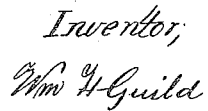


Pneumatic Pump.

Patented Nov. 28, 1865.



UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN PNEUMATIC PUMPS.

Specification forming part of Letters Patent No. 51,175, dated November 28, 1865.

To all whom it may concern:

Be it known that I, WILLIAM H. GUILD, of Williamsburg, in the county of Kings and State of New York, have invented certain new and useful Improvements in Vacuum-Pumps; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a plan of two double-action vacuum-pumps constructed according to my invention and a double steam engine by means of which they are operated. Fig. 2 is a longitudinal vertical section, on a larger scale than Fig. 1, of one of the pump-cylinders. Fig. 3 is a vertical transverse section, on the same scale as Fig. 2, of one of the pump-cylinders; and Fig. 4 is an inside face view of one of the cylinder-heads. Fig. 5 is a central horizontal section of the pump-cylinder and valve-chest.

Similar letters indicate corresponding parts of the machine in all the figures.

The object of this invention is to provide for the effective prevention of leakage of the valves of a vacuum-pump by keeping them covered with water or wet while closed, and especially to obtain this result with respect to eduction-valves arranged in the cylinder-heads; and to this end the invention consists, in part, in certain novel arrangements of the induction and eduction passages and the chambers containing the induction and eduction valves; and, further, in the attachment to the induction-valve chamber or chambers of the pump, between the air-induction valve or valves and cylinder, of a pipe or pipes distinct from the air-induction pipe, for the admission into the pump at each stroke of the piston of a sufficient quantity of water to make up for the loss of the quantity which is unavoidably carried out with the air at every stroke.

To enable others skilled in the art to apply my invention to use, I will proceed to describe it with reference to the drawings.

A is the bed-plate, which supports the horizontally-arranged vacuum-pump cylinders B B and the steam-engine by which they are operated.

Each of the pump-cylinders has an induction-valve chest, C, on one side. This valve-chest C is divided longitudinally by a parti-

tion, *a*, and between this partition and the cylinder is subdivided transversely, by means of a central partition, *a'*, Fig. 5, into two valve-chambers, *b b*, which contain the air-induction valves *c c*. From each of these chambers *b b* a port or ports in the partition *a* communicate with the outer or main induction-chamber, *d*; and the induction-valves, which are composed of or faced with india-rubber or other elastic or flexible material, are fitted or applied to these ports in such manner as to open inward, or toward the cylinder. The said chambers *b b* have also communication with the cylinder, near the ends thereof, by ports *l l*, (see Fig. 5,) which are always open. The air-induction pipe is connected at *x* with the main induction-chamber *d*.

To each of the valve-chambers *b* there is connected one end of a small water-pipe, *f*, the other end of which dips into the water in a conveniently-arranged water-tank, from which the water is supplied to the pump for sealing the air-valves. Each pipe *f* is furnished with a regulating cock or valve, *g*, and a check-valve, *h*, the valve *g* serving to regulate the quantity of water to be admitted; and the check-valve allowing the water to pass through the pipe *f* into the chamber *b*, but preventing the escape of air and the return of the water through the said pipe.

The cylinder B is covered at each end, inside of the cylinder-head D, with a valve-plate, *m*, containing the ports *n n* of the eduction-valve *o*, which is situated in a chamber, *r*, formed between the said plate and the cylinder-head by making the inner side of the cylinder-head concave. The valves *o* are of circular form and arranged in the center of the cylinder-head, and the ports in each plate *m* are arranged in a concentric circle. The said valves *o* are represented as made of flexible vulcanized india-rubber, and secured at or around the center, but opening all around the edges.

Each cylinder-head D is provided inside with an annular passage-way, S, surrounding the eduction-valve chamber *r*, and communicating therewith at the top by means of an opening, *t*. The said passage-way S has an outlet-opening, *u*, (see Figs. 2 and 4,) at the bottom of the cylinder-head D, where an eduction-pipe is to be attached. This pipe may lead into the water-tank, from which the pipes

f take their water, so that the water carried off from the pump with the air may be returned to the tank.

