the best substitute that we can devise.

The bisulphide of iron, iron pyrites, may be found in almost every neighborhood, and examined by our readers. Its properties will be found to be entirely different from those of either sulphur or iron, the two substances of which it is composed. If pounded with a hammer, it is not beaten out into a thin sheet, like iron, but it crumbles into powder. It is not malleable, but it is pulverizable. Neither has it the properties of sulphur. It is harder than either iron or sulphur. It will scratch glass. This is a simple test by which iron pyrites may be distinguished from copper pyrites; and it is well worth knowing, as copper pyrites is very valuable, while iron pyrites has no commercial value. One of the most wonderful things in nature is the entire change which is wrought in the properties of substances by their chemical combination.

The combination of sulphur and iron may be broken up by simply heating the pyrites red hot. The sulphur goes off, and as it leaves the iron it combines with the oxygen of the air, forming sulphurous acid, S O_2. By a certain treatment another atom of oxygen may be induced to unite with each atom of sulphurous acid, and sulphuric acid is produced, S O_2 becoming S O_3. Iron pyrites has come into extensive use within a few years for making sulphuric acid, in place of brimstone which was formerly employed. So far as we know, this is the only industrial use which is made of the bisulphide of iron.

The Cavendish Society.

There is in England an association called the Cavendish Society, of which many men of science in the United States are members. It was formed after the death of Henry Cavendish, the famous chemist and philosopher, who died in London on the 24th of February, 1810. He was a very rich old bachelor, and devoted his life to science from the pure love of the study, having no desire for fame. It is said that several of his discoveries perished with him, and are lost. He, however, published some of the more important in papers read before the Royal Society. He discovered the composition of water and of nitric acid, and proved that the electric spark will cause the oxygen and nitrogen, which are mechanically mixed in the air, to combine chemically and form nitric acid.

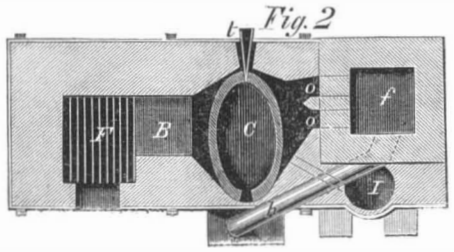
After the death of Cavendish, a society was formed to publish his writings, and it has bean continued for the purpose of publishing works valuable to the world, but of which the circulation would be too limited to render the publication remunerative. The society is now publishing an English translation of Gmelin's work on chemistry, in seventeen large volumes, by far the greatest work that has ever been written on any department of science. The terms of subscription to the Cavendish Society are five dollars a year, and the publications are distributed among the subscribers.

LEAD MINES — PROCESS OF SMELTING.

[Concluded from our last Number.]

In our last we illustrated the common reverberatory used in England for smelting galena; we now present two other furnaces, Fig. 2 being a plan view of the refinery for treating argentiferous lead to obtain its silver.

Fig. 2



F is the fire box, B is the fire bridge, and C is the *cupel*. The flame passes directly over the surface of the cupel, thence by a split passage, *o o*, into the flue, *f*, which is connected to the chimney. The cupel is an oval iron frame; its greatest diameter is 4 feet, its lesser 2½ feet, and it is surrounded with a ring, 4 inches deep, strengthened by crossbars. It is filled with powdered bone ash, moistened slightly with a weak solution of pearl ash. This gives it consistency. The bone ash is beaten down, and when the ring has been well filled, the centre is scooped out with a small trowel, which leaves a raised border of the ash, as represented in the Figs. The width of the border is about five inches, and a hole is cut in it for the escape of the scum which is litharge. The cupel is prepared outside of the furnace, then lifted into it and wedged in its place. The charge to be operated upon consists of lead containing a certain amount of silver. The chemistry of the operation consists in exposing the lead when highly heated to the action of air in the furnace. In this state the oxygen of the air readily unites with the lead forming litharge, but it does not unite with the silver. By constantly removing the litharge (brown oxide of lead) as it is formed, and exposing fresh surfaces of the melted metal to the heated air, the whole of the lead is ultimately convered into litharge leaving the silver in the bottom of the cupel.

The heat is applied very slowly at first in refining for silver, otherwise the cupel, C, would crack. The temperature is gradually raised to a cherry red, and the charge of lead previously fused in the cast-iron vessel, I, (which has a small fire under it) is introduced in the cupel by a spout. A blower is always necessary for refining, and the blast is introduced into the cupel by the tuyere, *t*. It blows off the litharge as it forms on the surface of the charge, and drives it over the cupel head on the other side into an iron vessel below. As the lead wastes away by the litharge scum forming on the top of the charge, and being blown off, more molten lead is occasionally added from the iron smelting vessel, I. The operation is continued until about five tuns of lead have been operated upon. The remainder is then withdrawn and tested, and it generally undergoes another refining operation before the silver is obtained pure. Pure lead, containing only three ounces of silver to the tun, may be advantageously treated for its silver, by what is called the Pattison process which is now followed in the lead mining districts of England. This process is founded upon the principle that when lead containing silver is melted and allowed to cool in the same vessel, crystals of lead will first form from the surface downward, while the silver remaining longer fluid sinks toward the bottom. Argentiferous lead when thus treated deposits all its silver in the bottom of the vessel, but combined with such a small quantity of lead that it can be coupled at a very moderate cost, in comparison with the old method of coupling a great quantity of lead to obtain a small quantity of silver.

Fig. 3

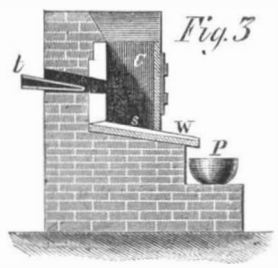


Fig. 3 is a very simple furnace employed for smelting the lead ore of the north of England and at the Scotch mines. C is a cavity of masonry lined with cast iron. The sole plate, *s*, is also cast iron, its back and sides are upright cast-iron ledges, and W is a cast-iron plate in front, called the *work-stone*. It has a rim at each side; it slopes forward and has a hind ledge rising about 4½ inches above the hearth. The back ledge of the sole, *s*, is surmounted with a piece of cast iron called the *back-stone*, on which the tuyere, *t*, is placed. As the ore is smelted, the fluid lead which is separated flows out by two gutters in the plate, W, and into the receiving pan, P. The bottom of the hearth, *s*, is usually rammed with a mixture of bone ash and galena. The front of the furnace is open for about twelve inches from the lower part of the front cross piece, to the upper part of the plate, W, and the smelter operates upon the charge through this opening. The escape of the sulphurous fumes into the smelting house, is prevented by enclosing the entire hearth in a hood of arched brick work. It will be understood that all these smelting furnaces are reverberatory; the fuel is not mixed with the ore. The fire is separated, as shown in Fig. I. The furnace, Fig. 3, requires the galena to be first roasted on a low flat hearth, covered by a low arch, and heated by a fire place at one end. The temperature of this roasting bed is kept below the melting point of galena. The object of this operation is to drive off the sulphur. Copious fumes of sulphurous acid always escape from the surface. In all smelting establishments there is difficulty in preventing a considerable portion of lead from being carried off in the form of fume, because lead sublimes at a high temperature. This occasions loss to the smelter in metal and these fumes are injurious to vegetation in the surrounding country, especially when the ores contain some arsenic. To prevent this, the flues of the chimney communicate with large chambers in which a shower of cold water is introduced, and the sulphurous fumes condensed. It may be stated in a general way, that the process of smelting galena consists simply in burning out the sulphur after the ore is properly prepared. The galena is kept at a temperature below that required for for its fusion, and air is freely admitted into the furnace. The sulphur being driven off, the lead is left pure excepting that which is formed into an oxide and passes into the slag, which is afterwards reduced with charcoal dust, and lime. The use of the hot blast in lead smelting reduces the ore in a much less space of time than the cold blast. In Germany and France, small reverberatory lead furnaces are employed, and about 28 per cent of old iron is thrown into the melted ore. This iron absorbs the sulphur, and the lead flows into the bottom of the basin, such as that represented in Fig. 1. This system involves the total loss of the iron, but it is quicker than the English mode.

Natural Spring of Carbonic Acid.

At Piermont, in Germany, there is a natural spring or well of carbonic acid gas. The sides of it have been walled, and steps have been laid for entering it. The well is shallow, and the gas fills it to a depth of about four feet, so that the gas rises about to the middle of a person standing in the well. Carbonic acid, in contact with the skin, produces a peculiar prickling sensation, and people visit Piermont for the purpose of taking a carbonic acid bath. The keeper makes a practice of blowing soap bubbles, which fall through the air, but which rest upon the surface of the heavier gas, and dance up and down as the gas is agitated.

All kinds of soft porous stone become hard by whitewashing them with fresh slacked lime. The lime absorbs carbonic acid from the atmosphere, and is converted into carbonate of lime. A portion of this remains in the pores of the stone, and ultimately becomes marble.

Correspondence

Steam Rams.

Messrs. Editors :—Mr. Ellet, civil engineer, has brought this important element of nautical aggression before the public so fully as to require little or nothing to be added to his views on the subject. It is the object of this article to furnish an example of the destructive force exerted by a light North river steamer, as illustrated in a remarkable way by the steamboat *Empire*, of Troy, in the year 1842. This vessel arrived early at the city of New York in a spring morning, when the river was obscured by a fog which lay some thirty feet high over the river. She had for the trip a new pilot, not well acquainted with the wharves in the upper part of the town. A new pier had been just completed of such length that the only vessel attached to it, and lying at its extreme end, seemed to be at anchor in the stream, leaving plenty of room for the boat to pass between it and the shore. Deceived by this appearance the new pilot headed the boat for the mid space between the vessel and shore, in consequence of which she struck the wharf fairly with the whole power of her engines, forcing the bow of the boat first through the timber facing of the wharf, logs of 18 inches square, then through solid stone filling 8½ feet, and then through earth and rubbish 17 feet further, making a triangular chasm of 12 feet wide at the logs, 27 feet long and 7 feet deep. The only injury sustained by the boat was the breakage of one of her oblique hog braces and a slight leak at the stern. Now, when the light weight and slight build of this vessel are considered, and the moderate impelling power compared with that employed for heavy vessels, there is here abundant evidence that in the momentum of vessels constructed for war there is a terrible element of destruction still dormant, yet to be employed in naval warfare. It seems to me that no vessel now existing would stand the blow given to the New York wharf by the *Empire* without being sunk at once. What could resist the momentum of a vessel of twice the weight and six times the propelling force of the *Empire*, fitted with a steel-ax prow and an iron fortified bow? Would the iron-mailed *Warrior* ever enter the harbor of New York if met head to head by such an antagonist passing through the water at a rate of 18 to 20 miles the hour?

The writer is disposed to think that for the harbor of New York the money expended upon a pair of iron rams, of 2,000 tuns each, would be more available for its defense than double the money on casemated forts.

New York, Nov. 6, 1861.

[The above is useful information, and our naval authorities may well profit by the suggestions of our correspondent. But it should never be forgotten that the efficiency of such rams must be in proportion to their mass and the power of their engines. If the huge *Warrior*, moving at the rate of 16½ knots per hour, were to strike such a boat as the *Empire*, armed with a steel bow, she would cleave through her almost as easily as pass through the foam of a sea wave.—Eds.

The Principle of the Barometer.

Messrs. Editors :—If I hold a pint vessel bottom up under water how heavy a weight would it take to force out the water, the weight forming a lid at the bottom, and thus causing the vessel to be empty while it is still under the water? N. A.

[It will depend upon the size of your vessel and the depth to which it is placed under the water. If your vessel is an inch square, (or, in scientific language, if the cross section of your vessel has one square inch of area,) if it is placed under water to the depth of 33 feet, it will require a weight of 15 lbs. to sustain the pressure of the water. If it is placed under the water 2 feet it will take about 1 lb. If the area is double, the weight must be double, and so on.—Eds.

The latest news from Europe states that the cotton market is dull, that the prices have slightly declined, and the Indian cotton crop is reported to be large.

The New Metals---Rubidium and Cæsium.

We find in the last number of the *American Journal of Photography* the following description, by Prof. Joy, of the new metals discovered by Bunsen and Kirchoff, of Germany. The description was given at a meeting of the Photographical Society, of which Prof. Joy is Vice President :—

Rubidium and cæsium resemble potassium so closely that they cannot be distinguished from it by the usual reagents, or before the blowpipe. Their presence in minute quantities can only be recognized by aid of the spectroscope.

Rubidium is so named from *rubidus*, dark red, that being the color of the spectral lines which fall outside of Fraunhofer's line, A, and are therefore difficult of detection, excepting with nicely adjusted instruments. Traces of rubidum are to be found in a majority of mineral waters. Bunsen found the largest quantity in lepidolite, or lithia mica, from Rogena in Moravia. Three hundred pounds of the mineral yielded two ounces of the oxide of rubidium.

In order to obtain the new salt, the double chloride of potassium and platinum, rubidium and platinum, and cæsium and platinum were precipitated by means of the bichloride of platinum. The potassio-bichloride of platinum is soluble in nineteen parts of water. The rubidio-bichloride of platinum requires one hundred and fifty-eight parts of water. This afforded a method of separation, by boiling the precipitate in *very little* water and pouring off the dissolved potassium salt for twenty times in succession, a tolerably pure rubidium salt was left as a residue. The atomic weight of rubidium is 85·36 (H = 1).

Caustic rubidia resembles caustic potash; carbonate of rubidia is insoluble in alcohol; it can be readily converted into bicarbonate. Nitrate of rubidia varies from nitrate of potassa in crystalline form. Sulphate of rubidia is isomorphous with sulphate of potassa and forms cubic alum with the sulphate of alumina. Chloride of rubidium crystallizes in cubes.

Cæsium appears to be a constant companion of rubidium, and is found in the largest quantity in Durkheimer water.

The three double salts of potassium, rubidium and cæsium were precipitated as before by the bichloride of platinum, and the potassium salt being removed by means of its greater solubility, the chloride of rubidium and cæsium were converted into carbonates and digested in alcohol. The carbonate of cæsia being soluable in alcohol, is in this manner separated from the carbonate of rubidia.

Pure cæsium can probably be obtained in the same manner as sodium and potassium by reduction of the carbonate. The atomic weight of cæsium is 123·4 (H = 1), after gold and iodine, the highest on the list of elements. Caustic cæsia resembles caustic potash; carbonate of cæsia is soluble in alcohol, in which reaction it differs from the carbonate of rubidia; nitrate of cæsia is isomorphous with the nitrate of rubidia; sulphate of cæsia forms alum with the sulphate of alumina. Chloride of cæsium is deliquescent like the chloride of lithium.

Uses of Rawhide.—Few persons know the value of rawhide. It seems almost strange to see them sell all of their "deacon" skins for the small sum of thirty or forty cents. Take a strip of well-tanned rawhide, an inch wide, and a horse can hardly break it by pulling back—two of them he cannot break any way. Cut into narrow strips, and shave the hair off with a sharp knife, to use for bag strings; the strings will outlast two sets of bags. Farmers know how perplexing it is to lend bags and have them returned minus strings. It will outlast hoop iron (common) in any shape, and is stronger. It is good to rap around a broken thill—better than iron. Two sets of rawhide halters will last a man's life time—(if he don't live too long). In some places the Spaniards use rawhide log chains to work cattle with, cut into narrow strips and twisted together hawser fashion. It is good to tie in for a broken link in a trace chain. It can be tanned so that it will be soft and pliable like harness leather. Save a cow and "deacon's" pelt and try it.—*Country Gentleman.*

Refusing the Honors.—The London *Times* announces that the Queen of England had offered to confer knighthood upon William Fairbairn, late President of the British Association for the Advancement of Science, and that he had declined the honor. Offers of knighthood have been made and refused by several of the distinguished mechanics and men of science in Great Britain. James Watt refused knighthood, as did Robert Stephenson, Michael Faraday, and now William Fairbairn, who, like Faraday, commenced public life as a poor mechanic, and has worked up to the head of his profession, is an honorary member of the Institute of France, Fellow of the Royal Society, an able author on engineering subjects, and is the inventor of the cellular hollow girder system, upon which the Britannia tubular bridge is built. Titles conferred by royalty cannot add to the honors of such a man, and Fairbairn, in all likelihood, looks upon them as mere baubles.

