New Inventions.

Ericsson's Hot Air Engine.

It is now twenty-five years since Capt. Ericsson was first introduced to the public as an inventor and improver of the hot air engine, and if ever an inventor deserved success, he certainly does. The resolute perseverance and ingenuity which he has displayed have at last led to the production of an engine which does him a great amount of credit. It is represented in the accompanying engravings, of which Fig. 1 is a perspective view of the entire engine. Fig. 2 is an enlarged longitudinal view of the "supply piston." Fig. 3 is a plan view of the cap of this piston, and Fig. 4 is a plan view of the outer face of the "working piston." There is a great amount of originality displayed in the mechanical details, and in the principles of operation embraced in this caloric air motor; it is in many respects different from all others which have preceded it, and deserves very general attention.

The engraving represents a horizontal single acting engine with one cylinder, the latter fulfills the offices of feed pump, prime mover, heater, and air chamber. Any number of such cylinders may be yoked to one shaft, but this one is complete in itself. Though single-acting and horizontal, it communicates a very equable motion to a main revolving shaft—a result very difficult to accomplish.

The cylinder, A, is prolonged and has its back end (which forms its air heater) inclosed in the furnace, B. There are two pistons in the cylinder, the outer one, C, is called the "working piston," and also forms a movable cylinder head. It has a spring valve, D, Fig. 4, in it for admitting cold feed air into the cylinder at each return stroke. The "supply piston," E, Fig. 2, is elongated and has a curved end next the heater—the end of the cylinder is also of the same form to allow for expansion and contraction of the metal. The rod, P, of this piston works through a stuffing box in the piston, C, Fig. 1, and is connected to one end of the angular lever, F, which vibrates on the pin, *g*; the other end of this lever is attached to the crank on the main shaft, G. The cap, *f*, of the piston, E, has an opening at its rim, and a circular recess behind it. In this recess there is a ring, *e*, which slides back and forth on stud pins. This ring closes the opening in the cap when the hot air pressure is operating the piston; when it exhausts at the end of a stroke, the cold air by atmospheric pressure rushes in to supply the partial vacuum, pushing open the spring valve, D, and the ring, *e*, thence passing through the recess and down between the piston, E, and the cylinder, to be heated for the next stroke. In this manner the cold air is fed in. When the expansive pressure of the hot air has moved the piston to the end of a stroke, at that instant the oscillating rod, H, attached to the main shaft opens the exhaust valve, I, on the back end of the cylinder. By the peculiar combination and arrangement of the angular levers with the two pistons, C and E, and their rocking shafts and the cranks on the main shaft, the supply piston, E, moves back, following the exhaust with a speed three times greater than that of the working piston, C, so that there is always a space between the two that is filled with air, which forms an elastic cool cushion between the pistons, C E. These move with variable speeds back, but nearly uniform forward. As the air is flowing in through the valve, D, by atmospheric pressure, whenever the back pressure exceeds this, the valve closes itself. The piston, C, has two guide rods moving through eyes, *a a*, in standards. There is also a vibrating angle lever, J, attached to this piston at each side of the guide rods; they are connected to a rocker shaft at the foot, and an oscillating lever, L, connected with a crank pin, K, on shaft, G. These mechanical devices and their peculiar arrangement cause the variable motions of the supply and working pistons described. And although they are represented connected to two crank pins on the main shaft, G, Capt. Ericsson has in some of these engines united them to one crank pin, and produced the same variety of motion.

Every mechanic will at once notice the novel mechanical arrangement of the angle levers with the pistons and main crank pins. The form of the piston, E, prevents it from being readily injured by a high heat, and as there is an air recess between the two pistons, the working one, C, is kept perfectly cool.

It may be supposed by some persons that the feed of the cold air will be comparatively slow, but air rushes into vacuo at the rate of 1,300 feet per second, a hundred times the piston velocity of our fastest steam engines. There is undoubtedly a great deal of back pressure in the cylinder, but there is also considerable in every steam engine. It cannot carry such a high pressure as a steam engine, but we have been assured that although air requires to be heated to about 500° Fah. to double its volume and exert a pressure of 15 lbs. on the square inch, that a much higher pressure has been carried in these engines without injury to any of the parts, by a high temperature.

