Scientific American.

A WEEKLY JOURNAL OF PRACTICAL INFORMATION IN ART, SCIENCE, MECHANICS, CHEMISTRY AND MANUFACTURES.

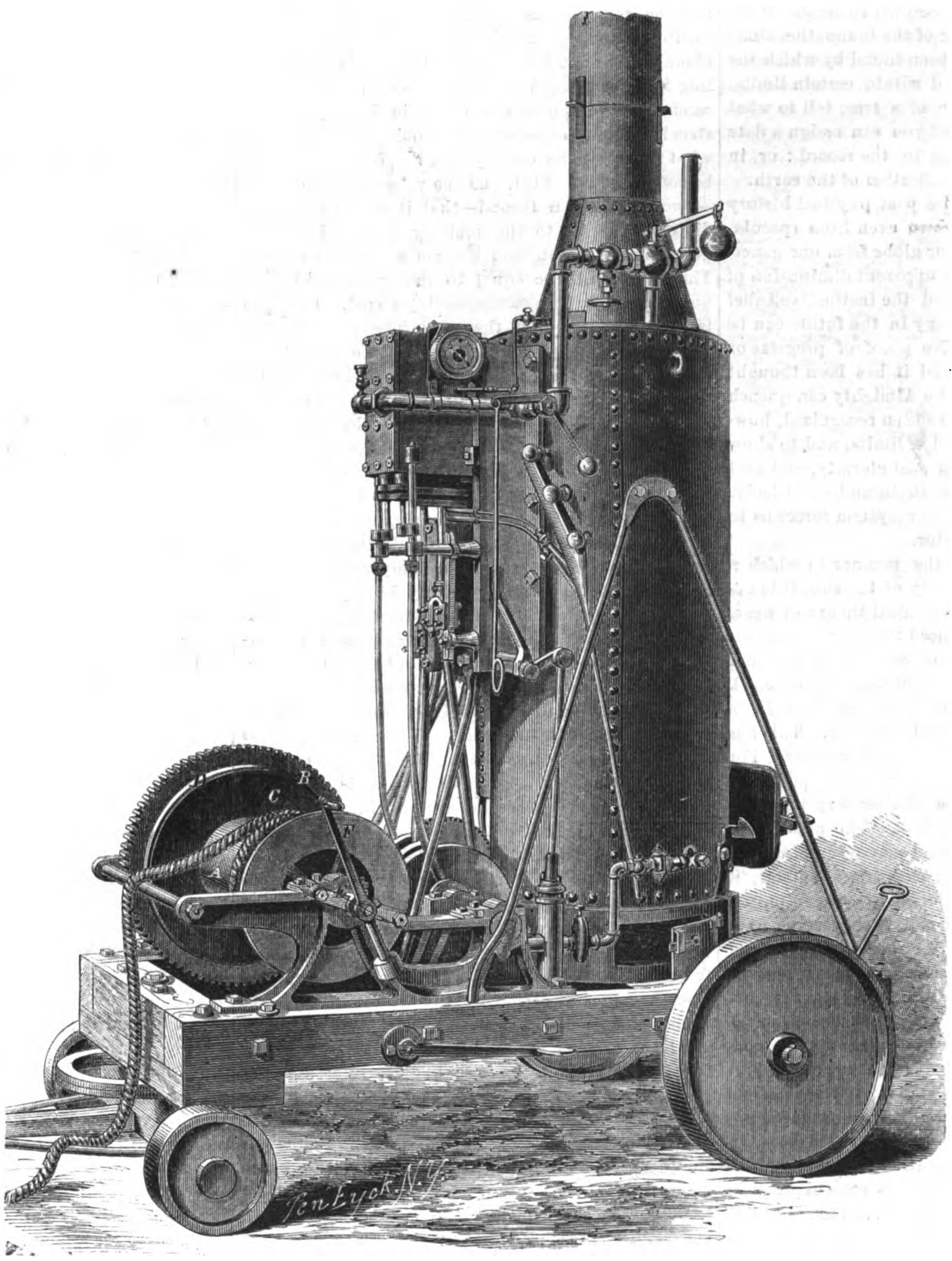
VOL. IX.—NO. 7. (NEW SERIES.) | NEW YORK, AUGUST 15, 1863. | SINGLE COPIES SIX CENTS. $3 PER ANNUM—IN ADVANCE

Improved Portable Engine.

The class of steam engine of which the engraving herewith published is an accurate representation, is one that we should like to see more generally adopted than has yet been done. It is surprising, in view of the many different branches of trade and commerce that are represented in this city, how few portable engines are in use. Not only in cities, however, but in the country at large, are such engines imperatively demanded; and we will say that there is not a village of 2,000 inhabitants which would not find such a machine a decided acquisition to the community. There are always more or less laborious tasks to be executed; and, in the absence of machinery, human strength must be stretched to its utmost, and time wasted, in accomplishing comparatively easy work. For sawing the wood at railway stations: or for the winter consumption of families: for drawing stumps in new land: clearing land of heavy boulders: splitting rails, stacking hay, drawing piles, thrashing grain; in fact, for every possible duty now performed by hand labor, the portable steam engine offers a complete and perfect substitute. It is, in fact, a public benefactor on wheels; which exercises its strength and energy on whatever its powers are directed. We repeat that there should be many more in use than there are now; and the engine herewith represented is a very excellent one of its kind.

It will be seen upon examination that the machinery is very neatly and conveniently arranged; the two steam cylinders—it being a double engine—are bolted on to a cast-iron plate, which in turn is secured to the boiler. The valves are slides; and are worked by eccentrics in the usual manner. There is but one steam, and one exhaust, pipe to the two engines; and the feed-pump is worked by the main engines, at one side. The general arrangement of the several parts is extremely convenient, and commendable. The inventor, being a practical engineer has designed the machine so that the person running the engine can have perfect control over it, without moving from his place. The handle working the throttle-valve is within easy reach; as also the feed apparatus and the ash-pit door; so that the fire can be cleared when necessary. In short, the general arrangement of all the parts cannot be excelled for convenience by any other portable engine of this class that we have ever examined.

In connection with this engine is the hoisting-drum, A, and its gears, B, to which it is connected by a friction clutch, C, provided with an arresting band or brake, D. The drum, A, slides upon the shaft, E, and has the friction clutch, C, formed upon its end; the face of which is provided with a number of concentric V-shaped grooves; these fit into similar grooves on the gear, B. When not in use for hoisting, the drum revolves easily upon the shaft; but when it is desired to elevate a weight, the handle, F, is turned, which forces the drum into contact with the gear revolved by the engines, upon which power is transmitted, and the work performed. The handle moves only a very short distance, as indicated by the dotted lines; it being furnished with a double-threaded screw, so that the drum moves quickly. The back-thrust of the shaft, on the further end, is taken by a steel bolt. The foot plate on the lever, G, places the friction brake under the control of the engineer; and it will be conceded at once, we think, that the improvements embraced in this machine are useful and valuable.



REQUA'S PORTABLE ENGINE.

A patent for this invention was obtained through the Scientific American Patent Agency on June 30, 1863, by C. B. Requa. Further information can be obtained by addressing C. B. Requa, care of C. Barnum, No. 11 Dey street, New York.

Mechanical Engineers.

There is a wide difference between the old-fashioned mechanic and the mechanic of to-day; between the "villain," the "slave," workman, with hands but no head of long ago, and the intelligent mechanical engineer of the present day. The mechanic of to-day is a respected and indispensable member of society; a strong right arm of every civilized nation. The skillful hand is now guided by an educated and enlightened head. The mechanic is expected not only to be able to use his tools, but to know something of principles; to see the theory of his art, and thus to make his work more than mere manipulation.

The making of machines, and the building of machines which shall reproduce themselves, and thus not only produce better and cheaper work, but at the same time enlarge the sphere of mechanics, is the work of the present. There can be no more inviting field for hundreds of young men now commencing business, than the machine shop; no department of labor gives more scope for the exercise of talent of the highest order; no department is more productive of good to mankind. The study of the chemistry and physics of the metals is well worth all the time and knowledge that can be brought to bear thereon. The establishment of a uniform system of measures, and of tools and machines, invites the labor of engineers. Millions of dollars are to be saved by the improvement of the railway track, by the reduction of the dead weight hauled, and by the use of iron in the place of wood. The arts of peace and war are both in the hands of the present race of engineers; and the interest of individuals and the public welfare are both dependent upon the perfection of mechanical engineering.—*Philadelphia Ledger*.

AGE OF THE SUN—FORCE AND HEAT.

The following extracts are from the Canadian *Presbyterian*, communicated by Principal Leitch. The subject is of general and profound interest, and it is treated with philosophical ability. Principal Leitch seems to be perfectly familiar with mechanical science:—

"Perhaps the most daring attempt of astronomy in modern times is that of fixing the age of the sun as an incandescent light-giving body, and that of the earth as a solid inhabitable globe. In reference to the earth, geology plainly indicates successive periods or chapters of its history; but no scale has been furnished of the length of the periods, and no approximation has hitherto been made to the whole period, from the first to the last page of the geological record. Science has at last attempted to assign an approximate date to the laying of the foundation stone of our world. A scale has been found by which the whole period can be measured within certain limits. You cannot, as in the section of a tree, tell to what year each layer belongs; but you can assign a date within limits to the first page in the record: or, in other words, to the first solidification of the earth.

"Again, as to the sun, its past physical history seemed to be entirely withdrawn even from speculation. He has enlightened our globe from one generation to another without any apparent diminution of strength, and we have formed the instinctive belief that no limit in the past or any in the future can be assigned to his functions. No proof of progress or decay has been detected; and it has been thought that nothing but the fiat of the Almighty can quench his rays. Principles have now been recognized, however, which enable us to assign limits, and to show that he has not shone from a past eternity, and that he has a limited existence as an incandescent body. This limit assigned to the solar system forces us to recognize the hand of a Creator.

"In order to understand the manner in which a limit is set to the past history of the sun, it is necessary to advert to the dynamical theory of heat, which has recently been reduced to a strictly scientific form. The expression of this theory is—that heat is but a form of force, and that for so much heat there is an equivalent of force, and that for a given force there is an equivalent heat. This has been acknowledged in a loose general manner. For example, the heat of the furnace gives its power to the steam-engine; and in a similar way power or energy can be converted into heat. The power of a steam-engine or a water-wheel may be employed to produce heat. Where water-power is abundant, it is employed to produce friction between iron plates, and these plates become so hot that they serve as a stove. Again, the blacksmith can convert the power of his arm into heat when he hammers a piece of iron till it is red hot, and sufficient to light his fire. Force is converted into heat when the axles of a railway car take fire. The power of your finger is converted into heat when you pull the trigger of a flint lock. The spark is the heat product of the power of your finger. The obvious relation between force and heat has always been acknowledged, but it is only recently that the exact quantitative relation has been determined. The relation is thus expressed: 'a unit of heat is equivalent to 772 foot-pounds.' By a unit of heat is meant heat sufficient to raise one pail of water 1° Fah. Suppose one pound of water enclosed in a vessel fell from a height of 772 feet, it would be found that it had become warmer by 1° Fah. That is, the force of the concussion has been converted into so much heat. On the other hand, if this 1° Fah., of heat could be extracted from a pound of water and applied to move an engine, it would raise, if there was no friction or loss of power, a pound of water to a height of 772 feet. The great law of force or energy is that its sum is ever the same. It cannot be annihilated. It may change from one form to the other, but the sum is ever the same. If there is a loss in mechanical power, there is a gain in some other force, such as heat, electricity, or chemical affinity. The mechanical power of the Falls of Niagara is lost as such when it reaches the bottom, but it only changes its form, for it only becomes heat; and this heat, if all applied to an engine, would raise the whole mass again to its former level. The heat of the furnace of the steamer is converted into the mechanical power of the engine. This power is reconverted into heat by the blow of the paddle, and the impact of the ship upon the water. What is lost in one form is gained in another. The sum is always the same. It is like a sand-glass; the sand is always the same in amount, though it is constantly changing from one end to the other.

"Let us apply this principle to the heat of the sun. When a ball is discharged from a gun and strikes an object, it is found that both the ball and the object struck have risen in temperature. If the force is sufficiently great you cannot touch the ball, it is so hot; and just in proportion to the power of the gun will be the heat of the ball. If the power be sufficiently great, the heat may be so intense as to bring it to a white heat and melt the ball. The meteoric stones that sometimes fall to our earth may be regarded as balls, but moving with much greater velocity. They strike against our atmosphere with so much force that the force is converted into heat, so intense that they glow or become incandescent. Suppose our earth, in its revolution, struck against some opposing object like a target, what would be the consequence? The force would be converted into heat, and the velocity is so great—twenty miles a second—that it would be immediately brought to the melting point. It would glow like the sun, and become a luminous body. The heat would be equal to that produced by the burning of fourteen earths made of coal. But this is not all. It would then fall into the sun, and would by its loss of momentum produce a heat 400 times greater than before, and it would be seen on the sun's disc as a bright luminous spot. The force of the earth falling upon the sun would communicate a heat to the sun equivalent to the heat emitted by the sun in a century. It would serve as fuel for that length of time. Now, the heat of the sun is most probably due to this source, the conversion of power into heat. It is probable that it is not a combustion. If the sun were composed of coal, it would last at the present rate only 5,000 years. The sun, in all probability, is not a burning but an incandescent body. Its light is rather that of a glowing molten metal than that of a burning furnace. But it is impossible that the sun should constantly be giving out heat, without either losing heat or being supplied with new fuel. We know the heat of the sun. Each point is about thirty times hotter than the furnace of a locomotive, that is, a square foot of the sun's surface gives thirty times more heat than a square foot of grating in a locomotive. Yet the mass of the sun is so great that it would require 3,500 solar systems, if made of coal, to account for the heat of the sun. Assuming that the heat of the sun has been kept up by meteoric bodies falling into it, and proof has been given of such fall, it is possible from the mass of the solar system to determine approximately the period during which the sun has shone as a luminary. On boarding a steamer you can by examining the hold for coals, and ascertaining its capacity, tell approximately how long she has been on her voyage. Limits can be set to the fuel of the solar system, and therefore limits can also be assigned to the existence of the sun as our luminary. The limits lie between 100 millions and 400 millions of years. These are enormous periods, but still they are definite. The mass is so great, and the cooling is so slow, that, even on the supposition that no fuel was added, it might be five or six thousand years before the sun cooled down a single degree."

The Spectroscope in Steel Casting.—Professor Roscoe, in a paper on the spectrum produced by the flame evolved in the manufacture of cast steel by the Bessemer process, states that, during a certain phase of its existence, the flame exhibits a complicated but most characteristic spectrum, including the sodium, lithium and potassium lines. He expresses his belief that this first practical application of the spectrum analysis will prove of the highest importance, in the manufacture of cast steel by the Bessemer process.

Preparation of Collodion.

Quite a number of formulas have been published, for preparing collodion, which is now employed so largely by photographers. The following is by Dr. E. Fuchs, the distinguished German chemist, in the *Zeitschrift* for *Fotografie* and *Stereoscopie*; who states that it has never failed, in his hands. He says:—

"For several years in succession, and when operating with two pounds, I have never spoiled the lot, nor have had any mishap with it. I took a large vessel, and weighed in it 40 pounds of English commercial sulphuric acid; to this I added 18 pounds of pulverized English crude saltpeter, and stirred the mixture with a wooden spatula for ten minutes or so; to this mixture I now added quickly 2 pounds of cotton, in light tufts as large as the first, whilst an assistant brought them in contact with the fluid. The mixture is sufficiently thin to allow the cotton to be easily pressed down with a spatula. I let the cotton remain in the mixture, until a small piece, after washing with water, pressing, soaking in alcohol, and again pressing, was easily and completely dissolved in two parts of ether and one of alcohol. Until this takes place, the cotton is not ready to take out.

"When it has reached to this degree of solubility, it is taken out with the spatula, immersed in a large tub of water, and thoroughly washed. It is then taken out in one mass, and pressed between folds of linen; after which it is put into a vessel, covered with alcohol, and allowed to remain in this condition for twenty-four hours. On the following day, the deep yellow-colored alcohol is poured off and totally removed by pressure. Whilst the cotton is still moist, for every single part add two parts of alcohol, and then from 15 to 20 drops of concentrated ether. By this means a colorless, excellent collodion is obtained without failure. I used the best cleansed cotton.

"Every other formula indicates exactly the time during which the cotton has to remain in the mixture. This depends, in a great measure, on the temperature and the strength of the cotton fibres. In summer, ten minutes is sufficient time for the reciprocal action of the saltpeter and the sulphuric acid, before the cotton is immersed. In winter, the vessel containing the mixture must be placed immediately in warm water, before the cotton is introduced; otherwise the fluid, by the formation of bisulphate of potassa in the cold, will become too thick, and the given quantity of cotton cannot be immersed. If abundance of red fumes arise, and these cannot be obviated by pressing the cotton beneath the surface of the mixture, a small quantity of sulphuric acid may be added without any injurious effect upon the product, on which the fumes will immediately cease.

"The transition of soluble cotton into insoluble, is not quick, and there is sufficient time to make the requisite test. As soon as the cotton has attained its solubility, it is taken out of the vessel, and the acid is well expressed before the cotton is washed. The fluid that remains can be used over again very well, in large quantities, when prepared with nitric acid. The cotton must be thoroughly freed from all traces of acidity; which is recognized by the taste, and by treatment with litmus paper.

"Good pyroxyline, when being washed, feels soft; whilst insoluble pyroxyline, when separated in a moist state, cracks in the fingers and is often corroded. I allow the washed and pressed pyroxyline to remain over night in alcohol; which totally removes the yellow coloring matter, by which proceeding the collodion becomes colorless. The residual alcohol can be used for a lamp. I dissolve the cotton, while moist, in order to spare the trouble of separating the tufts and drying. Alcohol 90 per cent, is sufficiently strong, as also concentrated ether of the specific gravity of 0.73."

Artificial parchment is made by dipping thick paper in dilute sulphuric acid. This process increases the strength of the paper, makes it translucent, and gives it the exact appearance of parchment, which it has in a great measure replaced, from its superior cheapness. According to Professor Calvert, of Manchester, England, the same process applied to cotton cloth very much increases its thickness and strength. The cotton thus prepared is technically known as "blanket."

Salisbury Iron.

The Litchfield *Enquirer* gives the following facts respecting the manufacture of iron in the vicinity of Salisbury, Conn. :—

"Barnum's furnace at North Canaan, is producing from six to eight tuns of iron per day.

"Adams' furnace, in the same town, is undergoing thorough repairs ; to be set in operation at an early day. The Chapinsville furnace is fitted up at an expense of several thousand dollars.

"The Huntsville furnace has been at work since last December, and is to continue for at least one year before 'blowing.' It yields about sixty tuns of iron a week, and of the best quality, being the product of the Salisbury and Amenia ore combined.

"Ore costs the several furnaces named from three to five dollars per tun. Coal ranges from seven to ten dollars per hundred bushels. It takes about three tuns of ore to make one of iron, and it takes about one hundred and twenty-five bushels of coal to smelt the three tuns of ore. The Salisbury ore costs at the bed $1 50 per tun, of which fifty cents is called bounty. So large an interest does the Hon. John H. Hubbard have in this bed, that it is supposed his income from this source alone must be about $3,000 per annum. The bed yields 26,000 tuns of ore per annum, and seems as inexhaustible now as ever, although it has been worked a hundred years. The cost of making a tun of iron is $30. It sells for $55 a tun.

