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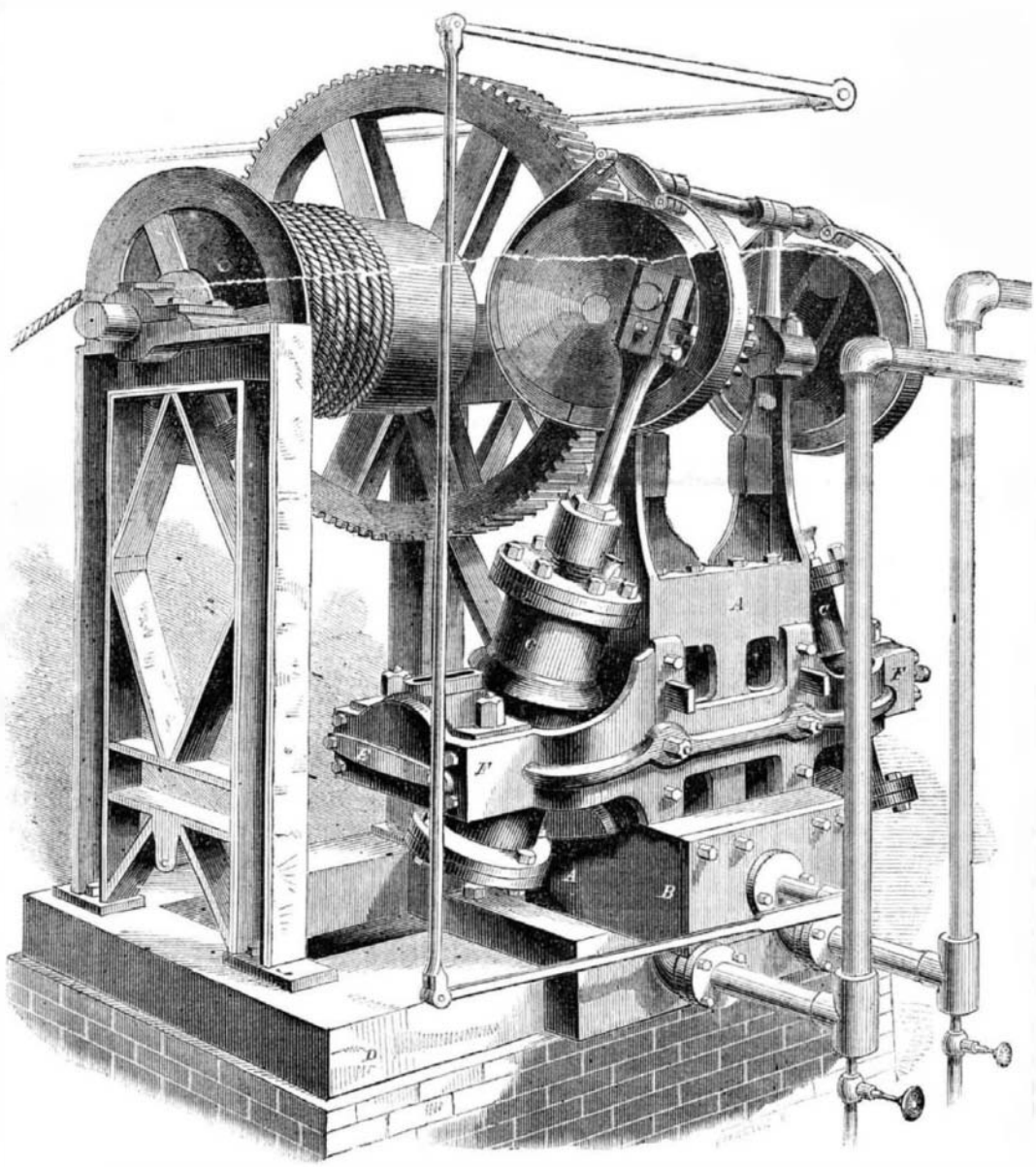
IMPROVED OSCILLATING ENGINE.

