

United States Patent Office.

JOHN S. MORTON AND JOSEPH H. LANING, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNORS TO JOHN S. MORTON.

Letters Patent No. 102,301, dated April 26, 1870.

PNEUMATIC VACUUM-ENGINE.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that we, JOHN S. MORTON and JOSEPH H. LANING, both of Philadelphia, Pennsylvania, have invented a new and useful Pneumatic Vacuum-Engine, of which the following is a specification.

In our said engine we employ the pressure of the atmosphere as the motive power; this pressure being caused to act alternately on the opposite faces of a piston, which moves in a cylinder into or toward a partial vacuum formed alternately on opposite sides of the piston.

In the drawings—

Figure 1 represents a horizontal section of the cylinder *a*, piston, piston-rod, valves, and a plan of the other parts of the engine.

Figure 2 represents a vertical section of the vacuum-chambers or vessels, their valves, and the fire-box, and a side elevation of other parts of the engine.

a represents a metallic cylinder, closed at each end by movable heads *b* and *c*, the head *c* being provided with a central aperture for the rod *d*, which is attached to the piston *e*.

f, *g*, *h*, and *i* are ports or openings in the cylinder *a* at its alternate ends.

The ports *f* and *g* are closed by valves *k* and *l*.

The ports *h* and *i* are left open at all times, they being connected by pipes or conduits *x* and *y* with the vacuum-chambers *m* and *n* respectively.

The chambers *m* and *n* are plain metallic cylinders, closed at each end by heads *p*, fig. 2.

q *q*¹ *q*² *q*³ are apertures in the heads *p*.

r *r*¹ *r*² *r*³ are slide-valves, for closing the apertures last named.

s *s*¹ are rods for moving these valves.

t, fig. 2, is the fire-box, which is of ordinary construction.

u is a rock-shaft, for operating the valve-rods *s* *s*¹.

v, fig. 1, is a lever, for operating the rock-shaft *u*.

The lever *v* is provided with a yoke, *w*, fig. 2, in which the full-stroke cam *x* turns.

*a*¹, fig. 1, is a lever, for operating the valves *k* and *l*. This lever is provided with a yoke and cam, similar to those marked *w* and *x*.

*b*¹, fig. 1, is the crank-shaft. It also carries the cams referred to.

*c*¹, fig. 1, is a lever, attached at one end to the crank *b*¹, and at the other end, by a flexible joint, *e*¹, to the cross-head *f*¹, which is attached to the piston rod *d*, and slides on guides *h*¹.

*g*¹ is a fly-wheel on the shaft *b*¹.

The operation of the engine is as follows:

The apertures *q* and *q*² being open, as shown in fig. 2, the heat or rarefied air and gaseous products of combustion from the fire-box *t* enter through the aperture *q*² into the chamber *m*, expanding the air therein, and driving it out of said chamber through the aperture *q*. At the same time the atmosphere is pressing through the open port *f* in cylinder *a*, fig. 1, on the piston *e*, and driving the piston to the opposite end of the cylinder toward the vacuum already formed in chamber *n*, the arrangement of the valve-rods *a*¹, *s*, and *s*¹, and their connected operating parts being such that the instant the piston *e* reaches the end of its stroke, the aperture *q*, *q*², and *f* are closed, and the apertures *q*¹, *q*³, and *g* at the same time opened.

The opening of apertures *q*¹ and *q*³ allows the heat or highly rarefied air and gaseous products of combustion from the fire-box *t* to enter through the aperture *q*³ into the chamber *n*, expanding the air therein and driving it out of this chamber through the aperture *q*¹. At the same time the atmosphere through the open port *g*, fig. 1, pressing on the piston *e*, drives it toward the opposite end of the cylinder *a*, to wit, into the position it is shown to occupy in fig. 1.

Thus it will be seen that a partial vacuum is alternately formed in the chambers *m* and *n* in front of the piston *e*, and that the motion of the said piston into or toward either such vacuum is due wholly to the pressure of the atmosphere exerted alternately on opposite faces of the piston.

We prefer to make the vacuum-chambers *m* and *n* each of from two to five times the capacity of the cylinder *a*.

We claim and desire to secure by Letters Patent—

1. The two separate vacuum-vessels or chambers, *m* and *n*, with their valves *r* *r*¹ *r*² *r*³ for the top and bottom apertures of said chambers, respectively, constructed substantially as set forth.

2. The cylinder *a*, its piston, ports, valves and valve-rods, in combination with the vacuum chambers *m* and *n* and fire-box, in the manner and for the purpose substantially as set forth.

3. The arrangement of the vacuum-chambers *m* and *n* in connection with a device for producing heat, so that the heat, rarefied air, or gaseous products of combustion, shall rise into and pass out of said chambers, substantially as set forth.

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Witnesses:

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