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

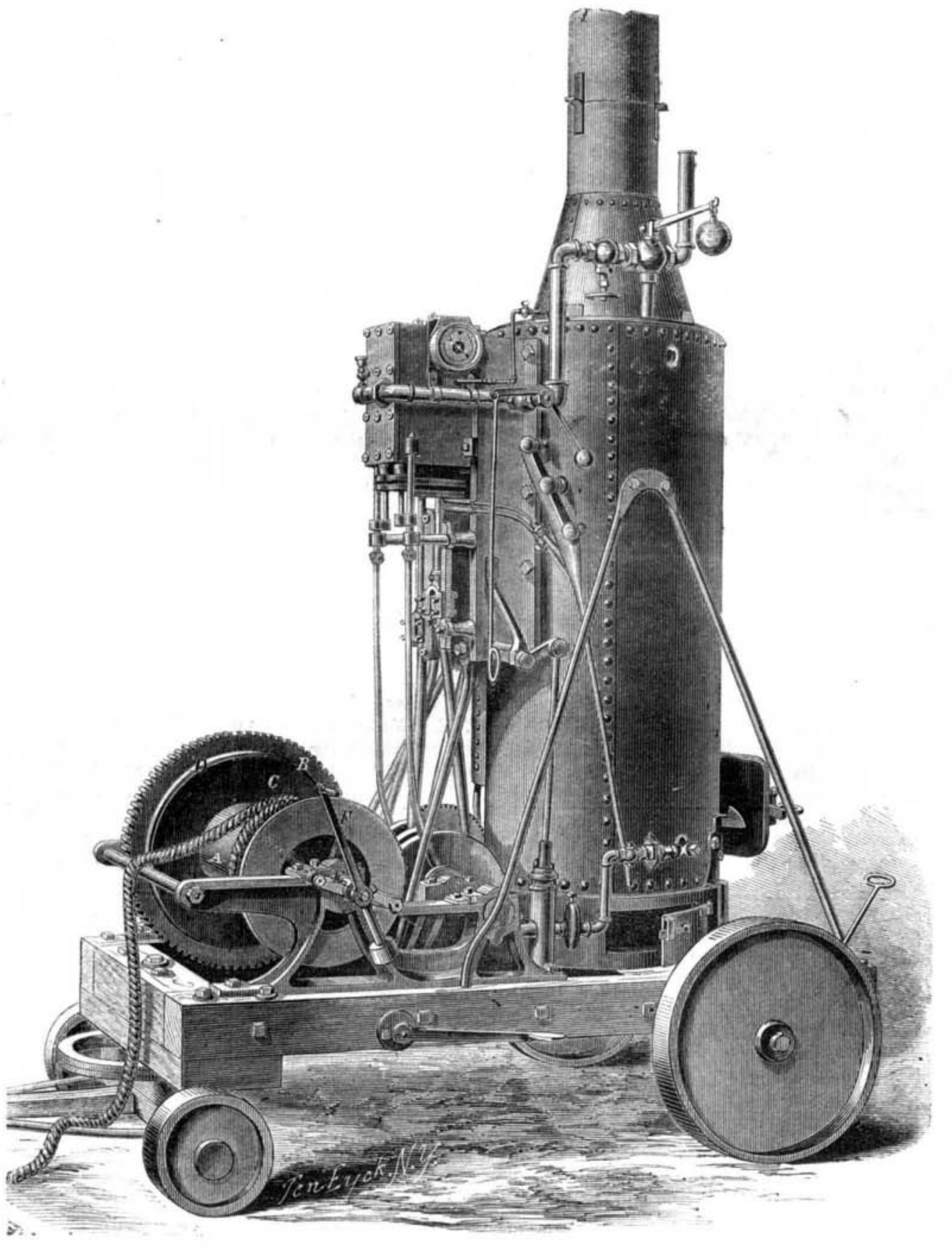
Improved Portable Engine.

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.

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.



REQUA'S PORTABLE ENGINE.

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."