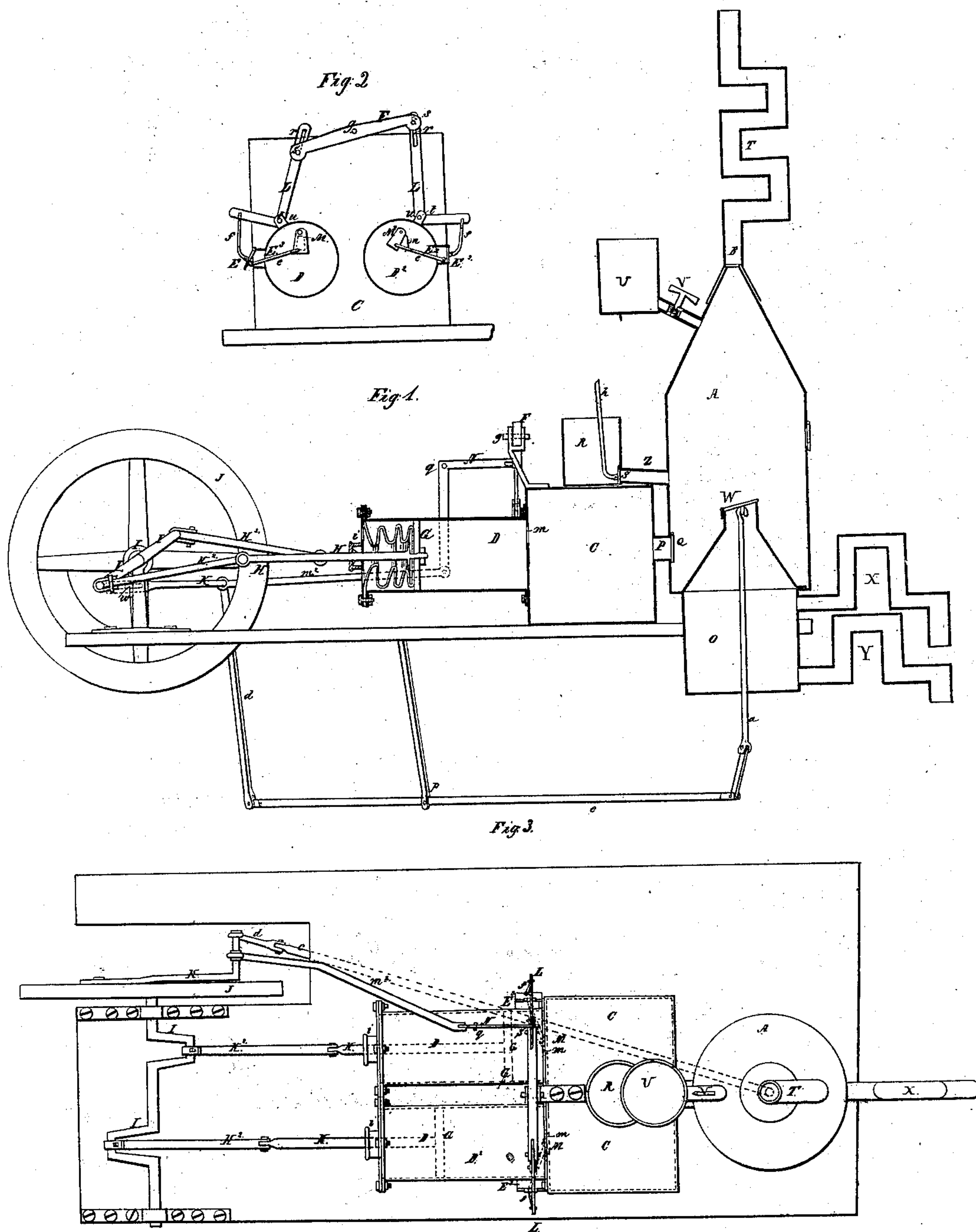


J. R. REMINGTON.  
PNEUMATIC ENGINE.

No. 2,637.

Patented May 26, 1842.





# UNITED STATES PATENT OFFICE.

JOHN R. REMINGTON, OF ABERFOIL, ALABAMA.

## IMPROVEMENT IN PNEUMATIC ENGINES.

Specification forming part of Letters Patent No. 2,637, dated May 26, 1842.

*To all whom it may concern:*

Be it known that I, JOHN R. REMINGTON, of Aberfoil, in the county of Bullock and State of Alabama, have invented a new and useful Improvement in Pneumatic Engines for Propelling Boats and other Machinery, which is described as follows, reference being had to the annexed drawings of the same, making part of this specification.

