(No Model.)

H. P. MORGAN.

FLUID COMPRESSOR.

No. 554,604. Patented Feb. 11, 1896.

Fig. 1.

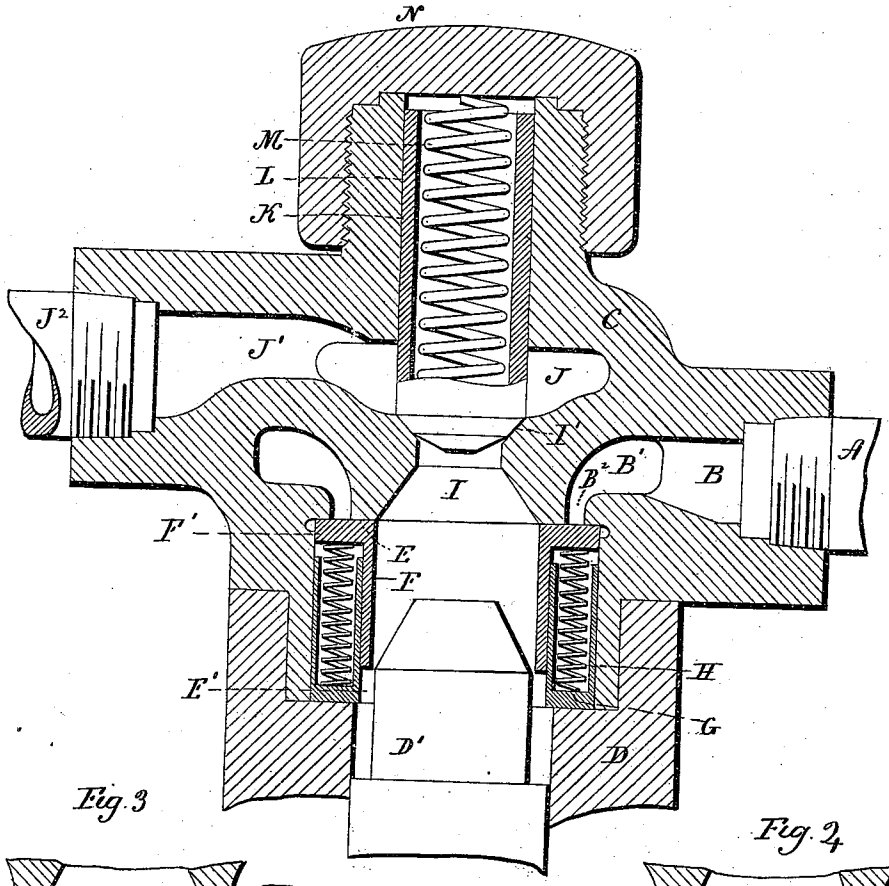


Fig. 3

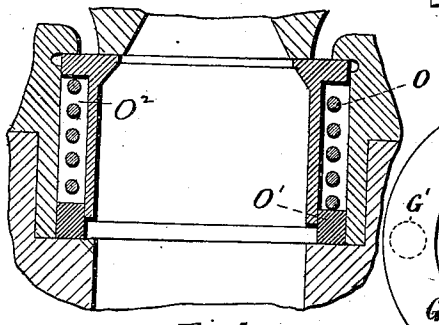


Fig. 2

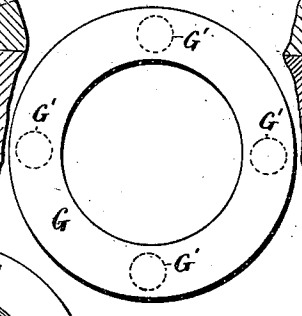


Fig. 4

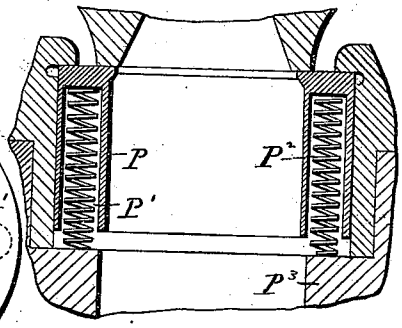
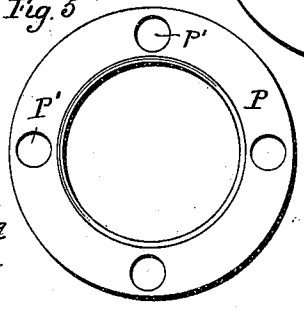


Fig. 5



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UNITED STATES PATENT OFFICE.

HENRY P. MORGAN, OF SOUTH NORWALK, CONNECTICUT, ASSIGNOR TO THE NORWALK IRON WORKS COMPANY, OF SAME PLACE.