Useful Table.

Contents of a tube of one inch diameter for any required height :—

Feet high.	Cubic inches.	Water, wt. in oz. avoirdupois.	Feet high.	Cubic inches.	Water, wt. in oz. avoirdupois.
1	9·42	5·46	20	188·49	109·24
2	18·85	10·92	30	282·74	163·86
3	28·27	16·38	40	376·99	218·47
4	37·70	21·85	50	471·24	273·09
5	47·12	27·31	60	565·49	327·71
6	56·55	32·77	70	659·73	382·33
7	65·97	38·23	80	753·98	436 95
8	75·40	43·69	90	848·23	491·57
9	84·82	49·16	100	942·48	546·19
10	94·25	54·62	200	1884·96	1092·38

The pressure of a fluid against a surface, in a direction perpendicular to it, is as the area of the surface multiplied into the depth of its center of gravity below the surface of the fluid, multiplied into the specific gravity of the fluid ; and is = to the weight of a cylinder of the same fluid, the area of whose bottom = given surface, and altitude the depth of the center of gravity : hence the pressure is entirely independent of the weight of the fluid. From this table the contents of tubes of any size may be easily ascertained ; as a tube two inches in diameter contains five times the quantity of a one inch tube, and so on for all sizes.

The Trial Balance.—Mr. R. B. Forbes of Boston, writes to the *Bulletin* of that city, and states upon the authority of the New York Chamber of Commerce that "the small force of the rebels has destroyed and bonded 150 vessels—comprising 1 United States gun-boat, 1 steamer, 1 steam-tug, 39 ships, 34 barques, 43 schooners—amounting to 61,429 tuns —valued at $50 per tun, at $3,050,000. Value of cargo from China, $3,500,000 ; value of cargo from other parts, $5,400,000. Total $11,950,000. He adds what will become of British commerce if she quarrels with us? If three or four rebel privateers can destroy twelve millions of property in three years—what amount can two hundred Yankee private armed ships destroy in half the time."

[A very pertinent question, which has doubtless occurred to John Bull some time ago.—Eds.

Engineering Run Mad.—A French locomotive was lately exhibited at the World's Fair, London, which had its boiler, cylinder, water tank, and coal bunkers, built up to such a height that it was a wonder to all who saw how the monster could ever pass under an ordinary railway bridge. The smoke-pipe had to be coiled up along the back of the boiler, like an elephants trunk. It is intended for heavy traffic only. This is a specimen of what engineering run mad can do. Perhaps more time and money has been spent in devising useless locomotives, than in any other class of engine, rotaries alone excepted.

MISCELLANEOUS SUMMARY.

The Draft and Government Works.—It is said that the operation of the conscription is likely to embarrass both the military and naval branches of the government service, by taking skilled laborers from positions where their work is of great value, and putting them in the ranks, where an ordinary laborer would be as efficient. From Colt's armory, at Hartford, one hundred and eighty men have been drafted. These works are running night and day on government work. From the Springfield armory, and from the thousands employed in armories, navy-yards, &c., large numbers must, of course, be taken ; and it will be difficult, if not impossible, to fill their places ; and much delay and interruption to work imperatively necessary to be done must be experienced. There is a clause in the Conscription act under which these drafted men might be retained in their places, and still be liable to service in the army whenever they should cease to be employed on government work.

Applications of Steel.—Experiments have been made in Prussia to ascertain the capabilities and advantages of cast-steel steam boilers. Two cylindrical egg-end boilers, one of steel, the other of wrought iron, were compared, and after working six months were examined. They were 30 feet long, and four feet in diameter ; the steel boiler plate was ¼ inch thick. It was tried by the hydraulic test to a pressure of 195 pounds per square inch, without altering in shape or showing leakage. After working six months, the cast-steel plates were found quite unaffected, and had a remarkably small amount of incrustation as compared with the other boiler. The former generated 25 per cent more steam than the latter. Another examination has recently been made, the boilers having been in use for a year and a half. The steel boiler was found in excellent condition. It appeared that it evaporated 11.66 cubic feet per hour, against 9.37 by the common boiler, with about the same expenditure of fuel.

The Hon. Erastus Corning, President of the New York Central Railway, notwithstanding his activity, is lame. He was one day hobbling over the railroad track at Albany, when an Irishman, who was placed to guard the track, sang out, with marked Celtic accent, "Will ye lave the track?" Mr. Corning smiled inwardly, and stumbled on ; when the Irishman again cried, "Begone, ye stumbling high-binder, or the 11.30 Express will be fornent ye, and Mister Corning will have to pay for ye the full price of a well man with two legs." This was too much for "Old Central ;" he yielded the track in good time for the 11.30 Express, and sent a reward and a commendation to the faithful watchman, who had never once suspected the position of the "stumbling high-binder."

Absorption of Heat by Gases.—In a paper recently read before the Royal Institution, London, by John Tyndall, F. R. S., relating to his researches on the radiation and absorption of heat by gaseous matter, he stated that olefiant gas absorbed more radient heat than all the other gases experimented with. A layer of olefiant gas 2 inches in thickness absorbed about 80 per cent. of the entire radiated heat. If a layer of the gas, two inches depth, surrounded the earth, it would offer no appreciable hindrance to the solar rays in their earthward course ; but it would intercept 80 per cent. of the terrestrial radiation ; and the earth would be raised to a stifling temperature.

The Heated Term.—During the recent hot weather the thermometer ranged as high as 94° in the cool parts of the city. It is not often that this figure is reached ; and it behooves every one to live temperately ; to eat and drink sparingly, during the prevalence of such weather. Avoid argument and much ice water ; wear flannel next the skin, and bathe frequently, at proper hours ; the dog-days will then have but few terrors for those who observe the above rules.

It is stated that a number of Treasury notes, altered from low to high denominations, are in circulation. Among these, twos altered to fifties are the best calculated to deceive. A close inspection will enable nearly any one to detect the base character of any bill suspected.

A Floating Island.—A remarkable sight was to have been seen on our lake yesterday ; a mass of trees and shrubs—over half an acre in extent—floated out of the marsh in the north-west part of the lake, and, impelled by a strong wind, floated down the lake. It had a most beautiful appearance, composed as it was of various kinds of trees and plants, green to the water's edge. There were several tamaracs, 16 to 18 feet high ; and many large and flourishing alders, besides other shrubs. They are all firmly rooted into the floating mass, on which you can walk easily. Many persons have visited it ; and to-day, at Colonel Foster's request, about a dozen men have been endeavoring to tow it to the centre of the lake, with the view of mooring it there permanently.—*Waterloo Advertiser*.

Artificial Ice.—A great degree of cold is produced by a mixture of saltpeter and Glauber salts, and there are now manufactured in England and exported to India, &c., in large quantities, chemical mixtures known as freezing powder, by means of which five pounds of rough ice can be produced in fifteen minutes, at a cost of about 4d per pound. This powder, introduced into a little machine, invented by the same person, may be used upon the table to ice wine or water with the greatest celerity. A bottle of champagne may be iced in ten minutes for 3d. So great is the intensity of cold produced, that the sparkling contents of the bottle may be actually transformed into a spongy mass.

Another "intelligent deserter" has recently arrived from Richmond, Va. ; who brings some information respecting the construction of rebel iron-clads, and the performances of their heavy guns, which are expected so to appal our Government that it will make no resistance whatever to their progress whenever they choose to appear. We think it time that correspondents should cease sending cock-and-bull stories to their respective journals.

Colored Troops.—Adjutant-general Thomas is again going West to complete the organization of the regiments of freed negroes along the Mississippi. He expects, the Washington *Chronicle* says, to have a hundred thousand colored troops under arms in a few months. This is outside of the draft, and will be that much more added to the strength of the Union army which the rebellion will have to encounter.

It is stated in the London *Shipping Gazette* that the iron clipper *Chili*, which was coated with Messrs. Peacock & Buchan's composition, has returned from New Zealand, having been twelve months out of dock, and upon being examined, she was found to be perfectly clean. It is further mentioned that there is not a particle of copper in this preparation.

The formal opening of the large new armory of Messrs Jenks & Mitchell, at Bridesburgh, near Philadelphia, took place on the 29th ult. It is stated to be the largest manufactory of army muskets in the country. At present 1,200 operatives are employed there. The new building is 800 feet long, by thirty-two in width.

Charles Kellogg & Co., iron bridge builders, of Detroit, Mich., have nearly completed at their works, twenty-seven spans of iron bridges for various railroads of Illinois and Indiana. They have just completed the shipment of a bridge to the Illinois Central Railroad Company, consisting of six spans, each 160 feet long in the clear.

Gallant Conduct.—It is stated that during the recent siege of Charleston, S. C., the *Montauk*, one of the *Monitor* batteries, ran in to within 100 feet of Fort Wagner, reconnoitered leisurely, and then returned without injury. Admiral Dahlgren was on board.

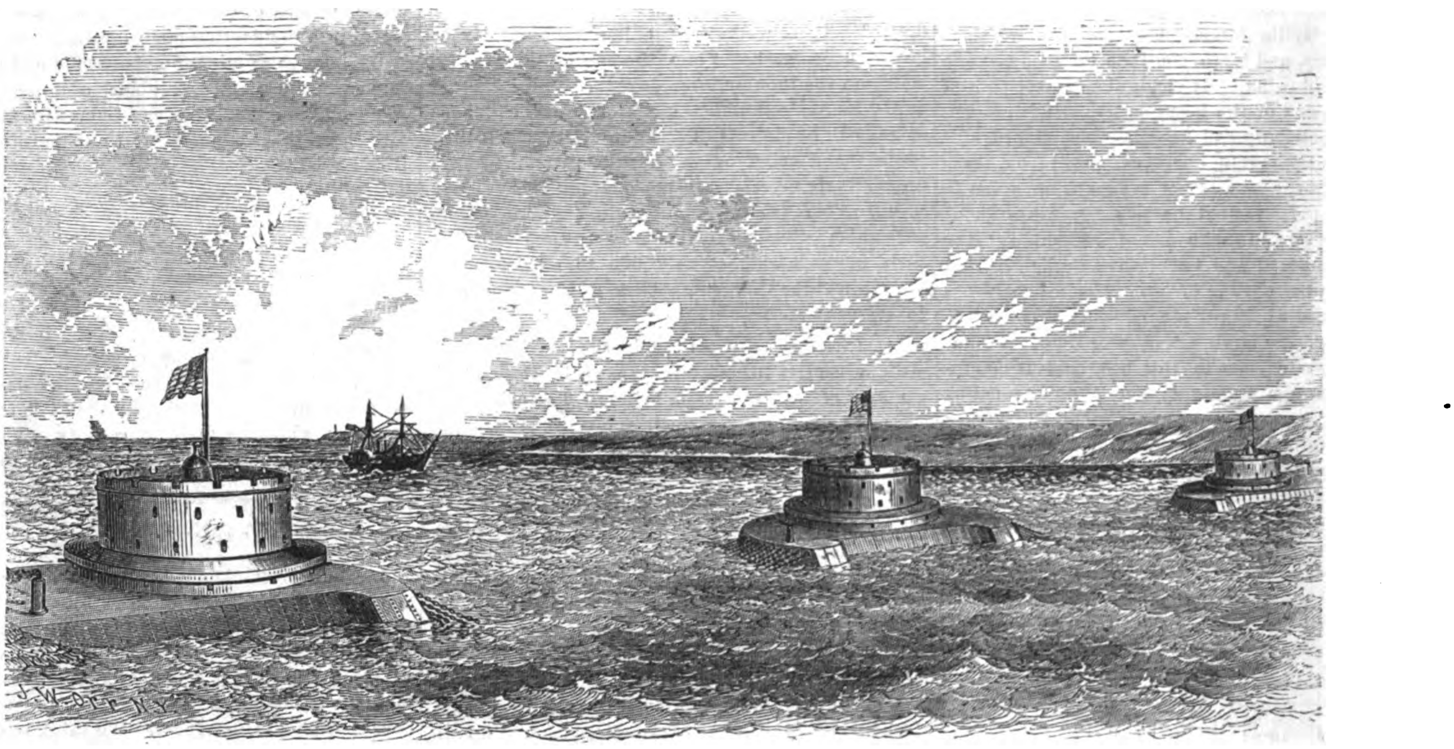
A gun burst recently in the turret of the Monitor *Lehigh*, when she was on the James river. What gun was it? a fifteen-inch, an eleven-inch, or the Parrott 200 pounder? The public would be glad of some information on this point.

In the late Industrial Exhibition held at London, some wine glasses were exhibited, which were so exquisitely engraved that they sold readily for $35 apiece.

Dean & Co., of Ann Arbor, Mich., have recently shipped to New York over 50,000 feet of black walnut lumber in the log. It is going to England where this handsome wood is greatly admired.

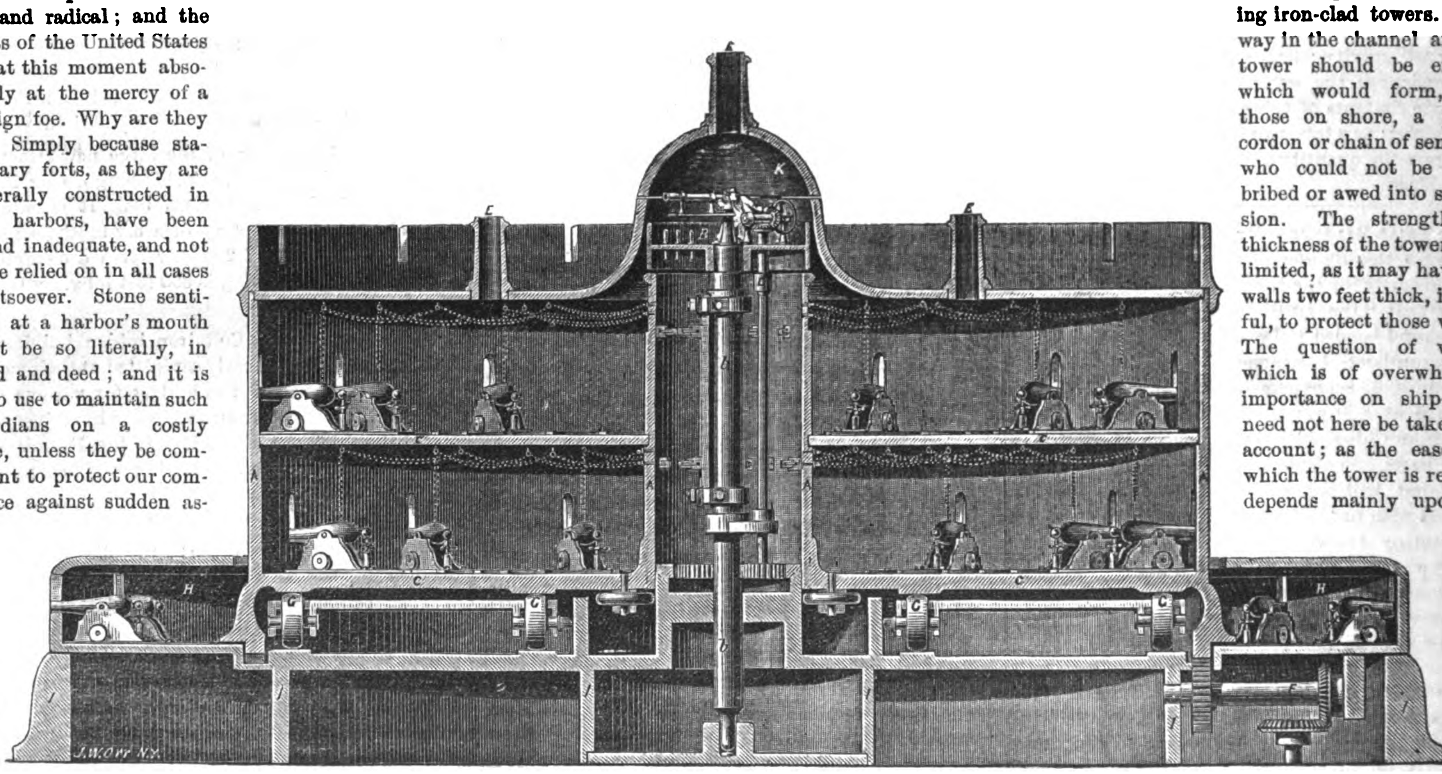
OUR NATIONAL DEFENSES.

It is quite time some change for the better was inaugurated in our fortifications on land and water. While nearly every system of attack and defense that can be named has sustained important modifications, singularly enough, land fortifications, or their equivalents, stationary forts, whether on land or in the water, have remained almost without improvement.



More particularly at this juncture, when governments all over the earth are increasing their offensive power, should we consider the best means of enforcing respect and insuring our own safety. *Already the French Government is illustrating these plans of Mr. Timby's, and discussing the advantages likely to ensue from their adoption; shall we then, with whom the invention first originated, be backward in initiating a system which is unquestionably of the utmost value?*

Thickness of wall, convenience of design, as regards access, and economy of space, arenot considered as improvements vital and radical; and the ports of the United States are at this moment absolutely at the mercy of a foreign foe. Why are they so? Simply because stationary forts, as they are generally constructed in our harbors, have been found inadequate, and not to be relied on in all cases whatsoever. Stone sentinels at a harbor's mouth must be so literally, in word and deed; and it is of no use to maintain such guardians on a costly scale, unless they be competent to protect our commerce against sudden assault; and have power to stop all intruders rushing in from the highway of nations, the ocean, to plunder and destroy. A granite fort can stop an iron-clad, or any other ship, provided the fort's artillery is powerful enough, and that the shot therefrom strike the enemy. But, if these conditions remain unfulfilled, the fort is as useless for purposes of defense as if it were an iceberg. Ships *have* run by forts unharmed. Forts Jackson and St. Philip, on the Mississippi, below New Orleans, being cases in point; and the shore batteries thrown up at various points along the Potomac and other rivers, during the present rebellion, may be also instanced as evidences of the impunity with which fixed artillery can be defied by vessels. These are indisputable facts that cannot be gainsaid.



What, then, is required to render our forts impregnable, and to seal them against any possible surprise occurring through the enemies daring, or from the protection afforded by the darkness of the night? Simply a system of defense that is, so far as human skill and the ingenuity of the present age can devise, absolutely impassible. These conditions are already fulfilled; and the erection of such a fortress might be commenced to-morrow, with the certainty of its accomplishing the end desired. When the Armstrong gun was introduced, and the Whitworth and Blakely guns were brought forward, the Powers that be, at home and abroad, naturally became alarmed; feeling that, for such weapons, there must be found some new shield and buckler, or else the question of superiority would be very quickly decided by the Napoleonic maxim that victory lies with those who have the greatest guns. Hence, after much discussion, came iron-clad ships; and now these having been measurably a success, we must endeavor to repel this latest invention of modern warfare.

