# New Inventions.

### Ericsson's New Hot Air Engine.

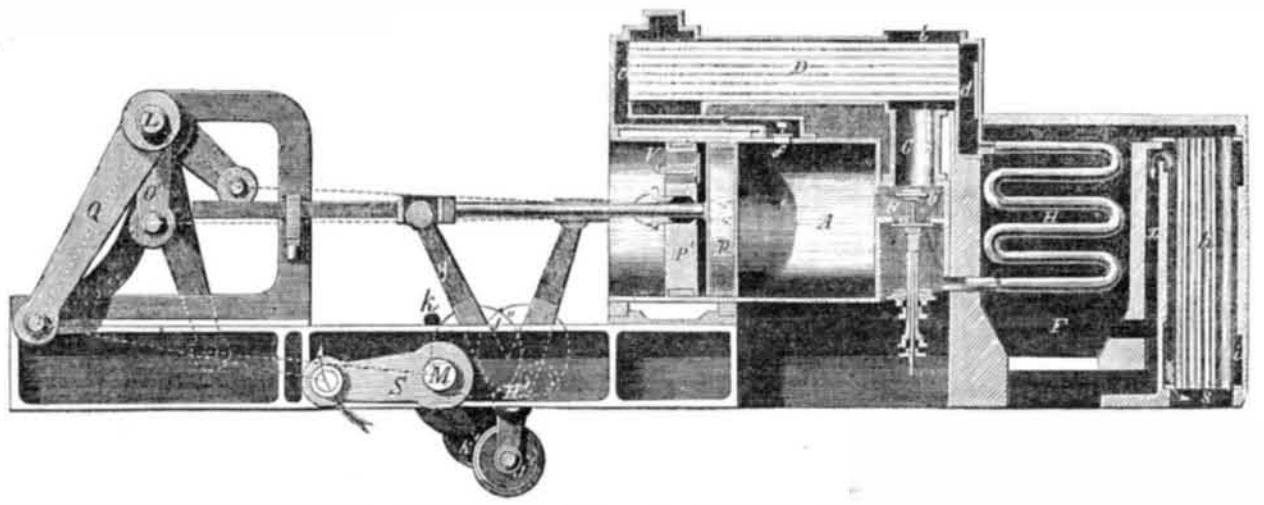
The accompanying engraving is a side elevation in section of the Hot Air Engine for which Capt. Ericsson recently obtained patents in America and Europe. This engine is a horizontal one; the old ones on the ship *Ericsson* were vertical. The pistons are single acting, that is, they are operated by the hot air only in one direction, it therefore requires two cylinders to form one rotating engine. The reader will therefore consider that there is another similar horizontal cylinder, with all its adjuncts, on the other side of the one shown—which is the nigh one—and that their rods are yoked to one shaft, and are working together, forming an entire hot air engine.

This illustration is taken from the London *Mechanic's Magazine*, furnished to that periodical by Captain Ericsson's agent. This and Paine's Electic Light are the only American inventions, we believe, we have copied from foreign magazines.