In regard to a variable increase of power, this has not the flexibility of the steam engine. Thus a non-condensing steam engine, if its boiler is sufficiently large and strong, can be worked at from thirty to one hundred pounds pressure, with a triple increase of power from the lowest to the highest pressure. This flexibility is very necessary and convenient in some factories where there are several machines that have to be stopped at intervals of some days, while others are kept running. But for constant small portable engines, capable of being applied to a great number of useful purposes, such as pumping water, driving portable grain mills, &c., this caloric engine appears to be a safe, economical, and convenient engine. Any boy or laborer who has sense enough to kindle and take care of a fire can take care of it; the fire has but to be kindled and in about from ten to fifteen minutes it will be ready to run. If left to itself it will stop when the fire goes down, and neglect cannot cause an explosion, because a charge of air has to be heated for each stroke.

It will be noticed by many of our constant readers that this caloric engine differs from all its predecessors. On page 153, Vol. 8, Scientific American, there is an engraving of Capt. Ericsson's hot air engine patented in 1833; on the succeeding page, 154, a figure of the one patented in 1850, and on page 180, Vol. 11, an illustration of the one patented in 1855. In all these a *regenerator* to take up the caloric of the exhaust air was employed, while in the above illustrated engine there is no regenerator; it exhausts direct—like a non-condensing steam engine—into the atmosphere. In reference to this mode of employing hot air, we said on page 181, Vol. 11, Scientific American, "The best way to use hot air as a motive agent appears to be to work it expansively as far as this can be done, then exhaust into the atmosphere." This idea is carried out in this engine, it is therefore rendered more simple, more efficient, and it costs much less to manufacture. In former hot air engines it was impossible to prevent the valves from leaking; this difficulty seems to be overcome in this one, as it has been running for several months without requiring any repairs or alterations; this is a very important point. One of these engines is now employed by the Metropolitan Bank of this city, for pumping water, and we have been informed it gives a high degree of satisfaction.

ERICSSON'S IMPROVED HOT AIR ENGINE.