Among all the ingenious plans proposed for the object alluded to—national defense—there is none that ranks higher, in our estimation, than that which is the subject of this article. Mr. Timby's invention, as is well known, consists of a revolving tower, adapted to either ship or shore. The unimpeachable value of the tower as an extraordinary means of resisting assault, and providing offensive power, has been amply proved; and the people owe him all the advantages which have accrued to us through its instrumentality. It being admitted that our ports are not in a desirable condition to arrest vessels striving to enter our harbors with malicious intent, it remains for us only to awaken from our apathy, and set to work without delay to remedy the evil. The plan of defense proposed by Mr. Timby, is to erect, at suitable points on either shore strong foundations; on these should be placed the revolving iron-clad towers. Midway in the channel another tower should be erected, which would form, with those on shore, a perfect cordon or chain of sentinels, who could not be either bribed or awed into submission. The strength and thickness of the tower is unlimited, as it may have iron walls two feet thick, if needful, to protect those within. The question of weight, which is of overwhelming importance on ship-board, need not here be taken into account; as the ease with which the tower is revolved depends mainly upon the size and proportions of the running gear below, on which it rests. As the diameter of the tower increases, the strength of the walls must, of course, be augmented. Mere strength and power of resistance in the turret, however, is only a question of mechanics; and any emergency can be fully met and overcome, in this respect, by the resources of science. The most remarkable feature is the extraordinary capacity of the revolving fortress to annihilate every floating thing that comes within range of its guns. The rock of Gibraltar is an impregnable natural monument; but it would be of very little advantage to the English if its strength consisted in bulk alone. So with the towers; two mountains standing midway in the channel would not appal the soul of the most timid Chinese mariner; but let these mountains belch forth fiery storms of lead and iron, and woe betide the adventurous craft which shall approach, even though trebly clad in the heaviest mail, always providing the shot hit the mark at which they are aimed. This is by no means generally the case. Various causes conflict with the taking of a true and unerring aim in ordinary forts; not the least of which is the unpleasant feeling on the part of the gunner that some shot, inimical to him alone, may enter the open port through which he is sighting his weapon, and deprive him of his head; his aim is consequently hurried and uncertain; and too often the discharge of cannon is merely

"Sound and fury signifying nothing."

We have the fullest proof of this in the history of the present struggle. Tuns of powder and shot have been wasted in firing at passing vessels; but there are very few, if any, instances on record where the gunners who blockaded the Potomac ever hit anything except the river, or the opposite shore. History is full of similar instances; and it is roughly computed that but one shot in about seven hundred ever takes effect! If the certain arrival of every shot at the destination intended could be assured, the cost of war would be reduced enormously; for, following the report of every gun would come the conviction that the enemy had received a vital blow, and that his destruction could soon be accomplished. So far as mechanical ingenuity can provide and foresight penetrate, this greatly desired consummation is within the capacities of the revolving fortress proposed by Tim by. The following explanation and engraving will fully illustrate the plan of the inventor, and, we think, convince all that the conception is a correct one.

The second cut on the preceding page represents a section of the battery, or revolving tower, and the several parts are here explained. The main structure, A, of the battery, is provided with a central or inner platform, B, on which the commander of the tower stands; this revolves independently of the main tower by means of the gearing, D. The decks or floors, C, are those on which the guns are mounted, and E, are ventilators through which are discharged all the smoke and gases caused in working the guns. In the foundation walls of the tower may be seen the gearing, F, which, through the medium of the rollers, G, causes the tower to revolve; and which is driven by a steam engine erected within a bomb-proof. The casemates, H, at the foot of the tower, also contain guns which are used independently of those in the tower. Down below these the walls, I, form a subterranean chamber, in which stores of all kinds may be placed. These are, in brief, the principal features. The dome-shaped roof, K, affords a shelter and protection to the commander who sights and fires the guns. The whole battery is thus literally under the control of one man; and, after the guns are loaded, they are fired by him through the agency of a galvanic battery; the current passing through the conductors depending from the roof or floor to each gun.

Let us now examine this feature, by far the most important in the revolving fort. Here are sixty guns, we will assume, that are to be brought into service. In ordinary forts, although the full complement of artillery may far exceed this number, the whole of them are not serviceable, by reason of the character of the work—that is, stationary. With the revolving fort and its peculiar arrangement, every gun can be fired once in a minute, or oftener, if required; depending only upon the rate of speed at which the tower revolves. Absolute accuracy in the flight of the shot is insured, so far as science can guarantee, by the certainty with which the cannon can be brought to bear on the enemy, guided by the telescope of the commander. The engraving shows this personage in the act of sighting, through the peepholes in the dome. As the tower revolves independently of the commanders platform, each gun is discharged at the precise moment when it arrives under the electrical conductor depending from the roof; and it will be seen that, as the flight of the shot to its mark does not depend in the least upon the skill in gunnery of a number of different persons, excited and eager with the heat of battle, much greater execution must ensue than when the reverse obtains. How many shots could an iron-clad vessel receive from guns discharged with such accuracy as is here attainable, before she would be obliged to succumb? Scarcely would the tower have revolved once ere the foe would go to the bottom with all on board; or else, exercising that discretion which is the better part of valor, 'bout ship, and tell the tale of her discomfiture to unwilling ears. As the tower revolves once a minute, 180 guns—supposing there are three tiers of sixty each—could be discharged at every turn; and, if these guns were Admiral Dahlgren's, of 15-inch bore, 32 tuns of iron might be hurled at every revolution of the tower; an amount of ballast which would interfere with the sea-going qualities of any ship that ever floated. No vessel in the world ever carried such a broadside, or could be made strong enough to resist the terrible execution which would be sure to follow therefrom. And though we must not suppose that the enemy will be idle, yet his responses would avail but little, and the chances of his dismounting a gun would be very slight indeed. As the tower rotates, each gun is loaded, after firing, on the safe side, or that opposite the fighting face of the tower, which is continually changing its aggressive front, and the exposure of life and limb thus greatly lessened. Of course the commander in the turret is not silent, but by a telegraph directs each officer to elevate or depress his gun, as may be required to suit the distance from the foe, although this duty must be done at times under exposure.

So far we have considered only a single tower; but when we have a cordon of revolving forts extending across our harbors, Mr. Timby proposes to stretch between the two a gang of heavy chain cables, in the manner shown in the engraving on the preceding page. These chains pass in through hawse-holes in the foundation of the tower, and are sustained by metallic buoys capable of carrying nine-tenths of the cables weight below the surface. These chains do not in the least interfere with the channel way, as they are slacked away the moment danger disappears; and, resting quietly on the bottom, permit pacific vessels to enter as they please. The object of these chains is to detain the enemy under fire; for, when he arrives at them, should he be foolish enough to run his ship against such a barrier, he will find the converging fire of two revolving forts bearing upon him with a deadly accuracy of aim from which there is no escape. We need not dilate upon the effect which will follow; nor is it necessary for us to pursue this subject through interminable columns. Very few unfavorable criticisms can be presented against the plans herein detailed, which Mr. Timby has been engaged for the past 22 years in perfecting. Were such fortifications as those proposed erected at the entrance of our harbors, we might dismiss all fears of invasion; defying alike hostile ships and those who sail them.

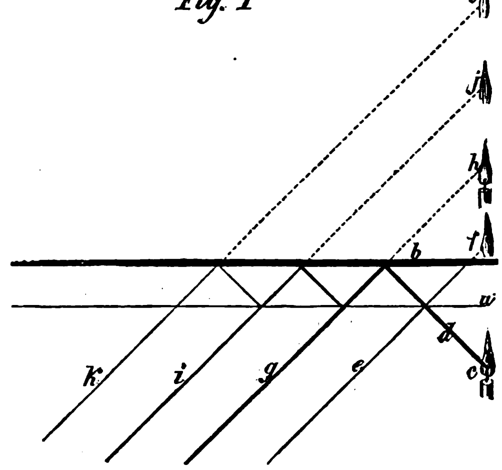
Permanency of Photographs.

The Paris correspondent of *The Photographic News* (London) states that, at a late meeting of the Paris Photographic Society, M. Davanne presented two photographic pictures, on paper which had been submitted to the test of exposure in two exhibitions (1861 and 1862), and which showed no signs of fading or alteration whatever. This, then, may be accepted as a satisfactory proof that photographs, when carefully prepared, are permanent; for the pictures in question were submitted to the severest test to which photographs are ever likely to be exposed, the conditions being every variation of light, heat, moisture, &c., and they remain as fresh and pure as at first. It was also remarked that photographs are more liable to change when kept in a portfolio than under glass exposed to luminous action. A sulphurized proof, if kept in a perfectly dry place, remains for a very long time without exhibiting any signs of alteration, while in a damp place change is immediately evident. Thus, a photograph carefully framed is much better sheltered from humidity than when kept in a portfolio.

THE OPTICS OF A LOOKING-GLASS.

When a beam of light, from a candle or other body, strikes a looking-glass, a small portion of the light is reflected from the front surface of the glass; but the principal portion passes through, and is reflected from the smooth surface of metal at the back. A looking-glass is as truly a metallic mirror as those which were anciently made of polished silver. The office of the glass is simply to hold the amalgam of tin and mercury in place, and to give it a finely polished surface. It answers this purpose admirably, as it permits the use of an exceedingly thin sheet of metal, and gives a surface so smooth that the metal is absolutely invisible.

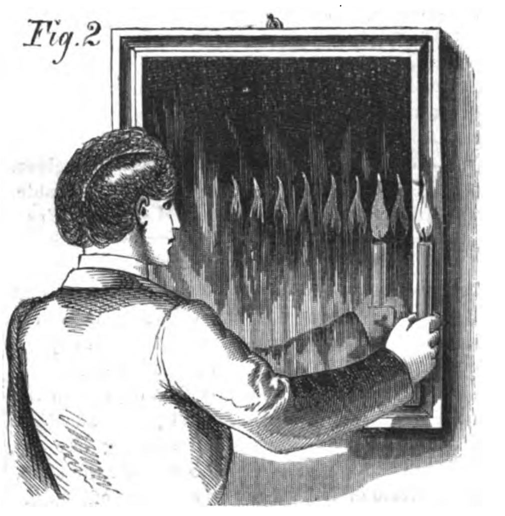
Fig. 1



It is only by the reflection of light from rough surfaces that any non-luminous objects are visible. Were all surfaces as smooth as that of the amalgam on the back of a good looking-glass, the eye would perceive nothing anywhere but a confused glitter.

When a beam of light from a lamp or candle strikes a looking-glass at an acute angle, a sufficient portion is reflected from the front surface of the glass to form an image of the lamp or candle; and if the eye is placed in the right position to receive the reflected ray, the image will be perceived. Even in this case, however, the principal portion of the beam will pass through the glass, and will be reflected by the metal at the back, forming a brighter image than the first; and this second image may be seen at a greater depth within the glass.

Fig. 2



The accompanying diagram illustrates the subject. *a*, is the front surface of the mirror, and *b*, the metal sheet at the back; *c*, is the candle, and *d*, the beam of light issuing from it. As this beam strikes the front surface of the mirror, a portion is reflected in the direction *e*, and if this ray is received by an eye, an image of the lamp will be seen at *f*. The ray reflected by the metallic surface is represented by the line, *g*, and the image of the candle formed by this may be seen at *h*. This image is brighter than the first, in proportion to the larger amount of light reflected from the front surface of the glass.

If the angle is sufficiently acute, as the ray, *g*, emerges from the glass, a portion of it will be reflected inward, against the metal back, and will rebound outward at *i*, forming a third image at *j*, fainter than that at *h*.

As the ray, *i*, emerges, a portion of it will be reflected inward from the surface; rebounding against the metal back, issuing in the direction, *k*, and forming a fourth and still fainter image at *l*. The beam of light will thus continue to be subdivided; forming images more and more faint, until they cease to be visible.

The reflection of light from the surface inward, as it emerges from one transparent medium into another, takes place at an acute angle only; and the requisite acuteness of the angle varies with different media; varying even with different kinds of glass.

Correspondence.

Steel Guns.

MESSRS. EDITORS:—The author of the article entitled "Why our Big Guns Fail," published on page 70, current volume of the SCIENTIFIC AMERICAN, is on the right track; and he reasons correctly. Cast-iron for guns has had its day. If the guns on the Monitor iron-clads were made of cast-steel, instead of cast-iron, they could be used with sixty, instead of thirty-pound charges. The guns employed in our navy are undoubtedly good of their kind; but the material employed in their construction is not the best for the purpose; as cast-steel possesses double the strength of cast-iron. Many persons may suppose tnat it is impossible to obtain such large castings of steel; but I am informed that Mr. Frederick Krupp, of Prussia, is making cast-steel guns of every size, from six-pounders up to guns weighing twenty tuns; and almost all nations, except ours, are having such guns made for them. I am credibly informed that the iron-clad war-vessels now building in England for the Confederates are to have ten large cast-steel guns. We may awake some unfortunate time to discover that we are behind our neighbors on this important subject. G. J. MIX.

Wallingford, Conn., August 1, 1863.

[Whether the cast-steel guns of Krupp are superior to the built-up guns of Armstrong, Blakely, and Parrott, embracing the system of Treadwell, we cannot tell; as there are no recorded experiments in our possession, relating to the comparative tests with his guns. We had become impressed with the idea, that a large gun made wholly of cast-steel, was more liable to burst than a built-up or banded gun. On page 121, Vol. VI., current series of the SCIENTIFIC AMERICAN, we directed attention, in an article on "Strong Cannon," to the defective character of cast-iron, and said, "The government which would adopt cast-iron muskets, rifles, and pistols, would be considered as insane as a railroad company that would adopt cast-iron for the boilers of their engines. Why? Because cast-iron is so weak and unreliable, in comparison with wrought-iron and steel."—EDS.

Extensive Prairie and Forest Fires.

MESSRS. EDITORS:—On the 19th of the present month, and continuing through the four succeeding days, the upper atmosphere wore an unusual copper-colored hue, through which the sun was scarcely visible; particularly on the three first days. On the 12th and 13th, the sun shed that peculiar mellow light that we are accustomed to see during our autumnal Indian Summer days. The weather was calm, and the surface of Lake Erie was scarcely ruffled during the five days. The mean temperature of each day ranged from 63 to 73 degrees. The surface wind (what was of it), was variable; mostly however from the east and northeast. At 2 A. M., on the 12th, there was a slight rain, sufficient only to "lay the dust." At 5 A. M., on the 14th, there was distant thunder; followed at 5½ to 9½ A. M., with a moderate rain; after which the heavens were overcast by the cirro-stratus cloud, through which pure sky was observed during the afternoon.

Recent intelligence from the far West leaves no doubt as to the cause of this untimely Indian Summer appearance. It was the result of smoke from the vast burning prairies west and north of the upper Mississippi and Missouri rivers; and the extensive pine forests in northern Wisconsin, in the vicinity of Lake Superior. Probably at no time since the whites have been acquainted with them have those prairie regions been visited with drought so severe, either in intensity or extent. The rivers and small streams in Minnesota, Dacotah, and Nebraska, are reported lower than they have been known for many years. In the pine lumber territory of north-western Wisconsin, many of the mills have stopped, for want of water in the streams to float a supply of logs to them. On the road from St. Paul to Lake Superior, well up the St. Croix river, the pine woods, to the extent of twenty-five miles, have been burnt over. The entire Red River country of the North, from Fort Abercrombie to Pembina, nearly all of which is prairie, has been burnt over, so that it is impossible to subsist animals on the route. This is believed to have been the work of Indians. The smoke from these prairie and forest lands has been wafted by the varying winds over nearly all the Northern and Western States, and Canada.

We hear of it as far south as St. Louis, and Cairo: where the sun was much obscured, and the atmosphere so filled with it, that navigation on the Mississippi and Ohio was considerably interfered with. At St. Paul, the smoke was so thick that objects at a short distance from the observer were quite invisible. On Lakes Superior and Michigan, and at the Straits of Mackinaw, this murky element was so prevalent that navigation became exceedingly hazardous, and in some instances disastrous. Many sailing vessels even were put in peril by getting off their course; an upward bound propeller ran ashore in the vicinity of Mackinaw, and got afloat again only by parting with some twelve thousand dollars worth of her cargo. The absence of any unusual aërial odor at this point, during the obscuration of the sky, with the fact that we had shifting surface winds with rain, seem to indicate a great elevation—far above the rain-cloud region—of this dusky visitation. W. I.

Buffalo, July 23, 1863.

Slate-dressing Machine Wanted.

MESSRS. EDITORS:—You are probably aware that the manufacture of roofing slate is extensively pursued in Maine, Vermont, New York and Pennsylvania. The processes are comparatively simple, and yet have hitherto seemed necessarily confined to manual labor. The slate stone is quarried in the usual manner; then split into thin sheets or laminæ, which sheets are afterwards dressed, or cut into the desired shapes by the laborer. These two processes of splitting and dressing, though very simple, require skill and practice; and consequently the number of persons who can split and dress are few, and their wages high. The best workmen are from Wales, England, nearly all of whom come from the great welsh slate quarries; strange as it may seem, although these laborers get very high wages, at this time $1 75 per day for the season, their children seem disinclined to learn the trade, and consequently there is no home growth of workmen. Any manufacture is necessarily precarious which is dependant on a limited supply of laborers, particularly when the labor must be imported, and the price of the article manufactured is fluctuating. In view of these facts, the slate workers of this region desire exceedingly to procure some cheap, simple and practicable machine to aid them in their work. It can hardly be hoped that a machine can ever be made for splitting, as the variation of split in different rocks, the presence of foreign material which deflects the split, and varying hardness of material, seem to require the eye of the workman, and the constant action of his judgment, as a guide to his hand.

But the process of cutting, trimming or dressing the split slate is simple, and might be done by machinery. Machines are used in the Welsh quarries with considerable success. A machine was used at Guilford, Vt., with imperfect success, and small machines for cutting the manufactured article into special shapes are in use in many slate yards. But no simple and successful American machine for general quarry use has ever been invented. The want is very great, and a successful machine would meet with a ready and extensive sale. If there is any one among your readers disposed to apply his inventive powers to this subject, he may rest assured that if successful he will be well repaid. I will gladly answer any questions; and inquiries may be addressed to Mr. Eleazer Jones, No. 28 Broadway, New York.

As your paper is devoted to the advancement of the mechanic arts, I am led to believe you will be glad to forward this matter. There can be no doubt that a successful invention would not only be a great public benefit, but would also prove very profitable to the inventor.

B. MORRIS COPELAND, Committee on Publications of the Rutland and Washington Counties Slate Dealer's Association.

West Castleton, Vt., July 27, 1863.

The Oil of Life.

MESSRS. MUNN & Co.—I am pleased to inform you that my Letters Patent came duly to hand a few days ago. In addition allow me to say that this last patent of my wagon-pole check-arrester constitutes the fifth patent granted me within four years, in four of which you have acted as my attorneys, and in each case have always conducted and discharged the business with dispatch and honesty. Accept my thanks, and rely upon it if ever I may have occasion for business of a like character, I shall call upon you to serve me again. J. MCNAMEE.

Easton, Pa., July 27, 1863.

A Mammoth Contract.

Messrs. Woodruff & Beach, well-known machinists of Hartford, have contracted with the United States to build the machinery for three large steam frigates. The Government has fifteen of these steam vessels ordered to be built. Each of the engines to be built will have a sixty-inch cylinder, with three feet stroke, and four tubular boilers, each of which are about one hundred thousand pounds weight. The propellers for the vessels will be of composition, or gun metal, four bladed, and sixteen feet in diameter. The crank shafts will be seventy-five feet long and thirteen inches in diameter.

The above contract will amount to about $1,500,000; and will be sufficient, it is estimated, to keep a force of five hundred men employed without cessation, from twelve to fifteen months. It is further stated that so urgent is the desire of the Government to have this contract filled at the earliest possible day that men who are engaged as employees in the concern alluded to, will, on being drafted, be at once detailed for service there. In order to execute this immense job, large additions are to be made, both to the works of the establishment and to the force employed therein. A new foundry 240 by 65 feet is to be built; and the present extensive machine shop will be made double its present size. A boiler shop 150 feet long is to be erected, and the paraphernalia of steam-hammers, lathes, furnaces, derricks and other mechanical appliances, will be multiplied to an almost indefinite extent.