A is the cylinder, which is made to answer the purpose of hot air working cylinder and cold air feed pump. It has a fixed bottom with a central passage in it to the hot air valve box, B; its other end is open, or rather, has no fixed cover. The valve box, B, has an induction port for hot air to enter by a valve, *a*, and a port for the exhaust air to escape, by a valve, *b*, the stem of which passes through the hollow stem of valve *a*. These two valves are operated by any common valve gear, from crank shaft, M, to give them separate and positive motions. The exhaust hot air escapes through a pipe, C, into the regenerator, which is a chamber with a series of small tubes, D. There are two pistons in the cylinder, A; the inner one, P, exercises power by the hot air acting directly on it to push it out; and when the stroke is made, the valve, *a*, closes its port to shut off the hot air, and then the valve, *b*, opens its port, and the exhausted air escapes into the regenerator, circulating around tubes, D, and then escapes into the air by pipe *l*. P' is another piston in the cylinder, A. The cold air to be heated to keep up the supply, is forced into the regenerator, to be partially heated by the exhaust hot air. To do this, the operations are complicated and peculiar. From cylinder, A, as feed pump, the cold air passes through the port of valve, *f*, into a passage, *e*, thence into a chamber, *c*, thence through the tubes, D, then out into passage, *d*, and from thence into the coiled tubes, H, of the heater, above the fire of the furnace, F, where it is fully charged with heat. The products of combustion—smoke and gases—pass down through flue tubes, *h*, and escape at S, to the chimney. These flue tubes are enclosed in a chamber which has an aperture, *i*, near the bottom to admit air, and another near the top through which the current passes after circulating among the tubes. The air which can be thus admitted is partially heated, and can be directed by dampers to feed the fire, if necessary, by the passage, *x*, and also to cool the heater pipes, H, if necessary. The hot air passes from the heater tubes into valve box, B, thence into cylinder, A, and forces out the piston, P, which is now represented as being at the end of a stroke, the hot air cut off, and the exhaust valve, *b*, opened. The rod of piston P, passes through a stuffing box in piston P'. This rod is connected to an arm, *g'*, which vibrates on a fulcrum pin, H'. This arm carries two rollers, *j' j''*, one on each side of the fulcrum pin. These rollers are alternately acted upon by two cams, *k k'*, on the crank shaft, M. The cam, *k*, acts on roller, *j''*, and the cam, *k'*, on roller, *j'*. In the figure the arm and its rollers are represented in the two opposite extreme positions. The cam, *k'*, operates the roller, *j'*, to carry piston, P, inwards towards the bottom, or inner end of the cylinder, and the other cam, *k*, governs its motion in the opposite direction when it (the piston) is impelled by the hot air. The cold air piston, P', has two wrist pins, one on each side of the stuffing box, through which the rod of P' passes. These pins are clasped by two rods on the vibrating arm, O', secured on a rock shaft, L, which is provided with another arm, Q, connected by a rod, shown in dotted lines, to the crank, S, on the shaft, M. The two single engines, A, are connected with the one shaft, M, by cranks set at right angles to one another on opposite sides. In the figure, the connecting rod of the off cylinder is represented as being returned ready to commence an outward stroke, while piston, P, is ready to be forced back.

To commence operations, the regenerator is first charged by a hand pump to about the pressure of the atmosphere. The engine is then started in the position shown. As the crank, S, is moving in the direction of the arrow, but little motion is imparted to piston P'; but piston P is then carried rapidly towards the inner end of the cylinder, A, by the action of its cam, *k*, on roller *j''*, of the arm, *g'*; this camas it rotates operates the piston inwards, and retains it briefly nearly at rest at the end of the stroke. During this inward motion of the piston, P, the cold air piston, P', makes but a small portion of its inward stroke; the air valve, V, in this piston, now opens inwards by the pressure of the atmosphere, and the cold air rushes in and fills up the space between the two pistons, P' and P. The piston, P', is then moved downwards, the valve, V, closes, and the air is partially compressed between the two pistons. The off hot air piston in the other cylinder works the cold air piston, P'. The piston, P, is now acted upon by hot air from heater, H, and is forced outward compressing the cold feed air still more between it and piston, P'; in fact, it is compressed until its pressure exceeds that in the regenerator, when the valve, *f*, opens, and the

## ERICSSON'S NEW HOT AIR ENGINE.



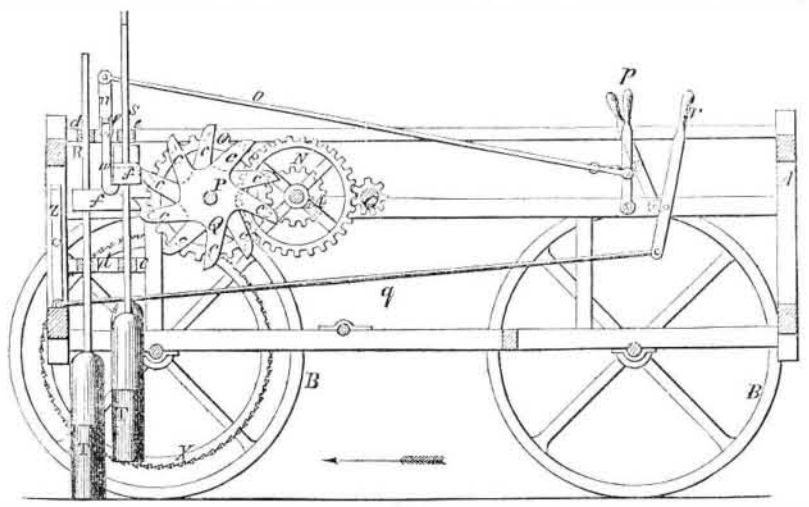
cold air rushes into the regenerator to feed it. This valve closes, when the piston, P, passes it. These actions repeated embrace the operations of this engine.

The difference between this engine and the old ones of Captain Ericsson is but small. Of course, as this engine is a horizontal one, it must have connections and a positive motion to move back the single-acting pistons, and these are shown in the figure. But if we set this engine on end and make it a vertical one, it is just the two old engines, illustrated on pages 153 and 154, Vol. 8, Scientific American, compounded. It is true, the main cylinder here is made to answer for both feed pump and working cylinder, but this is no advantage that we can perceive.