The Industrial Society of Mulhaus, France, has offered a prize of 17,500 francs (about $3,000) for the invention of a substitute for the white of eggs (albumine) which is much used in printing colors on muslins.

Defects of Bridges---Bad Workmanship.

The *American Railway Times* states that the iron railway bridge over Green river, at Greenfield, Mass., which was designed by Herman Haupt, Esq., and built by Mr. E. L. Childs, broke down under the very test which was to prove its capacity for the loads that were to pass over it, and this failure was caused by an infirm casting. "The span of the bridge was 120 feet in the clear. It was divided into three equal spaces and at points of division posts were erected, forming a truss girder system. The depth of the truss was 22 feet; the supports consisted of ten sets of suspension rods—five on each side—presenting a united cross section of 20.7 square inches, passing from the top ends of one set of posts to the bottom of the next. The rods were connected by passing into cylinders of cast iron (which were hooped with wrought iron bands) and were secured inside by nuts." The greatest strain upon the rods from the maximum load was less than 10,000 lbs to the square inch, and this was not one-sixth of the breaking weight. The cylinders of cast iron were not relied upon to resist any part of the strain; they were merely connections for the wrought-iron hoops and as supports for the posts, and yet it was one of these cast-iron cylinders which caused the failure. It was found fracturcd at the edge of one of the hoops. The fracture when examined, exhibited a rusty surface for nearly the whole distance. The casting was defective in a most extraordinary degree, and must have been broken before it was put into the bridge, but it was under one of the hoops and could not be detected. The calculated strength of this bridge was six times greater than any possible load intended for it, and it was designed, not in a parsimonious spirit, but to combine strength and durability, and to have no parts subject to rapid decay exposed to the weather. Mr. Samuel Nott, one of the engineers who examined the bridge, and gave evidence as to the cause of its fall, stated that the accident was caused by a slight mistake made by the blacksmith who did some work on the cylinders. All the important parts of a bridge should be open to full inspection, not only before they are put together, but after the bridge is erected. Such structures should be inspected regularly, because bolts may start and rods may crack by the passage of trains, by frosts and other causes.

Kind Words from our Cotemporaries.

The *Great Western Journal*, published at Grand Rapids, Michigan, s ys as follows, and we thank the editor for his kind remarks :—

"The Scientific American—A Journal of Practical Information in Art, Science, Mechanics, Agriculture, Chemistry and Manufactures." Such is the title of a weekly publication, of sixteen pages of letter-press, in a form suitable for binding, by Munn & Co., of New York city, over whose pages we have spent many a pleasant and profitable hour in bygone days, and from whose pages we hope to draw much practical information, for the benefit of all our readers. But our best efforts will fail to give a just appreciation of its real merits, for its beautiful engravings we cannot copy. For reliable information upon all practical subjects we know not its equal. It is a leader in all the great improvements, wonderful discoveries and inventions of this progressive age.

The *Register*, published at Bordentown, N. J., informs its readers that the Scientific American is worth $10 per annum to any mechanic. We wish there were fifty thousand persons who considered it worth to them even $2 a year. It adds :—

We are in receipt weekly of the Scientific American, one of the best papers for mechanics, machinists, &c., published in this country. No good mechanic should be without it, and we don't see how any aspiring machinist can get along without it. Every new invention and improvement upon machinery is given in it at the earliest opportunity. It is by studying the principles of mechanism alone that mechanics will rise to any degree of eminence in their profession, and we think the Scientific American is worth more in one year to a mechanic than $10 worth of instruction from a teacher.

The Pleasures of Business.

It is gratifying to every person to have his labors appreciated and his services acknowledged. It is to us one of the pleasures of our life to receive such expressions of satisfaction as are contained in letters like the following from men for whom we have acted as attorneys in obtaining their patents :—

Messrs. Munn & Co.:—I received my patent several days ago. I feel very grateful to you for the interest you manifested in my case, and shall take pleasure in entrusting all future patent business to your care, and cheerfully recommend all inventors to do the same. Feeling myself under many obligations to you for all official favors, I remain your most obedient servant, Isaac Freligh.

Windham, Ohio, Nov. 2, 1861.

GLADSTONE ON NATURE AND ART.

At the late opening of the Liverpool School of Science, Mr. Gladstone, M. P., certainly the most learned and eloquent member of the House of Commons, made a speech from which we select the following paragraphs as eminently suited to our columns.

RAILROADS.

My honorable friend, the President of the British Association, Mr. W. Fairbairn, in phraseology befitting his position, described the progress by the number of the pounds of pressure on the square inch. I will venture to refer to another mode of illustration, more familiar to us all, even if not so strictly accurate or profound—namely, the number of miles that we travel in the hour. Now, sir, I would recommend those who wish to measure practically the advancement of the kind we are now describing in this country to take the pains to read the evidence which was given by the elder Mr. Stephenson before the first committee of the House of Commons, which was appointed to consider the first bill for the purpose of making a railway from Liverpool to Manchester. When that gentleman appeared as a witness in the face of able and learned men, whose business it was to convict him of being a mere dreamer and enthusiast, he judiciously avoided stating what, perhaps, his prophetic spirit had divined of the great results that were about to be achieved; and I think that when Mr. Stephenson was asked at what rate it was probable that the locomotive engine would carry passengers along that railway, he judiciously confined himself to the statement that he was sanguine enough to believe that such an engine would be able, under favorable circumstances, to draw those passengers at the rate of eight or ten miles an hour. But even that did not satisfy the relentless ingenuity of those who cross-examined him, and they solemnly adjured Mr. Stephenson to say whether, upon his credit as a man of practice and a man of science he would undertake to assure that committee that he thought that such an instrument as a steam engine ever would draw people along the iron rails with such velocity as the speed of eight or ten miles an hour. And Mr. Stephenson was so wise in his generation that he would not adhere to the speed of eight or ten miles. I do not recollect the figure to which they brought him down, but I think at last he would not absolutely commit himself to promise a speed of more than five or six miles an hour. Mr. Harrison was the leading counsel against Mr. Stephenson. He was not satisfied with the modesty of that eminent man, and the prediction he had made. He ridiculed those predictions, and said; "Woe be to the unfortunate gentleman, who, living in Liverpool or Manchester, and having an engagement to dine in the country at a particular hour shall trust himself to one of our trains with the expectation that it will bring him in time for dinner." Well, ladies and gentlemen, we have passed by that scene; and I believe I should be correct in saying that even since the locomotive began to display its powers in practice—since the railway system was established—those powers have been far more than doubled; and we do not know at what point the limit of their application may be reached.

SCIENCE OF NATURAL HISTORY.

It may be asked what is the use of the science of natural history? Well, ladies and gentlemen, I must confess it appears to me that its moral uses are almost infinite; but I will venture to detain you for one moment upon its material uses. Nay, I will venture to take only one of those material uses—I mean this, the use of suggesting to the mind of man that he should copy the finished and exquisite, yet simple as well as beautiful processes by which the Author of Nature in the works of Nature has attained His ends. Now, it is not at all difficult to point out what I think are striking instances of this truth—that man in all periods has derived his most valuable inventions from the observation of nature. I believe there was a time when it was desired for an important purpose connected with the population on the banks of the river Clyde, to introduce pipes of a particular description under that river. The man who solved that difficulty, I believe, was no less a man than James Watt. And how did he solve that difficulty? Why, it is upon record that he solved that difficulty by learning how to construct the pipe to get water under the Clyde, from observing the construction of the shell of a lobster. Well, now, ladies and gentlemen, we often hear of the part which is performed by lobsters on certain occasions, chiefly festive and convivial occasions. I must say, as far as I know, we often hear of mischief resulting from a too free observation of lobsters upon those occasions, but Mr. Watt observed his lobster to some purpose, and he learnt from the construction of its shell, a great mechanical secret, which he applied to the solution of an important problem for the comfort and well-being of his fellow-citizens. Sir Isambard Brunel, in placing the Thames Tunnel, took his lesson from a very insignificant personage, and yet a personage wise enough to teach him more than he had known before—I mean that personage whom we know by the name of the earth-worm, for it was the manner in which he, I believe, bores the earth, that suggested to Brunel the mode of making that very remarkable work, the Thames Tunnel, with which his name is associated.

THE OAR, WHEEL AND PLOW.

I want to show the truth—the broad truth—of this doctrine, that in the observation of nature lies a great part of the means of scientific progress, and will you allow me to go back to the rudiments, to the very cradle of the whole matter. The three most important inventions, lying at the very root of social progress, are—the oar, the wheel and the plow. The history of the inventions is so old that it is lost sight of in the darkness of antiquity. If it be true that man in his infancy learned from the observations of nature, depend upon it nature has not told all nor a twentieth part of her secrets. She has a great deal more to tell for the benefit of those who come after us. Well, now, I believe there is little doubt, judging from such considerations of indirect evidence as can be brought to bear upon the question, that the oar—that instrument by which men passed from one continent to another, and from one island to another, a process otherwise impossible—that the oar was simply learned from the motion of the wing of a bird in cleaving the air. How came the wheel? I believe the wheel was learned from observing the circular motion of certain birds, and particularly of one description of hawk when in its flight—a description of hawk which, in the Greek tongue, still bears the name from which our word "circle" is derived. Well, then, thirdly, I come to the plow. Now, I must confess I think it is a question of great interest to know how it was or how it probably could have been, that man should have been directed to the use of that most valuable instrument the plow; because, if we consider ourselves in a primitive condition, it is by no means a simple or obvious matter. One would think that a man, beginning with the use of his hands, and with the use of some simple form of instrument, was a long way from the idea of the plow, which is rather an artificial formation, and supplies the double motion of direction from behind, traction from before, and then again a somewhat complex form of instrument. Gentlemen, I am not presuming to dogmatize, but I do believe that the most probable account that can be given of the invention of the plow is this, that it was founded upon an observation which, perhaps, may excite your mirth—upon the observation of that which is done by a very humble but useful animal—by the snout of the pig. If you will take the opportunity of observing the action of the pig when he gets upon the turf with his snout free, and when he has a mind to plow, you will soon perceive that he is an excellent plowman. I don't mean to say that he runs his furrows quite as straight as it is desirable that the human plowman should; but the idea of turning up the ground, which was what man soon found was necessary in order to bring in action the power of the atmosphere, and make it fertile for his purposes, is an idea the pig fully understands, and when he is free from the ring that annoys him, he constantly puts it into practice.

WEDGWOOD.

There is one name eminently connected with the observation of nature and works of the useful and beautiful in art—I mean the name of Wedgwood; and I don't believe that a greater name is to be found in the history of art in this country. Wedgwood was one of those who had begun, as we may say, from nothing; and I trust there are many that are now beginning from nothing; that there are some possibly in this hall that are making their commencement from nothing, but yet that are destined to leave a name honorable in the annals of their country. (Applause). You all know that the industry and skill of Wedgwood were directed to applying those clays and earthern materials which in this country abound to the formation of pottery and porcelain, especially of porcelain. Well, now, it is recorded in that most valuable work of Mr. Smiles—perhaps as valuable as his "Life of Stephenson"—which is designated "Self-Help," as one of the earliest of the stages of Wedgwood's operations, that, while he was still a mere laborer and hardly of full age, he used to make earthenware knife-handles in imitation of agate and tortoise-shell, and table plates in imitation of lemons and vessels to hold pickles in imitation of leaves and such like articles. And I do not believe there is one of those things that proceeded from the hands of Wedgwood that is not at this moment worth, six or eight times the price which Wedgwood himself put upon it. All I can say is, that I saw to-day, in a shop in this, town two little black cups which Wedgwood would have put up at 4s. or 5s., and the price asked for them—which was, no doubt, a moderate price, and the dealer had a right to ask it; but the price asked was £2 10s.

DISTINGUISHED MEN.

It is no small satisfaction to us to reflect how often the pursuit of science has been the means of bringing forth from an obscure and lowly lot those who deserve to be eminent among their fellow citizens. We have seen such men as Robert Stephenson, Faraday, Sir Humphrey Davy and Hugh Miller, beginning life in the condition of laborers, but ending in a station that was eminent in the face of their fellow countrymen. We have seen others, such as Watt and Crompton, beginning their services humbly—services in a manner that have contributed in a degree it would be impossible to describe to the general wealth and power of the country. We have seen Arkwright and others themselves reaping a large share of the rewards and benefits they have procured for others, and becoming the possessors by the most honorable means—by means most beneficial to the country as well as to themselves—of colossal fortunes. And I do not desire, in mentioning the progress achieved by individuals, that we should appeal to merely selfish motives. It is not the mere possession of money that constitutes the benefit. It is not the mere rising of this or that man that constitutes the benefit. It is the healthy action which is communicated to the whole social frame in a country where class mixes with class, where no man can stand simply upon traditlon, although tradition is justly respected here; but where the very lowest and humblest of the community, by diligence and perseverance, by making a full and regular use of the gifts which Providence has committed to him, may bring himself forward into the foremost ranks, and thereby not only reap advantages for himself, but may yield to others an example that will again become the spring and the spur to an honorable industry.

STUDY OF GOD'S WORKS.

When a man comes to study and observe the kingdom of nature, he finds himself in contact with vast and gigantic forces that he cannot for a moment resist. He feels himself absolutely in the power and at the disposal of an Almighty Being, and he sinks into humility before the majesty of that being. But while he thus learns humility, and while he might almost be appalled by the evidences of power—on the other hand, he sees those cheering proofs, multiplied from every side, of beneficent design, which encourage him to repose a filial trust in the goodness of that God who has so richly throughout the natural kingdom provided for the support, the comfort and the advancement of human nature. And if we are told that intellectual pride is to be the result of scientific knowledge, all I can say is that intellectual pride was not its result in the mind of Bacon, in the mind of Newton, in the mind of most of those great men who have most faithfully and successfully dedicated themselves to those pursuits; because they have always felt that whatever nature told to us was but a light which glanced upon other regions as yet unexplored, and which testified to the existence of an infinity of knowledge not as yet communicated, entirely transcending that limited province within which it has as yet been given to man to walk. In that humility, in that modesty, in that thankfulness, in that sense of wisdom and goodness of the Almighty, which all His works, with one voice and from every quarter, proclaim—surely we ought to find lessons, aye sermons I may call them, as effective perhaps even as those which may be delivered from the pulpit of religion, teaching us the lowliness of our condition, but teaching us also that there is One who cares for us, and who, while we trust in Him, and strive to follow Him, will never abandon us in our low estate.

Lime in Agriculture.

In a paper lately read by Boussingault, before the Paris Academy of Sciences, he stated that lime introduced in an arable soil very quickly sets at liberty a certain quantity of azote in the state of ammonia; the azote elements were before united in insoluble combinations, not assimilable by plants—the action of the lime sets them free, and permits a part of the capital buried in the soil to be utilized for the next crop. Boussingault thinks that certain mineral matters, such as potash and silica, may be liberated in the soil by the lime; that other substances injurious to plants, are destroyed or modified by the same agent, and that to these effects is added besides a physical action, changing the constitution of the land. The action of lime is thus excessively complex, and its good effects can only be explained by studying attentively the special circumstances under which they are produced. The grand fact proved by the present researches of Boussingault is, that there exists in mold, as well in the form of organic matters, as in that of mineral matters, a host of substances completely inert for vegetation, until the moment when some proper agent renders them assimilable by plants. The continuance of experiments can alone clear up these complex facts, and point out to our agriculturists the most effective processes.

Australian Acclimatizing Efforts.

From a report of a lecture delivered at the Melbourne Mechanics' Institute by Mr. Edward Wilson, of the *Argus* newspaper, it appears that the work of acclimatizing European birds and fishes is being pursued vigorously, and with considerable success. The skylark and the thrush were breeding freely in a wild state, and "not only making various neighborhoods vocal, but absolutely, by force of example, compelling the native birds to improve their song notes." A number of fallow deer had been turned out, and taken readily to bush life. Several kinds of English pond fish had been safely brought over, and transferred to the native waters. A collection of birds, amongst others the Indian curassow, gold, silver and common pheasants, Ceylon peafowl, American and other waterfowl, were being prepared in the Botanic Gardens for transfer to wild land, and it was thought that all would eventually thrive. The lama has been acclimatized and its wool has become one of the products of Australia.

