(No Model.)

A. H. HUTCHINSON.

AIR COMPRESSOR.

No. 481,143. Patented Aug. 16, 1892.

FIG. 1.

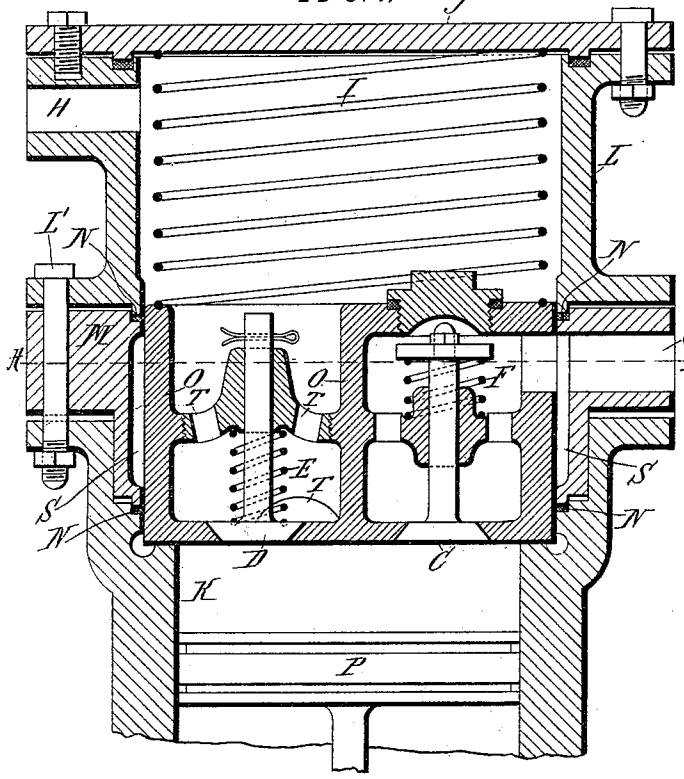


FIG. 3.

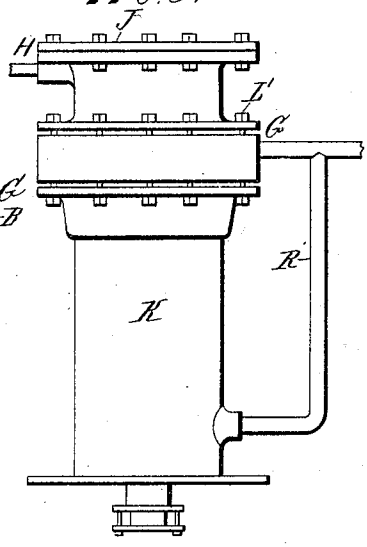
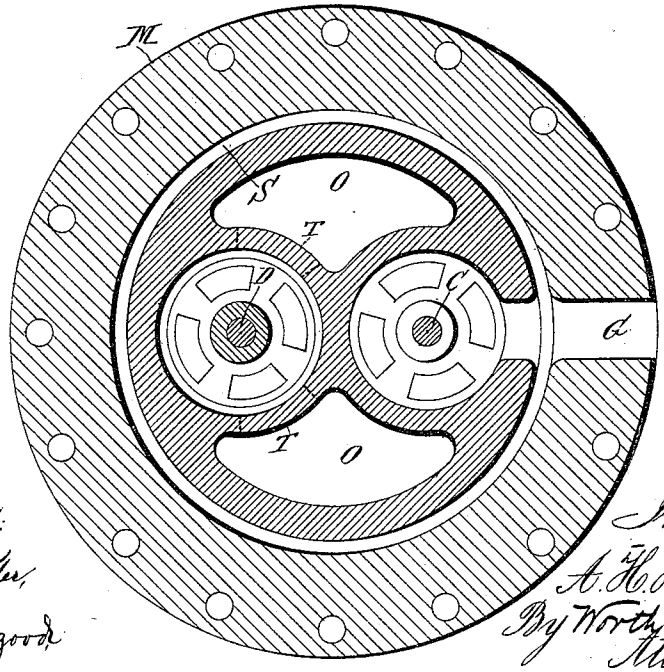


FIG. 2.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

ARTHUR H. HUTCHINSON, OF KANSAS CITY, MISSOURI, ASSIGNOR TO LAURA N. HUTCHINSON, OF SAME PLACE.

AIR-COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 481,143, dated August 16, 1892.

Application filed January 12, 1891. Serial No. 377,413. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR H. HUTCHINSON, of Kansas City, county of Jackson, and State of Missouri, have invented certain new and useful Improvements in Air-Compressors, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention relates chiefly to that class of compressors or pumps intended for use in connection with refrigerating and similar apparatus and employed for moving ammoniacal and like highly-expansible fluids; but my improvements are applicable in other varieties of pumps as well.

The object of my invention is to produce a simple and efficient compressor, whereof the contents of the cylinder may be discharged completely at each stroke of the piston, in which all the valves may be easily reached to be removed or replaced without disturbing the piston or any of its connections, in which the working parts are not liable to be damaged, in which the cylinder is maintained at a practically-constant temperature to obviate effects of expansions and contractions, and in which the piston moves easily and accurately without unnecessary consumption of power. To accomplish all of this and to secure other advantages and conveniences in the matters of construction, operation, and use, my improvements involve certain new and useful arrangements or combinations of parts and peculiarities of construction, as will be herein first fully explained, and then pointed out in the claims.