[This is certainly a heavy contract, but much larger orders have been executed at one time by the marine engine works in this city. It would be lost in the Novelty Works.—EDS.

THE FERTILITY OF INVENTORS.

As an evidence of the activity of inventors, we would state that, for the week ending July 31st, there were ordered to issue from the United States Patent Office, FORTY-EIGHT PATENTS the specifications and drawings of which were prepared at the Scientific American Offices. Of the total number of patents ordered to issue during the week we are not informed, but from the large number ordered to issue to the patrons of this office, we suppose the total amount must exceed one hundred. This is very encouraging, especially when we consider how many of our noble inventors have left their accustomed occupations and taken up arms for the support of our Government. There never was a time when good labor-saving machines were so much needed as the present, and we are rejoiced that our inventors are so active in supplying the demand.

AT Berrien, Michigan, a barrel of sorghum syrup was stored away some five years ago; it was recently opened, when the contents were found to be dry sugar.

Portable Gas Works in Paris.

There is a company in Paris which manufactures gas, and condenses it in cylinders, which are then carried round (like the vessels employed in New York for charging soda-water fountains), and supply such *cafes* and workshops on the outskirts of the city, as are beyond the common gas mains. The material employed for making the gas is boghead cannel, which is shipped from Scotland to Rouen, and thence is sent to Paris. The boghead is first broken into pieces about two inches square, and is then distilled in clay retorts, set nearly in the same manner as those used for the production of common coal-gas. They are set in benches of seven each, with a furnace in the middle, which is heated either with coke, or with the thick tar that is the first product of condensation. The products are carried off in the same manner as in manufacturing ordinary coal gas, by a perpendicular ascension-pipe. The gas holders are much smaller than those of ordinary gas-works; for the gas, as it enters, is withdrawn by twelve pumps, which force it into receivers, fixed in the wagons that convey the gas to the consumers. The wagons are supported by springs, on a solid framework of wood, each one being about 10 feet long and 6 feet 8 inches wide. Nine cylinders of plate iron, 10 feet long and 16 inches in diameter, each one being capable of holding 25 cubic feet of gas at the pressure of the atmosphere, are fixed in the wagon. As the cylinders are intended to hold gas compressed to eleven atmospheres, they are necessarily required to be very strong. They all communicate, through bent copper tubes, each furnished with stop-cocks on a brass pipe, that has a pressure-gage attached to it. When the receivers are to be charged, the wagon is brought near the pumps, and the stop-cocks being opened, the gas is forced in until the pressure-gage indicates eleven atmospheres. If the pumps should exhaust the gas-holders, a small bell rings, when the pressure is removed, and pumping ceases. At a pressure of eight atmospheres, a portion of the hydro-carbons in the gas condenses and forms a liquid. The quantity thus deposited averages about 46 grains per cubic foot. In the early progress of the works, this condensation was a serious obstacle; but it is now converted into a source of profit. The light condensed oils are collected through tubes in a reservoir, from which they are pumped into a distilling apparatus heated by steam. By this means, an extremely volatile hydro-carbon is produced similar to benzine.

When the nine cylinders in each wagon are charged, they contain 2.250 cubic feet of compressed gas, and are taken towards evening to the different places that are to be supplied. The consumers cylinders, that serve as reservoirs for the gas, are each about 6 feet 8 inches long and 2 feet in diameter, and made sufficiently strong to bear a pressure of five atmospheres. They are charged with gas from the cylinders in the wagon, through india-rubber tubes, fitted with appropriate connecting-screws. From those reservoirs, the gas is distributed to all parts of the house, after having passed through a regulator and a meter. The number of consumers now supplied in this manner amounts to nearly 1,200, who are distributed over 85 communes; and 84 horses are employed in conveying the gas.

Cesspools and Typhoid Fever.

The London *Builder*, an excellent authority in sanitary matters, says that the local commissioners of Galashiels, Scotland, have consulted Dr. Brisbane as to the connection of town cesspools with fever, and the consequent desirability of getting rid of the cesspools. The report of the doctor says, that for some years past the facts as to typhoid fever prove the connection of such fevers with cesspools. He further says: "That outbreaks of typhoid, enteric, or gastric fever, are essentially connected with defective drainage, is now an almost universally acknowledged fact. Whether the fever poison is generated *de novo* by decomposing sewage, or merely fostered thereby, may admit of some doubt; but no doubt whatever exists as to the intimate relation between outbreaks of gastric fever and the emanations from sewage or other putrescent substances. The continued fevers met with have been divided into four classes by Dr. Murchison: 1, Febricula, due to errors in diet, heat, fatigue, &c.; 2, Relapsing fever, due to famine; 3, Typhus fever, due to over-crowding and destitution; 4, Typhoid fever, or gastric fever, due to causes above stated. It is notorious that relapsing fever is never met with in Galashiels, and typhus rarely, the species of fever almost always met with being febricula, or gastric. Again, it is sufficiently established that the latter fever generally prevails most in autumn, particularly during dry, warm seasons; the high temperature favoring decomposition, while the defect of water prevents the efficient removal of the putrid substances thus generated. The causes of any disease being known, and these being remediable, it behooves sanitary authorities to direct every legitimate and available means towards the eradication of those." Dr. Brisbane also states that he believes the above cause is an equally fertile source of other and more formidable diseases, such as diptheria, cholera, &c. The quality of the water has also much to do with the health of the community.

The Action of Manganese in Iron Smelting.

Captain Caron, in continuing his reseaches on steel, has applied himself to the effects of manganese in iron ore. He remarks that nearly all good samples of steel come from ores containing much manganese; and it has long been observed that its presence is almost indispensable for the production of superior steel. The results of his experiments he sums up thus:—By the addition of a suitable quantity of metallic manganese, sulphur is removed even without refining; silicon is in great part removed on refining; while phosphorus resists its action altogether. These observations are confirmed by experience. Ores giving the best steel never contain phosphorus, whilst they often have sulphur; and although the ores may contain copper pyrites, the derived cast-iron is found free from sulphur. Manganese has also the property of making steel better in quality and more durable. A small quantity of manganese is sufficient to retain the carbon in combination, and thus to give steel of good quality. Yet steel should not contain more than a half per cent of manganese; above this amount it is rendered hard and brittle, losing much of its tenacity. Many forge-masters use, in refining, a mixture of ordinary and manganiferous cast-iron. In this case it is of great importance so to reduce the manganiferous ores that the iron shall contain the largest possible amount of manganese, in order that the maximum effect may be produced in purifying the ordinary iron.

Coating Armstrong Projectiles.

The shot for the Armstrong rifled guns is made of cast-iron, each being coated with a band of soft metal, to make it fit the bore. This is not put on by pouring molten soft metal into a mold, direct upon the cast iron shot; but by a process of galvanizing and dipping. The first shot made of this kind, had bands of soft metal upon them—but these were found defective—the bands flying off when the shot was discharged. According to the mode now practised, the cast-iron shot is turned in a lathe to a required gage; then heated in an oven nearly to the temperature of molten zinc; dipped into a solution of sal-ammoniac, and transferred to a bath of fused zinc. Thus a galvanized surface (a coat of zinc) is secured. From the molten zinc vessel the shot is immediately transferred to a bath of molten soft metal, consisting of lead, and a very small quantity of tin. This soft metallic alloy adheres perfectly to the zinced surface, but will not hold to the iron directly. It will also adhere to the zinc surface, whether the shot is dipt into the molten metal, or the latter cast upon the shot in a suitable mold.

ACTION OF WOLFRAM ON CAST-IRON.—M. le Guen has made experiments on this subject at the military post of Brest, and finds that cast-iron composed of old and new iron, combined in the proportions for giving greatest strength, is made much stronger by the addition of less than 2 per cent of wolfram. In one case, after two fusions, the resistance to fracture was increased by more than a third. The superiority was maintained after several fusions; and the cast-iron so treated was also rendered tougher and more elastic. The wolfram is easily added, merely requiring to be pulverized without previous reduction.

Be your own Right-hand Man.

People who have been bolstered up and levered all their lives, are seldom good for anything in a crisis. When misfortune comes, they look around for somebody to cling to, or lean upon. If the prop is not there, down they go. Once down, they are as helpless as capsized turtles, or unhorsed men in armor, and they cannot find their feet again without assistance. Such silken fellows no more resemble self-made men, who have fought their way to position, making difficulties their stepping-stones, and deriving determination from their defeat, than vines resemble oaks, or spluttering rushlights the stars of heaven. Efforts persisted to achievements train a man to self-reliance; and when he has proven to the world that he can trust himself, the world will trust him. We say, therefore, that it is unwise to deprive young men of the advantages which result from energetic action, by "boosting" them over obstacles which they ought to surmount alone. No one ever swam well who placed his confidence in a cork jacket; and if, when breasting the sea of life, we cannot buoy ourselves up and try to force ourselves ahead by dint of our own energies, we are not salvage, and it is of little consequence whether we "sink or swim, survive or perish."

One of the best lessons a father can give his son is this: "Work; strengthen your moral and mental faculties, as you would strengthen your muscles by vigorous exercise. Learn to conquer circumstances; you are then independent of fortune. The men of athletic minds, who left their marks on the years in which they lived, were all trained in a rough school. They did not mount their high position by the help of leverage; they leaped into chasms, grappled with the opposing rocks, avoided avalanches, and, when the goal was reached, felt that but for the toil that had strengthened them as they strove, it could never have been attained."

Thought Essential to Health.

If we would have our bodies healthy, our brains must be used, and used in orderly and vigorous ways, that the life-giving streams of force may flow down from them into the expectant organs, which can minister but as they are ministered unto. We admire the vigorous animal life of the Greeks; and with justice we recognize, and partly seek to imitate, the various gymnastic and other means which they employed to secure it. But probably we should make a fatal error if we omitted from our calculation the hearty and generous earnestness with which the highest subjects of art, speculation and politics were pursued by them. Surely, in their case, the beautiful and energetic mental life was expressed in the atletic and graceful frame. And is it a mere extravagance to ask whether some part of the lassitude and weariness of life, of which we hear so much in our day, may not be due to lack of mental occupation on worthy subjects, exciting and repaying a generous enthusiasm, as well as to an over-exercise on lower ones; whether an engrossment on matters which have not substance enough to justify or satisfy the mental grasp, be not at the root of some part of the maladies which affect our mental convalescence? Any one who tries it soon finds out how disproportionately exhausting is an overdose of light literature, compared with an equal quantity of time spent on real work. Of this we may be sure, that the due exercise of brain—of thought—is one of the essential elements of human life. The perfect health of man is not the same as that of an ox or horse. The preponderating capacity of his nervous parts demands a corresponding life.

PLATINUM.—At a scientific meeting held at Bonn, in the beginning of April, M. Von Dechen produced two fragments of crucibles in which platinum had been fused with coke by Dr. Carl Bischof. There was evidence of its perfect fusion, and of the great ductility secured. The crucibles were made of clay occurring in the coal-measures of Waldenburg, in Silesia, discovered by Dr. Bischof in his researches on fire-proof clays. Platinum cannot be fused in graphite crucibles, as the carbon unites with the metal making it very brittle. Messrs. Johnson & Matthey have prepared specimens of autogeneous soldering in platinum, with tubes of the same having cast-iron and leaden screw joints, for use with sulphuric acid at high temperatures.

Improved Cast-iron Tubular Bridge.

Herewith we publish an illustration of an improved iron tubular arch bridge, the invention of Hon. Isaiah Rogers, for which letters patent were recently obtained through the Scientific American Patent Agency.

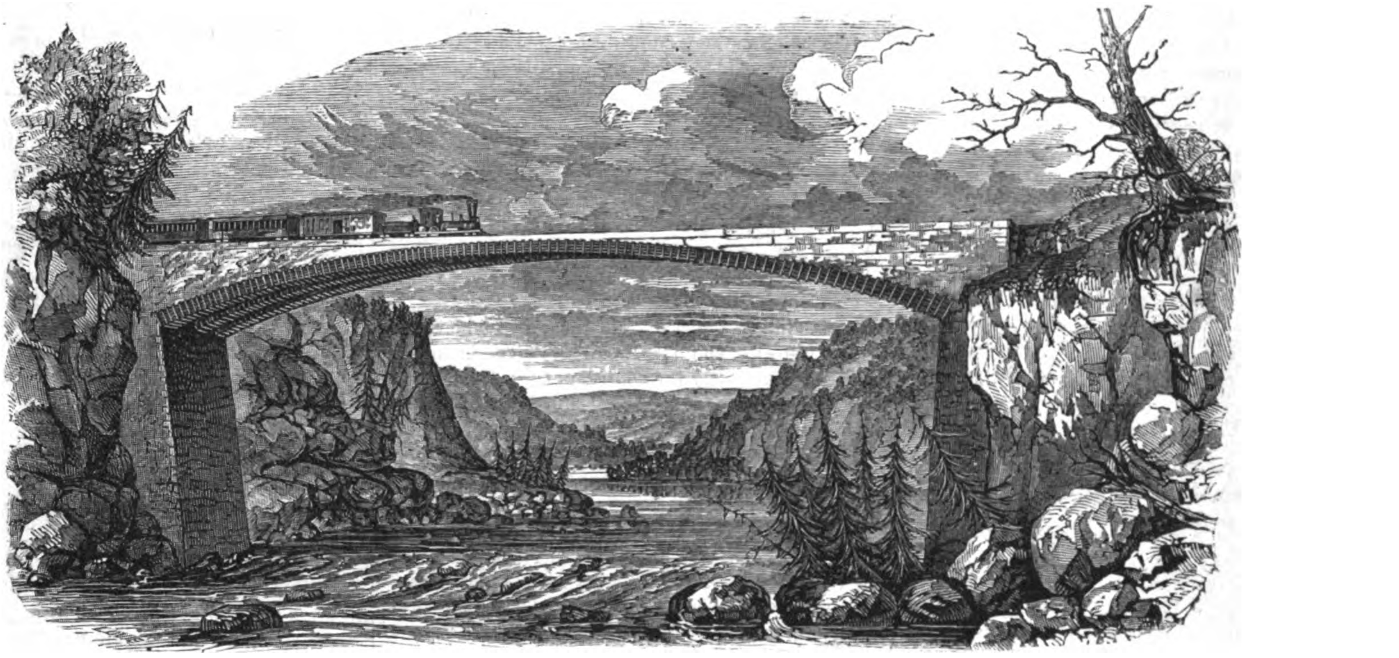
This invention has been discussed in official and political circles at Washington, in connection with the project of throwing an iron bridge over the Potomac in that vicinity; and we are informed that the discussion is likely to be resumed at the next meeting of Congress. As the name imports, the invention consists in a new application of iron to the construction of arched bridges. The advantages which it is claimed may be derived from this method of using iron for this purpose, are here enumerated.

The metal of which this bridge is composed, either cast or wrought-iron, is subjected to no tensional strain; but being placed in what may be termed the natural position—namely, that of compression, the length to which its span is capable of being extended is only limited by the ability of the material to resist pressure, or crushing weight. It possesses greater rigidity and freedom from vibration than any iron bridge capable of being constructed of long span. The mode of connecting the tubes or cylinders together by plates, gives the greatest amount of stiffness; also vertical and lateral strength; and practically renders each arch one entire piece from end to end; by that means relieving the abutments from excessive thrust.

It is believed that a bridge of this kind can be erected at a less cost, more particularly in cases where a great span is desired, than any other permanent bridge now before the public that is capable of sustaining an equal load. It is indestructible by fire, and will resist the wear and tear of the elements to a greater degree than any other material except granite; which in long spans cannot be used, and whose cost, under the most favorable circumstances, would greatly exceed that of iron. Its weight is less than that of most bridges, and it is believed far less than any other arched structure. Besides these features, it can be constructed on a lower segment than any other bridge now in use. This is an important point: as it obviates the necessity for a high grade, or great difference between the level of the roadway and the river.

It can be constructed with as little expense for scaffolding and centers as most bridges; and at much lest cost for them than any other arched structure; a scaffold of sufficient strength to sustain one set of tubes and their connecting plates being nearly all that is required. Each successive tube may be placed in position with ease, and requires but little support comparatively. Another great advantage will be found in the facility with which the tubes can be transported from the foundry where they are cast and fitted, to their desired location; each piece being of a size readily handled.

In bridges where draws for the passage of vessels are required, the support for the arches on either side of the draw is obtained in a novel manner, by reversed or counter-arches of stone, under the channel for the passage of vessels; thus obviating the massive piers that would otherwise be required, and combining durability with economy. The roadway of the bridge can be constructed of such materials as may be desired. These features constitute the chief recommendation of this bridge as a substitute for the long bridge which connects the Virginia and Columbia shore at Washington: and which, while it is a disgrace to the country, is said to infect it with annually increasing malarious fevers.



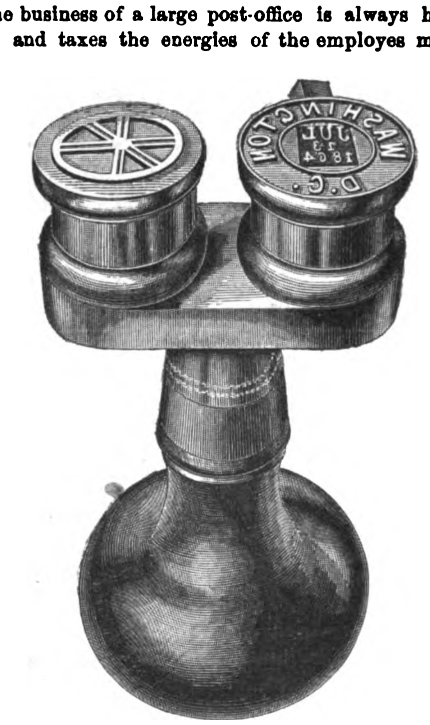
ROGERS' CAST-IRON TUBULAR BRIDGE.

We are told that the inventor has already tendered the use of the plans for this bridge to the Government, without compensation, while he remains in office; and he will, no doubt, be equally liberal with corporations or townships desiring to avail themselves of his invention.

This invention was patented through the Scientific American Patent Agency, on Feb. 10, 1863, by Hon. Isaiah Rogers. Further information can be had by addressing him at Washington, D. C.

NORTON'S COMBINED STAMP ERASER AND POST-MARK.

The business of a large post-office is always hurried, and taxes the energies of the employes most



severely at times. No matter how large the mail, or how great the number of packets, each and all must leave the office at a certain time, properly registered, and otherwise looked after, so that they are certain to reach their destination. Post-marking the letters, and defacing the stamps so that they cannot be used a second time, comprises no inconsiderable portion of the labor; and heretofore, both of these operations have been conducted singly. Herewith we illustrate a combined stamp-eraser and post-mark, the manipulation of which will be understood at a glance. The eraser and post-mark are both impressed upon the letter at one blow, and both being inked at one time, of course lessens the labor by one half of this portion of the mailing clerks duties. The name of the city, or township, is cast on the stamp; the other letters being adjustable, and confined in their places by a set screw. This is a most convenient little instrument; and it is so simple and efficient that the wonder is that no one has introduced it before. The cylinders can be taken off by removing a screw in the back of each. For further information address the inventor, Marcus Norton, at Troy, N. Y. Patented April 14, 1863.