FORMIDABLE WEAPON.—A very formidable weapon is, we understand, about to be introduced into our army on the Potomac. It is an improved Congreve rocket, so contrived as to be made to fly a distance of four to five thousand yards. For service against masses of cavalry and infantry, or "setting fire to towns and villages, or anything that will burn or has life," it is said to be one of the most fearfully destructive weapons ever devised by man. This terrible instrument of war, we presume, will also be employed to protect the coast, and for other purposes, on board the iron-clad ships and floating batteries of the United States. At the right time and place, there can be united with it another still more remarkable invention, whose name we withhold till it shall be required by the government, but which, properly used, will utterly annihilate any hostile fleet that may threaten our ports or seaboard.—*Boston Transcript.*

THERE is a lathe in Forrester & Co.'s Foundry, Liverpool, England, which has a face plate twenty feet in diameter, a slide rest twenty-five feet in length, it weighs seventy tuns, and is capable of boring a cylinder ten feet in diameter. Two eighteen-inch mortars have been cast in this establishment for the British government.

A NEW steam mail line between France and the West Indies has been projected and a firm in Scotland has obtained contracts from the French government to build eight iron paddle-wheel steamers for it, each of 3,000 tuns burden, with engines of 700-horse power. Screw steamers would certainly be more economical for such a purpose.

Improved Plow and Seeding Machine.

After all the seed planters that have been invented it is somewhat surprising to find one with as much novelty as is embraced in the one here illustrated. It is designed for sowing wheat and other small grains, and plowing in the seed at the same operation. By a slight alteration it is readily adapted for cultivating corn or potatoes, plowing four furrows at the same time, and throwing the dirt either toward or from the row as may be desired.

A light but stiff frame, A, supported upon two light wheels, is drawn by two horses. Four plows, B B B B, are attached to this frame by metallic rods, C C C C, pivoted at their forward ends, so that the plows may be raised clear of the ground in turning at the ends of the furrows, or in transporting the machine to and from the field. For each pair of plows a lever, D, connected with the rods, C C C C, is brought within reach of the driver's arm, to enable him to raise the plows with facility.—Notches in the upright standards, E E, hold these levers so as to suspend the plows in their raised position, or to confine them in the ground when lowered. The pivot pins, F F, are made of wood, and break in case the plows encounter any solid obstruction, and thus save from fracture other portions of the machine, the repair of which would be more expensive. The depth of the plows in the ground is adjusted by varying the hight of the rods, G G G G, either by means of nuts and screws, or by slots and keys, as may be desired.

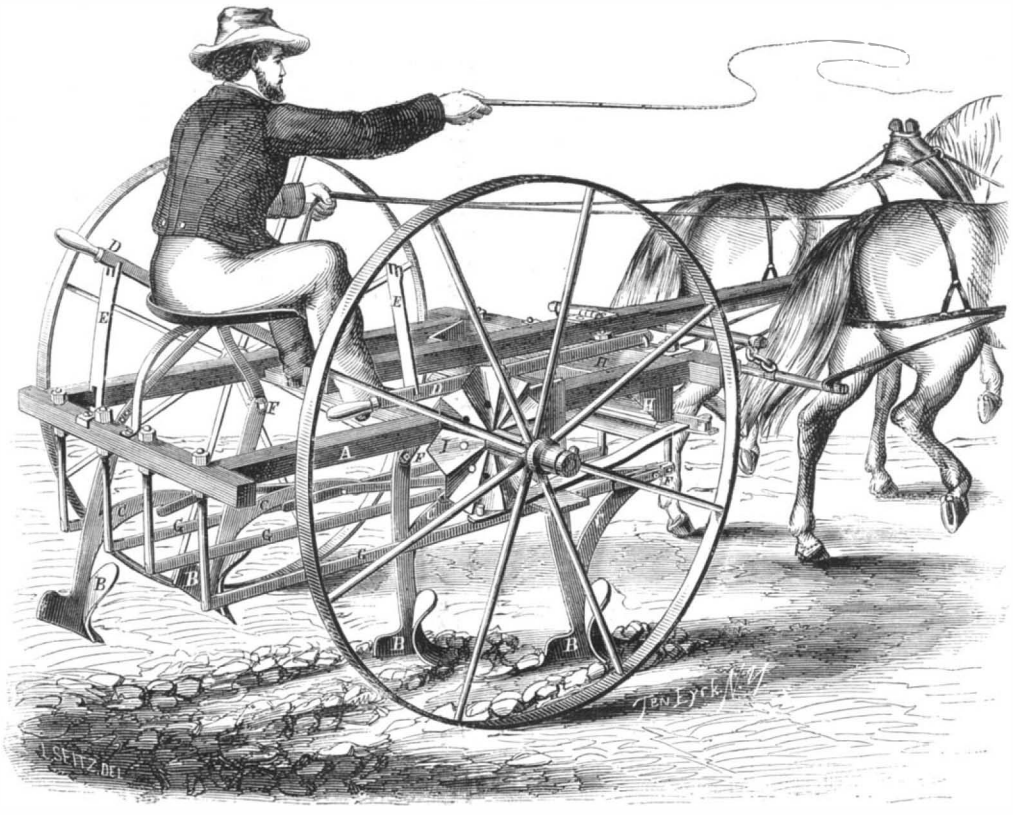
The seed box, H, which is placed across the forward end of the frame, A, is of peculiar construction. Upon its bottom are two metallic plates, lying one over the other, both perforated with holes and made adjustable, so that the holes may be brought to coincide more or less perfectly, to vary the size of the openings for the discharge of the seed, and thus to regulate the quantity per acre which it may be desired to sow. This double plate receives a reciprocating motion from the cam plate, I, on one of the driving wheels. Between the holes are brushes, under which the holes are carried to drop the seed, the bottom of the box having holes directly beneath the brushes. It will be seen that this arrangement prevents the grain from being cut or broken.

For plowing corn or potatoes two of the plows are left, one diagonally in the rear of the other, as shown, and the other pair are brought forward in a similar position, directly opposite. The horses walk one upon each side of the row, and thus the row is completely plowed at a single passage through the field. It will be seen that by reversing the position of the two pairs of plows, the dirt may be thrown either toward or from the row.

It might be supposed that plows running in gangs would be more likely to become clogged with weeds, but the very reverse is found to be the case. A rear plow throws the dirt upon the ends of weeds caught by the plow before it, and thus the weeds are drawn out and the plows cleared.

By this machine the seed is sown directly in front of the driver, and plainly in his sight, which enables him to instantly check any irregularity in the sowing. As a cultivator it enables a man to plow an acre in half the usual time, and consequently to raise forty acres of corn instead of twenty, if he has the land.

Application for a patent for this invention has been made through the Scientific American Patent Agency, and further information in relation to it may be obtained by addressing the inventors, Jacob Early and J. B. Parvin, at Hightstown, N. J.



EARLY AND PARVIN'S PLOW AND SEEDING MACHINE.

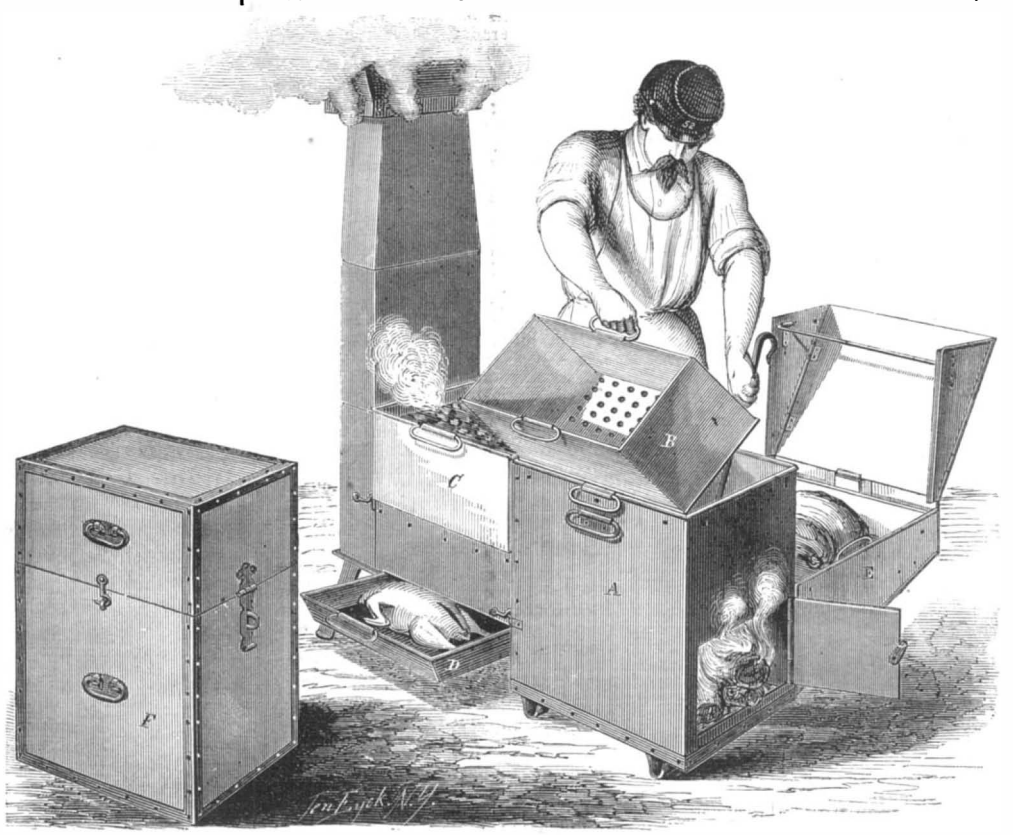
Improved Camp Stove.

It is difficult to conceive of a stove at the same time more compact when packed away, and affording more extensive and varied conveniences when unfolded than the one here illustrated.

The main body, A, of the stove is made of sheet iron, with the space for the fire in the lower part, as shown. A boiler fits into the upper part of the stove, and on this rests the steamer, B, for cooking vegetables, rice, &c. A third boiler, C, fits upon an opening in the horizontal portion of the flue, and a broiling pan or oven, D, slides like a drawer under this portion of the flue. A supplemental oven is suspended by hooks upon the side of the stove, with bright tin reflectors at the top and bottom for throwing the heat upon the articles to be baked.

In packing away, the three boilers, one within another, are placed in the upper part of the stove. The drawer, D, and the several sections of the upright part of the flue fit in the horizontal portion of the flue, which is placed in the fire space of the stove. The whole is then placed in the box, F, and the several plates of the oven, E, are folded together, being hinged for the purpose, and are slipped into the box by the side of the stove.—The box, F, is made water tight so that it may be used for washing dishes or other articles.

A patent for this invention has recently been obtained through the Scientific American Patent Agency, and further information in relation to it may be obtained by addressing the inventor, Geo. A. Higgins, at 19 Beekman street, New York.



HIGGINS'S IMPROVED CAMP STOVE.

PHOTOGRAPHY IN THE REFORMATORY.—A novel and interesting application of the art is now in daily use at the famous Mettray colony, near Tours, which is the first and most celebrated reformatory established in France for young convicts. Every urchin brought to this house of correction has his portrait taken the moment he sets foot in it, and another is made on the day of his leaving. The first represents the rags, dirt and misery, the physical and moral degradation, the prematurely careworn features, the scowling, cowering, timid, uneasy and withal ferocious look of the born thief. The second shows the same individual transformed by the magic of judicious discipline, which includes physical comfort and kind treatment. His dress is now clean and neat, and his countenance is redolent of health, contentment, benevolence and energy. Philosophy had never, in any age, a grander subject for contemplation than two such pictures. More than one of the English reformatories adopt a similarly interesting record of the good they effect.

OF the total tunnage of shipping which enters the port of Liverpool annually about one-half of it comes from the United States.

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VOL. V. NO. 21.....[NEW SERIES.]....*Seventeenth Year*

NEW YORK, SATURDAY, NOVEMBER 23, 1861.

PROGRESS OF THE ELECTRIC TELEGRAPH.

The rapid development and extensive application of the electric telegraph seem more like miraculous results than the efforts of man. This discovery confers upon human beings powers almost akin to those possessed by the Omniscient Governor of the universe. With a few plates of platinum and zinc immersed in dilute acid, a coil of copper wire surrounding an iron bar, and an iron cord stretched upon poles extending along the highway, man can now hold instantaneous converse with his fellow man from one end of a continent to the other. With materials so simple in form and arrangement, such a power seems, indeed, to be superhuman.

The march of invention has been regular in all its cadences;—every note is situated in its appropriate place and all its numbers flow harmoniously.

The invention of the compass for navigating seas enabled the daring mariner to cross unknown oceans and discover new realms. After this came the progression of peoples to the western hemisphere and the settling of new continents and isles of the sea, thus uniting distant lands by the ties of kindred and commerce. Emigration and trade soon afterward increased in an unprecedented ratio, and the wings of the wind were found all too slow for wafting the merchant's bark across the billows. Some great improvement was then felt to be necessary for increasing commercial facilities and obtaining more frequent communication with separated friends. As if designed to supply the want, steam power then joined in the march of invention, long voyages were shortened upon the sea, and by the railway distant settlements were more nearly linked together.

But while these improvements undoubtedly brought separated nations and kindred closer together, they also, at the same time, tended to invite the enterprising to the exploration of new and more distant realms. As the result of this influence, the golden slopes of the Pacific have been peopled in a very few years with many thousands of human beings whose native hearths are on the shores of the Atlantic. It really appears as if the wide earth, through the influence of discoveries in science, had of late years been growing more and more like the abode of one family, for there is scarcely a household in any civilized community which has not a representative in some far-off land, and with whom frequent communication is much desired. And now the telegraph joins in to complete the grand roll of social improvements. The electric cord now spans the continent of the New World, and faster than the earth revolves upon its axis, messages speed along the slender wire between the Atlantic and Pacific cities.

The first scientific suggestion for the construction of the present electric telegraph was made by Ampere, in 1820, and he applied the subtile galvanic coil—the principle upon which the electric-magnetic telegraph is based. In 1837 Professor Morse publicly described his telegraph, which was invented in 1832, but Cook and Wheatstone, of England, first applied the electric telegraph to public business in 1838. In 1844 the first public telegraph line in America was erected between Washington and Baltimore, and since then we may truly assert the whole world has been *electrified* by the invention. It is but seventeen years since the first line of 44 miles was erected, and now there are no less than 56,000 miles of line in operation in America. What an astounding development of the agencies for rapid communication!

But with the triumph of the Pacific telegraph inventors and telegraph companies must not fold their hands under the supposition that we are at the end of improvement. We take this opportunity to suggest, as we did on a former occasion, that the telegraph is capable of being improved and adapted to a much greater extent than it is, as a substitute for the post-office system. Of course improvements are necessary for increasing the number of messages sent by each machine, and the cost of operation must be greatly reduced. One man can write as fast as a common sounding instrument can receive messages; but this is too slow for the present electric age. Companies for working short independent lines should be formed in every city and in all thickly peopled districts, for introducing the telegraph as a substitute for the "Penny post." The powers of eachm achine may be greatly increased by modifying its parts and adapting it for working four, five or more wires—such a number not being objectionable on short lines. This is an important subject and it deserves general attention.

CHANGES IN OUR MANUFACTURES.

If the war should continue for any considerable length of time, it will make some very important changes in our manufacturing industry. Our cotton mills must cease running for want of the raw material. What will be the effect? Will the owners shut themselves up in their houses, and doze away the rest of their lives in idleness? And will the workmen all fold their hands in helpless imbecility, and die of starvation? Events now passing before our eyes are a complete answer to the question. We see the expansion of our cotton manufacture suddenly brought to a stop, and a ready investment by our cotton manufacturers in great establishments for making arms. That great impelling power of industrial operations—the love of gain—one of the most useful and valuable principles that have been planted in the heart of man by his beneficent Creator, fortunately drives our manufacturers to seek new employments for their capital; and thus our industry, instead of being destroyed, is simply diverted. If a continuance of the war should make a permanent change desirable, we may be sure that it will take place. The active, ingenious and versatile Yankee is not going naked if he cannot get cotton; much less is he going to starve to death for the want of that particular vegetable fiber. Men lived and clothed themselves very well before cotton came into general use as an article of clothing, and if a blight should seize the cotton plant so that no more of it should ever grow, it would take mankind but a very short time to adapt themselves to the change.