E is the piston, fitted into the cylinder B and packed in any suitable manner. The piston-rod *v*, to which the piston E is attached, passes at one end of the cylinder B through the valve-plate *m* and the cylinder-head D, (see Figs. 2 and 5,) which for this purpose is provided with a stuffing-box, *w*. When the piston-rod *v* passes through the valve-plate *m*, that opening should likewise be provided with proper packing. The eduction-valve *o* at that end of the cylinder may be so fitted to the cylinder as to constitute a proper packing.

As the steam-engine represented forms no part of this invention, I shall omit a more particular description of it.

The vacuum-pumps may be attached to any kind of well-working engines.

When the pump is in operation the air, entering at *x* into the main induction-chamber *d*, presses open the induction-valve *e* in the chamber *b*, communicating with that end of the cylinder from which the piston is moving, and passes through the said chamber and its port or ports *l* into the cylinder, while the air in front of the piston opens the eduction-valve *o* at that end of the cylinder toward which the piston is moving, and passes through the ports *n*, eduction-chamber *r*, opening *t*, passage *s*, opening *u*, and eduction-pipe, the other induction and eduction valve being in the meantime closed. During the first few strokes of the piston after starting, the valves or cocks *g* in the water-pipes *f* are kept wide open to admit water enough to fill the induction-valve chamber *b* and eduction-valve chamber *r*, communicating with each end of the cylinder toward which the piston is moving as the piston completes its stroke, and when such quantity of water has been admitted the valves or cocks *g* are partly closed, to reduce the supply of water to what is necessary to make up for what unavoidably passes off with the air at each stroke of the piston. As the piston moves away from either end of the cylinder the small quantity of water which remained in the cylinder between the piston and eduction-valve plate *m* at the end of the cylinder, and which filled the corresponding induction-valve chamber *l*, follows the piston along the bottom of the cylinder, accompanied by the small quan-

tity of fresh water which enters through the pipe *f*, port or ports *e*, and induction-valve *e* belonging to that end of the cylinder; and as the piston moves toward either end of the cylinder the water in front of it is pushed before it along the lower part of the cylinder, without interfering with the egress of air through the eduction-valve, until the piston is completing its stroke, when the water, rising in the diminishing space between the piston and cylinder-head, and being forced out through the ports *l* and *n*, fills the induction-chamber *b* and eduction-chamber *r* belonging to that end of the cylinder toward which the piston is moving. As the piston returns the eduction-valve, closing behind it, shuts in the water in the eduction-chamber *r* behind it, and so keeps the valve *o* of said chambers covered with water and perfectly sealed, the water being prevented from escaping from the said chamber to the eduction-pipe by reason of the outlet *t* being in the upper part of the said chamber and above the valve *o*. As the piston commences its movement toward either end of the cylinder the opening of the eduction-valve *o* at that end allows the water to run back by gravitation through the ports *n* into the cylinder, and so prevents its interference with the egress of air.

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

1. The arrangement of the main air-induction chamber *d*, induction-valve chamber *b*, induction-valves *e*, and ports *c* and *l*, substantially as herein described, whereby provision is made for covering the said valves with water as the piston approaches or arrives at their respective end of the cylinder.

2. The arrangement of the air-eduction chambers *r*, passages *s*, and openings *t* and *u* in relation to the eduction-valves in the cylinder-heads, substantially as and for the purpose herein specified.

3. The water-pipes *f* and check-valves *h*, applied in combination with the eduction-valve chambers of a vacuum-pump to induct water from a suitable reservoir at each stroke of the pump-piston, substantially as herein specified.

WM. H. GUILD.

Witnesses:

HENRY T. BROWN.
J. W. COOMBS.