In the drawings, Figure 1 is an axial section and elevation of the head of a pump constructed and arranged for operation in accordance with my invention and involving my improvements. Fig. 2 is a horizontal section on a plane through line A B of Fig. 1. Fig. 3 is a plan or elevation showing the exterior of the pump, on a smaller scale than previous figures, indicating the application of a by-pass pipe or connection to reduce the power required for working.

In all the figures like letters of reference wherever they occur indicate corresponding parts.

K represents the cylinder of the pump, and P the piston working therein. The inlet G to the cylinder is of any appropriate style and opens into the cylinder at a point or points above or beyond the limit of travel of the piston.

C is a valve opening toward the piston, and D another valve opening from it.

E and F are springs bearing or acting upon the valves to keep them normally closed.

H is the outlet.

O is a loose or movable valve-case held in position by a strong spring I, and moves or gives way only in case of accident.

M is a guide mounted in the end of the cylinder and operating, if so desired, also as a guide for the movable valve-case O.

N N are packings of rubber or other suitable material, and L is a second follower secured to the end of the cylinder by adjusting appliances, such as bolts L′ L′, this follower being made long enough to afford space for the accommodation of spring I.

R is a by-pass pipe.

S is an annular space to allow cool fluid to pass entirely around the movable valve-case.

The pump being constructed as thus indicated, its operation is as follows: The fluid to be pumped is admitted at the inlet G, fills the annular space S, and enters the cylinder through the port governed by valve C, which opens upon the retreating movement of the piston. When piston P reaches its limit of stroke opposite the movable valve-case, valve C closes, and the piston-chamber is then full of the fluid to be moved. In the return stroke of the piston, when the fluid has been sufficiently compressed, valve D is opened and the fluid forced out through ports or passages T T T and discharge-opening H. By use of a movable valve-case the piston can travel much closer to the said valve-case than would otherwise be safe, and with any volatile fluids the piston might with safety be allowed to strike the movable valve-case, thus completely expelling the fluid from the piston-chamber and leaving none to re-expand on the return stroke of piston, by which the efficiency of the pump would be impaired; also, in case a valve should become damaged and enter the piston-chamber it would cause a serious accident if the movable valve-case were stationary instead of being movable, the piston in such

case striking an unyielding body, resulting in damage to the movable valve-case, the piston, piston-rod, or other part of the machinery and causing a stoppage of the pump; but with the yielding movable valve-case no such serious damage can result, as will be readily understood.

I make no claim to a loose valve-case in itself, the same being well known, but to certain improvements in connection therewith, as specified in the claims. By having both valves—the inlet as well as the outlet valve—in the movable valve-case, as contemplated by this invention, the valves and the valve-case are removable together without disturbing the piston, and the difficulties and delays above alluded to are practically annihilated. Again, when the inlet is at one end of the cylinder and outlet at the other the cold inflowing fluid contracts the metal and decreases size of the cylinder, while the compressed or warm outflowing fluid expands the cylinder, thus opening a passage between piston and wall of cylinder, allowing compressed fluid to escape back to the rear piston, thus decreasing the capacity of the pump and requiring more power to do the required amount of work than when this difficulty is obviated. By my invention I obviate this difficulty, for by having the cool inflowing fluid enter the same end of cylinder as that at which the warm outflowing fluid escapes I am enabled to equalize the effects of heat and cold, to balance the warm against the cold, and thereby keep the cylinder of uniform size and insure always a full complement of fluid at each stroke.

The by-pass pipe R (shown in Fig. 3, but omitted from other figures) allows fluid to follow the piston on its rear, so as to obviate the formation of a vacuum, which would consume power. This by-pass is a valuable adjunct to the pump, though it may be omitted, if desired.

The packings N effectually separate the ingoing from the outgoing fluid, and without them or some equivalent for them the guides for the yielding or movable valve-case could not be made tight. The improvements above described will be found to admirably answer the purposes or objects of the invention previously set forth.

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

1. In a pump, the combination, with loose valve-case O, carrying an inlet-valve C and an outlet-valve D, of the packings N, substantially as set forth.

2. In a pump, the combination of the cylinder and piston, the movable valve-case arranged in the cylinder and having an inlet and outlet, the spring for holding the valve-case, the spring-controlled valves in the case, and the guide surrounding the valve-case, substantially as described.

3. In a pump, the combination of the cylinder and piston therein, the guide above the cylinder, the movable valve-case having the chambers, the inlet and outlet valves in said chambers, the chamber above the valve-case having an outlet, and the by-pass pipe leading from the valve-case to the cylinder, as described.

4. In a pump, the combination of the cylinder and piston therein, the guide above the cylinder having an inlet, the movable valve-case fitting the guide and having an inlet, the by-pass pipe, the chamber around the valve-case, the inlet and outlet valves in the case, and the case or chamber above the cylinder having the outlet, all arranged as described.

In testimony that I claim the foregoing I have hereunto set my hand in the presence of two witnesses.

ARTHUR H. HUTCHINSON.

Witnesses:
FRANK H. DENTEN,
ANDREW F. EVANS.