The idea that the persons employed in any particular industry must perish if that industry is destroyed results simply from an ignorance of the nature of wealth and the process of its production. There is no limit to the demand for the products of labor. If a man cannot produce one article of property let him produce another. He will be sure to find a market for it at some price. It is true that he may pay such prices for his raw material and for labor that his article will cost him more than it will bring. But the enlightened self-interest of each manufacturer will save him from this error, and will so distribute the labor of the country that it will be generally remunerative. There will be an enormous increase in the number of our woolen and linen mills, though we look for the largest expansion in our iron manufacture. This is the industry which has had the steadiest and most vigorous growth throughout the world, and this growth is unquestionably destined to continue. New uses are constantly being discovered for this most valuable metal, and new improvements in the process of its manufacture. Both of these classes of discoveries tend to increase the amount of its consumption. We published last week a statement from the London *Engineer* that the Bessemer steel of excellent quality can now be made for $35 per tun, or 1¾ cents per pound. It is impossible for any person to conceive the extent to which this single improvement will increase the consumption of iron. There are thousands of uses for which iron is adapted but for which it is not used on account of the cost, and every reduction of the cost increases enormously the amount of its consumption.

Any community that leans exclusively upon one branch of manufactures is more exposed to general disaster than a community whose industry is varied. It is fortunate for this country at the present time that we are not so exclusively devoted to the cotton manufacture as some of the districts of England. If the war has the effect to direct the attention of our manufacturers to the hundreds of openings which exist for the profitable employment of capital, and thus to give a greater variety to our occupations, its effects may be ultimately favorable to the prosperity of the county.

THE GREAT INDUSTRIAL EXHIBITION—IMPORTANT TO INVENTORS.

The approaching great Industrial Exhibition, which is to open in London early next year, promises to equal, if it does not outrival, its great prototype of 1851. The building is rapidly progressing, and already the number of applicants for space is very large. The particulars in reference to applications on behalf of proposed exhibitors were given in our last number, together with a full list of Commissioners. Persons desirous of contributing must have their articles entered without delay and accepted, as all articles, if to be sent by public conveyance, must be ready for shipment at New York by the 1st of January, 1862. A brief description of the articles will be required, with the space they will probably occupy. The exhibition is to open on the 1st of May next, and our country is likely to be well represented.

It is important to inventors who propose to exhibit their articles to know that they cannot safely do so without first obtaining protection under the English Patent Law. They cannot introduce their inventions to public notice without forfeiting their rights to protection under that law. Patents must first be secured, and the claims should be prepared with great care and by experienced attorneys; otherwise they will not stand the test of judicial examination. The proprietors of the SCIENTIFIC AMERICAN have had many years' experience in soliciting European patents. Their agency in London is one of the oldest and most reliable in England, and the utmost care is taken to prepare the case to stand the most searching investigation. Inventors and patentees who wish to secure their patents under the English law can obtain all needful advice by addressing MUNN & Co.

LAMP CHIMNEYS.—The greatest expense and trouble connected with burning coal and petroleum oil, arises from the frequent breaking of lamp chimneys. These are made of clear white glass, and are brittle to a proverb. They could be made of a stronger and cheaper glass, such as that used for making bottles. A patent has lately been taken out by Mr. Bailey, of Wolverhampton, England, for making such chimneys, and also lamp globes of bottle glass, moderately colored, to modify the intense glare of the flame. Oil merchants and refiners of coal oil should encourage such an improvement, as more coal oil would be used were it not for the trouble experienced with the common miserable chimneys furnished for oil lamps.

THE manufacture of large Armstrong guns for the navy has been suspended by the British authorities. The *Engineer* states that they have been found inferior to the common 68-pounder smooth bore cannon.

"DEPOSITION OF KING COTTON."

One of our cotemporaries, under the above heading, exults over the decease of "King Cotton," and shouts aloud for his successor "King Wool." In times of public excitement common sense frequently takes aerial flights, and it has done so in this case. Our cotemporary says, respecting cotton :—"We have to provide a substitute, and Providence, which is liberal as well as wise in dispensing its favors, gives us a compensation. Henceforth, if we be wise, wool will replace cotton." It then goes on to advance proof and argument to show that wool can be produced in quantities sufficient to take the place of the cotton we have been accustomed to use. It states that our annual consumption of wool has been about seven pounds per head, and that this may be doubled if not trebled.

We have sought in vain to obtain accurate statistics respecting the annual home consumption of wool, but that of cotton amounts to 308,295,600 lbs. But even if the crop of wool were to be trebled, it would, according to the above standard, only amount to 630,000.000 lbs., which would be a very inadequate supply for the quantity of cotton that has been hitherto required. In the port of Liverpool no less than 1,314,491,392 lbs. of cotton were received in 1860 and only $43,715,472 lbs. of wool. These figures, showing the quantities of cotton and wool that arrived at Liverpool—celebrated for its imports of manufacturers' materials—afford, according to our notion, good comparative data of the two crops all the world over.

The average yield of American ginned cotton to the acre of land has been 252 lbs. It will take eight acres of land devoted to sheep culture to raise the same quantity of wool. The demand for wool has generally exceeded the supply even when cotton was free for sale. We, therefore, consider that those who have stated that wool can be raised in sufficient quantities to supply the place of cotton, have drawn upon their fancy for facts.

We think we can "see through a millstone" just as far as any other person, but we confess our utter inability to offer a sensible prediction as to the future of cotton. We know—because it is self-evident—that if cotton cannot be obtained in sufficient quantities next year, there will be a great demand for some substitute, even if its price be double or treble that formerly paid for cotton. It appears to us that flax is the only material that seems to be capable of supplying this want to a very considerable extent; hence, we have exhorted farmers to make preparations for its cultivation upon an enlarged scale. At the same time, we also urge more devotion to sheep culture, as there will certainly be a full demand for all the wool that can possibly be raised.

A NORTHEAST STORM MOVES AGAINST THE WIND.

Dr. Franklin observed that the northeast storms on the east side of the North American continent usually commence at the southwest and travel against the wind; and the fact of this apparently impossible operation has been confirmed by all subsequent observation. So well established is the law, that since the construction of telegraphs, it has been customary in Washington to arrange out door operations on the telegraphic reports of the weather at the southwest. A northeast storm, commencing in South Carolina usually reaches New York in from 18 to 30 hours, and continues at the same rate to Boston, Portland and Halifax. When telegraphs were first established it was repeatedly suggested that the intelligence which they would furnish of the weather at the southwest would prove a safe guide for the departure of vessels from our harbor, but we are not aware that an organization was ever formed among our merchants for the purpose of procuring this valuable knowledge.

Though it might seem at first sight impossible for a storm to move against the wind, when the fact is fully established it is not difficult to find an explanation. Clouds are formed by the condensation of vapor in the air which is invisible until it is condensed. As the wind comes from the comparatively warm ocean lying to the northeast, it is loaded with vapor which is condensed as soon as the air is cooled down to the dew point. The winds at first blow a long way over the land, reaching the foot of the Alleghany mountains before they become sufficiently cooled to cause the condensation of the vapor which they contain. The reduction of temperature however extends backward into the current, cooling it, and forming cloud and rain. So, though the clouds are constantly moving with the wind, the border of the falling rain is constantly traveling backward against it. It is easy to see that the rate at which it travels will vary with the varying difference between the temperature of the ocean and that of the land.

TRANSFERRING STEEL ENGRAVINGS ON BANK NOTES.

In the course of our business we are in the way of receiving bank bills from all parts of the country, and having observed that the engraving of those made by the National Bank Note Company is of a very superior quality, our attention was thus called to their establishment; and the idea suggested itself that there might be something in the process that would interest our readers. We purpose to describe at this time only the mode of transferring steel engravings.

The portraits and other small pictures which are engraved on bank notes are used on several plates without being reëngraved, and as the engraving of these, in the high style of the art employed, costs some two or three hundred dollars a piece, the process by which they can be transferred from one plate to another saves an enormous expense. Before a window, with the best light which can possibly be obtained, the engraver sits at his bench with his magnifying glass at his eye, and before him a small steel plate about an eighth of an inch in thickness and perhaps two inches square. He has in sight a drawing, say of the head of Washington, which it is his business to copy upon the steel plate, by scratching lines in the plate with a small steel point. The plate is softened by annealing before it is engraved, and is afterward hardened by a process which we will describe at another time. The lines which the engraver makes in the plate are to receive the ink, and he accordingly makes them broad and close together in the dark parts of the picture and omits them entirely in the high lights. This work requires the utmost care and is exceedingly slow, demanding weeks, and even months to engrave a single head; and as the labor is performed by artists who can command high pay, the engravings are very costly.

After the engraving is finished the plate is hardened and the engraving is then transferred to the periphery of a small steel roller. The rollers are two or three inches in diameter, with faces of different widths for engravings of different sizes, and they have holes through their axes about an inch in diameter for mandrels. The plate being hardened, and the temper of the roller being drawn, both are placed in the transferring press. This consists of a massive iron lever about five inches square, the farther end of which is forced up by a second lever with the fulcrum very near one end, by which means the end of the large lever next the workman can be forced down with very great power. The roller is slipped on a mandrel and placed under the lever, with the engraved plate on a platten below it. The platten rests on friction rollers between smooth guides, and when the workman has brought the pressure of the lever upon the mandrel of the roller, he moves the platten many times back and forth, thus rolling the roller repeatedly upon the engraving under great pressure. As the engraved plate is hard while the roller is soft, the metal of the roller is pressed into the grooves of the plate, and a reversed transfer of the engraving is produced. The roller is then hardened, and, by a precisely similar operation, in the same press, the engraving is transferred to the plate from which the bank note is printed. As the second transfer again reverses the engraving, the depressions and elevations on the second plate are the same as on the first.

The National Bank Note Company have large safes filled with these rollers, bearing upon their peripheries the transfers of engravings. The engravings are so costly that the rollers are worth far more than their weight in gold, and they constitute no inconsiderable portion of the capital of the company.

THE aggregate receipts for the six principal lines of railway in France, from January to October, 1861—nine months—amounted to about $59,863,430, which is an increase of more than $6,000,000 over the receipts during the same period of the previous year.

THE SUCCESSORS OF THE URETS.

The words sulphuret, carburet, cyanuret and the others of this class, are now obsolete, having been replaced by sulphide, carbide, cyanide and the others. The editors of the *American Journal of Science and Arts* and a few other writers, in dropping the *uret* supplied its place with *id*, writing carbid, sulphid, &c., and on another page will be found the reasons for this orthography, stated with remarkable clearness by the editor of the *American Journal of Photography*. Some of the principal chemists in the city have represented to us that, as the SCIENTIFIC AMERICAN has by far the largest circulation of any scientific publication in the world, the course that we take will probably decide which termination shall be adopted.

It is a matter of small importance, and it seems to us that it is hardly worth while for the chemists of this country to separate themselves in this matter from those of Germany, France and England. We should like to see not only a common nomenclature but a common thermometer, a common unit of atomic weights, a common system of weights and measures, and as many things as possible in common universally adopted throughout the world of science. In order to do this some must give way, and we are not sorry that Americans have the opportunity to take the lead in the emulation of small sacrifices which is necessary to bring the men of science of all nations upon a common ground. We are in favor, therefore, of retaining the final e, and we think that the editors both of the *American Journal of Science and Arts* and of the *American Journal of Photography* will finally approve of our decision.

Death of an Eminent Patent Lawyer.

The name of Seth P. Staples has been familiar to us for many years, but in announcing his death we are somewhat surprised to find that he had attained to so great an age. He was born in Canterbury, Conn., Sept. 1, 1776. His father, the Rev. John Staples, was a lineal descendant of Miles Standish of the Plymouth Colony. He entered Yale College in 1794, and, on graduating in 1797, received an honorable appointment, and immediately afterward commenced the study of law, and was admitted to the bar at Litchfield, Conn., in 1799. He practiced with considerable success in that State, where he founded the Law School connected with Yale College. In the commencement of his legal career, he was elected a member of the Connecticut Academy of Arts and Sciences, and subsequently was representative in the State Legislature for seven or eight sessions, and retired from political life in 1816. He afterward removed to New York city, where he attained the summit of his profession, first as a commercial solicitor, and then as a lawyer in patent cases. He was at one time the leading counsel in this class of cases and was connected with the Goodyear India Rubber suits, the Tathan Lead Pipe cases, the Wilder and Herring Safe litigation and many others. He was considered an able and upright lawyer.

Railways of Great Britain.

From two Parliamentary returns just issued, it appears that the aggregate number of miles of railway open for traffic in the United Kingdom at the end of 1860, was 10,433, against 10,002 miles at the end of 1859. The total number of passengers conveyed on those railways in the year 1860 was 163,485,678, against 149,757,294 in the year 1859, showing an increase of 13,678,384. The total traffic receipts for the year 1860 amounted to £27,766,622, against £25,743,502 in the year 1859, showing an increase of £2,023,120.

The total working expenditure amounted to £13,187,368, or 47 per cent of the receipts. There were £14,579,254 for the year applicable to the purposes of interest and dividend on the loan and share capital of the various Railway Companies of the United Kingdom. Of the total working expenditure 18.48 per cent was for the maintenance of the permanent way: 28.83 per cent for locomotive power; 8.49 per cent, for repairs and renewals of carriages and wagons; 22.05 per cent for traffic charges; 3.93 per cent for rates and taxes; 2.75 per cent for government duty; 1.37 per cent for compensation for accidents and losses; 8.10 per cent for miscellaneous expenses; making the total working expenditure as above stated. The total income was about $188,833,000,

THE ERICSSON BATTERY.

At the late extra session of Congress an appropriation of $1,500,000 was made for building iron-clad vessels, under a provision that three naval commanders were to approve of all plans before being adopted. The Secretary of the Navy accordingly appointed Commodores Smith and Paulding, and Captain Charles H. Davis to examine and report on the several plans submitted by engineers and shipbuilders. Among others, Captain Ericsson appeared before the committee with a plan of an impregnable battery, which was at once adopted, and the construction of the battery was ordered by the Secretary of the Navy. The contract bears date 5th of October, and stipulates that within one hundred days the entire structure must be ready for active service. In view of the magnitude of the work to be performed this condition would appear almost impossible to comply with, and calls for extraordinary diligence on the part of the constructor. There is another stipulation in the contract of a most remarkable character, and probably without a precedent, viz., the trial of the efficiency of the battery must be made under the guns of the enemy's batteries at the shortest ranges. The United States to furnish guns and ammunition, as well as officers and men.

We have had an opportunity of making a minute examination of the plans of this novel instrument of aggressive naval warfare, and shall probably soon publish an elaborate illustration of it in the SCIENTIFIC AMERICAN. In the meantime the following general description will give a correct idea of its leading features.

The structure consists of three principal parts, viz., a shallow-decked vessel with perpendicular sides, dead flat bottom and pointed ends. Under this shallow vessel a second and deeper vessel is attached with raking stem and stern, perfectly flat bottom and sides inclined at an angle of 51° to the vertical line. This lower vessel does not extend the entire length or breadth of the upper one. It is in free communication with the latter, the bottom of which is cut out corresponding exactly with the top line of the lower vessel. The third principal part consists of a cylindrical turret placed on the deck of the upper vessel. This turret contains the armament, which it effectually protects. We have only to add that a screw propeller is applied aft of the raking stem of the lower vessel, and aft of the propeller an equipoise rudder, both of which are thus hidden under the upper vessel, by which they are most effectually protected; the anchor being in like manner protected by the forward projecting part of the upper vessel, within which it is suspended in a cylindrical chamber open from below. A steam engine, boilers and blowers, all snugly stowed away in the lower vessel, complete the general arrangement of the battery which Ericsson is now building for the government for the purpose of silencing the guns of our antagonists on the banks of the southern rivers. The following particulars will furnish our readers with the necessary data for estimating the chances of success in this important enterprise:—The upper vessel, built of iron, is 174 feet long, 41 feet 4 inches wide, and 5 feet extreme depth. The draught of water will be 3 feet 6 inches, and consequently the projection above water line will be only 18 inches. A wooden bulwark, composed principally of white oak, 30 inches thick, protects the side of the upper vessel, and extends down to the bottom, being thus 5 feet deep. This bulwark is secured to the vessel's sides in a peculiar manner, requiring no through bolts. An armor, composed of rolled plate iron, in all 6 inches thick, covers the bulwark from top to bottom, extending all round the vessel. The stem and stern being both pointed at an angle of 80°, the armor will present a sharp wedge at each end of the vessel of enormous strength. The deck, as it must be shell proof, is made very heavy. It is composed of oak beams, 10 inches square, placed 26 inches apart, the deck plank being eight inches thick, covered all over with double plating, one inch thick. The lower vessel is 124 feet long and 34 feet wide at the junction with the upper vessel, and its depth is 6 feet 6 inches. This lower vessel is built quite light, as it is perfectly protected by the upper one. The manner in which this necessary protection of the lightly-constructed lower hull, propeller, rudder and anchor is attained is the most important feature of this singular structure. The constructor, we find, instead of relying on the water as protection, brings the lower body within such angles that shot cannot strike without first passing through water for a distance of more than 25 feet, and then striking at a very acute angle, 10° at the most; while the propeller, rudder and anchor cannot be reached by shot at all.