Figure 1 is a vertical longitudinal section through the fire-box, exhauster, receiver, cylinder, reservoirs, and pipes. Fig. 2 is a transverse section through the cylinders. Fig. 3 is a bird's-eye or top view.

Similar letters refer to corresponding parts.

The nature of my invention and improvement consists in giving motion to machinery by alternately producing partial vacuums in two horizontal parallel cylinders in which the pistons alternately move from one end to the other by atmospheric pressure and the momentum of the fly-wheel, said vacuums being produced by heat generated in a fire-box opening into a large exhauster communicating with the said cylinders by means of a receiver placed between the exhauster and ends of the cylinder, and with which they all communicate by openings provided with valves opened and shut alternately.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

I construct a large cylinder A, called the "exhauster," having a conical, spherical, or convex top, with an aperture and valve B at the apex, the valve opening upward into a tube or pipe T for allowing the rarefied air to escape. The exhauster rests upon a fire-box or heat-generator O, of a cylindrical or other form, with a conical or spherical or other convex top, with an aperture in the apex opening into the exhauster A, which aperture is opened or closed by a valve W, opening upward into the exhauster by means of connecting-rods *a b c d*, connected to the working parts of the engine in any convenient manner for opening and closing said valve at stated intervals for the purpose of admitting heat from the fire-box O into the exhauster A to rarefy the air therein or drive it out of the exhauster by an explosion to be produced by gunpowder, or by the union of hydrogen and oxygen gases

and fire, or by any other suitable means whereby the vacuum may be produced in said exhauster.

The rods *a b c d* for opening and shutting the valve W are attached to the cam-rod K, which is attached to the fly-wheel J. Rod *a* is attached to the under side of valve W and extends down through the bottom of the fire-box O a convenient distance, where it is connected with a short rod *b*, which is connected to a vibrating rod *c*, which vibrates on the fulcrum *p*, said vibrating rod *c* being connected to the cam-rod K by a connecting-rod *d*, so that as the fly-wheel revolves it moves the cam-rod *k*, and this the valve W by the connection of rods *a b c d*, before described.

The cam-rod K is provided with an oblong mortise or slot *w* (represented by dotted lines in Fig. 1) to allow the cam-rod to play back and forth over a wrist-pin or arm *x*, inserted into the side of the balance-wheel J, for the purpose of regulating the operation of the valves by means of the application of gage-blocks in said mortise *w*.

The tubes X Y are inserted into the side of the fire-box O to admit air.

An air-receiver C, of a square or other form, is placed between the side of the exhauster A and the ends of the cylinders D, communicating with both by suitable apertures opened and closed alternately by suitable valves M Q. The valves M M, which are in the ends of the cylinders D, (see Fig. 2,) are connected with other valves E E<sup>2</sup>, placed over openings in the sides of the cylinders by rods *e e* in such manner that when valve M is opened it closes valve E, and vice versa, the opening and shutting of said valves being effected by means of two L-shaped elbows attached to the valves E by rods *f*, and to a vibrating beam F, vibrating on a center or fulcrum *g*, by a connection of rods K *m*<sup>2</sup> and elbow N, said elbow N vibrating on a fulcrum *q* in a post or other convenient place by means of the connecting-rod *m*<sup>2</sup>, attached to the lower end of the perpendicular arm of the elbow N and to the cam-rod K, so that as the cam-rod K moves the elbow N is vibrated on the fulcrum *q*, and said elbow, by means of its connection with the vibrating beam F, causes the said beam F to vibrate on the fulcrum *g*, supported by a post of the frame. To the



outer extremities of said beam F are attached two vibrating elbows L by means of pins s, passed through the ends of beam F, and through oblong slots r in the longer arms of said elbows to allow said pins to play up and down in said slots freely, said elbows vibrating on fulcrum t, supported on convenient posts u, to the short arms of which elbows the hinged valves E are attached by the rods f, to which hinged valves are attached the swinging valves M, so that the two valves M E of each cylinder move simultaneously, one opening and the other closing, by means of the aforesaid connection, and the vibrating of the beam F on the fulcrum g by the elbow N, connected to the cam-rod K by the rod m<sup>2</sup>.

The valve Q is at the end of the horizontal pipe P, which connects the receiver and exhauster and opens inside the exhauster for allowing the air to pass from the receiver C into the exhauster A, in which the partial vacuum is produced.

A water-vessel R for containing water is placed over the receiver C, having a pipe Z in the bottom of the same leading into the exhauster A for the purpose of conducting water into the said exhauster A.