Fast Steamboats and Super-heaters.

In the July number of *Newton's London Journal of Art*, it is stated that there are four iron steamers running between Holyhead, on the English Coast, and Kingston, Ireland, carrying the mails; which have made about 2,000 passages each, at the average rate of about 18 miles per hour, including trips made in fogs and gales. Two of them have been furnished with super-heaters; but these have not lessened their consumption of fuel, nor increased their speed. The engines on these steamers are oscillators; boilers multi-tubular. These vessels commenced running in 1860; and thus far had required no repairs; they are now apparently as perfect as when on their first trips. They require however to be frequently docked, for the purpose of cleaning and painting their bottoms. Each has a post-office on board, in which the letters are sorted on the passage, to be ready for delivery on arrival.

New Safety Lamp.—From our English files we see that an improved safety-lamp for colliers has recently been invented by Mr. Isaac M. Evans, of Cefn Mawr, Denbigh, the object being to provide a glass-sided lamp, which shall be as safe as the ordinary gauze lamp, and give a larger amount of light than any yet devised. The lamp may be described as somewhat upon the principal of the Stephenson; for, in the event of the air becoming dangerously foul, it goes out. The flame is enclosed within two glasses, the inner one being thin, and the outer one of sufficient strength to bear almost any amount of hard usage. At the top is a double gauze cone, and the air is admitted below, through extremely small orifices. It will be seen that, from the construction of the lamp, the outer glass could never become heated, and that the inner glass will admit of ample expansion; there can be no doubt either that, while the lamp is burning, there is a continual upward current of cool air between the glasses.

The Scientific American.

MUNN & COMPANY, Editors and Proprietors.

PUBLISHED WEEKLY

At No. 37 Park Row (Park Building), New York.

O. D. MUNN, S. H. WALES, A. E. BEACH.

TERMS—Three Dollars per annum—One Dollar in advance, for four months.
Single copies of the paper are on sale at the office of publication, and at all periodical stores in the United States and Canada.
Sampson Low, Son & Co., the American Booksellers, No. 47 Ludgate Hill, London, England, are the British Agents to receive subscriptions for the SCIENTIFIC AMERICAN.
See Prospectus on last page. No traveling agents employed.

VOL. IX, NO. 7...[NEW SERIES.]......*Nineteenth Year*

NEW YORK, SATURDAY, AUGUST 15, 1868.

HOW MECHANICS ARE MADE.

It has often been a matter for no little speculation among metaphysicians, why our country should be so far in advance of other nations in the art of invention. Although our system of education, and free institutions for obtaining knowledge of all kinds, have an important influence over the character and intellectual capacity of our countrymen, it is not to these that we must ascribe the important and notorious advantage we possess in originating new and useful contrivances for saving time and labor, and consequently amassing wealth. The great majority of inventors in this country are mechanics of one kind or another; although ingenuity is by no means confined to craftsmen, but seems inherent to all classes of our citizens, whether lay or professional. All the colleges and schools in the world cannot make an inventor out of a dunce; and in seeking for the cause of our indisputable eminence in this respect, we must turn to the manner in which our workshops are carried on, and the enterprise and mechanical talent evinced by those concerned in them.

In order to draw a parallel between our own system, and those of other countries, it will be necessary to present the condition of, and restrictions imposed upon apprentices, or those young men, by whatever name they are called, from whom all arts and trades are recruited. Abroad, nearly every workshop is hedged about with the most absurd regulations, as to inspection and free access; some proprietors going so far as to impose bonds upon their workmen to keep silence respecting the nature of their occupations. Young men, in many instances, pay a premium for a place in a workshop, and if they do not actually sign indentures, are bound by other considerations, equally compulsory, to remain in the service of their masters. They are taught only the time-hallowed processes of ages; and go on blindly in the track of routine, with, it is unnecessary to add, not the most beneficial results. The manufacture itself, whatever it may be, is divided into several branches; over each of which there is a seperate foreman, who carefully preserves his supposed secret from the others. Under these circumstances the neophyte succeeds with difficulty in becoming master of his business; and, when out of his time, sets out upon his three years travel in order to complete his knowledge. When at length he returns to his native town, he must have money and interest to be made a citizen; and be admitted as member of a trade, or guild, before he can follow his calling, except as a journeyman. Without offering any comments upon this system—practised throughout Europe, as we are informed by those who have thus served—let us proceed to consider the course pursued in this country toward young men desiring to learn trades, and the shops themselves.

Among us, the apprentice signs no bonds, nor does he give any assurance, beyond a verbal pledge, that he will remain until the close of his term. Rarely, to the credit of our young men be it said, is this confidence forfeited; and the system has been found much better than one which formerly prevailed to some extent—of taking youths from workhouses, and binding them to trades from which they ran away on the first opportunity. The workshops are all open; every process is freely witnessed by all the apprentices, and each in turn has a chance at it; they circulate among the workmen, and discuss with them the advantage of this or that tool, or way of doing work. Now is it not clear that such a course as this is greatly to the employers benefit—to the advancement of the interests of the community—and creditable to the young men themselves? It makes mechanics. It produces a generation of inventors, who are eager and anxious to win fame, and make fortunes for themselves and families by developing the experience of their working hours. It is not possible to keep such men down; it is not reasonable to suppose that they can be otherwise than ingenious, when rewards in the shape of increased wages, and prizes in the form of stupendous fortunes await only the swift inspiration, and its practical development into iron and brass, to make the inventor a benefactor of his race. Of old, nations enslaved their fellows, and made the prisoners captured by the chance of war, their serfs. To-day the inventor sits in his room, and with his instruments devises a more willing and able helot, that accomplishes tenfold greater tasks than all the armies of Xerxes could achieve. Mechanics are made by the intelligent cooperation of hand and brain; by the efficient exercise of the gifts imparted to them by nature, and the advantages extended to them for observation, by study and toil; occasionally by birth or hereditary descent; but not one person in all the world was ever a mechanic in the true sense of the word by chance, or from the force of circumstances.

HOW TO BREAK YOUR NEIGHBOR'S LEG.

If you want to injure some one, eat a banana, and throw the skin on the sidewalk. If there is a crowd passing, so much the better; you cannot fail to trip up somebody. Do the same with an apple-paring, or an orange-peel. If a poor man, who works ten hours a day to support a family of six children, step on it, he will most likely sprain his ankle, if he do no more; and be confined to the house for a month, thereby losing his wages for that time. Peach skins are also efficient weapons against the public safety. If you throw the refuse of your fruit into the gutter, that would be an infraction of your privileges as an American citizen: a deprivation not to be borne calmly. It evinces a much greater degree of independence to see a man eat fruit, and throw the stones or skins just where some unfortunate person, perhaps a member of his own family, will tread upon the treacherous thing, and be maimed for life.

Such recklessness is but little short of criminality; and although the press has from time to time inveighed against the practice, it is yet committed far too often. We are now in the season of fruit of all kinds, and let every man take these words as addressed to himself. He will not then be the unintentional cause of suffering to some innocent person.

HEATING AND BENDING ARMOR-PLATES.

In a recent report to the Admiralty of the British Armor-plate Committee, Lord J. Hay Chairman, it is stated that various processes for bending armor-plates have been examined, and that the plates do not suffer deterioration in quality from any reasonable degree of bending, provided the process is properly performed. The most essential requirement for the bending operation is that the plate be sufficiently heated, to impart to it that degree of softness necessary to admit of its shape being freely altered. A cherry-red heat is hardly sufficient for the purpose; but it should be carried very little beyond this temperature. An essential condition to safety also, is the heating of the plate gradually and uniformly throughout. The furnace must be so arranged as to prevent fierce fire-currents impinging on the edges of the plates. It is believed by the Armor-plate Committee, that the re-heating rather improves the quality of the plates, when the process is carefully conducted; as it is equivalent to annealing the metal. It is deemed injurious to bend thick plates when cold, or even slightly heated; as there are few kinds of iron sufficiently ductile to bend cold, even in small bars. A hydraulic screw, wedge, or any dead pressure, is recommended for bending, instead of blows by powerful hammers.

JERKED BEEF AND MEAT BISCUIT.

A cargo of preserved beef has lately been forwarded to Scotland from Monte Video, as an experiment, by a company established for the purpose of introducing this article into new markets. If this production suited the tastes of the "canny Scots," other shipments were to follow. It is thus described, "The beef consists of the finest grass-fed ox beef, from which the bone is separated before drying, thus reducing the weight to about one-half, i. e., every pound of dry represents two of fresh beef. This food is in general use in Brazil at the tables of both rich and poor." It is nearly similar to the dried beef so much used in the United States. In all likelihood, it will not meet with much favor in Scotland; not being prepared to suit the long established tastes of the people of that country for "spiced beef," which is prepared by rubbing the meats with dry salt, ground pepper and cloves, regularly for five or six days before it is hung up to dry. The mixture used consists of an ounce of pepper, and half an ounce of cloves, to each pound of the best salt. If American dried beef were prepared in this manner, it would be much improved, and considerable quantities might be exported to Europe at remunerative prices. Such spiced beef would undoubtedly be beneficial as part of the rations of our soldiers, if substituted for some of the pork now supplied. We are informed that the spices in such meats tend to prevent scorbutic diseases. But superior to all these beef preparations, as a convenient article for long marches, is Gail Borden's meat-biscuit. This consists of an extract of the best beef, baked with flour, into biscuit. A few ounces of it will afford nourishment to a soldier for a whole day. The late General Sumner, while colonel of dragoons, in Texas, used it; four ounces made into soup, being sufficient for his daily food in field operations. At this rate, two pounds carried in the haversack of a soldier would sustain him for eight days. What a great advantage it would therefore be to supply this as part of a soldier's rations during long marches, in place of salt junk and hard tack.

In the lectures delivered in London by scientific personages, on articles in the Great Exhibition of 1851, Dr. J. Lindley, F. R. S., Professor of Botany in University College, said this article was more important than all other preserved food substances in the exhibition. And Dr. Playfair to whom it was referred for analysis said, "it contained 32 per cent. of flesh forming principles, and was in all respects excellent."

CONNECTIONS OF SLIDE VALVES.

The essential virtue in the mechanical adjustment of a slide valve is that it shall open and close the ports at the proper time, and that it shall be steam-tight. Other considerations present themselves, such as the proportions, friction, &c., but we confine our discussion of this topic to the connection between the stem and the valve itself. A slide valve may be properly fitted to its bearing; but by reason of a badly designed or applied connection with the stem, it may be rendered inefficient. How many of our readers experienced in these matters are there who have not noticed that the slide valve is (oftener than otherwise) worn winding, or all on one side, when there was no apparent reason for such disaster? The cause can generally be attributed to the stem and its connection. Let us examine the ordinary plans in use for working a valve. If we do so, we shall find that the form generally employed is a simple nut, in which the stem is screwed, fitted into a pocket on the valve. This kind of connection is in use on some very large engines, and it is not at all to be commended. The stem working through the stuffing-box, has a very material vibration, and does not by any means work in a straight line. The packing affords no protection whatever against the evil, and the stem may deviate measurably from travel in a true line, to the manifest injury and loss of economy in the engine.

The supposition is that the nut being easily fitted, will give a little, up and down, and let the valve work fairly on its face. Such is not the case, however; and the stiffer the valve stem is, the greater the evil. It constitutes a lever which works on the stuffing-box as a fulcrum, and pries the valve up so much that it wears harder in one place than another. The pressure of the steam is not sufficient to overcome the strain exerted on the valve stem by the several connections. Even when guides are provided, the same evil is not wholly obviated: as they are not always set in a direct line with the valve face. Another popular form of connecting a valve to its stem is found in the square yoke fitting completely about the upper part of the valve, and in some cases provided with a tail which runs through the back end of the chest. The double stuffing-box is a good feature, as it insures a true linear movement of the valve stem; or at least one more correct than is ordinarily obtained. But without this provision, the valve is even more liable to tilt than with the single nut; for the reason that the surfaces in contact are greater. Slide valves are also driven by a nut laying in the center of the top through which the stem passes. This is perhaps the best form of applying the stem for general use; as it insures a direct pull from the center of the object moved, and does not create an undue twisting or straining of the valve itself. Too often the face and seat of a valve seem to indicate a true surface by their polished appearance; but upon examination by proper instruments it will be found that they are not so. The slide valve, as a means of controlling the energies of the rest of the machinery, should be carefully and frequently examined to see if it is in perfect order, as much loss results by its imperfect action. A leaky valve destroys not only its own face, but that of the cylinder also; and the latter is renewed only at an expenditure of much time and labor.

THE INTERNATIONAL EXHIBITION AT HAMBURGH.

This exhibition, of which we gave notice in the SCIENTIFIC AMERICAN some months ago, was duly inaugurated, on July 14th, at Hamburgh, Germany, amid much rejoicing. The American department of the exhibition was not very well filled; nevertheless, one of the exhibitors, Mr. George Campbell, of Vermont, took three prizes, for the finest wool-sheep; thus distancing the celebrated Saxony fleeces, which have been so widely known. As was natural, the Germans were quite disappointed at the award of the first and second prizes to this gentleman; and expressed open dissatisfaction. Colonel Needham, the Commissioner from Vermont, in order to heal the wounded sensibilities of the natives, proposed that a comparison of the weight of the fleeces from his sheep and those of the others entered should be had; and he made up a sum of one hundred dollars as a bonus to the owner of those animals who should excel. The challenge was not accepted, however; and the previous award of the jury was confirmed.

The machinery exhibited was very small in quantity, but received favorable notice; and much disappointment was expressed that so little interest had been taken in the object and success of the Exhibition by our people. At a trial of locomotive engines for common roads, the best results were only 5 miles an hour, on a macadamized road. Professor Kelsey, of Pennsylvania, was awarded a bronze medal for an improved harrow. A number of distinguished persons from America were present.

THE ENGINEERING SYSTEM OF THE ENGLISH NAVY.

A contemplation of the laws laid down by the English Admiralty for the control of engineers in the British Navy, would hardly induce foreigners to enlist in that service (provided they were allowed to enter), nor does it excite admiration for the courtesy or sense of justice of those who sanction the laws, which are complained of as unjust and harsh to a very great degree. Our own engineers have great reason to be contented with their position and prospects, when they compare both with that of their English brethren in the profession. Of late, that portion of the English press devoted to mechanical subjects—the *Artizan*, *Mechanic's Magazine*, and others, have devoted much space to the discussion of some points, a brief digest of which we give below. If the comments and strictures of the journals are not exaggerated, and we have no reason to think they are, the most monstrous injustice and intolerance is practiced toward a class of men than whom none in any navy are more indispensable. The doctor indeed, or surgeon (in most cases by courtesy) might throw his pills and powders overboard, and no one be a loser by it. If he would but turn his attention to dosing the enemy—giving his boluses to the boarders as they came swarming over the side—he might inflict serious and irreparable damage upon them. Will it be believed, then, that this immense destructive power is turned upon the defenseless crew; and that the follower in the footsteps of Esculapius actually receives more compensation, and greater distinction, than the engineer? In a vessel of war, the latter official should in all cases rank after the first officer in the ship: commander, admiral, or whatever his title; for reasons that are fully apparent. Without further comment, we transcribe a paragraph or two on this subject from the *Artizan*. The remarks are called out by a printed circular issued by the engineers and addressed to the House of Commons, setting forth their grievances:—

"We will now briefly refer to the several clauses of the printed statement. The first states that the pay is 'insufficient to maintain the position, which their rank,' &c., and here perhaps a little consideration of naval rank may not be out of place. Of course, every individual in the navy, as in the mercantile marine, holds a certain rank or position, supposed to follow from the nature and importance of his duties—but the great distinction of the naval service is in its division into military and civil branches. The first includes Admirals, Captains, Lieutenants, Masters, &c.; the latter embraces Engineers, Surgeons, and Paymasters. The former are called Executives, the latter Civilians. The former aspire to command, and the latter, to a very great extent, monopolize all the honors and rewards the naval service has to offer. The latter—at all events the engineers—enter the service as a profession, in which at least a respectable livelihood ought to be obtained. The former are the class to which Lord Palmerston referred when he asserted in the House of Commons that 'the honor of holding a commission in the Navy was to be considered as a fair set off to an acknowledged smallness of pay.' The civilian class, however, cannot accept that supposed honor as an equivalent for the hard cash which their labor and skill fairly entitles them to receive.

"Engineers, then, few of whom can be expected to possess private means, have a right to ask that their pay shall be such as to enable them to maintain their position; not in extravagance, certainly, but fairly and honorably to pay their way, without running into embarrassment in order to maintain an appearance while in commission; when too often a wife and family is left at home struggling through difficulty and debt, to make 'both ends meet.'

"Again, 'other officers of the *Civil* branch are better paid, for services neither more responsible nor more arduous.' We do not think the engineers can be charged with presumption, in making this comparative statement of the relative importance of the duties of the civil officers; for instance, however essential the duties of a surgeon may be, and however necessary the labors of a paymaster, we think it will be readily admitted that, in a war ship especially, an engineer is at least as indispensable as either of the preceding officers. Why, then, we may well ask, are they so much better paid? The medical officer (and we should indeed be sorry if we were understood to imply that he is *too* well paid) receives 10s. per day, the first day he joins the service, while the young engineer commences at 6s. The surgeon, on his promotion, which usually takes place in about seven or eight years from his entry into the navy, gets 15s. per day; while the engineer, who seldom gets his promotion to chief in less than twelve or thirteen years, receives but 10s. 6d. per day. Nor is this injustice removed by length of service, as will be seen from a glance at the highest rates of pay to which each of the classes of civil officers can, under any circumstances, attain. The pay of a Medical Inspector is £821, or about $4,100 per annum; that of a first-class Paymaster is £600, or $3,000 per annum; whilst the highest pay of an Inspector of Machinery is but £401, or $2,000 per annum.

"The third clause refers to the accommodation provided for Assistant Engineers. Now, let us imagine a young Engineer, of good education and ability, of fair social position, and accustomed to the comforts of a good home, entering the service. His first night on ship-board is almost sufficient to sicken him. A hammock to sleep in, the open deck to undress upon, no partition, even of canvass, to screen him from the sights and sounds of stokers, marines, and sailors, he may well feel disgusted with his new career; yet so difficult is it to provide a remedy for this state of things, that it appears cabin accommodation is only asked for the senior assistant in all ships.

"The necessity for making the junior Engineers gun-room officers, is very great; not because Engineers are willing to admit that an entry into the gun-room would be an elevation or an honor to themselves: but because, while they mess by themselves, other officers in the ship are enabled, and in most instances do treat them with neglect and indifference. Their rank is at all possible times ignored; and their being banished—as they are in the *Warrior*, *Black Prince*, and many other vessels—to the fore part of the ship, away from all contact with the other officers, is looked upon and urged as a proof that the rank which the Admiralty have given them is really only nominal; and was not intended to confer upon them such claims to considerate treatment, as it does in the case of the other junior officers.

"The request that the Engineer in charge of the machinery of a ship be allowed to mess in the wardroom, is, we consider, reasonable enough; seeing that he is virtually Chief Engineer of that ship, although his rank in the service may only be Engineer, or perhaps first-class Assistant.