The turret, within which two guns of the largest caliber are worked, consists of a cylinder 20 feet internal diameter, 9 feet high, composed of 8 consecutive rings, each one inch thick, all firmly bolted and riveted together. There are no horizontal joints, the plates lap over each other in such a manner as to present a single joint only at any one place. Including the interior skeleton to which the plates are attached, the turret presents an immense wrought-iron cylinder, 9 inches thick, weighing upwards of 100 tuns. The top is covered with a shell-proof flat roof, placed six inches down the cylinder; it consists of forged beams covered with perforated plate iron. Several sliding hatches, composed of 2 inch thick plate iron, give access to the turret from above. The port holes are circular and placed 3 feet above the decks. The guns will move on slides made of forged iron extending across the turret; the carriages, also composed of wrought iron, are made to fit the slides very accurately, these latter being planed for that purpose. The circumference of the turret rests on a turned composition ring inserted in the deck, but the weight is sustained principally by a vertical shaft, 10 inches diameter, which rests in a cup supported by a bracket firmly bolted and braced to the main bulkhead of the vessel about half way down. A spur wheel 6½ feet diameter, 11-inch face is attached to the turret shaft. By means of the spur wheel and intermediate gearing, actuated by a double cylinder engine, the turret will be turned and the guns pointed in any direction. A rod connected with the reversing gear of the engine, passes through the vertical shaft, and enables the person in charge of the guns, to control the aim. For a contest with iron-clad ships carrying the heavy ordnance recently devised in Europe, captain Ericsson proposes to dispense with two of the outer plate rings of the turret, and to attach in their place staves of rolled iron 4 inches thick, thus presenting an aggregate thickness of 10 inches of plating besides the internal skeleton.

The steam machinery and propellers now being built for the battery demand no special notice at present. The cylinders are 40 inches in diameter and 22-inch stroke; the boilers are on the horizontal tubular plan. The blowers for the boilers and for ventilating the vessel will be actuated by separate engines, as usual. Smoke pipes above deck will be entirely dispensed with during active service, the products of combustion passing off through shell-proof gratings in the deck.

Extraordinary exertions are being made to complete the work within the time specified, the number of hands now employed being estimated at 1,000. Three of the largest rolling mills are at work on the plating. Messrs. Corning, Winslow & Co., Abbott & Son and Holdane & Co., all contribute to their utmost ability. The turret is being built at the Novelty Works, the whole of the tools and machinery usually employed in iron ship building in the establishment being now devoted to the work connected with the turret. The main engines, boilers, propellers, &c., are being manufactured at the Delamater Works. The turret engines, gun carriages, &c., are being made by Messrs. Clute Brothers, of Schenectady. The hull and works connected with the deck are being carried out at the Continental Iron Works, Green Point, a considerable portion of the force being employed day and night.

HAND LAMP.—We have been using for some time past a very convenient hand lamp, designed by J. E. Ambrose of Jersey City, N. J. It is a coal oil lamp, dispenses entirely with the chimney, and affords a light equal to three ordinary candles. It is a very convenient and safe arrangement, and for common household purposes the best plan we have yet seen.

THE phosphorus disease, a terrible malady which rots the bones of workmen in lucifer match factories, &c., is said to be curable by the use of bichromates. M. Ponsier, a French chemist, who has investigated this subject, declares that the best remedy is bichromate of ammonia.

California Cotton.

The San Francisco *Mercantile Gazette* says:—"We were shown a few days since a sample of cotton raised in Tulare county, which in length of staple, fineness and strength, we found nearly if not quite equal to good middling Louisianas. It was deficient in color, having been bleached probably by too long exposure after opening, but the fiber was excellent. From our recollections of the King's river and Four Creeks region of country, we have no doubt that large tracts of land can be found there, well adapted to the culture of cotton. It is certainly worth the trial. A sample of cotton raised near Salt Lake city was also shown to us not long ago, part of a crop of 100 bales (if we remember correctly), and about equal to middling Tennessees. It was slightly stained, and not well handled, but fair in body and staple. We regard these facts as unequivocal indications of the capability of our State to produce cotton in quantity. The plant requires moisture, and sufficient length of season, to mature between late and early frosts. There are certainly many localities in the state where these requisites can be found."

The Quantity and Clip of California Wool.

In the first annual report, lately issued, of the California Sheep-Raisers' and Wool-Growers' Association, it is stated that the number of sheep in that State is estimated at 1,574,666 from one year old and upward. The daily consumption of mutton is 2,300 sheep per day, or 839,500 per annum. The prices of sheep have advanced 60 per cent since July last. The clip of wool for this year is 4,544,000 lbs., of which 3,069,000 lbs were shipped for New York, Boston and England. The report states that no less than 10,000,000 lbs. of wool will be required this year for army purposes. The average cost for maintaining sheep in California is 75 cents per head per annum. The average weight of fleece is 3 lbs. Some very large flocks of Australian merino ewes have lately been imported; their yield is 6⅜ lbs. of fleece each.

Messrs. Flint, Bixby & Co., sheep raisers, of San Juan, in Monterey county, California, have clipped 100,000 pounds of wool from their flocks this year. Several of the sheep yielded 12 pounds, and one buck a 25-pound fleece. The yield of wool on the sheep in California is greater than on those in any other country in the world. The climate is most favorable for sheep raising.

IRON CEMENT.—To prepare iron cement for stopping leaks, take sixteen parts of clean wrought-iron filings, three parts powdered salammoniac and two parts flower of sulphur; mix all well together, and preserve the compound in a stoppered vessel and in a dry place till wanted for use. Then take one part of the mixture and add to it twelve parts of clean iron filings, and mix this new compound with as much water as will bring it to the consistency of a paste, having previously added to the water a few drops of sulphuric acid.

ON the first week of last month (October) the river Nile overflowed its banks, and Egypt experienced an inundation unparalleled for 25 years. Villages were flooded, crops of corn and cotton swept away, and desolation spread far and wide. A vast extent of the delta of the Nile presented the aspect of alake.

MR. J. NICHOLS relates, in the *Lancet*, an interesting instance of complete separation of the nose from the face, with a transverse division of the upper lip throughout its whole extent, so as to allow it to hang down over the mouth, both of which readily reunited on being replaced, and kept in their appropriate positions.

THE Philadelphia *Press* states that no less than eight firms in and around that city are engaged in making swords for the army. Henry Diston, of Laurel street, Philadelphia, has converted his extensive saw factory into an establishment for making sabers and other cavalry equipments.

Dr. DOUGLASS, in his report to the Sanitary Commission of his visit to the camps about Washington, states that in all the regiments but four, a majority of the soldiers are Americans. Two of the regiments are composed of Irishmen, and two are composed about equally of Germans, Irishmen and Americans,

Interesting Facts about Army Mules.

[From the Cincinnati Commercial.]

At Perryville, opposite Havre de Grace, twenty-five miles northeast from Baltimore, a great mule and wagon depot has been established. The American flag at that point waves in triumph over 6,000 mules and 3,000 wagons, with arrivals every day. A thick cloud of dust hovers over the region round about, and the air is resonant with multitudinous brays, intermingled with the hoarse cries of the mule-breaker.

Coming down from Port Deposit in a buggy, by the river road, in the outskirts of the city, we came upon a vast *corral* of United States wagons, inclosing a space of five or six acres. Inside of the inclosure we noticed a perfect forest of long ears and a compact mass of black hides working and surging to and fro. There are quite a number of these pens near Perryville, each containing 1,500 or 2,000 mules, collected from all parts of the country, and stored in these pens to await the process of breaking.

Some distance from the pen we found the breaking ground, where about 100 lusty darkies were engaged in the work of taking the mules through a rudimentary course of instruction preparatory to fitting them for duty in harness. The process of breaking is exciting and interesting, and not unattended with danger. The mule is driven into a "chute" just the width of his body, with strong wooden bars on each side, which prevent his kicking out laterally, and at the same time admit of his being handled through the cracks. A rope is then fastened to his jaw, and another tied as a girth around his belly; after which one is attached to his fore foot, and passed under the girth and out at the rear, in which condition he is turned out for the preliminary exercises, consisting of a series of frantic plunges, with some ludicrous ground and lofty tumbling, vicious attempts to bite, and strike with his fore feet. The exercise continues for a longer or shorter period of time, according to the intelligence and obstinacy of the subject. But your mule is not altogether such a fool as he looks, and after coming to grief a matter of a dozen times by means of the check rope, he wisely concludes that plunging and rearing is not remunerative, and lies still, either reflecting or groaning piteously. If unusually obstinate through the first course, he is trotted round the course at double quick, and his hide copiously anointed with a stout cudgel. After the first course, the mule then being supposed to have absorbed something of the rudiments of his education, it is reconducted to the "chute," where he is invested with harness and again led forth, and another series of gymnastic exercises takes place. After becoming somewhat accustomed to the harness, the mules are hitched up to the large wagons, and driven around the course. The operation of hitching up is a delicate one, requiring great care. The negro approaches cautiously and gingerly, with his eyes fixed on the mule's ears. A suspicious movement of the auricular appendages is seen, and the startled African springs backward as quick as lightning, just in time to escape a flashing pair of heels. Again he approaches, and finally succeeds in hitching up. A brace of broken mules are usually put in the rear, with a team of wild ones in front. Different phases of mule character are developed in the process of starting. Some plunge and rear all the time, others lie down and obstinately refuse to move; others kick out of the traces, face on driver riding the saddle mule, rear up and viciously strike at him with their fore feet. Again one will remain properly quiet for a time, and then spring forward to the full length of his traces with such violence as to bring him to his knees. Nothing but the natural obstinacy of the mule prevents a general smash up. Fortunately while one plunges forward, the other through sheer perverseness, will pull back. Sometimes a forward mule will turn round in his traces, come to a dead halt, and stare at the driver in the most ludicrous and side-splitting manner. In shoeing mules, a broad leather belt is passed around his belly, and the mule hoisted clear, when his feet are drawn back and fastened, when he helplessly submits to the operation of shoeing, entering sundry protests in the way of snorts and groans. Currying is an operation which hardly pays for the danger incurred. The mule is altogether too handy with his heels to render it a desirable employment. Sometimes a currycomb is fastened to an eight-foot pole, when the groom stands out of range and rakes him down from "long taw." Watering the mule is not the least interesting of the operations that I witnessed at Perryville. The mules to the number of a thousand at a time, were driven down a small ravine in front of a hotel, spreading at its mouth to a width of about a hundred yards into the river. They rushed far out into the stream, so that most of them were covered with the exception of their heads floundering and plunging, and lashing the water into foam, and all braying continually. They reminded me forcibly of a school of immense porpoises sporting in the water. Negroes are exclusively employed in the breaking and training of mules at Perryville. I asked one of the men superintending the matter why this was so. "Well," said he, "a nigger is the next thing to a mule anyhow. They understand each other better, and there is a natural affinity of character between them. The niggers like it, and I believe the mules like it too. At any rate, a nigger can break a mule twice as quick as a white man, and get more out of him after he is broken. We tried white men, but it wouldn't do. The mules have no confidence in them."

They break about a hundred and twenty long ears a day at Perryville.

California Silk—Labor-Saving Machinery.

The following are some very interesting extracts taken from the speech of Mr. Wilson Flint, delivered before the Agricultural Society at Eldorado, Cal., in the month of September last. He said:—

A vast region, stretching almost from the equator to the north pole, along the center of the American continent of more than a thousand miles in width, is richly sown with mineral substances, and over vast portions of which the ban of the Almighty has forbidden the introduction of the reaper and the cotton gin. Here millions of the human race may find employment through all coming time in delving for hidden treasures deeply buried; while just on its western margin will be found the vine-clad hills of California, teeming with its happy people, amid luxury and contentment.

Not the least important among the many satisfactory results of arboriculture in our State, and especially in the mountain districts, is the entire success in the growing of the white Italian mulberry tree. The luxurious tendency of the age producing an increased demand for silk fabrics, renders its production a matter of first importance in countries where it can be raised. The gathering of the mulberry leaves and feeding them to the worms, and the various little attentions required by the operations of the cocoonery are of a fascinating character and well calculated to promote industrious and cheerful habits, and a higher order of intelligence among those devoted to this lucrative business.

The day is not far distant when California will become as celebrated for the unequaled texture of its silks as for the various products in which she already excels all other countries, and at the risk of raising a dubious smile on the countenance of some victim of the *morus multicaulis* fever of a quarter of a century since, I earnestly urge upon our people to plant the mulberry, for shade and ornamental purposes, as no tree is of more rapid growth, and its entire exemption from the attacks of the insect tribes makes it an agreeable associate of residences and the vicinage of orchards and vineyards. In no long time silk should become one of our staple articles of export.

Marvelous innovations have taken place in the fields of human labor during the last quarter of a century, by the introduction of labor-saving machinery, and, though it has tended to multiply human employments, yet it is driving manual labor to the wall in almost every branch of industrial enterprise. The substitution of the reaper, mower and thrashing machines, for the sickle, scythe and flail, has ameliorated harvest labor to such an extent as to have produced a social revolution in our agricultural districts, while the recent successful experiments with the steam plow promises the the near approach of the time when hunger shall be fed almost exempt from the sweat of the brow. When the steam plow shall have been introduced to our great wheat-growing plains, the small farmer will be forced to turn his attention to other branches of agriculture. With the steam plow and a machine to pick cotton —which will be invented when its want becomes a necessity—human labor may forever drop cotton growing. Against these certain results, which are nigh their accomplishment, the Allwise has made ample provision for the myriads who will be forced to seek new fields of labor.

NEW ELECTRIC LIGHT.—The London *Times'* Paris correspondent says:—"A trappist, named Delalot-Sevin, of the Abbeye de la Grâce-Dieu, has made a discovery which will probably produce a revolution in the system of lighting and heating public and private buildings. He has invented a new pile much stronger, and at the same time much cheaper, than the pile of Bunsen. By means of his photo-electric apparatus he produces an electric light as cheap as gas; and with his thermo-electric pile he supplies caloric on economic terms hitherto unknown. Several of these apparatuses have been constructed, and one is at full work in the Abbeye de la Grâce-Dieu. Manufactories for the public are shortly to be established in Paris and at Lyons. The apparatus for producing gas will not be given to the public until after the Exhibition at London, next year; but that for heating buildings will be made public on the 16th of December next. The inventor has been authorized to make public experiments with his system of lighting on the Place Saint Jacques, in Paris, and on the Place Bellecourt, at Lyons."

Expansion and Controlling the Momentum of Steam Engines.

In the number for this month of the *Journal of the Franklin Institute*, Mr. Samuel McElroy, C. E., concludes his criticism of the official report of the Erie steam experiments, from which we select the following, as bearing upon an important and scientific appreciation of the use of the cut-off. It freely explains the well known benefits which result in common practice from using the cut-off on locomotives and all engines in which high-pressure steam is used. He says:—

A certain mechanical principle underlies and controls the whole question of expansion, although its connexion is not commonly recognized. A principle which belongs to the primitive formations of all engineering theory and is indissolubly united to the very elements of motion. Our allusion to it involves a slight historical discussion.