The admission of the water from the water-vessel R into the exhauster A through the pipe Z is governed by a valve S at the end of the pipe Z, connected to the working part of the engine by a rod h in any convenient manner known to the mechanic. This water is introduced for the purpose of condensing what air may remain in the exhauster after the main body of it is driven out through the valve B for producing a more perfect vacuum.

The cylinders D D<sup>2</sup>, in which the pistons G work, are made of sufficient size and strength and connected with the air-receiver in the way hereinafter described in any convenient manner, and are placed parallel with each other, being each provided with three apertures—namely, first, i, in the head for admitting atmospheric air for driving the piston through the vacuum; the second, E<sup>3</sup>, for admitting the same description of air into the space in which the vacuum is formed on the return of the piston to produce an equilibrium, and the third, m, for letting the air into the receiver C.

The apertures m for allowing the cold air to escape from the cylinders D D<sup>2</sup> into the receiver C, and from thence to pass into the exhauster A, are made in the ends of the cylinder attached to the receiver C, and are opened and closed alternately by the valves M M<sup>2</sup>, when the pistons are at the opposite ends or heads of the cylinders, by means of the connection of rods and elbows before described, said valves M being made to turn on pins against the inside of the heads and the valves E against the outside of the cylinders near the ends thereof.

The apertures E<sup>3</sup> for admitting cold air to the cylinders to produce an equal pressure on the side of the piston next the receiver with

that of the opposite side or next the heads of the cylinders are made in the sides of the cylinders near their ends, which are connected with the receiver C. These apertures are alternately closed by the valves E E<sup>2</sup> when the apertures M are open. One of the side apertures E<sup>3</sup> is open while the other aperture E<sup>3</sup> is closed.

The apertures i in the heads are always open for allowing the air to enter and drive the pistons to the bottom of the cylinders and to escape on the return of the pistons.

The pistons G are connected to the crank-shaft I by means of the piston-rod H and connecting-rods H<sup>2</sup> in the usual manner of constructing air and steam engines.

The fly-wheel J is placed on the crank-shaft in the usual manner.

The cam-rod K is attached to the crank-shaft I and operates the several valves by means of the connecting-rods, vibrating-beam, and elbows, before mentioned, arranged in the manner before described, or in any convenient manner.

The cylinders should be provided at their ends next the air-receiver with circular perforated flanges for bolting them to the side of the said air-receiver, and with similar flanges at the opposite ends, to which the heads are bolted.

The fire-box O should be made water-tight to contain water and the air-tubes bent so as to prevent its escape.

The composition to be put into the water in the fire-box O for raising the heat for the exhauster need not be described, as this will form the subject of another patent.

When the valve E is open, as represented in Fig. 2, and the valve M closed, the external air will rush into the vacuum in the cylinder D and produce an equilibrium, the momentum of the fly-wheel J carrying the piston G toward the head of the cylinder by means of the connection of the fly-wheel with the crank-shaft, and this with the piston, as represented in Figs. 1 and 3, and at the same time closing valve E<sup>2</sup> of cylinder D<sup>2</sup> and opening valve M<sup>2</sup>, which will suffer the cold air in cylinder D<sup>2</sup> to rush into the heated exhauster A through receiver C, leaving a partial vacuum in said cylinder D<sup>2</sup>, through which the piston of said cylinder is instantly forced toward the end of the cylinder next the receiver C by the pressure of the external air admitted through the apertures i in the head of the cylinder, and when valve E is closed and the valve M open valve E<sup>2</sup> will at the same time be open and valve M<sup>2</sup> will be closed, and piston G will be in the position that the first-mentioned piston G was in—namely, near the head of the cylinder—and so on alternately, the alternate opening and closing of the valves being effected by means of the crank-shaft I, cam-rod K and connecting-rod m<sup>2</sup>, elbow N and walking-beam F, elbows L and connecting-rod e f, in the manner before described, the vacuum being produced by the exhaustion of the air in the cylinders



through the intervention of the receiver C and exhauster A in the manner herein described, the air from the cylinders passing first into the receiver C and from thence into the exhauster A, forcing open the valve Q by its elasticity and entering exhauster A, from whence it is driven by any suitable agent admitted through the fire-box O, as before described.

I do not claim to be the inventor of the principle of giving a reciprocating movement to a piston in a cylinder by a vacuum and atmospheric pressure; but

What I do claim as my invention, and which I desire to secure by Letters Patent, is—

The before-described combination of the exhauster A with the fire-box O, air-receiver C, cylinders D, and pistons G, and the several valves, connecting-rods, cranks, and elbows for opening and shutting the valves and operating the pistons, as herein set forth.

JOHN R. REMINGTON.

Witnesses:

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ROBT. K. NICHOLS.