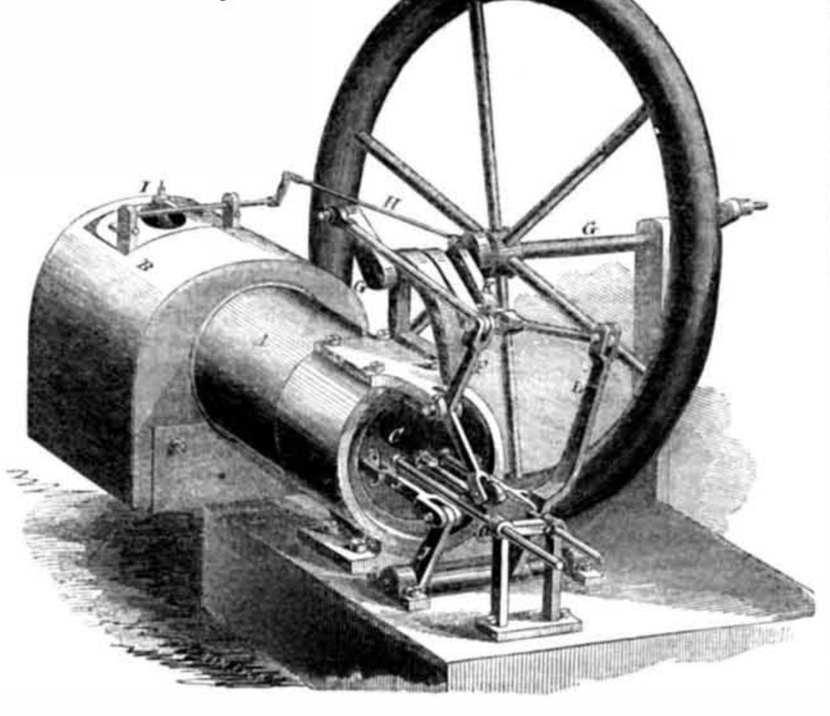
Fig. 1

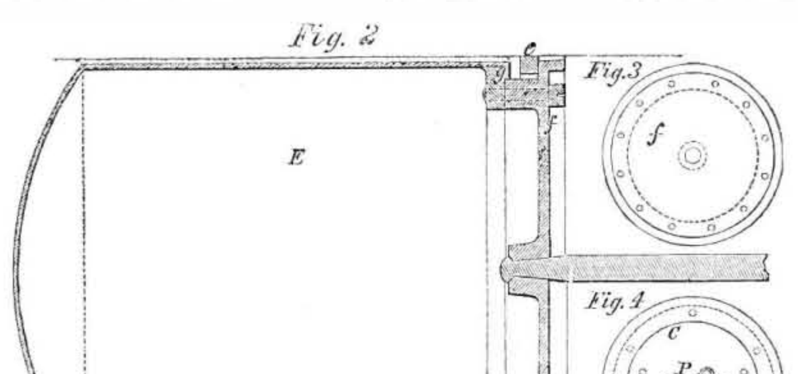

Fig. 2 Fig. 3 Fig. 4

The old fashion of rating steam engines as of a certain nominal horse power depending on the size of the cylinders alone, was established at a time when the pressure of the steam was almost uniformly low, and never conveyed a very definite idea of the actual work performed even under those circumstances. Of late it has become common to include in the estimate of power all the conditions affecting the engine, such as the speed with which it works, the pressure of the steam in the boiler, the expansion in the cylinder, etc. This is *actual* horse power, and can be reckoned very closely by the employment of suitable apparatus in any given case. In some experiments lately made on the New York and Erie Railroad, it was found that a common broad-gauge locomotive in good order could pull with a force of about 14,000 lbs. on the couplings connecting it with the cars, and could continue to pull steadily with that amount of strain until the speed reached about 15 miles per hour. Above that velocity the ability to pull gradually diminishes, until at somewhere from 40 to 80 miles per hour the machine becomes able only to move itself without any train. Mr. Henry Waterman, of this city, who is conducting a series of experiments on this and kindred points, employing better apparatus and expending more care than in any previously made, finds that the greatest mechanical effect of an ordinary locomotive is at about the speed of 15 miles per hour, and in one case, at least, has actually found the boiler to continue to generate steam in sufficient quantities to maintain the pressure while the locomotive was moving at that speed, and pulling with an average strain or force of a little more than the amount above stated. This makes the actual power of that locomotive 560 horse power, without including the power necessary to overcome the resistance to its own motion. This will, we feel positive, be considered an extraordinary result even by those most familiar with the subject. It should also be remarked that the amount of adhesion is, in this instance, considerably greater than is given by the results of the older experiments on a smaller scale. The adhesion, or the resistance to the slipping of the wrought iron tires upon the wrought iron rails, was in these instances more than one-third of the weight upon the driving wheels. It is needless to say that the rails were in these trials perfectly dry, but no sand was applied to increase the adhesion.

New York, April 14, 1858. T. D. S.

Decision of the Supreme Court.

McCormick vs. Manny & Co.—In December, 1854, C. H. McCormick brought a suit in the Circuit Court of the United States for the Northern District of Illinois, against John H. Manny and his partners, charging that they were building Reaping Machines that infringed his patent of 1845 for the divider and the reel post, and his patent of 1847 for the raker's-seat and reel. The case was elaborately argued before the Circuit Court in September, 1850, and in January, 1857. Judge McLean delivered the opinion of the Court, deciding that Manny & Co.'s machine did not infringe on McCormick's patents as charged, but, on the contrary, was an improvement invented and patented by John A. Manny, upon reaping machines which existed prior to McCormick's.

From this decision McCormick appealed to the Supreme Court, and this final appellate tribunal rendered judgment on the 22d instant, affirming Judge McLean's decision and dismissing McCormick's bill with costs. The case was argued for Manny & Co. by E. M. Stanton and George Harding, and for McCormick by E. N. Dickerson.

A synopsis of the decision will be given next week.

At the opening of a new street in Paris lately, M. Dubose's electric light was employed with great success, perfectly illuminating the street, and shedding a beam of brilliant white for a great distance.