In the abstract of this report Watt is credited with the first applicatiod of expansion as suggested to him by the announcement, of Mariotte's law. The writer is in error in two respects; first, by the fact that Hornblower preceded Watt six years in the application of expansion as a source of economy, and second, that Watt's original application of the cut-off was made in view of the great principle to which we allude, viz., the effect of the *mass of an engine in motion*. Nor is the speculation as to Watt's unpublished experiments on expansion leading him to adopt a steam travel of three-quarters probable, as he made the mistake of the Erie Board and vitiated the results within his reach by using too low pressure. He proposed in 1782 to cut off at one-quarter. Trevithick, in 1806, apprehended the question of economy much more fully, using steam at 40 lbs., and proposing to build an engine to cut off at less than one-sixth. And since that time, the whole Cornish school, instead of confining itself to this standard, has carried the grade of expansion in some cases to one-twentieth, not for purposes of experiment, but for regular duty. It is a very great mistake to suppose or to assert that, "until quite recently, it was the exception, and not the rule, to find new engines cutting off at less than one-half."

But without pausing here to sustain a very simple matter of record, we refer again to the fact, that when the genius of Watt superseded the *atmospheric* engine and used steam as a driving power, it also comprehended an inevitable law of motion, which demanded the application of the cut-off as a mechanical necessity, in advance of any idea of economy. We take an impregnable position, then, based on absolute principles, when we assert that the cut-off is an appurtenance which bears to every engine in full motion a relationship entirely independent of any question of economy, although this is a natural sequence, and that the idea of assuming full steam travel as a basis of comparative mechanical action is a misapprehension of engine duty.

The argument on this point is sufficiently clear in reference to all bodies in motion which have weight. To overcome the inertia of an engine, a certain surplus pressure must be applied to the piston, which corresponds with initial pressure, and is exceeded at no after point of the stroke. The mass being thus put in motion by charging it with surplus power, it is a mechanical absurdity to continue the initial pressure any further than will suffice to complete the stroke by virtue of the surplus power imparted at the commencement. In the general application of this law, there is no distinction between single-acting and fly-wheel engines; mass in motion characterizes both.

It is an absolute necessity, then, in every engine, that the power necessary to complete its stroke properly, must be imparted to it in excess at an early period of such stroke; and inasmuch as the whole experience of the steam engine in practice abundantly confirms the theoretical conclusion that this surplus power may be exerted at a very early point of motion, this disposes of the expansion question, not only as to mechanical effect, but as to economy. For all the fine drawn arguments on condensation and re-condensation are of very little consequence to the mass which is by this time distributing its excess of power.

Viewed in this light, the doctrine of expansion divests itself of all incumbrances. We come back again to the principle of maximum useful effect. There is a given velocity to be imparted to a given load at the start. If a steam travel of four feet under ten pounds pressure will do it, who is to assert that a travel of one foot under forty pounds pressure will not do it equally well, better in fact, and much more cheaply? No experimental philosophy can prevail against a plain mechanical law like this and certainly no such experiments as those we have here discussed. On the contrary, the most extensive, severe, laborious research, by the first men of the age, has brought out this law "seven times refined" for the benefit of the world. So long as we know that the maximum velocity of motion can be imparted to an engine before it reaches the half-stroke, we decide the fallacy of any argument which prescribes any latter point of cut-off; and we also decide that the only limit to economy of steam by expansion, is to be determined by the practicable conditions of such initial motion, and the practicable perfection of construction.

COPPER.—At Ontonagon, Lake Superior, the National mines yielded 107 tuns 1,078 lbs. of copper in the month of September last. Of this amount there was 123,487 lbs. of it in masses. A French company is going to erect copper smelting works in the Ontonagon district next spring. The processes of smelting to be introduced are said to be superior to those practiced at our copper works.

ISSUED FROM THE UNITED STATES PATENT OFFICE

Reported Officially for the Scientific American.

PATENTEES, READ THIS.

The new Patent Laws which went into force on the 2d of March last, authorized the Commissioner of Patents to have all the specifications which form part of the Letters Patent printed.

This is a wise provision, and it renders the documents much handsomer than the old system of engrossing them on parchment; besides, in passing before the printer and proof reader, the clerical errors, which were often made by the copyist, are mostly obviated, thus rendering the patent more likely to be correct.

But to afford the printer and proof reader an opportunity to do their work properly, the Patent Office is obliged to withhold the Letters Patent after granting them, from *four to six weeks* after the claims are published in the SCIENTIFIC AMERICAN.

*** Pamphlets giving full particulars of the mode of applying for patents, under the new law which went into force March 2, 1861, specifying size of model required, and much other information useful to inventors, may be had gratis by addressing MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, New York.

NOTICE—LIST OF PATENT CLAIMS.

At the time of going to press the usual weekly list of patent claims had not arrived from Washington. In serving a great community with such information regularly the officers of the Patent Office should be exceedingly careful not to cause such a disappointment.

RECENT AMERICAN INVENTIONS.

Iron Pavements.—The object of this invention is to produce a pavement which will present a smooth and even surface for the wheels of vehicles and which at the same time will prevent the slipping of the horses' feet and allow of being readily cleared from snow and ice. It consists in the employment of movable teeth or keys projecting through openings or slots in flat metal surfaces, which form the pavement, said teeth or keys being balanced by weights or springs or any other desirable means, in such a manner that they yield when exposed to the pressure of a flat surface, and that they prevent the slipping of the horses' feet when not depressed; also in forming the pavement out of two plates, each being gibbed in such a manner that channels are provided to carry off the water and the dirt, or out of one plate provided with suitable ribs to form such channels, and that steam. water or hot air can be introduced for the purpose of melting snow or ice, or for any other purpose desired, The inventor of this pavement is Lucius Stebbins, of New York city.

Improved Canteen.—The object of this invention is to produce a canteen which is useful not only for the purpose of carrying water and other liquids, but can be readily and easily converted into an apparatus for boiling and cooking purposes. The invention consists in making the canteen of such form as to admit of a large opening being made in the top, for the purpose of introducing any article to be cooked, and for the convenience of cleaning; it also consists in attaching legs to the canteen in such a manner that when supported thereon it can be used for boiling or cooking, or the legs can be folded up, and the canteen made so as not to occupy more room than the ordinary canteen, and be as convenient for carrying about on the person; it further consists in a provision for carrying a cup and candlestick. Samuel Herbert, of New York city, is the inventor.

NOTES ON FOREIGN INVENTIONS.

Flannel.—A patent has been taken out by J. Thomson Pagan and T. B. Williams, of Rochdale, England, for flannel intended for shirts, dressing gowns, &c., made as follows:—Cotton and wool in about equal proportions by weight are first carded together and made into slivers, then spun into yarn and woven into a fabric of cloth which the patentees call "Angola flannel." This fabric is afterward printed when intended for dressing gowns. The claim is for "manufacturing flannel from yarn produced from a mixture of vegetable and animal fibers." Flannel composed of half wool and half cotton has been quite common for years in the United States, and is much worn in summer because it does not shrink so much as pure woolen flannel. Are they only just beginning to learn this in England?

Clay Picture Frames.—James Brown, of London, has obtained a patent for making photographic picture frames of burnt clay. He prefers to use the kind of which tobacco pipes are made. The clay is taken in a moist state and forced into a mold of the desired pattern, then the mold is subjected to pressure in a suitable press, for the purpose of giving strength and sharpness to the frame. The mold is slightly oiled inside, and the back of the clay is covered with a tin plate, to which it will not adhere. This is for the purpose of permitting the frame to be easily drawn from the mold. After the mold is pressed, the clay frame is removed from it and placed in a kiln, and when a sufficient number are ready they are burnt, after which they are gilded or otherwise ornamented, like porcelain.

Distilling Coal and Shale for Oil.—A patent has recently been taken out by Mr. James Young (the first inventor of distilling coal and obtaining marketable oil) for an improved distillery apparatus to obtain the crude oil. Several chambers, built principally of fire brick, are placed side by side in a circle and filled with cannel coal, or bituminous shale. A jet of high pressure steam of the heat necessary to effect distillation is admitted into the first chamber of the series, and after passing through the contents of it the steam passes through an outlet pipe into the second chamber, thence to the third, and so on through the whole series. The oils thus generated and the steam which is condensed fall down to the bottom of the chambers, and are conveyed into suitable tanks, ready for the second, or refining process. The contents of the first chamber, after being deprived of their oil, are withdrawn, then another charge is put in, when this chamber then becomes the last of the series, the steam being then turned direct into the second chamber, and so on, thus obtaining a continual circulation of steam and a continuous succession of charges.

Composition for Covering the Caulking of Ships.—W. J. Hay, of Southsea, England, patentee. The improved composition claimed for this purpose consists of asphalt, or any of the natural bitumens, dissolved in rosin oil, then mixed with vegetable tar and some dissolved india rubber. The common pitch which is used for covering the caulked seams of vessels does not possess sufficient elasticity. This new composition is elastic, adhesive and very durable.

Purifying Oils.—In distilling crude oils for purification, C. Corroy Rignault, London, mixes with them a powder compound of ground charcoal and powdered clay, or powdered soap dust, then submits the oil to distillation in the usual method. It is stated that the tarry bitumen in the crude coal combines with the powder, and a tolerably pure oil passes over. A second distillation, however, is necessary to obtain the most highly refined oil, and for this purpose a powder compound of charcoal dust, soapstone powder, some powdered quick lime and carbonate of soda are mixed with the oil, which is submitted again, as before, to distillation. Rosin and fatty oils thus treated become, it is stated, highly refined, and free from disagreeable odor.

Utilizing Spent Bark of Tanneries.—M. Larberg, of London, has patented a process for treating spent tanbark and obtaining useful chemical products therefrom. He takes the tanbark as it comes from the yard, places it in retorts, and subjects it to destructive distillation. Crude oil, tar and gas pass over, and charcoal is left behind in the retort. The gas which passes over is employed to illuminate the tannery or village in which the works are situated, and the tar and oil are treated with chemicals for obtaining paraffine, benzole and naphtha—all useful products.

Treating Teas to Improve their Flavor.—A patent has been obtained by J. Franke, London, for the following very peculiar process of treating teas, whereby their qualities are said to be greatly improved. A mixture of ouchong, flowery Pekoe, Sstrong black leafed Congou and Assam, fine gunpowder and early buds of the cowslip hyson green, in about equal proportions, is made up and placed between two highly polished surfaces of metal plates and subjected to pressure. The apartment in which this process is conducted must be maintained at 60° Fah., and the leaves are kept at this heat for seven days. They are then removed into an apartment 80° temperature, spread out upon smooth tiles, and turned regularly, so as to expose the whole to the heat, for about twelve hours. The tea is then put through an ordinary tea mill, and all the inferior leaves picked out. It is then packed in hermetically-sealed tin cans and stored in a dry room heated to 90°, where it is left for four months before it is removed for use. This heating and drying process may improve tea for use as much as the roasting of coffee beans to obtain palatable extracts of coffee.

Operations of the Patent Office.

Some recent statistics of the Patent Office have appeared, which will afford interest to our readers. Since May 31st, patents have been issued to citizens of the several States as follows:

New York	253	Wisconsin	16	Kansas	
Massachusetts	107	Iowa	15	Georgia	1
Pennsylvania	96	Maine	13	Oregon	1
Ohio	59	California	13	Alabama	1
Illinois	56	Vermont	9	Tennessee	1
Connecticut	45	Missouri	8		
New Jersey	35	Kentucky	6	England	11
Michigan	26	Texas	3	France	5
Rhode Island	24	Minnesota	3	Canada	2
Indiana	23	Australia	2	Prussia	1
Maryland	20	Dist. of Columbia	2	Germany	1
New Hampshire	18	Virginia	2	Bavaria	1

The present war has stimulated the invention of the following improvements, which have been patented:

1 Camp bedstead,	1 Guide for bombs, lances and other projectiles,
1 Camp chair,	1 Water-proof cartridge,
1 Camp cot,	3 Cast-iron ordnance,
1 Tent fixtures,	1 Ordnance,
1 Camp chest,	1 Vent-stopper for ordnance,
1 Camp stool,	2 Breech-loading ordnance,
3 Tents,	4 Firearms,
1 Hand grenade,	5 Breech-loading firearms,
1 Preparation of granulated powder, to serve as charges for fire-arms,	1 Adjustable back sight for fire arms,
3 Projectile for rifled ordnance,	2 Canteens,
3 Projectiles for ordnance,	1 Canteen filler,
1 Bombshell,	1 Military cap,
1 Gun carriage,	1 Officers' shoulder straps.

Of these, the improvement in gun carriages and granulated powder are the inventions of subjects of Queen Victoria; the others are inventions of Americans. The whole number of patents granted since January 1, 1861, is 2,223.

TO PREVENT SKIPPERS IN HAMS.—In a communication to the *Cotton Planter*, Mr. W. McWillie says:—"There is, according to my experience, nothing easier than to avoid the skipper and all worms and bugs that usually infest and often destroy so much bacon. It is simply to keep your smoke house dark, and the moth that deposits the egg will neverenter it. For the past twenty-five years I have attended to this, and never have had my bacon troubled with any insect. I have now hanging in my smoke house hams one, two and three years old, and the oldest are as free from insects as when first hung up. I am not aware of other causes for the exemption of my bacon from insects, but simply the fact that my smoke house is always kept dark. Before adopting this plan, I had tried many experiments, but always either without success or with injury to the flavor of my bacon. I smoke with green hickory—this is important, as the flavor of bacon is often utterly destroyed by smoking it with improper wood.

A VORACIOUS SERPENT.—M. Dumeril, Professor at the Museum of Natural History in Paris, communicated to the French Academy of Sciences, at its sitting on September 30th, a remarkable fact regarding the voracity of a boa constrictor. One of these serpents, originally from the island of Trinidad, has been in the Museum of Natural History for five years. In the evening of August 20th, being very hungry, it swallowed a large woolen blanket, over 7 feet 2 inches in length and 5 feet in breadth. One month afterward, on September 20th, it made great efforts to vomit, and at last succeeded in throwing up the blanket, and though it appeared fatigued and sick for the two following days, it is now in perfect health.

Notes and Queries

C. M. F., of Conn.—The way to calculate the actual horse power of your engine, or any other, is to multiply the steam pressure in pounds per square inch into the area of piston in inches, and velocity of piston in feet per minute, and divide by 44,000. The result is the horse power. The power varies with the pressure of steam. You must take the average steam pressure during the stroke. More friction is involved in a large than a small engine, because the parts are more massive. The cylinder of an engine should always be sufficiently large to obtain the benefit arising from using a cut-off. We advise you to get an engine with a 3½-inch cylinder and 9-inch stroke, in preference to using a second cylinder, combined with your present engine of 2-inch bore and 5-inch stroke.

D. E. B., of Pa.—We cannot tell where you can obtain Dingler's *Polytechnic Journal* containing the receipt for making Prussian blue to which you refer. It is not republished in the English language, so far as we know.

J. K., of Pa.—The best cement known to us for fixing leather coverings on iron pulleys is made with gum shellac and india rubber, dissolved in rectified naphtha. The pulley should be heated to the temperature of the cement when the lather is applied. A temperature of about 150° Fah. will be sufficient, but we are not positive whether the cement will adhere while the leather endures.

G. W. S., of Conn.—A gun can be made weighing no more than 50 pounds, which will carry a few grape shot, and kill at a mile distant. We have recently examined a divided bullet, formed in three sections, and secured in a cloth cartridge that was fired from a secession rifle musket at the fight of Big Bethel. A convenient and portable steam apparatus, capable of being drawn by one horse, and cooking for a whole company, beside warming all their tents, would be a very desirable improvement we believe for camp life. The gun and incendiary shell which are represented in your sketch are new to us, but incendiary shells charged with phosphorated naphtha are well known, and were in vented for burning ships and wood buildings

A. G. A., of Ind.—In tempering mill picks the first object is to get the proper quality of steel, as all the tempering processes in the world cannot make a good pick of a poor piece of steel. Use the best cast steel only. Do not heat it above a cherry red for hammering, and then hammer the points till the grains of steel are driven compactly together, then file the ends sharp. Put the end in the fire and keep it therein until it acquires a low red heat, then take it out and dip it into cold water, when it will be found fit to work the best burr stones. Avoid raising the heat of the steel above a cherry red.

H. B. F., of Ill.—There is no published work on millwrighting which is up to the practice of the present day. If your supply of water on a fall of five feet is irregular, we believe that a good overshot wheel is the best you can use. If well made, it will be found durable and well adapted for your flouring mill. On high falls with a steady supply of water, we recommend a good turbine, as large overshot wheels are very expensive.