"It is asked that 'all time served from date on entry count for full and half pay.' We cannot understand why the younger years of a man's life should be thrown away; and why, if any time at all which an engineer serves ought to be reckoned, the whole of it should not be taken into account. At present the engineer who enters the service at 21 years of age, and is lucky enough to arrive at the position of Chief Engineer at the age of 33 or 34, loses entirely at least eight years of his time. Medical officers, on the other hand, count their time from the moment they enter, and we think Engineers should also have that right extended to them. The request is also urged that when an Assistant becomes a commissioned officer, he should be allowed a scale of half-pay.

"Assistant Engineers are the only class of commissioned officers who are not allowed half-pay; which they consider is an invidious distinction: tending, with other things, to lower them in the estimation of other officers. They are allowed a scale of harbor pay; with the amount of which they do not so much complain, as of the compulsory attendance at one of the dockyards which it enforces upon them. Other officers, after a three or four years' absence, receive their half-pay, and are thus able to visit their friends in various parts of the country; recruiting their health, and enjoying some of those social amenities, to which, however, the Engineer is expected to bid adieu when he enters Her Majesty's Navy. And when it is seen that the half-pay which is granted to an Assistant Surgeon—with whom only the Engineer can fairly be compared—is greater even than that allowed to a Chief Engineer, the Assistant Engineer, with his harbor pay and dockyard attendance, has a right to complain.

"'Their names also to appear on the Navy List,' &c. Here again Engineers are the only commissioned officers whose names do not appear on the official lists—published quarterly—and when it is known what frequent changes take place among the junior officers of ships on foreign stations, it is not surprising that the friends of an Assistant Engineer very frequently lose sight of him altogether for years, unless they happen to be in personal communication with him.

It is self evident, especially when the fact is considered that the average time it takes to arrive at the position of Chief Engineer is thirteen years, that there must be many who can never arrive at that position at all.

"Paragraph 6 is one of great importance; but except the first point, it comes under the old and most important head of pay. More pay is what it means; pay to increase annually, instead of every five years, as at present. The first point, however, deserves some consideration; the Inspector of Machinery should, we think, be a distinct rank of itself; carrying with it distinct full and half-pay. At present, however, the Inspector of Machinery, after serving in his admittedly responsible position for any number of years, returns to the scale of half-pay to which he would have been entitled had he remained simply a Chief Engineer. This, were it not an injustice, would be ridiculous; and we think it certainly must be an oversight."

The social footing upon which the Engineers are placed is the most disagreeable part of the system, if we except the amount of pay. The office and position of an Engineer in the American Navy is justly looked upon as an honor and a distinction. Not indeed for the "yellow metal" the official carries upon his coat, but for the responsibility he owes to the country at large, and as a representative of one of its most powerful and important interests—the mechanical ingenuity; and the cultivation of the members composing the body of steam engineers. Our men are taken from the workshops of the country, as we presume Engineers in the English Navy are; and they are therefore samples, so to speak, of the men and mechanics our institutions, social, political, and mechanical, turn out.

If these young men were to be consigned to the worst quarters of the ship—to the companionship of the lowest scale of intelligence in the vessel, stokers, marines, &c.: and exposed to the debasing influences which the English youth have to undergo—we imagine that the Navy would cease to be a desirable place for anybody but one who had forsaken every social amenity, and devoted himself to simply dragging out his existence. Not only this, but the standard of intelligence is materially lowered by contact with inferior minds; and in this respect the English engineers, as a mass, must fall behind men of other nations who are not subjected to such indignities Our position as journalists fits us to comment on and compare the two systems, English and American, for the government and control of the engineering force of the Navy. The American plan we cannot give in this already too long article. But we have yet to hear of any wide-spread or general disaffection among the members composing our own corps. They are, as a body, universally recognized and treated as gentlemen on sea and shore; and he who should exhibit other than the consideration gentlemen always show one another, would very soon repent himself of it. We hope that the English engineers will succeed in obtaining a proper consideration of their merits.

The Great Lake Tunnel.

The *Chicago Tribune* says:—"The Board of Public Works, after considering the numerous plans suggested for obtaining a supply of pure water for the use of the city, are more favorably impressed with that of a 'Lake Tunnel' than either of the other plans, and they have already organized a corps of men to investigate the character of the bottom of the Lake, to ascertain if the project is practicable. It is known from artesian borings on the Lake shore, at Lill's brewery, that, about twenty feet below the surface, a clay formation commences, which continues upwards of one hundred feet further. Wherever the investigation has been made, the bottom of the Lake, where the water is more than twenty feet deep, is clay. Should this clay prove to be continuous, and free from beds of sand or gravel, a tunnel can be easily constructed, of sufficient capacity to supply the city for several years, and still others to increase the supply, if the first proves a success. The plan proposed by the Board contemplates the sinking of octagonal cribs eighty feet in diameter, with central spaces, say thirty feet in diameter, leaving an average of twenty-five feet thickness to the crib around the shaft. In the central space, protected by the crib from the action of the waves, it is proposed to sink iron cylinders nine feet in diameter, by the pneumatic process. The outmost shaft would be constructed with reference to its becoming the inlet for the water. The others might be removed to such a depth as not to interfere with navigation.

"It is proposed to construct the cribs in still water, plank their bottoms and sides water-tight for several feet up, fill them with as much stone as they can safely carry, tow them to their places, and sink them by letting water into their bottoms, and then to fill them up as promptly as possible to their tops, with stone previously provided. Cribs of this shape and size would be stronger, and better calculated to resist the action of storms, than cribs of the same width and construction placed in a straight line. The shafts are to be air-tight iron cylinders, jointed together in sections of six to ten feet, and nine feet in diameter. They are to be sunk by the pneumatic process, which consists in exhausting the air from them to sink them, and in compressing the air sufficiently within them afterwards to force the water entirely out of them through syphons, thus allowing excavation and other kinds of work to be performed in them.

"The estimated cost of excavation and masonry for the tunnel is $143,000, or $13.54 per lineal foot; and for the tunnel complete, $307,552.

"Mr. E. S. Chesbrough, city engineer, commenced making investigations touching the practicability of this plan, on Thursday. The party employed to prosecute this work, are Captain A. S. Berg, foreman, assisted by C. W. Fuller, Charles Simmons, P. H. Crosby, George Hall, and John Igo.

"Two large scows, with all necessary apparatus on board, are towed to the proper locality, and there secured by four anchors. In the space between the boats, a two-inch gas pipe is lowered, and rests upon the surface of the earth, the top being two or three feet above the surface of the water. The auger is then passed down through the pipe, and worked by two men: the pipe being held in place by others. Both the outside pipe and the auger are lengthened, as circumstances may require, by the addition of joints or sections, which are readily screwed on. The pipe and auger are drawn out and lowered, by means of a derrick about 25 feet high, with rope and tackle. Up to the present time three localities have been examined. The first three-fourths of a mile from shore. Here the water was 23 feet deep, with a covering of four inches of sand. They penetrated 30 feet deep, and found nothing but blue clay. The second locality was 1¾ miles out. Here the water was 31 feet deep, with about the same depth of sand. The auger was sunk 30 feet with the same result. The third, and the last locality, was about 2¼ miles due east from the water works. Here the water is 36 feet deep, clear and cool. The earth was here penetrated 30 feet below its surface. The surface is covered a foot in depth with a mixture of sand, and soft, mashy clay. After penetrating six or eight feet, the clay becomes thick, and is harder the deeper it is penetrated. It is of a bluish slate color, of very fine grain, with little or no grit, and would probably make excellent brick. It is apparently fine enough for pottery ware. The clay is of about the same character the entire depth, wherever the borings have been made.

"At several points along the western shore of the lake there is an outcrop of limestone. A ledge of this is seen at Lake View, and another at Cleaverville, about equi-distant from the mouth of the river. In order to be satisfied that none of these ledges exist in the line of the proposed tunnel, borings will be made the entire length, about one hundred feet apart. The investigations to-day will be made about half a mile nearer the shore than those last made. This important pioneer work has been intrusted to competent and faithful men; and the Board of Public Works have reason to be very well satisfied with the result of the investigations thus far.

New Steam Carriage for the Prairies.

A Western cotemporary thus describes one of these machines recently put in operation:—

An engine, built by John A. Reed, an eminent and skillful inventor, arrived in Nebraska City a year ago. It will draw eight tuns of freight up a grade of 600 feet to the mile, nearly twice as steep as the heaviest railroad grade. The tread wheels are ridged to prevent slipping. This machine, being the first one built, is propelled by four engines of ten horse-power each. The cylinders are oscillating, and connect with shafts, upon which are pinions of twelve inches in diameter, which move upon and give motion to wheels, about six feet in diameter, which are attached to the inside of the spokes of the driving wheels. The drivers are ten feet in diameter, made of boiler iron, and have a thread of eighteen inches. The steering wheel is six feet in diameter, and attached at the middle of the axle to the forward end of the tank by a ball and socket arrangement. The tank forms the body of the wagon. The boiler is an upright tubular, and aft the driving shaft. The wagon will carry wood and water sufficient for a four hours' run. It consumes one cord per eight hours. The hands required to run the steam wagon are an engineer, fireman and pilot.

Substances for Preventing and Removing Boiler Incrustations.

The following is a list of substances which have been used, with more or less success, in preventing and removing the incrustations which are formed by using hard water in boilers:—

Potatoes.—By using about one-fiftieth of potatoes to the weight of water in a boiler, scale will be prevented, but not removed. Their action is mechanical; they coat the calcareous particles in the water, and prevent them from adhering to the metal.

Extract of Tannin.—A mixture has been used of 12 parts chloride of sodium, 2½ parts caustic soda, ⅛th extract of oak bark, ½ of potashes, for the boilers of stationary and locomotive engines. The principal agent in this appears to be the tannin of the extract of oak bark.

Pieces of Oak-wood, suspended in the boiler and renewed monthly, prevent all deposit, even from waters containing a large quantity of lime. The action depends principally upon the tannic acid.

Ammonia.—The muriate of ammonia softens old incrustations. Its action is chemical; it decomposes the scale. In Holland it has been used with satisfaction in the boilers of locomotives. About two ounces placed in a boiler twice per week have kept it clean, without attacking the metal.

Fatty Oils.—It is stated that oils and tallow in a boiler prevent incrustations. A mixture composed of 8 parts of black lead, and 18 parts tallow, applied hot, in coating the interior of a boiler, has given great satisfaction in preventing scale. It should be applied every few weeks.

Molasses.—About 13 pounds of molasses, fed occasionally into a boiler of eight horse-power, have served to prevent incrustations for six months.

Saw dust.—Mahogany and oak saw dust have been used to prevent and remove scale; but care must be exercised not to allow it to choke up pipes leading to and from the boiler. Catechu contains tannic acid, and has also been used satisfactorily for boilers. A very small amount of free tannic acid will attack the iron; therefore a very limited quantity of these substances should be employed.

Slippery Elm Bark.—This substance has also been used with some success, in preventing and removing incrustations.

Soda.—The carbonate of soda has been recommended by Professors Kuhlman and Fresenius, of Germany, and Crace Calvert, of England. It is now employed with satisfaction in the boilers of engines in Manchester.

Tin Salt.—The chloride of tin is equal to the muriate of ammonia; and is similar in its action in preventing scale.

The *Extract of Tobacco* and *Spent Tanners' Bark* have been employed with some degree of satisfaction. The sulphate (not the carbonate) of lime is the chief agent in forming incrustations. By frequent blowing off, incrustations from carbonate of lime in water will be in a great measure prevented.

Armament of the "Monitors."

That much-mooted question, the armament of the iron-clads, seems to be as uncertain as the author of the "Moon Hoax." Here is the latest paragraph concerning them:—

When the first attack was made upon Charleston, all the *Monitors* were armed with one eleven inch, and one fifteen-inch gun, except the *Patapsco*, and another, which had one rifled gun instead of the eleven-inch. In the present contest at Charleston, however, nearly all of the *Monitors* have rifled guns in place of the eleven-inch. It is proper to state, in view of recent newspaper articles, that none of the fifteen-inch guns have been removed. A new navy gun is in course of construction, which, if successful, will replace those at present in use in heavy armed vessels.

Dr. John Struthers, in the Edinburgh *New Philosophical Journal*, gives an account of a breed of hogs having solid feet, *i. e.*, feet not divided into two toes. He also mentions a case seen by himself, of a horse having one two-toed foot.

Weights of Wrought Iron, Steel, Copper and Brass Wire and Plates.

The specific gravities to determine the weights of the following-named metals, and the calculations of them, were taken and made by Charles H. Haswell, of this city, for the well-known manufacturers, Messrs. J. R. Brown & Sharpe, of Providence, R. I. Diameters and thickness determined by American gage :—

No. of Gage.	Size of each number.	Wire—per Lineal Foot.				Plates—per Lineal Foot.			
		Wrought Iron.	Steel.	Copper.	Brass.	Wrought Iron.	Steel.	Copper.	Brass.
	Inch.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
0000	.46000	.560740	.566030	.640513	.605176	17.25	17.48	20.838	19.688
000	.40964	.444683	.448879	.507946	.479908	15.3615	15.5663	18.5567	17.5326
00	.36480	.352659	.355986	.402830	.380666	13.68	13.8624	16.5254	15.6134
0	.32486	.279665	.282303	.319451	.301816	12.1823	12.3447	14.7162	13.904
1	.28930	.221789	.223891	.253342	.239[illegible]3	10.8488	10.9984	13.1058	12.382
2	.25763	.175888	.177548	.200911	.189818	9.6611	9.7899	11.6706	11.0266
3	.22942	.139480	.140796	.159323	.150522	8.6033	8.7180	10.3927	9.8192
4	.20431	.110616	.111660	.126353	.119376	7.6616	7.7638	9.2552	8.7445
5	.18194	.087720	.088548	.100200	.094666	6.8228	6.9137	8 2419	7.787
6	.16202	.069565	.070221	.079462	.075075	6.0758	6.1568	7.3395	6 9845
7	.14428	.055165	.055685	.063013	.059545	5.4105	5.4826	6.5359	6 1752
8	.12849	.043751	.044164	.049976	.047219	4.8184	4.8826	5.8206	5.4994
9	.11443	.034699	.035026	.039636	.037437	4.2911	4.3483	5.1837	4.8976
10	.10189	.027512	.027772	.031426	.029687	3.8209	3.8718	4 6156	4 3609
11	.090742	.021820	.022026	.024924	.023549	3.4028	3.4482	4 1106	3.8838
12	.080808	.017304	.017468	.019766	.018676	3.0303	3.0707	3 6606	3.4586
13	.071961	.013722	.013851	.015674	.014809	2.6985	2.7345	3.2598	3 0799
14	.064084	.010886	.010909	.012435	.011746	2.4032	2.4352	2.9030	2 7428
15	.057068	.008631	.008712	.009859	.009315	2.1401	2.1686	2 5852	2.4425
16	.050320	.006845	.006909	.007819	.007587	1.9058	1.9312	2.3021	2 1751
17	.045257	.005407	.005478	.006199	.005857	1.6971	1.7198	2.0501	1.937
18	.040303	.004304	.004304	.004916	.004645	1.5114	1.5315	1.8257	1.725
19	.035890	.003413	.003445	.003899	.003684	1.3459	1.3638	1.6258	1.5361
20	.031961	.002708	.002734	.003094	.002920	1.1985	1.2145	1.4478	1.3679
21	.028462	.002147	.002167	.002452	.002317	1.0673	1.0816	1.2898	1.2182
22	.025347	.001703	.001719	.001945	.001838	.95051	.96319	1.1482	1.0849
23	.022571	.001350	.001363	.001542	.001457	.84641	.8577	1.0225	.96604
24	.020100	.001071	.001081	.001223	.001155	.75375	.7638	.91053	.86028
25	.017900	.0008491	.0008571	.0009699	.0009163	.67125	.6802	.81087	.76612
26	.015940	.0006734	.0006797	.0007692	.0007267	.59775	.60572	.72208	.68223
27	.014195	.0005340	.0005391	.0006099	.0005763	.53231	.53941	.64303	.60755
28	.012641	.0004235	.0004275	.0004837	.0004570	.47404	.48036	.57264	.53103
29	.011257	.0003358	.0003389	.0003835	.0003624	.42214	.42777	.50994	.48180
30	.010025	.0002663	.0002688	.0003042	.0002874	.37594	.38095	.45413	.42907
31	.008928	.0002113	.0002132	.0002413	.0002280	.3348	.33926	.40444	.38212
32	.007950	.0001675	.0001691	.0001913	.0001808	.29813	.3021	.36014	.34026
33	.007080	.0001328	.0001341	.0901517	.0001434	.2655	.26904	.32072	.30302
34	.006304	.0001053	.0001065	.0001204	.0001137	.2364	.23955	.28557	.26981
35	.005614	.00008366	.00008445	.0000956	.00009015	.21053	.21333	.25431	.24028
36	.005000	.00006625	.00006687	.0000757	.0000715	.1875	.19	.2265	.2140
37	.004453	.00005255	.00005304	.00006003	.00005671	.16699	.16921	.20172	.19059
38	.003965	.00004166	.00005205	.00004758	.00004496	.14869	.15067	.17961	.1697
39	.003531	.00003305	.00003336	.00003775	.00003566	.13241	.13418	.15995	.15113
40	.003144	.00002620	.00002644	.00002992	.00002827	.1179	.11947	.14242	.13456
Specific Gravities,....		7.774	7.847	8.880	8.386	7.200	7.296	8.698	8.218
Weights of a cubic foot,		585.87	490.45	554.988	524.16	450.	456.	543.6	513.6

The Poetry of Prose.

Among her many celebrated men, America boasts no brighter names than those which adorn the pulpits of the different churches throughout the land. In very many parts of the country there are ministers laboring in the service of the gospel who are possessed of gifts of poetry and language that charm their hearers ; and which would, in any other sphere of life, make them an imperishable fame. The address delivered by Rev. Thomas Starr King, before the Agricultural Society, in San Francisco, some time since, embodies the very essence of all that is beautiful in nature and elegant in language ; and we regret our inability to produce it in full :—

"In dealing with the land, man is called to be a co-worker with the Infinite Mind. This is the foundation of the nobleness of the farmer's office.

"The air is given to us. We cannot alter its constitution, or change its currents. The sea is not placed under our dominion. We cannot freshen it, or increase its saltness ; we cannot level or raise its billows. The rain is ordained for each latitude, and we cannot hasten or vary the bounty of the clouds. Minerals are provided in a definite, unalterable measure, by the creative force. But the soil we can make our own. We can increase or renew its richness. God does not make it to be a fixed or self-perpetuating blessing, like the atmosphere and the ocean. It is a trust. So much he will do for it ; but a very great deal is left for us to be faithful in. In the management of the soil, the Creator takes us into partnership : and on our fidelity within the bounds of our trust, the progress of society depends.

"The greatness of the trust is seen in this—that agriculture requires the greatest amount and variety of knowledge, and is everywhere latent in its development. We are only now entering upon the study of it. Nation after nation has withered and shriveled, because it could not manage its land—because it had not science enough, virtue enough, to organize the State, so that the soil could be thoroughly tilled and refreshed. As soon as the land begins to yield regularly decreasing stores, so that small farms are absorbed into larger ones, and poverty creeps towards the farmer's hearth, there is radical evil in the State. Its prosperity is not rightly based. Its roots are feeble. It has begun to die. It is not able to sustain the tremendous partnership with Providence in making the soil creative.