FLUID-COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 554,604, dated February 11, 1896.

Application filed October 15, 1894. Serial No. 525,956. (No model.)

To all whom it may concern:

Be it known that I, HENRY P. MORGAN, of South Norwalk, in the county of Fairfield and State of Connecticut, have invented a new Improvement in Fluid-Compressors; and I do hereby declare the following, when taken in connection with the accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a sectional view of the cylinder-head of one form which a fluid-compressor constructed in accordance with my invention may assume; Fig. 2, a detached plan view of the inlet-valve of the said head; Fig. 3, a broken sectional view of one of the modified forms which the inlet-valve may assume, showing also a portion of the cylinder-head; Fig. 4, a similar view of still another form which the inlet-valve may take; Fig. 5, a detached plan view of the valve shown by the preceding figure.

My invention relates to an improvement in fluid-compressors, particularly designed for the compression of air and gases, but equally well adapted for pumping water or other fluids, the object being to produce a simple, compact, and effective construction, made with particular reference to increasing the area of the inlet and outlet valves, and to avoiding damage to the machine in case the inlet-valve or its spring or springs are broken or displaced.

With these ends in view my invention consists in a fluid-compressor having certain details of construction and combinations of parts, as will be hereinafter described, and pointed out in the claims.

As herein shown, an inlet-pipe A leads into the outer end of an inlet-port B, formed in a cylinder-head C, which is adapted to be connected with a compression-cylinder D, only a portion of which is shown, but which, it will be understood, is of any approved construction and contains a piston-plunger D′, the construction of which will be described later on. The inlet-port B terminates at its inner end in an annular inlet-chamber B′, located horizontally in the head C below the center thereof and merging into a narrow annular passage B^2, which centrally intersects an annular valve-seat E, forming the top of a circular valve-chamber E′ formed in the said head. The said chamber E′ receives a hollow cylindrical inlet-valve F, constructed at its inner end with a flange F′, which extends over the annular passage B^2 and seats on the valve-seat on opposite sides of the said passage. The said valve, it will be observed, is shorter in length than the depth of the chamber E′, in which it is therefore free to have limited longitudinal movement. The valve itself is located within a guide-ring G, corresponding in external diameter to the diameter of the said chamber and in internal diameter to the external diameter of the said valve, and held in place by engagement with the cylinder D. Spring-chambers G′, four in number, lead outward from the inner end of this ring and receive spiral springs H, the inner ends of which engage with the outer face of the flange F′ and tend to keep the same in contact with the valve-seat E. The large central opening of the inlet-valve F leads at its inner end into a concentric tapered or conical passage I, formed in the cylinder-head and opening into an outlet-chamber J, located horizontally in the head C, but in a different plane from the annular inlet-chamber B′, before mentioned, the said chamber J forming the inner termination of the outlet-port J′, from which the outlet-pipe J^2 leads. It will be noted that the passage I, which connects the inlet-valve chamber E′ with the outlet-chamber J, is located within the circle or line of the narrow annular passage B^2 with which the flange of the hollow cylindrical inlet-valve coacts.

A valve-seat I′, located at the inner end of the passage I, is engaged by the tapering inner end of the outlet or discharge valve K, which passes centrally through the chamber J, and is mainly located in a valve-chamber L, formed in the cylinder-head C, concentric with the chambers B′ and J and in line with the passage I. The said chamber L is enough longer than the valve K to permit the same to have limited movement within it. The said

outlet-valve K is formed with a longitudinal chamber to receive a spring M, the outer end of which abuts against a screw-cap N, applied to the head C. By removing this cap the inlet-valve and its spring may be removed and replaced, and by changing the adjustment of the cap the tension of the spring may be varied as desired. The inner end of the piston-plunger D′, before referred to, conforms in external diameter to the internal diameter of the inlet-valve through which it plays back and forth, its extreme end being, as shown, tapered to conform to the taper of the conical passage I, leading into the outlet-chamber J. When the piston-plunger makes its instroke, its said inner end occupies the entire opening of the inlet-valve, while its beveled portion entirely occupies the said conical passage leading into the outlet-chamber, thus reducing clearance-spaces to the minimum, whereby practically all of the air compressed by any one stroke of the plunger is forced into the outlet-chamber. Furthermore, in case the inlet-valve is broken or displaced the piston-plunger by reason of its tapered end will act as a wedge and force the fragments laterally aside and prevent them from getting into the path of the piston-plunger, thus avoiding the breaking of the machine.