E. J. B., of Pa.—The best way for you to use your old copper is to melt it with some zinc and convert it into brass for your journal boxes. Melt the copper in a crucible first, then add the zinc in small pieces, stir up until the whole becomes homogeneous, then run it into ingots. Babbitt's metal is composed of 25 parts tin, 2 of antimony and 5 of copper. You may also use your old copper in making this alloy. Gum shellac varnish is the best we can recommend for coating patterns; by mixing a little red lead with it we think its quality is improved.

C. S., of Pa.—Dr. Gesner's work on coal oil, published by Balliere Bros., 440 Broadway, this city, contains information respecting the refining of coal oils. A variety of chemical proceses are practiced by different refiners of such oils.

J. W. P., of England.—We do not know the address of Charles McBurney. A letter will probably reach him if you address it to the care of the Boston Belting Company, Boston, Mass.

O. R. H., of Wis.—We do not remember the apparatus to which you refer. Mr. J. D. Prindle, of East Bethany, N. Y., obtained a patent through this office not long ago for the best boiler for cooking food for cattle we have ever seen. Address him, as above, for information.

S. H. F., of Canada.—We think it would be of great advantage to Mr. A. to advertise his coal oils in our journal. It cannot be expected of us to give space for gratuitous advertising.

N. D., of N. Y.—We are always glad to receive contributions for our paper, and are much obliged for the one you have sent us, but its publication would do you no credit whatever. We want sound practical ideas. No matter if they are rudely stated, we can put them into proper shape for publication. Mere vague theories are of very little account at this time.

Z. K., of Mass.—A patent was obtained by B. Wood, of Nashville, Tenn., on March 20, 1860, for a very fusible alloy, composed of lead, cadmium and tin.

A. J. S., of Pa.—We do not know the address of Mr. Coon. You had better address him at the place given in the list of Patents.

G. A. S., of N. Y. asks the following questions:—I have a deed of a patent right for Oneida county, and gave, in consideration, a contract agreeing to pay a certain amount on each machine sold. Now, if a man who owns the right for another county wishes to purchase machines of me, to sell in his territory, would I be obliged to pay the commission on machines sold to him? Ans.—Yes. The intention of the purchaser has nothing at all to do with your contract. If I sell a machine to a man who lives in this county, and then after a time moves away to another county, would he have full right to use it there? Ans.—No. He must get the consent of the owner of the county to which he moves before he can lawfully use the invention there.

J. A. C., of C. W.—Your induced current might be stronger than the primary; still on the remov l of the battery, all of the currents would cease. A caveat is not received at our Patent office except rom American citizens.

Money Received

At the Scientific American Office on account of Patent Office business, during one week preceding Wednesday, Nov. 13, 1861:—

J. F. Q, of Del., $20; C. E. P., of Wis., $20; A. S. D, of N. Y., $20; J. M., of N. Y., $20; J. M. M., of N. Y., $20; C. H. A., of Conn., $20; B. D. P., of Pa., $20; W. H. A., of Conn., $20; W. R. S., of N. Y., $15; J. P., of N. Y., $15; I. C., of N. Y., $15; E. D. L., of R. I., $25; S. H., of Conn., $25; W. W. F., of Iowa, $25; H. M., of N. Y., $25; H. R., of Ill., $15; W. J. S., of Ohio, $15; O. M. T., of N. Y., $25; S. J. S., of N. Y., $15; A. G. B., of N. Y., $10; W. O. H., of Pa., $30; A. S. F., of N. Y., $15; J. M., of Ill., $15; S. & P., of Conn., $60; O. E. M., of Ill., $15; W. A. B., of Wis., $25; H. & H., of Ill., $15; B. T., of Ill., $15; M. E. L., of N. Y., $15; E. R., of N. Y., $40; L. W. P., of Mass., $25; J. B. D., of Conn., $10; J. D. H., of Pa., $15; A. S. K., of Mich., $15; C. M., of N. Y., $25; F. C. P., of N. Y., $15; W. H. S., of Conn., $15; S. S. W., of Pa., $725; J. C., of Mass., $15; T. J. B., of N. Y., $15; T. & R., of N. Y., $25; J. F. B., of Conn., $15; J. R. A., of Pa., $25; D. J. S., of N. Y., $25; S. P, C., of Conn., $20; A. B., of N. J., $25; T. F. L., of N. Y., $25; W. S. W, of N. Y., $25; N. A., of N. Y., $40; M. & B., of N. Y., $20; J. H. S., of N. J., $20; R. G. H., of Mass., $45; J. W. S., of N. Y., $45.

Specifications and drawings and models belonging to parties with the following initials have been forwarded to the Patent Office from Oct. 30, to Wednesday, Nov. 13, 1861:—

W. A. B., of Wis.; D. J. S., of N. Y.; H. W. M., of N. Y.; G. & Co., of Paris; E. & P., of N. J.; C. O. P., of Mass.; S. H., of Conn.; J. P., of N. Y.; O. M. T., of N. Y.; S P. C., of Conn.; E. D. L., of R. I.; W. W. F., of Iowa; A. B., of N. J.; T. F. L., of N. Y.; T. & R., of N. Y.; S. & P., of Conn., 2 (cases); C. M., of N. Y.; B. M. S., of N. J.; A. G. B., of N. Y.; K. & H., of Wis.; N. A., of N. Y.

TO OUR READERS.

Models are required to accompany applications for Patents under the new law, the same as formerly, except on Design Patents, when two good drawings are all that is required to accompany the petition, specification and oath, except the government fee.

BACK NUMBERS AND VOLUMES OF THE SCIENTIFIC AMERICAN.—Volumes I., II. and III. (bound or unbound) may be had at this office and from all periodical dealers. Price, bound, $1.50 per volume. by mail, $2—which includes postage. Price in sheets, $1. Every mechanic, inventor or artisan in the United States should have a complete set of this publication for reference. Subscribers should not fail to preserve their numbers for binding.

BINDING.—We are prepared to bind volumes, in handsome covers, with illuminated sides, and to furnish covers for other binders. Price for binding, 50 cents. Price for covers, by mail, 50 cents; by express or delivered at the office, 40 cents.

Circulars of information concerning the proper course to be pursued in obtaining Patents in foreign countries through our Agency, the requirements of different Patent Offices, &c., may be had gratis upon application at our principal office, No. 37 Park-row, New York, or either of our Branch Offices.

Interferences.

We offer our services to examine witnesses in cases of interference, to prepare arguments, and appear before the Commissioner of Patents, or in the United States Court, as counsel in conducting interferences or appeals.

For further information, send for a copy of "*Hints to Inventors*," Furnished free. Address MUNN & CO., No. 37 Park-row, New York.

The Validity of Patents.

Persons who are about purchasing Patent property, or Patentees who are about erecting extensive works for manufacturing under their Patents, should have their claims examined carefully by competent attorneys, to see if they are not likely to infringe some existing Patent, before making large investments. Written opinions on the validity of Pateuts, after careful examination into the facts, can be had for a reasonabie remuneration. The price for such services is always settled upon in advance, after knowing the nature of the invention and being informed of the points on which an opinion is solicited For further particulars, address MUNN & CO., No. 37 Park-row, New York

Extension of Patents.

Valuable Patents are annually expiring which might be extended and bring fortunes to the households of many a poor Inventor or his family. We have had much experience in procuring the extension of Patents; and, as an evidence of our success in this department, we would state hat, in all our immense practice, we have lost but *two* cases, and these were unsuccessful from causes entirely beyond our control.

It is important that extension cases should be managed by attorneys of the utmost skill to insure success. All documents connected with extensions require to be carefully drawn up, as any d screpancy or untruth exhibited in the papers is very liable to defeat the application.

Of all business connected with Patents, it is most important that extensions should be intrusted only to those who have had long experience, and understand the kind of evidence to be furnished the Patent Office, and the manner of presenting it. The heirs of a deceased Patentee may apply for an extension. Parties should arrange for an application for an extension at least six months before the expiration of the Patent.

For further information as to terms and mode of procedure in obtaining an extension, address MUNN & CO., No. 37 Park-row, New York.

Assignments of Patents.

The assignment of Patents, and agreements between Patentees and manufacturers, carefully prepared and placed upon the records at the Patent Office. Address MUNN & CO., at the Scientific American Patent Agency, No. 37 Park-row, New York.

It would require many columns to detail all the ways in which the Inventor or Patentee may be served at our offices. We cordially invite all who have anything to do with Patent property or inventions to call at our extensive offices, No. 37 Park-row, New York, where any questions regarding the rights of Patentees, will be cheerfully answered.

Communications and remittances by mail, and models by express (prepaid), should be addressed to MUNN & CO., No. 37 Park-row, New York.

A GREAT STORY, BY A POPULAR AUTHOR.—Will be commenced

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IN THE NEW YORK WEEKLY,

the greatest story and sketch paper of the age, a new and thrilling historical romance, entitled

THE SEXTON OF SAXONY; or THE BRIDE'S BURIAL,

From the pen of Francis S. Smith, author of "Eveleen Wilson," "Florence O'Niel, or the Rebel's Daughter," "Lillian, the Wanderer;" "Maggie, the child of Charity;" "Galenus, the Gladiator," &c. For sale everywhere.

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GUN BARREL ROLLS—GUN BARREL ROLLS.—Gun Barrel Manufacturers can be supplied with rolls for bend g, welding and tapering gun barrels, by addressing HALL & ADAMS, Portsmouth, Scioto Co., Ohio. Post office Box 158. 1*

GOSSYPIUM ARBORIUM—PERENNIAL Cotton Tree. We have received a small consignment of this seed grown in the northern part of Peru. Mr. R. C. Kendal, who has successfully grown the cotton tree in Maryland from seed brought from southern Chili, advises that the plant produced from this seed be protected from frost during the first winter of its growth. A specimen of the cotton grown in Maryland by Mr. Kendal, and a colored drawing of the tree in full bearing, can be seen at our office. As an ornamental tree the Perennial Cotton has few equals. Its growth is compact and symmetrical, foliage dense and variegated as the silver maple, flowers profuse, delicately and distinctly odorous. The seed can be obtained in small papers bearing full printed directions at our warehouse. A pamphlet by Mr. Kendal is in print and will shortly be for sale by us, demonstrating the importance of the introduction of this tree as a field of culture to which the energies of the American farmer may be profitably directed. MAPES & LOCKWOOD,

Agricultural Warehouse, 23 Courtland street, New York.

A series of articles on this subject by Mr. Kendal will appear in the *Working Farmer and U. S. Journal*, published monthly at 23 Courtland street. 20 3

PARTIES HAVING ARTICLES TO DISPOSE OF which, if sold in the United States, are liable to a patentee's tariff, or subject to infringement of some patent, may learn of a foreign market by addressing Box 1,378 Post Office, Boston. 19tf

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GUN FORGING.—PECK'S PATENT DROP PRESS, for gun and other forging. Manufactured by MILO PECK & CO., New Haven, Conn. 19 10*

THE INTERNATIONAL EXHIBITION OF 1862.—THE want of a suitable and competent Agency, prepared to undertake the receiving, unpacking, fitting up and repacking of goods, and other incidental operations required by foreign and colonial exhibitors, in connection with the exhibition of the articles of their produce or manufacture, was severely felt in the former Great London Exhibition, as well as in the Paris one of 1855.

Impressed with these facts, and in compliance with the suggestions and wishes expressed to them by several of their continental and colonial friends, the undersigned have decided on establishing an International Agency in connection with the Exhibition of 1862, which they will spare no trouble or expense to render truly supplemental and auxiliary to that great undertaking, and in every way worthy of it.

Having correspondents in most of the principal continental cities, the name and character of their firm must be well known to many of the intending exhibitors; and to those to whom they may as yet be unknown, they are prepared to offer ample guarantees and references.

The arrangements entered into will enable them to place at the service of exhibitors subscribing to the agency—

1. Suitable offices and committee rooms, properly supplied with stationery, guide books and other works of reference, &c.
2. Storage premises for stowing away empty boxes, cases, &c., until required for re-packing.
3. Reception rooms, and all the conveniences of a home in connection with
4. An old-established club house, in the very center of London, within five minutes' walk of the Central Office of the International Exhibition at Charing-cross, with dining, smoking and dressing rooms, and separate apartments for the accommodation of the female members of exhibitors' families who may visit London. Also, a reading saloon, supplied with all the English and the principal foreign newspapers and periodicals.

The great and peculiar advantages of this part of the undertaking, affording exhibitors during their stay in London the enjoyment of the convenience and comfort of a private establishment, open only to them and the members of the club, are self-evident, and need, therefore, not be further expatiated upon here.

An office of inquiry, reference and advice, where the most reliable information may be obtained, more particularly about hotels and their accommodation and charges, private apartments, conveyances, routes, &c.; likewise, proper directions for exchanging foreign coin and notes, &c., and where the services of interpreters and commissionaires may also be procured at moderate charges.

The advantages which this feature of the undertaking offers to strangers visiting London, will, no doubt, also be readily appreciated by them.

The 1862 International Exhibition Agency will be placed under the

GENERAL MANAGEMENT

of our Mr. W. V. Morgan (member of the Society of Arts and one of the guarantors of the exhibition fund), who will be assisted in his arduous duties by an efficient staff of sub-managers, clerks, interpreters, commissionaires, &c.

It is proposed not only to supplement the action of the Royal Commissioners in the business arrangements of the exhibition, but also to attend in *all* other respects, such as negotiating sales, arranging for advertisements, and other aids to publicity, providing assistants, &c., to the interests and requirements of those exhibitors who shall avail themselves of the services of the agency.

THE TERMS OF SUBSCRIPTION

will be arranged for two classes of subscribers, viz:—

1. Exhibitors who propose visiting England, and availing themselves of the services of the agency, will be charged a subscription of £3, which will entitle them to the free use and enjoyment of all the advantages of the establishment during the whole or any part of the year 1862, the only additional charge being a commission of ten per cent on all moneys actually laid out on their behalf below sums of £5, and 5 per cent on all such outlays above £5.
2. Exhibitors who do not intend to visit England will simply be charged the above commission of 10 per cent or 5 per cent made on outlays on their behalf.

A full programme of the arrangements, with the names of the principal members of the staff engaged, &c., has been published, and will be forwarded on application.

It is requested that all communications up to December 31st next, be addressed to Mr. W. V. Morgan, at 21 Bow-lane, London, E. C., after which date, at Arundal street, Strand, London, W. C., as all preliminary arrangements will be fully carried out by that time.

MORGAN BROTHERS,
21 21 to 23 Bow-lane, London.

MANUFACTURERS WANTED FOR BALL'S OHIO Mower and Reaper, the most popular, where introduced, and best in the world. Also for his light mower, having all the peculiar features of the large one. J. A. SAXTON, Canton, Ohio. 21 4*

WARREN'S TURBINE WATERWHEEL (WARREN & Damon's patent), manufacturd by the American Waterwheel Works, Boston, Mass.—We would say to our patrons and parties in need of Turbine Waterwheels for factories, flouring mills, grist and sawmills, &c., that we are now able to furnish the most powerful, economical, cheap and durable wheel in use. They are constructed upon the most scientific principles, with steel buckets, and are highly finished. Seven hundred are now operating successfully in places where the greatest economy in water is required. Send for pamphlet, with illustrations complete. Address ALONZO WARREN, Agent, 31 Exchange street, Boston, Mass. 18 6*

BALLARD'S PATENT CLAW SASH SCREWS FOR Various Purposes. For railroads, boiler builders, bridge builders, &c., press for beef, pork and other substances. For sale by
20 3m W. BALLARD, No. 7 Eldridge street, New York.

THE TINMAN'S MANUAL AND BUILDER'S AND Mechanic's Handbook.—Second edition; 208 pages. Price $1. This useful book will be sent by mail (free of postage) to any place in the United States or British Provinces on the receipt of price.
18 4* I. R. BUTTS & CO., Publishers, Boston, Mass.