The expansion and contraction of metal from changes of temperature has been the cause of more inconvenience and difficulty in the working of the steam engine than perhaps any other property of matter. Many acute and fertile minds have devoted a great deal of time and study to plans for counteracting the effects of these changes, and the field still proves an inviting one for men of inventive genius. In the invention which we here illustrate, the evils of expansion are effectually avoided, and at the same time a very convenient reversing arrangement is secured. It relates to the double oscillating engine, and the engravings represent two forms of engines, one being shown in the large perspective and the other in the sectional cuts inserted on the next page. We will first describe the latter and then explain the modifications shown in the perspective view.



OTIS' IMPROVED DOUBLE OSCILLATING ENGINE.

Fig. 1 is a central vertical section at right angles to the shaft of a double oscillating engine. Fig. 2 is a vertical section of the same taken parallel with the shaft. Fig. 3 is a vertical section of the reversing valve and valve chest. Fig. 4 is a horizontal section of one of the cylinders. Similar letters of reference indicate corresponding parts in the several figures.

A is the bed-plate of the engine. B is a steam chest in the form of a quadrangular box of cast iron, with a system of passages (to be presently described) formed by coring. This steam chest may be considered as the principal portion of the framing of the engine, as it supports the two standards, C C, in which are the bearings of the main shaft, and also supports the bearings, *a a*, for one trunnion, *i*, of each of the two cylinders, E E. The other two trunnions, *j j*, are supported on bearings in two standards, F F, erected on the bed-plate, one on each side of the steam chest. H is a valve chest, and bolted to t e front of the steam chest, B, and containing the reversing valve, This valve chest is divided into two compartments, d c, to the latter of which is connected the steam pipe, and to the former of which is connected the exhaust pipe. The compartment, *c*, contains the valve, which is of the oscillating disk kind, and which fits to a flat seat provided for it on the steam chest, B. This seat contains three ports, *d e f*, of which *d* and *e* communicate with separate sets of passages in the steam chest, B (as will be presently described), and *f* communicates by a passage, *k*, in the steam chest, B, with the exhaust compartment, *b*. The valve has in its face a cavity, which will bring either the port, *d* or *e*, into communcation with the port, *f*, and has two openings, *g h*, right through it, so arranged that when the cavity covers the ports, *d* and *f*, the port, *h*, will be opposite to *e*, and when the said cavity covers the ports, *e* and *f*, the port, *g*, will be opposite to *d*, as shown in Fig. 3. The central stem of the valve, G, works through a stuffing-box, *r*, in the valve chest, H, outside of which it is to be furnished with a lever for the purpose of bringing it to either of the positions above specified, or to a position to close both ports, *d* and *e*, for the purpose of stopping the engine. Near the valve there is a passage, *m*, leading from the induction compartment of the valve box through part of the steam chest, B, to a chamber formed in the bed-plate, said chamber being in communication with the cavities of the standards, F F, and the said chamber and cavities being kept filled with steam from the induction compartment, *c*, of the valve box.

The cylinders are furnished each, on the side next the steam chest, B, with two flat faces, *s s*, one near each end; said faces constituting valves, and each of them containing a port for the induction and a port for the eduction of steam, through two ports on corresponding faces provided on the valve chest for the said faces of the cylinder to work against; the said ports in the cylinder and steam chest being opened and closed to each other in turn by the oscillation of the cylinder in a manner which is common to many well-known oscillating engines, and therefore requires no description. The port, *d*, in the valve seat, communicates with an upright passage, *d**, in the steam chest; and from this passage, passages, *d* 1 *d* 1 *d* 2 *d* 2, branch off to the ports in the side faces of the steam chest, one passage leading to the upper and another to the lower of each cylinder. The port, *e*, in the valve seat communicates with a similar upright passage, *e**, in the steam chest, and from this passage similar passages, *e*1 *e*1 *e*2 *e*2, branch off to the ports in the side faces of the steam chest, one passage leading to the upper and the other to the lower end of the cylinder. By bringing the valve, G, to one or other of the positions hereinbefore mentioned; that is to say, to open either of the ports, *d e*, to the steam compartment and the other to the exhaust compartment of the valve chest, either set of passages, *d* d* 1 *d* 1 *d* 2 *d* 2 or *e* e*1 *e*1 *e*2 *e*2, may be made to constitute induction passages and the other set to constitute eduction passages, according to the direction in which the rotation of the crankshaft is desired; and by shifting the valve from one to the other of such positions the engine may be reversed.