It will be understood that air entering through the inlet-pipe A will pass thence through the inlet-port B into the annular inlet-chamber B′, in which it acts through the annular passage B^2 thereof against the flange F′ of the inlet-valve F, which it forces outward against the tension of the springs H. The said inlet-valve being lifted from its seat, the air flows into it around its flange and passes thence into the compression-cylinder, into which the air is drawn, as described, upon the outstroke of the piston. Then, as the piston of the cylinder makes its instroke, and the air in the piston is compressed, the compressed air flows back through the central passage of the inlet-valve, which is by the force of the said springs H and the compressed air held firmly upon its seat. The compressed air therefore passes into the passage I and, impinging against the outlet-valve K, retires the same against the force of its spring M and enters the annular outlet-chamber J, from which it passes to the outlet-port J′ and thence into the outlet-pipe J^2. It will be seen from the foregoing that the air passes through the inlet-valve into the compression-cylinder before it is compressed, and then, after it is compressed, passes out through the same valve, retiring the outlet-valve, and entering the annular outlet-chamber.

It will be noted that under my construction, which locates the two valves in line, I am enabled to employ valves of relatively large area to obvious advantage, whereas in prior constructions it has been found necessary to locate the inlet and outlet valves side by side and both in direct communication with the cylinder. These valves and the annular inlet and outlet port chambers being located in different planes in the head C may be of any desired size.

Another point that I wish to call particular attention to is, that in case any one of the inlet-valve springs should become broken it is so confined and housed within the guard-ring H that the broken parts cannot escape and get into the compression-cylinder and do any damage; but if by any chance a spring or other part of the device should break and escape, or if foreign matter should get into the cylinder by being drawn thereinto with the air, it is probable that it would be discharged through the inlet-valve and through the annular outlet-chamber without damage to the rest of the device, or otherwise taken care of by the piston-plunger, as set forth above. It will thus be seen that by my invention I am enabled to construct a simple, durable, and effective fluid-compressor and secure large valve-areas without sacrificing strength or space.

It is apparent that in carrying out my invention the form of the cylinder-head and its connections and the particular form and arrangement of the ports and valves may be varied; and I would therefore have it understood that I do not limit myself to the exact construction herein shown and described, but hold myself at liberty to make such changes and alterations as fairly fall within the spirit and scope of my invention. Thus, if desired, the guide-ring H of the inlet-valve may be dispensed with and a large coiled spring O encircling the body of the valve employed, as shown in Fig. 3, the spring being held in place by a ring O′, located in the outer end of the inlet-valve chamber O^2; or the inlet-valve P may be made very thick, as shown in Figs. 4 and 5, and constructed with small circular spring-chambers P′ entering it from its outer edge and receiving small coiled springs P^2, the outer ends of which abut against the adjacent portion of the compression-cylinder P^3. In both of these modified constructions it will be observed that the springs are housed or confined, so that in case of breakage they are kept out of the compression-cylinder.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A fluid-compressor having an inlet-chamber and an outlet-chamber, an inlet-valve chamber, an annular passage leading from the said inlet-chamber into the said inlet-valve chamber, a passage leading from the said inlet-valve chamber into the said outlet-chamber and located within the circle of the said annular passage, a hollow, cylindrical inlet-valve formed independently of the cylinder proper, located in the inlet-valve chamber, and coacting with the said annular passage, a piston-plunger located within the said valve, and an outlet-valve closing the passage be-

tween the inlet-valve chamber and the outlet-chamber, substantially as described.

2. A fluid-compressor having an inlet-valve chamber, a hollow cylindrical inlet-valve located therein, a piston-plunger arranged to play back and forth in the said valve, and springs located within the said valve-chamber, and arranged to hold the said inlet-valve upon its seat, substantially as described.

3. A fluid-compressor having an inlet-valve chamber, an annular passage leading into one end thereof, a hollow, cylindrical inlet-valve having one end flanged for coaction with the said annular passage which it normally closes, and a piston-plunger arranged to play back and forth in the said valve, substantially as described.

4. A fluid-compressor having a cylinder-head containing a circular inlet-valve chamber, a hollow cylindrical inlet-valve located in the said chamber, an annular guide-ring located in the said chamber, and receiving the said valve, and springs located in the guide-ring, and housed therein, so that in case they become broken they will not escape into the compression-cylinder, substantially as described.

5. In a fluid-compressor, the combination with a cylinder-head containing an inlet-port terminating at its inner end in an annular inlet-chamber, and an outlet-port terminating at its inner end in an outlet-chamber, which is located concentric with but in a different plane from the said inlet-chamber, a hollow cylindrical inlet-valve closing an annular passage opening into the annular inlet-chamber, and an outlet-valve located concentric with the inlet-valve, passing through the annular outlet-chamber, and seated in the passage which connects the annular inlet-chamber with the annular outlet-chamber, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

HENRY P. MORGAN.

Witnesses:
EBENEZER HILL,
JACOB M. LAYTON.