"In fact we shall not reach the right point for appreciating the eminence of agriculture as a duty, a profession and a trust, until we see that the earth is not yet finished. The Creator has left part of the fashioning to man ; or rather waits to work through man in perfecting it. The air comes up to the Divine idea. The sea also answers to the majesty of God's first conception of it. The clouds correspond in their charms of form and glory of color to the archetypes of them in the Divine imagination. The highest mountain tops, of splintered crag or dazzling snow, cannot be improved, any more than they can be altered by the power and wit of man. But the earth does not fulfil the Divine intention. It was not made for nettles, nor for the manisito and chaparal. It was made for grain, for orchards, for the vine, for the comfort and luxuries of thrifty homes. It was made for these through the educated, organized, and moral labor of man. As plows run deeper, as irrigation is better understood and observed, as the capacities of different soils are comprehended, as types of vegetation are improved, as economy in the renewal of the vitality of the land is learned and practised, the process of creation goes on ; chaos subsides ; the divine power and beauty appear in nature."

The providential care in the gift of the faithful season of growth and abundance is thus depicted :—

"Suppose that, early in this year, the whole world had bent itself in supplication to the Invisible Ruler —every man and woman, from the Arctic circle to the hot Equator, kneeling in the humility of conscious dependence, and lifting up from every zone the prayer, "Forsake us not, this year, Great Benefactor, but bless us in our helplessness, from the treasury of thy goodness!" And suppose that, after such a verbal petition, the supply had come—that in every house had been found the water and the stores, the bounties of vegetable and animal food—how surprising would the mercy have seemed !

"But how much more surprising and inspiring is the real wonder, than such a shower upon a barren globe could be ! With few prayers for it the great miracle has been wrought, and in the double way of beauty and bounty. For what is the display of the seasons? Is not the quickening of nature in the early months of the year as though God smiles upon the earth at the Equator ; and then the spreading wave of that benignity sweeps northward, rolling back the winter line, loosing the fetters of the frost, melting snows into fertilizing juices, pressing the cold clouds farther and farther back, and from the Tropics to the edges of the Polar seas gladdening the soil, till it utters in spreading verdure the visible green lyric of its joy ! And the summer ! Is it not the warm effluence of his breath that flows northward, and reveals the infinite goodness as it floats through the southern groves, and fills the fruit with sweetness, thickens the sap of the sugar fields, nourishes the rice plains, feeds the energies of the temperate clime, blesses the hardy orchards and the struggling wheat and corn, and dies amid the everlasting ice, after completing the circuit of its mission in clothing the northern woods with life? And then the many-hued pomp of harvest comes, when the more ruddy light and the georgeous coloring repeat the joy of the Creator in the vast witnesses of his beneficence, and the tired fields yield to the laborers their ample bounty, and seem to whisper, 'Take, O children of men, and be grateful, until the course of the stupendous miracle is renewed.'

"If we could see the wheat woven by fairy spinners, apples rounded and painted and packed with juice by elfin fingers—or if the sky were a vast granary or provision store, from which our needs were supplied in response to verbal prayers, who could help cherishing a constant undertone of wonder at the miraculous forces that encircle us? But consider how much more amazing is the fact ! Consider how, out of the same moisture, the various flowers are compounded ! The dew that drops in the tropics is transmitted into the rich orange liquor, and banana pulp, and sweet substance of the fig ; the pomegranate stores itself with fine fragrance and savor from it ; the various colors and qualitities of the grape are drawn from it ; and in the temperate orchards the rain is distilled in the dark arteries of trees, into the rich juice of the peach and the pear, the apple and the plum. When a travelling trickster pours several different liquors from one bottle into a cup for the spectators, it is called magical. Yet nature, not by deception, but actually, does pour for us one tasteless liquid into all the varieties of taste which the vegetable world supplies. If, by a miracle kindred with that of Christ at Cana, a jar of water could be tonight converted within your houses into wholesome wine, could it be so admirable as the ways in which the vines make wine upon the hillside, out of vapor and sunlight, at the bidding of God?"

Escaping from Fire.

Human life has been often thrown away from persons not taking the precaution to accustom their minds to dwell at times on the proper method of acting in emergencies. From want of this, many rush into the very jaws of death, when a single moment's calm reflection would have pointed out a certain and easy means of escape. It is the more necessary to fix in the mind a general course of action in case of being in a house while it is on fire, since the most dangerous conflagrations occur at dead of night; and at the moment of being aroused from a sound sleep, the brain is apt to become too confused to direct the bodily movements with any kind of appropriateness, without some previous preparation in the manner contained herein. The London Fire Department suggests, in case premises are on fire,

1. Be careful to acquaint yourself with the best means of exit from the house, both at the top and bottom.

2. On the first alarm, reflect before you act. If in bed at the time, wrap yourself in a blanket or bedside carpet. Open no more doors than are absolutely necessary, and shut every door after you.

3. There is always from eight to twelve inches of pure air close to the ground; if you cannot, therefore, walk upright through the smoke, drop on your hands and knees, and thus progress. A wetted silk handkerchief, a piece of flannel, or a worsted stocking, drawn over the face, permits breathing, and, to a great extent, excludes the smoke.

4. If you can neither make your way upward nor downward, get into a front room; if there is a family, see that they are all collected here, and keep the door closed as much as possible, for remember that smoke always follows a draught, and fire always rushes after smoke.

5. On no account throw yourself, or allow others to throw themselves, from the window. If no assistance is at hand, and you are in extremity, tie the sheets together, having fastened one side to some heavy piece of furniture, and let down the women and children one by one, by tying the end of the line of sheets around the waist, and lowering them through the window that is over the door, rather than one that is over the area. You can easily let yourself down after the helpless are saved.

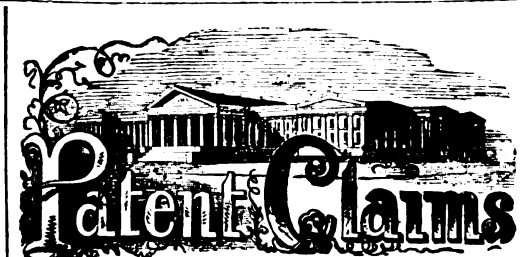
6. If a woman's clothes catch fire, let her instantly roll herself over and over on the ground. If a man be present, let him throw her down and do the like, and then wrap her up in a rug, coat, or the first woolen thing that is at hand.

Of the preceding suggestions, there are two which cannot be too deeply engraven on the mind, that the air is comparatively pure within a foot of the floor, and that any wetted silk or woolen texture thrown over the face excludes smoke to a great extent; it is often the case that the sleeper is awakened by the suffocating effects of the smoke, and the very first effort should be to get rid of it, so as to give time to compose the mind, and make some muscular effort to escape.

In case any portion of the body is burned, it cannot be too strongly impressed on the mind that putting the burned part under water, or milk, or other bland fluid, gives instantaneous and perfect relief from all pain whatever; and there it should remain until the burn can be covered perfectly with half an inch or more of common wheaten flour, put on with a dredging-box, or in any other way, and allowed to remain until a cure is effected; when the dry, caked flour will fall off, or can be softened with water, disclosing a beautiful, new, and healthful skin, in all cases where the burns have been superficial. But in any case of burn, the first effort should be to compose the mind, by instantaneously removing bodily pain, which is done as above named; the philosophy of it being, that the fluid, whether water, milk, oil, &c., excludes the air from the wound; the flour does the same thing; and it is rare indeed that water and flour are not instantaneously to be had in all habitable localities.—*Hall's Journal of Health.*

Meteor.—A brilliant meteor was seen in New York on the 24th inst., about 10 P. M., moving in a north-westerly direction.

A tremendous fire in Havana, Cuba, recently consumed $5,000,000 worth of property.



ISSUED FROM THE UNITED STATES PATENT OFFICE

FOR THE WEEK ENDING JULY 28, 1863.

Reported Officially for the Scientific American.

*** Pamphlets containing the Patent Laws and full particulars of the mode of applying for Letters Patent, 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.

39,332.—Traction and Connecting Apparatus for Railroad Trains.—Claude Arnoux, Paris, France. Patented in England Dec. 24, 1861:

I claim the draw-bar, F, when arranged to turn the front and rear axles of the car through the medium of the rods, I and I', sleeves, J and J', lever, G, rods, K and K', and rods, H and H', or a system of rods and levers equivalent to the same, substantially as and for the purpose herein set forth.

39,333.—Plant Fender.—Philo Barber, Lostant, Ill.:

I claim, first, A fender-guard, consisting of longitudinal rods and sliding transverse rods, put together in such a manner as to form a sieve, the meshes of which are capable of being extended or contracted, substantially as and for the purposes herein described.

Second, In combination with a flexible fender constructed substantially as described, the extension rod, c, or its equivalent, substantially as described.

Third, A fender or plant shield constructed of longitudinal and transverse wire rods looped together and twisted so as to constitute an open sieve-like frame, substantially as described, whether the meshes of the fender are variable or invariable in size.

39,334.—Tool for finishing Buckets and Tubs.—J. W. Bartlett, Harmer, Ohio, and A. Morris, Marietta, Ohio:

We claim the bit-stocks, D B, and the bits, e C, or their equivalent, in combination with the crozing bits, f f, in the manner and for the purpose we have herein set forth.

39,335.—Leather-rounding Machine.—Philip Beckman, Napierville, Ill.:

I claim, as a new article of manufacture, a leather-worker's rounding machine, so constructed that the adjoining faces of the parts between which the leather is rounded shall overlap, in the manner and for the purpose substantially as set forth.

39,336.—Cording-guide for Sewing Machines.—C. P. Benedict, New York City:

I claim the construction of the cord guide, and its attachment to the machine, in such a manner that it can be turned around the point at which the cord is delivered as a center to accommodate the work to be performed, substantially as and for the purpose set forth.

39,337.—Cultivator.—John Burns, Franklin, Ohio:

I claim the attachment of the handles, G, at their forward end to the upper end of the perforated prow-shaped clevis, E, which is formed on and made a part of the central beam, A, in the manner described, in combination with the stay rods, H, and beams, A B B, when arranged in the manner and for the purpose specified.

39,338.—Saw-mill.—Henry Caslow, York, Pa.:

I claim, first, Operating the log carriage by means of the cone-pulleys, and the toothed wheels, o t q, so as to enable the saw to cut the timber both ways, substantially as herein described.

Second, The combination of cone pulleys, main driving saw shaft balance wheel and pitman, with the log carriage, substantially as and for the purpose described.

Third, The laterally-sliding trundle wheels, t q, levers, spring and catches, with the adjustable clamps on the longitudinal bars, operating substantially as and for the purposes described.

Fourth, The saw sash constructed with a spring-back for stretching and keeping the saw under constant tension, substantially as herein described.

Fifth, The slotted yokes or loops applied to the saw sash and adapted for receiving two single saw blades, in conjunction with a spring-backed saw sash, substantially as described.

Sixth, The combination of vibrating arms, working in a slotted plate, on a pitman, rock-shaft, vibrating arms, pawls, and double, right-and-left ratchet wheel, J, with their spring supporting rods and latches, all arranged and operating substantially as herein described.

39,339.—Bung-cutter.—Jes. Christiansen, Milwaukie, Wis.:

I claim, first, The arrangement of the parts, substantially as herein described, so as to constitute a machine for cutting tapering bungs.

Second, The movable apparatus, I, to hold the timber in place, substantially as described.

Third, The cutting knife, figures 7 and 8, with spurs, to head down, and projecting edge to clear the chips, substantially as and for the purpose described.

39,340.—Clothes-frame.—John Danner, Canton, Ohio:

I claim the combination of the arms, a', having small inclined grooves, f, with the revolving head, b, and circular wire, c, constructed, arranged, and operated substantially in the manner and for the purposes described.

39,341.—Washing Machine.—John Danner, Canton, Ohio:

I claim the combination with a stationary wash box of a rotating rounded-slotted cylinder, provided with knobs, G, and weighted balls, the whole being constructed and operating substantially as set forth.

39,342.—Carbureting Gas from Steam and Hydro-carbons.—W. H. Gwynne, White Plains, N. Y. Ante-dated Jan. 19, 1863:

I claim making illuminating gas from water and hydro-carbons, by passing the water gas through any liquid hydro-carbon, contained in a reservoir, attached to a gas fixture.

39,343.—Washing Machine.—Ashman Hall, Dansville, N. Y.:

I claim, first, The washboard composed of alternately right-and-left, or zig-zag, open surfaces, substantially as described.

Second, A washboard constructed with a soap suds receptacle, m, arranged beneath the open slatted surface, l l, substantially as and for the purposes described.

Third, Combining with the zig-zag ribbed and waved washboard the spirally-ribbed rollers, the ribs of which run in opposite directions on each roller, substantially as, and for the purposes herein described.

39,344.—Slide Valve for Steam Engines.—J. F. Hamilton, Pittsburgh, Pa.:

I claim the use of the grooves, r, and inclined planes, e, when used in combination with the plate, c, screw, f, and a metallic compound, as herein described and for the purpose set forth.

39,345.—Wagon.—L. M. Ham, Boston, and J. H. Dodge, Chelsea, Mass.:

We claim, first, The means herein described for obviating the strain upon the center-bolt or rod of the front axletree, the same consisting of the connecting chain, u, and fixed staple, v, arranged with regard to the same, and operating substantially as specified.

Second, The arrangement of the pole with regard to the body, the spring and futchells of the front axle-tree, substantially as herein described and for the purpose specified.

39,346.—Tunnel Measure.—J. J. Hillman, Boston, Mass. Ante-dated Feb. 29, 1863:

I claim, in combination with the hinged valve, e, at the bottom of the tunnel, the swinging elastic handle, H, substantially as described, and for the objects specified.

39,347.—Knitting-machine Burr.—George Jackson and Geo. Campbell, Cohoes, N. Y.:

We claim a knitting burr blade, A, having a tapered shank, b, provided with a projection, c, so that a series of the blades can be secured in a slotted hub, E, by means of a ring, F, on one side only of the burr and surrounding the shanks, substantially as herein described.

We also claim a knitting burr having a series of blades, A, provided with tapered shanks, b, and projections, c, thereon, and fastened in a slotted hub, E, by a ring, F, on one side only of the burr, and surrounding the shanks, and secured thereon by a tightening and holding device, H I, substantially as herein set forth.

39,348.—Apparatus for Injections.—Claude Andre Jozansi, Saint Romain, France:

I claim, first, The elliptical bent plate, D E, and pap or conoidal projection, F, G, forming part thereof, or their equivalents constituting a mouth-piece which when inserted into the organ will form an air-tight joint, for the purposes set forth and substantially as described and represented on the annexed drawings.

Second, The mode of making said conoidal mouth-piece, D E F G, hollow, and providing it with an outlet as at L and M, for the purpose of drawing off the spent liquid, substantially as described and shown on the drawings annexed.

Third, The arrangement of the pumping apparatus, with the projection, U, on the pipe, A B C, and with the pipe, A' B', attached to the said pipe, A B C, in the form of a cross, in combination with the bent plate, D E, and conoidal projection, F G, substantially as and for the purpose described.

39,349.—Locomotive Horse, for Vehicles, &c.—Philip W. Mackenzie, Jersey City, N. J.:

I claim, first, In combination with a horse or proper seat for the rider, the employment of a cranked axle having three or more centers, substantially as described, whereby the weight of the rider being alternately shifted from the saddle or seat to the foot rests, produces a rotary motion of the vehicle, substantially as described and set forth.

Second, I claim in combination with a horse or other proper seat for an erect position of the rider, the steering mechanism consisting of the grooved segments, I I, and plates, d d, or their equivalents, whereby the hind wheels can be readily turned, and the direction of the vehicle perfectly governed at whatever pitch the body of the rider may be, substantially as described and specified.

Third, I claim in combination with a steering mechanism substantially such as described, the fork, G, and cross-head, f, or their equivalents, and the bit or lever in the mouth of the horse so that by drawing the bridle the vehicle can be perfectly directed by the rider while in the seat, substantially as described and specified.

Fourth, I claim mounting a horse or proper seat for an erect position of the rider upon wheels so that it may be propelled by the weight of the rider and guided in any direction, substantially as specified and set forth.

Fifth, I also claim in combination with the steering and propelling mechanism, making the body of the horse hollow, substantially as described, whereby I am enabled to obviate the danger of capsizing consequent upon a solid heavy horse, and for the purpose of readily adjusting and securing the steering mechanism therein, substantially as set forth and specified.

39,350.—Manufacture of Illuminating Gas.—William P. McConnell, Washington, D. C.:

I claim the improvement herein described in making illuminating gas from petroleum or coal oil, viz., subjecting the products of destructive distillation therefrom to a high degree of heat, substantially in the manner and for the purposes herein set forth.

39,351.—Snap Hook.—F. Palmer, Janesville, Wis.:

I claim, first, Combining with the notched shank, a, and hook, b, the sliding spring tongue, e, and locking bar, f, operating substantially as and for the purposes herein described.

Second, Enclosing a flat spring, g', which throws the locking bar, f, in its place in the watch, i, within the sliding box, d, substantially as and for the purposes herein described.

Third, In combination with a square notched shank, a, the rectangular sliding box, d, tongue, e, ears, e' e', and locking bar, f, substantially as herein described.

Fourth, A sliding spring tongue, e, which is capable of being depressed upon the shank, a, and also slid longitudinally to unlock and open the snap, substantially as herein described.

39,352.—Machine for Cutting Veneers.—Harrison Parker & Charles W. Hawkes, Boston, Mass.:

We claim the arrangement of the knife, c, bed-plate, D, head-block, G, feed-screws, H H, lever, g, and rocker-shaft, d, all arranged and operated as set forth.

39,353.—Washing Machine.—Moses Perin, Lakeland, Minn.:

I claim the combination and arrangement of the slatted drum, B, which is held down by the yielding pressure of boxed springs, c c, with a rolling concave bed, with side supporting rockers, h h, which are suspended beneath said drum by means of links, i i, and outside springs, E E, substantially as described.

39,354.—Manufacturing Bomb Shells.—Abiel Pevey, Lowell, Mass.:

I claim, first, The journal boxes, C, of the flask, A, as herein described.

Second, Also the reamer as herein described.

Third, Also the ball pattern, D, as herein described.

Fourth, Also the core-box, as herein described, all corresponding so as to fit the journal boxes, C, of the flask, for the purpose set forth.

39,355.—Carding Engine.—Robert Plews, Smithfield, R. I.:

I claim, first, The combination of a transverse adjustable blade, G, or a pair of adjustable blades, G G, with the cylinder of a machine for carding fibrous material, substantially as described for the purposes specified.

Second, Intercepting the current of air generated by the cylinder of a carding machine when in operation by means of a transverse adjustable cutting blade, G, or its equivalent, substantially as described for the purposes specified.

39,356.—Stilt for burning Earthenware.—Philip Pointon (assignor to James Ford & Charles Leak), Trenton, N. J.:

I claim making said stilts, with a point or lower end to fit a hole or cavity in a base plate, stand or cagger, or the hole or cavity in the next stilt below; and with a hole or cavity in the upper end to receive the next stilt above, and with one or more spurs at the side to support the ware when burned.

39,357.—Apparatus for heating Wagon Tires.—Samuel G. Reed, Worcester, Mass.:

I claim the application of gas for heating tire.

I also claim the apparatus for heating tire when constructed in the manner, or its equivalent, substantially as and for the purpose set forth.

39,358.—Raking and Binding Apparatus for Reaping Machines.—A. B. Smith, Clinton, Pa. Ante-dated Jan. 20, 1862:

I claim the arrangement of the parts, E E' E'', composing a separate and complete frame, and so as to be attached to the main frame, A, by a single bolt, Z, substantially as and for the purpose described.