L L are springs secured to the standards, F, for the purpose of pressing against the ends of the trunnions, *j j*, and thereby holding the cylinders close up to the steam chest and preserving steam-tight joints between them. These springs have screws and nuts, *t t*, applied to them for the purpose of graduating their pressure.

By providing the chamber, *n*, in the bed-plate, connecting the induction chamber of the valve chest with cavities in the standards, F F, not only is the bed-plate caused to expand and contract as the cylinder becomes heated and cooled, thereby keeping the joints between the cylinder and steam chest tight, but the standards, F F, are caused to expand and contract vertically in a manner corresponding with the vertical expansion and contraction of the steam chest, and by that means the

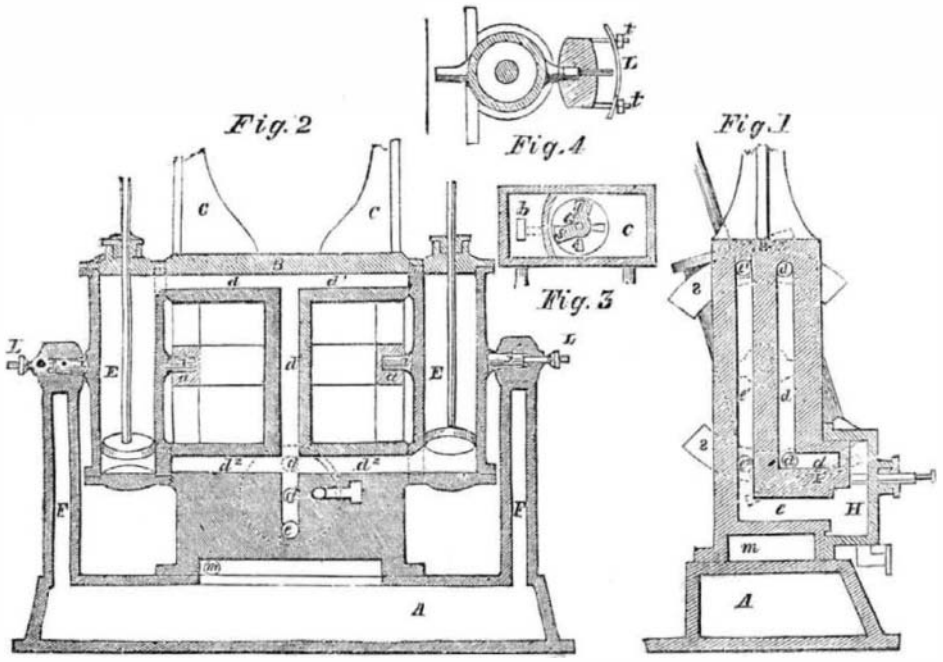
bearings of the outer trunnions will rise and descend with the bearings of the inner ones, and the axis of oscillation of the cylinders will remain always parallel with the axis of the main shaft.

The modification shown in the perspective will be readily understood by a glance at the engraving. The outer trunnions of the cylinders, C C, instead of being supported by hollow [illegible] communicating with the bed-plate, D, have their bearings in a long bar or yoke, F, which is bolted to the steam chest, A, so as to rise and fall with the expansions and contractions of the latter.

