W. F. GARRISON.

AIR COMPRESSOR.

No. 186,336. Patented Jan. 16, 1877.

Fig. 1.

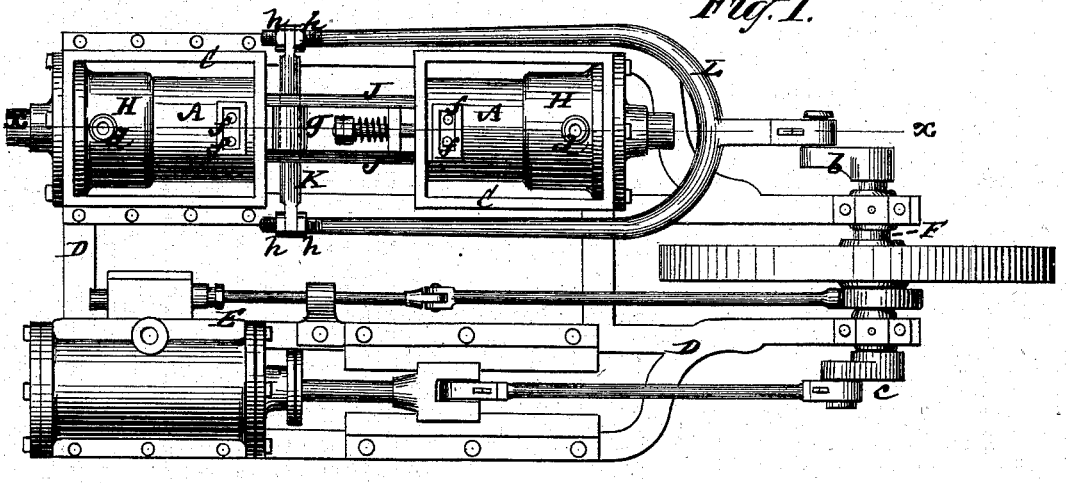


Fig. 2.

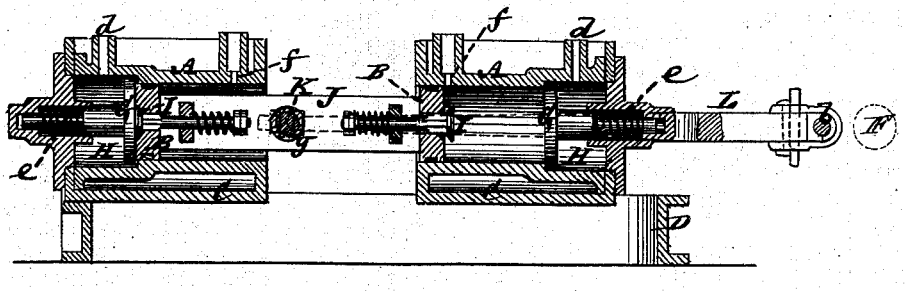
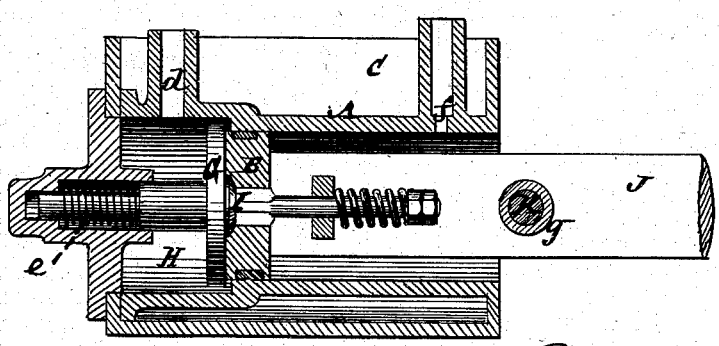


Fig. 3.



Witnesses
John Becker
Fred Haynes

Wm F. Garrison
by his Attorneys
Brown & Allen

UNITED STATES PATENT OFFICE.

WILLIAM F. GARRISON, OF WILLIAMSBURG, BROOKLYN, NEW YORK.

IMPROVEMENT IN AIR-COMPRESSORS.

Specification forming part of Letters Patent No. **186,336**, dated January 16, 1877; application filed September 7, 1876.

To all whom it may concern:

Be it known that I, WILLIAM F. GARRISON, of Williamsburg, Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Air-Compressors; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, which forms part of this specification.

This invention mainly relates to air-compressors in which duplicate single-acting pistons, arranged to work in separate cylinders, and operating alternately to produce compression of the air, are used; also, in which the cylinders at their compressing ends are provided with outlet-valves of the full area of the cylinders.

The invention consists in an enlarged chamber at the compressing end of the working cylinder, formed by an extension of the cylinder itself, separate and distinct from the cover which closes said end, and constructed to form a seat for the outlet-valve; also provided with the outlet for the compressed air, in combination with the compressing-piston working within the reduced portion of the cylinder and beyond it on the enlarged chamber end thereof; also being constructed to form a flush joint with the outlet-valve when the latter is closed. By this construction and combination not only is a full or free discharge obtained and the entire volume of compressed air expelled from the cylinder, but whenever it is necessary to obtain access to the outlet-valve, which overlaps the working portion of the cylinder, or to remove and replace said valve, the same can readily be done by removing the end cover of the cylinder and without breaking the connections which carry off the compressed air from the enlarged chamber at the closed end of the cylinder.