It is rather an obscure and complex arrangement, not so simple as the separate air pumps and hot air cylinders, and the direct connections of the engines on the ship *Ericsson*. And yet the manner of working the two pistons in one cylinder and making a feed pump and single air engine of one cylinder, constitute all the new improvements claimed.

The crown plates of the heater furnaces which gave way in the late hot air engine, are laid aside in this one, and the heater, H, here shown, is exactly the same as the oldest one used by Captain Ericsson. The famous wire gauze regenerator appears to be laid aside and the old tubular one adopted, with this difference, that the same air was to be used over again in the old engine, while in this one a new charge is taken in at every stroke, and the old charge exhausted. This air engine does not obviate the great objection to the use of air as a motive agent, that is, a whole cylinder full of cold air at every stroke must be heated up to 490° to obtain the low pressure of 15 lbs. on the square inch. It is too bulky to use as a motive agent.

## APPARATUS FOR RAMMING DOWN PAVING STONES.



### Paving Machine.

The solidity and durability of nearly all the various kinds of stone pavements used for carriage ways depend much on the finishing blows which they receive from the rammer. However carefully selected or smoothly laid the stones may be, the pavement cannot endure long unless it be thoroughly compacted. To do this well, by hand, is a slow and tedious process, for each stone must be rammed down with great power. No species of labor is more exhausting. The rammers commonly used consist of stout sticks of hard wood, shod at their lower ends with heavy masses of metal; these must be lifted up perpendicularly by the workman to the proper distance, and then thrust down with all his force. From this operation there is no change, no variety; stone by stone, one at a time, each must be powerfully embedded in the soil. The method is not only slow and hard, but it is expensive.

The engraving herewith presented illustrates the Street Paving Machine for which a patent was granted to Mr. Thomas Davidson, Jr., of Kensington, Pa., on the 8th of January, 1856. The design of the inventor is to employ steam power in ramming down the stones, and he expects, thereby, to do the work quicker cheaper, and better, than it can possibly be done by hand.

Referring to the engraving it will be seen that the machine consists of a four-wheeled vehicle, which moves over the ground, when at work, in the direction indicated by the arrow. A is the frame of the machine, B the wheels, the axles of which revolve; a locomotive steam engine connected with pinion G forms part of the apparatus, but is not here shown. Power is transmitted from pinion G, through gear wheels M, N, and O, to shaft P, upon which there are located a number of spoke wheels, Q, having radiating arms or spokes, *c*, as shown. As the spokes rotate they catch beneath projections, *f*, of the rammers, R S, and thus lift the latter; they fall by their own gravity. The rammers are shod with heavy metallic weights, T, and slide up and down between guides, *d e*.

On the front axles there are two large ratchet wheels, X, operated by pawls, which are connected by means of eccentrics and rods with the pinion G. At every revolution of G the pawls alternately catch in the ratchet wheel, and move the machine along a little, so as to bring the rammers over new stones. The connections between the ratchet wheels and driving pinion being easily understood, are not shown.

V is a shaft, upon which are mounted a series of arms, *m*, hooked so as to catch under and hold up, when desired, the rammer projections, *f*; shaft V is connected, by means of bar *n*, and rod *o*, to the lever handle, *p*, by moving which the arms are thrown in or out of play. There is a similar device, consisting of a swinging bar, Z, rod *q*, and lever *r*, for holding up the outer row of rammers.

When traveling from place to place, the various parts used in paving may be entirely disconnected from the engine, and its power be employed in rapidly propelling the machine along, after the manner of a steam carriage It is manifest that this machine ought to effect a great saving of labor over the present hard method of embedding paving stones, besides doing the work in a far superior manner. Driven by steam, the rammers will never get tired or lazy. The machines, we are told, can be constructed at no great cost; they will save the labor of from fifty to one hundred men, according to size. Mechanism of this kind is greatly needed in all our larger towns and cities; it must, ere long, find a very extensive employment. Address the inventor for further information.

### The Compass and Iron Ships.

Dr. Scoresby is going out to Australia with an express view to make experiments relative to the variation of the compass in iron ships in the southern hemisphere. With great liberality, the directors of the Liverpool and Australian Navigation Company have granted the use of a state cabin in their splendid screw steamer, the *Royal Charter*, a vessel well adapted for scientific experiments. The masts are of wood. The compasses are so arranged as to check each other

### California Quicksilver.

The produce of quicksilver has much increased in California. The exports for the past year were 28,917 flasks of 75 lbs., valued at one million of dollars.