We have seen the engine from which these engravings were taken; it is in operation at the new and elegant jewelry store of Messrs. Ball, Black & Co., on Broadway, where it is used principally for hoisting goods. It runs very smoothly, not leaking a particle between the face of the cylinder and that of the bed-plate. It it the invention of Messrs. E. G. and C. R. Otis, to the former of whom—residing at Yonkers, N. Y.—inquiries for further information in relation to the matter may be addressed.

GIFFARD'S INJECTOR.

This is the name of a peculiar feeder for steam boilers, the invention of M. Giffard, of Paris. In its elements and action, it consists of a jet of steam flowing through a tube taken from the steam-chamber of the boiler; thence it passes through a narrow nozzle, at the point of which it comes in contact with a jet of water in an angular pipe running from the well or tank; this water is carried by the steam into a throat, where it opens a check-valve and enters the boiler under the water-line. In this case, steam of a certain pressure—say 10, 20, 30 or 60 lbs.—forces water into a boiler where there is an equal amount of pressure on every square inch. This really appears paradoxical; but, nevertheless, it is a fact. This injector has been employed for one year in France, is coming into extensive use in England, and we had the pleasure of witnessing one in operation last week at the works of Wm. Sellers & Co., Philadelphia, the agents for the invention in the United States. The apparatus is the most simple, compact and peculiar for the purpose imaginable. A small tube comes down from the steam-chamber in the boiler and enters a little brass box, resembling an enlarged nut with a hole in its side. Here a hissing sound is heard; and, looking through the little opening, a snowy jet of combined steam and water is seen rushing through the feed tube, without the motion of a single pinion, piston or lever. Had any person proposed such an arrangement and method of feeding steam boilers, to most all the scientific men in the world, we believe it would have been condemned as an impossible project. The answer to such a proposition would have been: "As the pressure in all parts of the boiler is equal, steam taken from one part cannot force water into another part against an equal pressure—the two pressures will exactly balance each other." How much superior, if any, the injector may prove to be to a good force pump, we do not know. It cannot feed such warm water as a pump, but its compactness and simplicity may give it the preference. It appears to be more safe than a pump, because there are three ways of detecting whether it is working properly or not; and, as the safety of a steam boiler is dependent upon the correct action of the feed, the injector has much to commend it. Thus: when it is in operation, the ear can hear and the eye can see what is going on in the inside, and the hand can also feel whether or not the steam and water are flowing. In darkness and daylight, it signals its own operation to the engineer.



The feed-water is under the most perfect regulation, so as to allow the exact quantity to pass, according to the demands of the engine. The size of these injectors, as well as the temperature of the feed-water, varies with the pressure of steam carried.

The following is the theory of the action of the injector, as given by Mr. John Robinson, of Manchester, of the firm of Robinson & Stewart, the agents of the apparatus in England:—"The pressure on all parts of the interior of steam boilers being equal, some reason must be sought why steam taken from one part is able to overcome the resistance opposed to its entrance in another part of the same boiler. If a pipe conveying steam were turned directly back into the water of the same boiler, it is evident that equilibrium would ensue, and no effect be produced. If, on the other hand, a break were made in the continuity of the pipe, so as to leave an intervalopento the atmosphere, the steam would rush from one pipe and water from the other in the boiler, with a velocity proportioned to their *different densities*. In constructing the injector, the feed-water chamber is placed at the break in the pipe; and this arrangement accounts for the power of the steam to overcome the resistance to its entrance into the receiving pipe of the boiler. The jet of steam being concentrated on the water, forces its way through the interval surrounded by feed-water, by contact with which it is gradually condensed, and reduced in volume and velocity, until it it entirely converted into water at the throat. In doing so, it imparts to the feed-water a velocity proportioned to the pressure in the boiler and its own temperature; and, being non-elastic, the feed-water acquires sufficient momentum to overcome the resistance of the water in the boiler." Mr. Robinson further says, in an article on the subject in the London *Artizan*:—"The injector is a valuable application of a force which has never been explained in books. With it, by steam of 24 lbs. pressure, it has been found possible to inject water into a boiler at 48 lbs. pressure."