The invention also consists in an air-compressing cylinder, within which a single-acting piston works, provided near its open or receiving end with one or more free air-inlets, arranged so that the same are passed or exposed by the piston in its back stroke, in combination with one or more inlet-valves in the piston, whereby, in case of said valves sticking or failing to supply the cylinder with a proper amount of air, the deficiency is made up by the free inlets, and a certainty of supply is at all times insured. The invention likewise consists in a novel combination of parts for connecting and operating the pistons of an air-compressor having duplicate single-acting pistons, whereby the greatest facility is afforded for the adjustment of said pistons relatively to the delivery-valves of the compressor, to meet disturbances consequent on wear and tightening up of the driving connection, and great simplicity and efficiency generally are obtained.

Figure 1 represents a plan of an air-compressor constructed in accordance with my invention; Fig. 2, a vertical longitudinal section of the same on the line *x x*; and Fig. 3, a similar section through one of the cylinders only, on a larger scale.

A A are two air-compressing cylinders containing single-acting pistons B B within them, and set in the same plane, with their non-compressing or open ends facing each other. The two pistons B B are connected to work simultaneously in the same direction, and so that they alternately compress the air in their respective cylinders. Both cylinders A A, which may be arranged within water-tanks C C, to maintain a desirable cooling effect, are secured on the same bed D which carries the engine E that operates the compressor from or by its main shaft F or crank *b* on said shaft, which crank I prefer to make of less throw than the engine-crank *c*.

Each cylinder A is formed with an enlarged chamber, H, at its outer or compressing end, between the reduced portion of the cylinder in which the piston works and the lid or cover which closes said end of the cylinder. This enlarged chamber H, however, is distinct from said lid or cover, and is constructed to form a seat for an outlet or delivery valve, G, of larger area than the working-bore of the cylinder, so as to cover or overlap said bore. The enlarged chamber H, which is an end extension of the cylinder, has also attached to it the outlet *d*, by which the compressed air escapes into a receiver, or elsewhere, the alternate compressing action of the two pistons keeping up a constant supply of compressed air. Each valve G is closed by a spring, *e*,

and is faced to form a flush or close joint with the opposite face of its respective piston B, and the back of the air-inlet valve I is constructed to be flush with the said face of the piston when the latter valve is closed.

This construction, combined with an extended stroke of either piston B beyond the outer end of the bore of its cylinder A, as shown in Figs. 2 and 3, insures a close meeting of such piston B at the end of its compressing stroke with the valve G throughout the whole area of said piston, and makes positive or certain the expulsion of all the compressed air from the cylinder in which said piston works, and so that no compressed air remains between the outer valve G and piston B to expand within the cylinder during the back stroke of the piston. This not merely provides for a free discharge of the compressed air, and for a perfect and thorough expulsion thereof during each compressing stroke of the piston, but, by reason of the chamber H being a portion of the cylinder itself and forming the seat for the valve G, (also having the outlet I attached to it,) the end cover of the cylinder may readily be removed without disturbing the outlet-connections whenever it is necessary to get at or remove the outlet-valve G

To guard against any deficiency in the supply of air to either cylinder A between the outer or delivery valve G and the piston B, which works in connection therewith, during the back stroke of said piston, and by its inlet-valve I, which opens to supply air entering by the inner open end of the cylinder A, I construct either cylinder, near its open or inner end, with one or more free air inlets or passages *f*, arranged so that the piston, as shown to the right hand of Fig. 2, in completing its back stroke, passes or exposes said free-air inlet or inlets *f*, and thus makes up any deficiency of air-supply through the valve I.

The pistons B B are connected and operated to work simultaneously in the same direction, as hereinbefore referred to, as follows: J is a slotted or hollow connection between the pistons B B, providing ready access to the air-inlet valves I, and having a box, *g*, which forms a bearing for a rocking cross-head, K. This cross-head is connected with the operating-crank *b* of the compressor by a strap-shaped or forked connecting-rod, L, the open ends of which are secured to the cross-head by nuts *h h*, arranged to screw onto said open ends on opposite sides of both ends of the cross-head, which is thus clamped between the nuts. This not only forms a simple and efficient driving means for the pistons B B, but by means of the nuts *h h* provision is made for adjusting said pistons relatively to the outlet-valves G G of their respective cylinders on keying or tightening up the connecting-rod L on the wrist-pin of the crank *b*, as wear requires, or as other circumstances may make necessary.

By the cross-head K being fitted to vibrate, at and along with the inner ends of the forked connecting-rod L, within the box *g* of the slotted connection J, an elongated bearing is provided for said cross-head. This materially reduces wear and does away with the necessity of bushing the connection between said connecting-rod and the pistons.

I claim—

1. The enlarged chamber H, at the closed end of either cylinder A, formed by an extension of the cylinder and constructed to form a seat for the outlet-valve G of the compressor, also provided with an outlet, *d*, for the compressed air, in combination with the detachable cylinder lid or cover at the outer end of the enlarged chamber, and the piston B, constructed and arranged to work within the reduced portion of the cylinder and in relation with the overlapping outlet-valve G, substantially as shown and described.

2. The combination, with the air-inlet valve I in the piston B of one or more free air-inlets, *f*, in the cylinder A, near its air-receiving end, but within the range of the piston, so that said inlets are uncovered by the piston after the latter in its back stroke has passed them, essentially as and for the purpose herein set forth.

3. The combination of the connection J, between the pistons, with its intermediately-arranged box or elongated bearing *g*, the rocking cross-head K, supported by and turning within said box, the forked connecting-rod L, the adjusting-nuts *h h*, the pistons B B, and the cylinders A A, essentially as described.

WM. F. GARRISON.

Witnesses:

HENRY T. BROWN,

BENJAMIN W. HOFFMAN.