I also claim the combination and arrangement of the cam, T, sliding bar, V, and tappet, U, substantially as set forth, for the purpose of producing the return vibratory motion of the rock-shaft, J, to open the compressing and binding arms, by a positive movement.

I also claim the combination and arrangement of the vibrating lever, O, its notch, s, and the pin, r, for operating the band hook, N, substantially as herein specified.

I also claim the thin lip, a, projecting closely over the hook, N, in the manner and for the purpose set forth.

I also claim carrying the rake forward beyond or within the ends of the arms, L M, by means of the crank-shaped bend, g, in the rake-head, O, or any equivalent means, for the purpose specified.

I also claim the guards, e e, behind the rake-teeth, f f, or their equivalents, operating substantially as set forth.

39,359.—Breech-loading Ordnance.—A. B. Smith, Clinton, Pa. Ante-dated Jan. 10, 1863:

I claim the combination of the packing cap, H, with the loosely fitting mandrel, B, being attached thereto, so as to have a side play, in all directions, and thus adapt itself concentrically in the breech-chamber, substantially as and for the purposes herein specified.

39,360.—Washing Machine.—Hamilton E. Smith, Pittsburgh, Pa.:

I claim, first, The perforated vessel, B, hung within a trough, A, and actuated from any adjacent driving shaft through the medium of the devices herein described, or any equivalent to the same, for the purpose of reversing the motion of the vessel at intervals

Second, Operating the strap guides, t and t', by means of a cam wheel, T, or its equivalent, to which a continuous rotary motion is imparted by means of the loose pulley, L'', and strap, M', and any desired system of intermediate gearing, substantially as described.

39,361.—Artificial Leg.—Uriah Smith, Battle Creek, Mich.:

I claim, first, A knee-joint formed by the two parts, A B, representing the femur and tibia, brought together in such a way as to take bearings end to end against each other, and held in their normal relations to each other by the straps, g g h h, the side pieces C C, the bar, D, and the pins, P P, the ends of the said pieces, A B, being rounded so as to allow the knee to be flexed to the full extent of the natural limb.

Second, I claim a knee-stop formed by the cross-bars, E E F F, or their equivalents, acting upon the bar, D, substantially as and for the purpose herein set forth.

Third, I claim an ankle-joint formed by the projections, a a, upon the tibia, resting upon the corresponding shoulders, b b, of the foot piece, I, in connection with the straps, c d, and the cord, u, as herein set forth and described.

Fourth, I claim the cord, L, or its equivalent, attached to the instep of the foot, passing up under the patella and attaching at some point above the leg, to the supporting strap, S, to operate both the knee and ankle joints, substantially in the manner herein specified.

39,362.—Combination of the Strap and Hone.—George Snyder, Philadelphia, Pa.:

I claim as a new article of manufacture the block, A, hone, B, lid, C, and strop, e, with a case, D, the whole being constructed and arranged as and for the purpose described.

39,363.—Means of Checking and Resisting Missiles.—Alexander C. Twining, New Haven, Conn. Ante-dated April 11, 1863:

I claim, first, The above construction or arrangement by successive plates or layers, with the successive separating spaces or intervals between, and with lugs or angle irons or projections when necessary, or my construction, substantially the same, all for the purpose above described.

Second, I claim the mode of constructing the successive plates or layers and spaces between by bending forward and back a single plate (or plates placed side by side in layers) from outside to inside or *vice versa*, substantially as and for the purpose specified.

39,364.—Manufacture of Malleable Iron and Steel.—Edward Brown Wilson, Westminster, England:

I claim the peculiar construction and arrangement of apparatus for manufacturing malleable iron and steel, as hereinbefore described and illustrated in the annexed drawings, so that the tuyere or tuyeres may be out of contact with the molten metal and blow the air or gases down upon and through the metal in place of blowing up through or around the same, as heretofore.

39,365.—Hay and Cotton Press.—Platt C. Ingersoll (assignor to himself and H. F. Dougherty), Green Point, N. Y.:

I claim connecting the levers, D D, to each end of the follower, F, by means of the two connecting rods and joints, G G, and also controlling the movement of the said levers by the friction rollers, H H, and the outside rods B' B', as shown and for the purposes before specified.

39,366.—Channeling Tool.—Joseph B. Johnson (assignor to John B. Nichols), of Lynn, Mass.:

I claim my improved sole channelling apparatus as made of the separate tubular and angular cutters, B C, and a guide stock, A, (made substantially as described) fastened together by one or more screws or devices which will admit of such cutters being adjusted with reference to one another, as well as either one or both being removed from the stock for the purpose of being sharpened, or for any other purpose, as circumstances may require.

39,367.—Windlass.—John J. Kersey, Bearstown, Pa., assignor to himself and Robert L. McClellan, Cochransville, Pa.:

I claim the arrangement of the movable drum, H, with its flange, I, in combination with the stationary brake, G, the pinion, K, on the shaft that revolves the drum, in connection with the shifting lever, E, hold-fast or ratchet, F, all operating substantially in the manner and for the purpose specified.

39,368.—Tea Kettle.—William H. Lazelle (assignor to himself and Augustus G. Seaman, Brooklyn, N. Y.:

I claim the combination of the kettle, c, and connecting pipes, D d, with the suspended dish-shaped boiler, E, when the whole are constructed, arranged and operate as described, for the purpose specified.

39,369.—Compound Sub-caliber Projectile.—Clifford Arick, St. Clairsville, Ohio:

I claim, first, Loading with incendiary, explosive or other destructive material, the bearings or the casing and bearings used for projecting from a gun a "sub-caliber shot."

Second, So arranging the bearings used for projecting a sub-caliber shot or bolt from a gun that, on its flight, the shot and its bearings or its bearings and casing shall be separated by atmospheric and other causes in such manner that the sub-caliber shot shall act as a preceding penetrating tool, and its bearings and casing or either or all of them as may be most desirable, shall act in conjunction with it as an effective following shot.

Third, A casing for a sub-caliber bolt or shot with its bearings arranged with suitable chambers for the reception of explosive incendiary or other destructive material, to be operated in any manner as and for a following shot.

Fourth, A corrugated and grooved casing, or with otherwise perforated bearings for a "sub-caliber shot" or a grooved shot, whereby the atmosphere is admitted from its front to its rear, in the manner and for the purpose described.

Fifth, A supplemental chamber made of glass or other suitable material, and adapted to the bearings and casing for a sub-caliber shot, and as an auxiliary chamber for the reception of destructive material, to increase the efficiency of a following shot, substantially as and for the purpose set forth.

Sixth, A sub-caliber shot, in combination with an incendiary shell, acting as its bearings, or its casing and bearings, and whether detachable or not, substantially as described.

Seventh, The introduction of air-passages through the bearings or the bearings and casing of a sub-caliber shot, for regulating the flight of a following shot, substantially as described.

Eighth, A combined sub-caliber shot and following shot with their accompanying chambers for the reception of destructives, with its constructed and resulting openings for the admission of air from its front facings to its rear, constructed and operating substantially as and for the purposes set forth.

RE-ISSUE.

1,514.—Halter Ring.—Lucius C. Chase, Boston, Mass. Patented April 30, 1861:

I claim, first, Attaching a halter-dee, or other harness ring, to a halter, or harness-strap, by means of one or more rivets passing through holes in one or more flanges on said dee or ring, substantially as set forth and for the purpose described.

Second, Providing the edge of the flange or flanges, a, with the rim or rims, f, substantially as described and for the purpose specified.

DESIGN.

1,805.—Label.—Charles H. Wells, Philadelphia, Pa., assignor to W. H. Swift and Henry B. Courtney, Wilmington, Del.

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On filing each Caveat	$10
On filing each application for a Patent, except for a design	$15
On issuing each original Patent	$20
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On application for Re-issue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
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On filing application for Design, seven years	$15
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Notes & Queries

T. R. W., of Wis.—In referring hereafter to any article which has been published in our columns, cite the page and volume, not the date, which will save us a great deal of trouble in looking for it. Saleratus is a carbonate of soda. When mixed with flour in a state of dough, it produces raised bread; the carbonic acid gas being set free by the heat during the operation of baking.

C. A. M., of C. W.—Naptha and benzole dissolve india-rubber rapidly; and make a water-proof varnish that dries much sooner than a varnish made with india-rubber and turpentine.

H. R. G., of N. Y.—If you wish to obtain employment in the Novelty Works you must apply in person; no letters will be noticed.

K. J. C., of Cal.—To manufacture the soluble silicates, special apparatus is necessary. The quartz must be ground, and dissolved under pressure, in an alkaline solution. It can also be made by fusing silica with an excess of alkali; then grinding the product after it becomes cold, and dissolving it in boiling water.

O. E. M., of Ill.—You will find a history of mineral Franklinite in the new *American Cyclopedia*, also on page 393 Vol. V, current series of the SCIENTIFIC AMERICAN.

"Amateur Mechanic."—Smooth iron castings are made every day, as you may see by looking at any sewing machine. Still finer qualities of this kind of work are made at Berlin, Prussia, for jewelry; which are not retouched at all. Your remarks respecting the round nose and diamond point tools are sensible; but your opinion of the article you mention is not. You misapprehend most utterly the tone of our criticisms; we desire to lead men to investigate the best form of turning tools for themselves, believing that they will be much benefited thereby. Chain feed is discarded by the best tool makers, at home and abroad; for reasons which are obvious to every unprejudiced person.

J. M., of R. I.—We are much obliged for your compliments respecting our considerations of the interests of mechanics. We are daily in the receipt of such friendly letters as yours.

R. L., of Mich.—We do not think that the article you speak of has ever been patented in this country. We cannot find any record of it.

T. B., of Conn.—A revolving teasting fork is not a novelty. We have seen them in use many long years ago.

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At the Scientific American Office, on account of Patent Office business, from Wednesday, July 29, to Wednesday, August 5, 1863:—

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Specifications and drawings and models belonging to parties with the following initials have been forwarded to the Patent Office from Wednesday, July 29, to Wednesday, August 5, 1863:—

S. W. P., of Mass.; H. P. S., of N. Y.; C. T. D., of N. J. (2 cases); W. H. B, of N. Y.; R. J. M., of N. Y.; J. R., of N. Y.; F. S. G., of N. Y.; O. P., of Vt.; P. B., of Ill.; T. H. B., of Mass.; N. B. B., of N. Y.; J. O., of Canada; A. J. A., of Ill.; G. & H. of Mass.; E. B., of Mass.; A. J. S., of Ill.; S. G., of Ill.; D H. S., of Iowa; G. S. P., of Mass.; C. C., of Cal.; J. H., of Ill.; J. D., of Ill.; M. C. B., of Ill.; K. C. & R.. of Wis.; B. B. B., of N. B. Ter.; Z. W., of Cal.; L. A. J., of Cal.; M. W. W., of Mo.

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The complete Patent Law Amendment Act of 1861—Practical Instructions to Inventors, how to obtain Letters Patent, also about Models—Designs—Caveats—Trade-marks—Assignments—Revenue Tax—Extensions—Interferences—Infringements—Appeals—Re-issues of Defective Patents—Validity of Patents—Abandonment of Inventions—Best Mode of Introducing them—Importance of the Specification—Who are entitled to Patents—What will prevent the Granting of a Patent—Patents in Canada and European Patents—Schedule of Patent Fees; also a variety of miscellaneous items on patent law questions.

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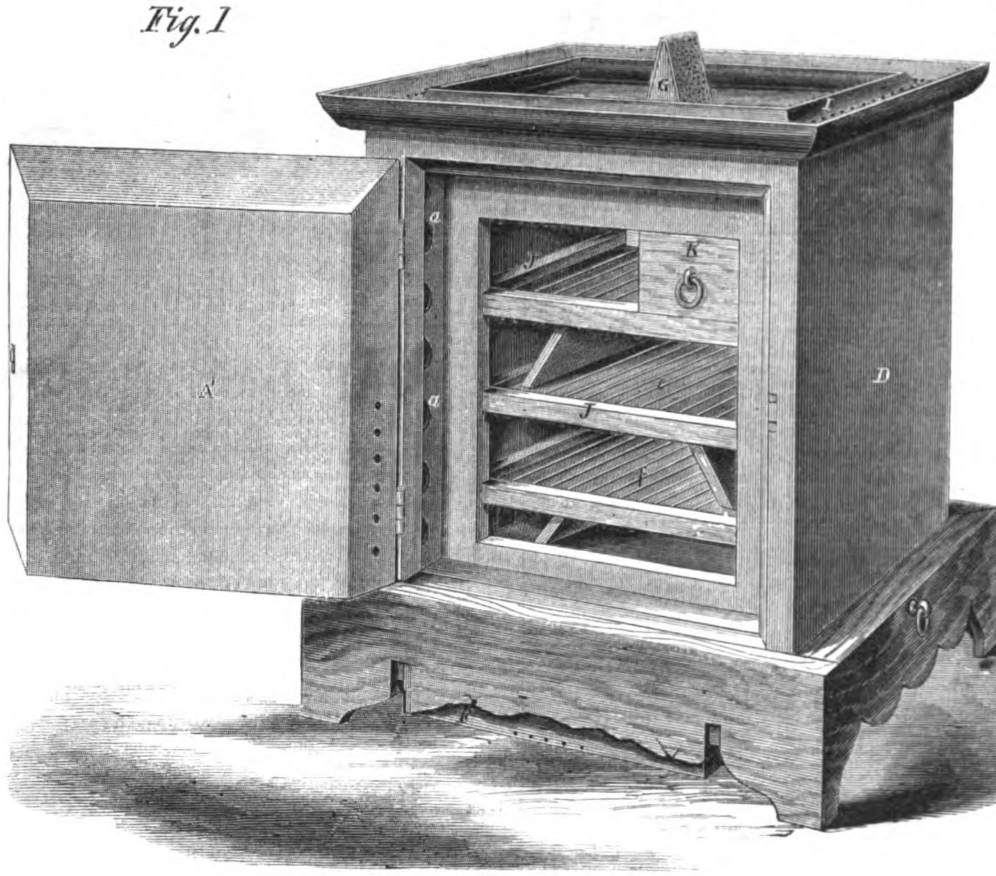
Improved Refrigerator.

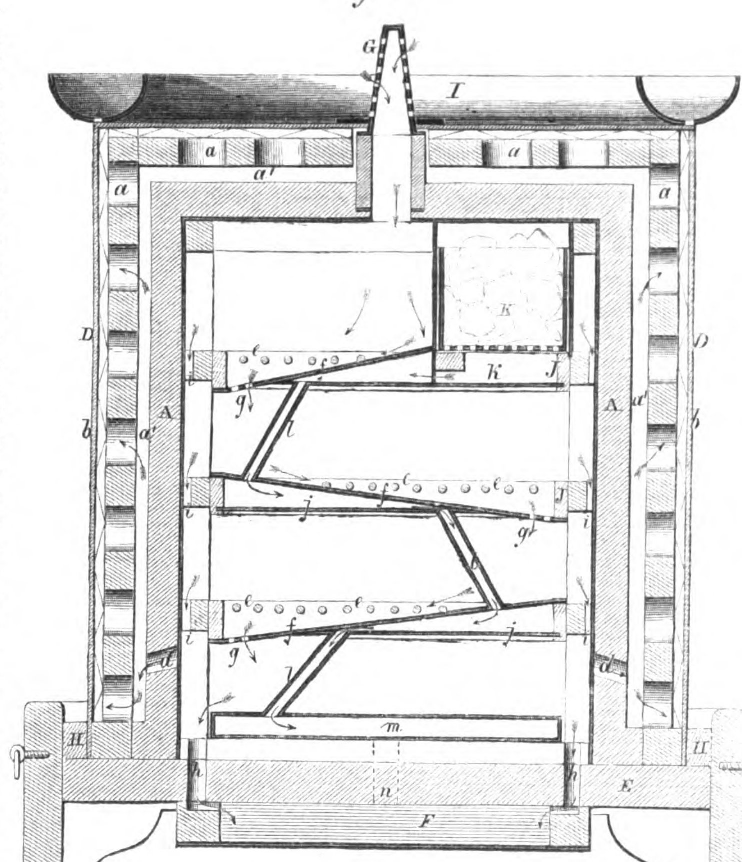
Intense heat, or close and sultry weather, is very unfavorable to the preservation of provisions of all kinds. Food which is spoiling undergoes a chemical change, which completely alters its nature; so that from being an essential of life, it becomes in fact an active poison. In some parts of the globe the atmosphere is sufficiently dry to preserve food without artificial means. These peculiarities are confined to certain localities, however; and in most places it is necessary to use ice, and scientifically-constructed boxes or chambers, called refrigerators, to prevent provisions from spoiling. The refrigerator herewith represented has many good features about it, and the inventor says will exhibit favorable results, even though no ice be in the compartment allotted to it. The following description will enable the reader to understand all parts very easily. The box, A, is constructed with walls of any non-conductor of heat; and may be made either solid, or with a space filled in with the non-conducting substance before mentioned. The strips of wood, of which the outside of the box is composed, are bevelled away to a sharp edge, b; over these a canvas cover, D, is tightly drawn. The holes, a, at the top of the refrigerator, serve as air passages. The refrigerator proper rests upon the base, E, underneath which is placed the filter, F, which has an inclined bottom and suitable discharge apertures at one end, which are not shown. There is further a ventilator, G, at the top; which is a very important addition to this class of household utensils; it is simply an air passage communicating with the interior of the box. The base, E, projects beyond the sides of the box or refrigerator, where the water receptacle, H, is set; and upon the top of the box or refrigerator the reservoir, I, extends around the whole four sides; in it there are small apertures directly over the canvas cover on the outside of the box. Near the bottom of the walls there are other small openings, d' which form a means of communicating with the interior of the refrigerator and the open space a'

Fig. 1



BAKER'S PATENT REFRIGERATOR.

Fig. 2.



The shelves for sustaining the articles to be preserved fresh are formed of round rods, e, which set in the wooden frames, J; underneath these rods there is an inclined plate, f, the lowest part of which is perforated with small holes, g. These plates incline in opposite directions, all through the box; and they allow all the moisture deposited upon them to run off, through the holes before mentioned, down to the filter at the bottom, through still other holes, h. The frames are also grooved, so that humidity collecting upon them runs through the other gutters, i, to the common chamber at the bottom. The plates, j, also have a connection with the other plates, f, previously spoken of. The close chamber, k, also communicates by means of the chutes, l, with the chamber, m, at the bottom, which in turn opens into the filter, F, at the bottom of the refrigerator, through the passage, n. The chamber, k, catches the drip from the ice box, K, and carries the water through the channels just named. When the refrigerator or box is used as an evaporator, the reservoir, I, is filled with water, which descends upon the canvas covering and saturates it; the evaporation of this moisture reduces the temperature in the refrigerator, and in this case the air passages are not necessary. The door, A', of the refrigerator is also constructed of material similar to that employed in the construction of the rest of the case. The water that passes through the filter is of course purified, and may be used for any purpose. It will thus be seen that the construction of this apparatus provides for the maintenance of a dry cold temperature in the interior of the provision chamber. All moisture is conducted away, so far as it is possible to do so; and with ordinary attention the chamber will be clean and sweet at all times.

A patent for this invention was secured through the Scientific American Patent Agency on April 3, 1860. Since that time valuable changes have been made in the refrigerator, for which another patent is ordered to issue to the inventor, W. M. Baker, of Walpole, Ind.; further information can be had by addressing him as above.