THE SMELTING OF LAKE SUPERIOR COPPER.

The Haughton (Portage Lake) *Mining Gazette* gives the following description of the practical operations in the smelting of American copper:—

For the purpose of obtaining pure malleable copper from the masses, stamp and barrel-work, sent down from the mines of Lake Superior, it is only necessary to separate the earthy matter which still adheres to the metal, and then to deprive the copper of the oxygen it has absorbed while in the liquid state. The furnaces are reverberatories of an ordinary construction.

Sometimes the whole process is conducted in a single furnace. In this case the ore is charged into the furnace, mixed with a flux adapted to the nature of the earthy matter under treatment. The heat is kept up till the whole is fused, when the copper, owing to its greater specific gravity, sinks, while the liquid earthy matter or slag floats upon its surface. This slag is now drawn off the face of the copper by means of rabbles, and the metallic bath is exposed. During the fusion, the copper has of course absorbed oxygen, which, if allowed to remain, would render the metal, to a great extent, fragile. The surface is, therefore, covered with charcoal, and rods of green wood are plunged into the metallic bath, in order to reduce the oxyd. The refining being completed, the metal is ladled out, and poured into molds.

At other times, two furnaces are used, and in that case the metal is first obtained in the form of pigs, which are afterwards refined. The slag taken from these furnaces are very rich in copper, containing numerous shots and flakes of copper diffused through them. They are therefore worked over again with an additional quantity of flux, in order to obtain as much as possible of this retained metal. Still the slag is found to contain too much copper to be thrown away. In order to obtain this, the slags are passed through a small cupola furnace. The resulting slag may be considered clean, but there has been an unavoidable waste of copper, which has volatilized at the high heat of the cupola and passed out of the chimney.

The establishments at which the Lake Superior copper is worked are at Detroit, Cleveland, Pittsburgh and Boston.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

Mode of Performing Surgical Operations.—W. T. G. Morton, of Boston, Mass., has applied for the extension of a patent granted to him on the 12th of November, 1846, for an improvement in the above-named class of inventions. The testimony will close on the 15th of October next; and the petition will be heard at the Patent Office on the 29th of that month.

Cider Mill.—George W. D. Culp, of Allensville, Ind., has applied for the extension of a patent granted to him on the 14th of November, 1846, for an improvement in the above-named class of inventions. The testimony will close on the 16th of October next; and the petition will be heard at the Patent Office on the 29th of that month.

Harvester.—Andrew J. Cook, of Enon, Ohio, has applied for the extension of a patent granted to him on the 20th of November, 1846, for an improvement in the above-named class of inventions. The testimony will close on the 22d of October next, and the petition will be heard at the Patent Office on the 5th of November.

PROGRESS OF POPULATION IN NEW YORK.

In the year 1805, an ingenious individual, who was fond of figures, finding that the population of New York at that time numbered 75,700, and that it had increased at the rate of 25 per cent per annum for the previous five years, went on, from that number and from that ratio, to predict the population of New York in future times; and the following table shows his figures, as published in Valentine's *Manual of the Common Council*:—

1805	75,700	1835	289,035
1810	94,715	1840	361,293
1815	110,390	1845	451,616
1820	140,907	1850	564,520
1825	164,903	1855	705,650
1830	231,928	1860	882,062

The number (882,062) for 1860 will perhaps come within 10,000 of the census. Calculating upon such a basis, what will be the future of New York in the year 1900? Its population will be 5,257,493, or twice that of the present population of London. In 40 years from the present date, if the same rate of increase continues, New York will be the largest city in the world.

A LADY in an omnibus at Washington espied the great unfinished dome of the capitol (which don't look much like a dome at present), and said, innocently, "I suppose those are the gas-works?" "Yes, madam, for the *nation*," was the reply of a fellow-passenger.