PORTABLE STEAM ENGINES—COMBINING THE maximum of efficiency, durability and economy with the minimum of weight and price. They are widely and favorably known, more than 200 being in use. All waranted satisfactory or no sale. A large stock on hand ready for immediate application. Descriptive circulars sent on application. Address J. C. HOADLEY, Lawrence, Mass. 19 13

PROPRIETORS OF NEW INVENTIONS, PATENT and Quack Medicines, Improvements, &c., wishing to extend their sale and introduct on into a foreign market, will please address circulars, catalogues or price lists, with best terms for export, to the address of Box 1,378, Post Office, Boston. 19tf

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IRON PLANERS, LATHES, FOUR SPINDLE DRILLS, Milling Machines, and other Machinist's Tools, of superior quality, on hand and finishing, and for sale low. For description and prices address NEW HAVEN MANUFACTURING COMPANY, New Haven, Conn. 1 26

CRUDE PARAFFINE WANTED—FOR WHICH THE highest price will be paid for a good article well pressed. Address H. RYDER & CO., Patent Paraffine Candle Manufacturers, New Bedford, Mass. 12 tf

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HARRISON'S GRIST MILLS—20, 30, 36 AND 48 inches diameter, at $100, $200, $300 and $400, with all the modern improvements. Also, Portable and Stationary Steam Engines of all sizes, suitable for said mills. Also, Bolters, Elevators, Belting, &c. Apply to S. C. HILLS, No. 12 Platt-street, New York. 1 e3w

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NONPAREIL WASHING MACHINE.—THIS MACHINE must take precedence of all other machines now in use, being the only one justly entitled to be considered as constructed on correct mechanical principles. Machines and State and county rights for sale by OAKLEY & KEATING, 73 South street, New York. 15 3m

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A MESSIEURS LES INVENTEURS—AVIS IMPORtant. Les Inventeurs non familiers avec la langue Anglaise et qui préféreraient nous communiquer leurs nventions en Frangais, peuvent nous addresser dans leur langue natalle. Envoyez nous un dessn et une description concise pour notre examen. Toutes communications seront regues en confidence. MUNN & CO.,

SCIENTIFIC AMERICAN Office, No. 37 Park-row, New York.

NEW YORK OBSERVER FOR 1862.—IN ASKING the aid of all who may desire to extend the circulation of the *New York Observer*, it is proper for us to state distinctly the position it occupies with reference to the present condition of public affairs in our beloved country.

Having always maintained the duty of good citizens in all parts of the land to stand by the Constitution, in its spirit and letter, when that Constitution was assailed and its overthrow attempted, we accordingly at once gave a cordial support to the Government in its patriotic endeavor to assert its lawful authority over the whole land. Believing secession to be rebellion, and when attempted, as in this case, without adequate reasons, to be the highest crime, we hold

1. That the war was forced upon us by the unjustifiable rebellion of the seceding States.
2. That the Government, as the ordinance of God, must put down rebellion and uphold the Constitution in its integrity.
3. That every citizen is bound to support the Government under which he lives, in the struggle to reëstablish its authority over the whole country.
4. That the Constitution of the United States is the supreme law of the Government as well as of the people; that the war should be prosecuted solely to uphold the Constitution and in strict subordination to its provisions: and the war should be arrested, and peace concluded, just so soon as the people now in revolt will lay down their arms and submit to the Constitution and laws of the land.

The distinctive features of the *Observer* are,

1. It is printed on a double sheet, so as to make two complete newspapers, one devoted to secular and the other religious matters; and these may be separated so as to make two complete journals, while the price for both is no greater than is charged for many papers smaller than either one of the two.
2. It gives every week a complete synopsis of the most interesting events in all the denominations, including those that are called Evangelical and those that are not; as every intelligent Chris an wishes to be well informed respecting all of them.
3. It gives a well-digested epitome of the News of the Day, Foreign and Domestic, prepared with great labor and care, so that the reader is sure to be put in possession of every event of interest and importance to the public.

The foreign correspondence of the *Observer* is unrivaled, and has long commanded the admiration of intelligent men.

TERMS FOR NEW SUBSCRIBERS.

1. To each new subscriber paying in advance $2 50 for one year, we will send the paper and a copy of our Bible Atlas, with five beautiful colored maps.
2. To the person obtaining subscribers we will give $1 for each new subscriber paying $2 50 in advance.
3. To any person now a subscriber sending us one new subscriber and $4 we will send both papers for one year.

Specimen numbers of the *New York Observer* will be sent gratis to any address that may be forwarded to us for that purpose.

The state of the country renders it important for us and esirable for the churches, that a new and earnest effort be made to extend the principles of good government and sound religious truth into all the families of the land. In every neighborhood there must be some who do not now take a religious newspaper, and who might with a little exertion be induced to subscribe.

SIDNEY E. MORSE, JR., & CO.,
Editors and Proprietors,
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SOLID EMERY VULCANITE.—WE ARE NOW MANUfacturing wheels of this remarkable substance for cutting, grinding and polishing metals, that will outwear hundreds of the kind commonly used, and will do a much greater amount of work in the same time, and more efficiently. All interested can see them in operation at our warehouse, or circulars describing them will be furnished by mail. NEW YORK BELTING AND PACKING CO.
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BRASS LIFT AND FORCE PUMPS, SHIP PUMPS, Steam Whistles, Gage Cocks, Oil Cups, and every variety Brass-Work used by engine builders, manufactured by HAYDEN, SANDERS & CO., 84 Beekman street, New York. 14 13*

GUILD & GARRISON'S CELEBRATED STEAM Pumps—Adapted to every variety of pumping. The principal styles are the Direct Action Excelsior Steam Pump, the improved Balance Wheel Pump, Duplex Vacuum and Steam Pumps, and the Water Propeller, an entirely new invention for pumping large quantities at a light lift. For sale at Nos. 55 and 57 First street, Williamsburgh, and No. 74 Beekman street, New York.
9 tf GUILD, GARRISON & CO.

PUMPS! PUMPS!! PUMPS!!!—CARY'S IMPROVED Rotary Force Pump, unrivaled for pumping hot or cold liquids. Manufactured and sold by CARY & BRAINERD, Brockport, N. Y Also, sold by J. C. CARY, No. 2 Astor House, New York. 14tf

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MACHINE BELTING, STEAM PACKING, ENGINE HOSE.—The superiority of these articles, manufactured of vulcanized rubber, is established. Every belt will be warranted superior to leather, at one-third less price. The Steam Packing is made in every variety, and warranted to stand 300 degs. of heat. The Hose never needs oiling, and is warranted to stand any required pressure; together with all varieties of rubber adapted to mechanical purposes. Directions, prices, &c., can be obtained by mail or otherwise at our warehouse. NEW YORK BELTING AND PACKING COMPANY.

JOHN H. CHEEVER, Treasurer,
14 13 Nos. 37 and 38 Park-row New York.

ALBANY IRON WORKS, TROY, N. Y.—SEMI-STEEL Plates and Forgings.—We are prepared to furnish forged shapes of this approved metal, and without unnecessary delay, having large facilities for production. Among the uses to which this material is now applied, and with great success, we name, rifled cannon for government use; also rifle and musket barrel shapes, locomotive engine tires, locomotive engine axles, straight and crank, car axles, crank pins, plates for locomotive fire box, flue sheets, &c. It is peculiarly adapted for shafting, indeed, for all purposes where strength and rigid qualities are required, its tensile strength ranging from 90,000 to 118,000 lbs. to the square inch, nearly double that of the best iron.—Cast-steel forgings up to 1,500 lbs each, likewise furnished. Communications addressed to CORNING, WINSLOW & CO., A. L Works, Troy, N. Y., will be promptly responded to. Parties at the West can be supplied on addressing their orders to A. S. WINSLOW, Cincinnati, Ohio. 15 6m*

MACHINERY.—C. S. HILLS, No. 12 PLATT-STREET New York, dealer in Steam Engines, Boilers, Planers, Lathes Chucks, Drills, Pumps; Mortising Tenoning and Sash Machines; Woodworth's and Daniels' Planers, Dick's Punches, Presses and Shears; Cob and Corn Mills; Harrison's Grist Mills; Johnson's Shingle Mills; Belting, Oil, &c. 2*etw

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PORTABLE STEAM ENGINES—6, 8 AND 10-HORSE at $500, $625 and $780. For sale by S. C. HILLS, No. 12 Platt street, New York. 2e3*

Zur Beachtung für deutsche Erfinder.

Die Unterzeichneten haben eine Anleitung, die Erfindern das Verhalten angibt, um sich ihre Patente zu sichern, herausgegeben, und verabfolgen solche gratis an dieselben.

Erfinder, welche nicht mit der englischen Sprache bekannt sind, können ihre Mittheilungen in der deutschen Sprache machen. Skizzen von Erfindungen mit kurzen, deutlich geschriebenen Beschreibungen beliebe man zu addressiren an

Munn & Co.,
37 Park Row, New York.

Auf der Office wird deutsch gesprochen.

Daselbst ist zu haben:

Die Patent-Gesetze der Vereinigten Staaten,

nebst den Regeln und der Geschäftsordnung der Patent-Office und Anleitungen für den Erfinder, um sich Patente zu sichern, in den Ver. St. sowohl als in Europa. Ferner Auszüge aus den Patent-Gesetzen fremder Länder und darauf bezügliche Rathschläge; ebenfalls nützliche Winke für Erfinder und solche, welche patentiren wollen.

Preis 20 Cts., per Post 25 Cts.

Mr. Fairbairn on High Pressure Steam.

At the opening of the Liverpool School of Science, Mr. Fairbairn said :—"As a laborer in the field of science, more particularly practical science, I am sure you will allow me to give you a few examples of the great advantages which the industrial arts receive from the exact sciences, and particularly from those constructions which are of much greater advantage to the industry and property of the community. With regard to steam I am quite sure every person here present, must be aware of the very great advantages of that source of power, that immense power we see daily before us; and if we look back to the days since James Watt lived, to the present time, everybody will be convinced of the great improvements that have taken place by the application of science to that particular element. I recollect well, in the early part of my own history, that the steam engine never worked above 7 lbs to 8 lbs upon the square inch; it then reached 20 lbs, then 50 lbs. But now if we look at the locomotive engine, the pressure is upwards of 150 lbs and even 200 lbs, upon the square inch. This is a great advantage, and if we may judge by the great improvements which are taking place with regard to the steam engine, the locomotive as well as the condensing engine, I am inclined to think that we are not by any means arrived at the full economy of the production of steam in this country and all other countries. Instead of working at the rate of 200 lbs upon the square inch, I think it is very likely that it will reach 500 lbs." Mr. Fairbairn said he would next allude to the application of iron to all the purposes of the industrial arts. That application was, he said, by no means limited, and it would continue to extend. He instanced the construction of the Conway and Britannia bridges in proof of the principle of construction by experimental research. He had every confidence that the institution which they had inaugurated would be highly productive, and prove of benefit to the people of Liverpool, and to the rising generation, and that it would add to our knowledge of science.

Smoke House—How it Should be Built.

A smoke house should be square, its size varying from four to eight feet in diameter, according to the quantity of meat required to be smoked; the lower portion to the hight of five feet should be of brick, with a door lined with sheet iron. This part may serve both as an ashhouse and as the proper place for the fire to furnish the smoke. Fire should be placed in the middle and covered with the material to be burned, so that the mass, being surrounded by ashes, may maintain the ignition for a long time, giving off the smoke with regularity. The upper part may be wood, and the separation from the lower part by joists, covered with scantling, so as to leave spaces averaging three inches in diameter, for the ascent of the smoke. The hight of this upper portion may be four feet, beside the ascent of the roof, and should be furnished with a door that may be locked, so that the door to the lower portion will not give ingress to the meat room. This separation between the two portions will catch any piece of meat which may accidentally fall, while the lower portion need not be locked, so as to enable the frequent removal of ashes from the house, and the proper attention to the fire to be more readily performed. Sawdust placed over a few ignited coals, will furnish the necessary material for smoking the meat. The sawdust, however, should be from such wood as is most free from resinous matter; the pyroligenous acid evaporated is of a better flavor from hard than from the soft woods, while the amount of creosote, which is the preservative property, will be the same.

Improved Armor for Ships.

On pages 266 and 267 of the current volume of the Scientific American we gave an illustration of J. F. Winslow's mode of constructing iron-plated ships and securing the armor upon their sides. We now present an illustration of an improvement upon the plan made by the same inventor, who claims, as one of the advantages of his principle of armor construction, that it admits of various modifications.

Fig. 1

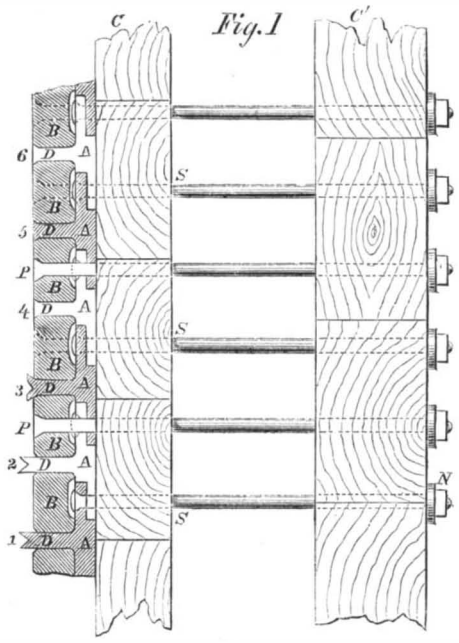

Fig. 1 represents a portion of the transverse section of the vessel, showing the armor attached. C C' shows the internal and external planking of the vessel; A A A A A A represent a series of rolled chairs from 12 to 20 feet long, and 5 inches broad. The form of these chairs, A, admits of their lapping and forming a continuous sheet next to the hull or sides of the vessel, of any desired thickness not exceeding 1½ inches. The chairs are held together by spikes and the through bolts, S, which bolts, passing through both parts or lapped part of the chairs, and through to the inside of the vessel, are then secured by nut and screw, N. These spikes and through bolts may be alternate or in any other relative position to meet the exigency. These chairs, A, are armed with a tongue, D, also a rolled portion of the chair; and between these tongues are placed the bars, B. The angles or sharp corners being removed in the process of rolling to form a countersink to be filled by setting over that portion of the tongue which protrudes beyond the plane, as shown respectively in the stages 1 2 3 and 4; 1 and 2 show the bar between two tongues, V-shaped at the end, also formed in the rollers; 3 shows the tongue flanched over and filling the countersink, and 4 5 and 6 show the finished stage. In addition to this rivet securement the bolts, P, are introduced every 6 or 7 lineal feet apart. These bolts pass through to the inside of the vessel and are secured with nut and screw, as shown.

Fig. 2

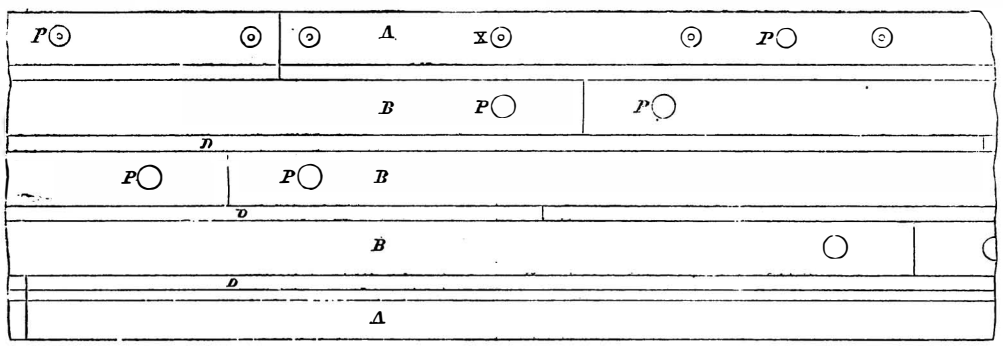

Fig. 2 represents an external view of the armor when complete. The holes, X, represent the points through the chair, A, to receive the spikes and bolts, and P P represent the points to receive the countersunk bolts, P, (Fig. 1).

WINSLOW'S IMPROVED ARMOR FOR SHIPS.

The object of having these narrow bars and chairs is to obviate the necessity of tonguing and grooving plates, and it will readily suggest itself that these narrow chairs and bars will accommodate their forms to the most difficult curves in the hull of a vessel, and in cases of repair can be removed at comparatively little cost.

This plan is as novel as it is ingenious and facile of attachment, and not least among its recommendations ranks economy of construction. Measures have been taken to secure it by Letters Patent.

In an address delivered recently before the Glasgow, (Scotland) Philosophical Society, Dr. Taylor suggested the use of the electric light for coal mines, so as to avoid the danger of explosion from fire damp with miners' common lamps. He proposed that the light be contained in sealed glass tubes hung from the roof of the mine, and that the current should be obtained from a Ruhmkorff coil.

FROM THE STEAM PRESS OF JOHN A. GRAY.