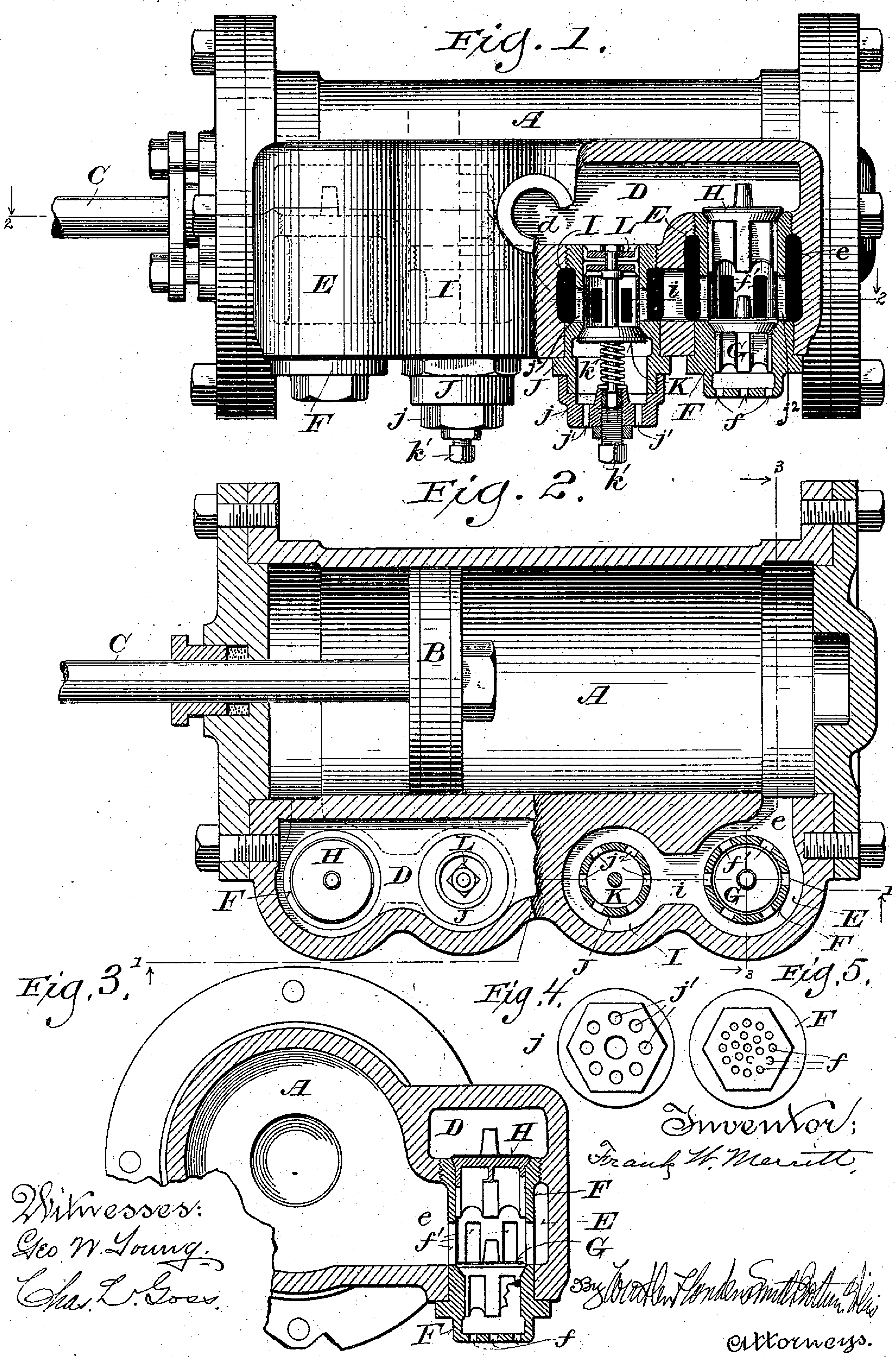
(No Model.)

F. W. MERRITT.
AIR COMPRESSOR.

No. 562,475. Patented June 23, 1896.



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UNITED STATES PATENT OFFICE.

FRANK W. MERRITT, OF DULUTH, MINNESOTA, ASSIGNOR TO THE ELECTRIC MOTOR COMPANY, OF SAME PLACE.

AIR-COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 562,475, dated June 23, 1896.

Application filed December 2, 1892. Serial No. 453,825. (No model.)

To all whom it may concern:

Be it known that I, FRANK W. MERRITT, of Duluth, in the county of St. Louis and State of Minnesota, 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 invention, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

The main objects of my invention are to prevent the air-pressure from rising above a certain predetermined point without stopping or interrupting the operation of the pump, and to avoid undue heating of the pump-cylinder and associated parts.

It consists, essentially, of auxiliary relief-valves communicating with the ends of the pump-cylinder and connected with pistons exposed to the pressure produced by the pump, and of certain novel features of construction and arrangement of parts, hereinafter particularly described, and pointed out in the claim.

In the accompanying drawings like letters designate the same parts in the several figures.

Figure 1 is a side elevation and partial vertical section on the line 1 1, Fig. 2, through the compressed-air chamber and valve-chambers at one end of a pump embodying my improvements. Fig. 2 is a horizontal section of the same on the line 2 2, Fig. 1. Fig. 3 is a vertical cross-section on the line 3 3, Fig. 2; and Figs. 4 and 5 are inverted plan views of the valve-cages at one end of the pump-cylinder.

A represents the pump-cylinder, provided, as shown in Fig. 2, with a piston B, fixed upon a piston-rod C, which passes through a suitable stuffing-box in one of the cylinder-heads in the usual manner. The cylinder is cast or otherwise provided on one side with a compressed-air chest or chamber D, having a discharge opening or connection *d*, and at or near each end with valve-chambers E E, adjoining chamber D and communicating with the ends of cylinder A through ports *e*. In the chambers E E are fitted and held by screw-threaded connections valve-cages F, which open at their inner ends into the compressed-air chamber D, at their outer ends through a number of small holes *f f* into the outside atmosphere, and at intermediate points through lateral openings or ports *f' f'* into the valve-chambers E E, in which they are inserted. Each of these cages is formed or provided at its inner end, and between the ports *f'* and its outer end, with valve-seats for inlet and outlet valves G and H, the inlet-valve opening inwardly from the outer end of the cage toward the port *f'*, and the outlet-valve opening outwardly from the port *f'* into the compressed-air chamber D.

I I are relief-valve chambers adjoining the compressed-air chamber D and the valve-chambers E E at each end of the cylinder, and communicating with the latter through ports *i*. In these chambers I I are inserted, and held by screw-threaded connection, cages J, opening at their inner ends into the compressed-air chamber D, and at their outer ends into the external atmosphere. They are provided at their outer ends with screw-threaded caps *j j*, having a number of small air-inlet holes *j' j'*, and are formed with lateral openings or ports j^2 j^2, communicating with the chambers I I, in which they are inserted.

Each of the cages J is provided with an outwardly-opening relief-valve K, which has a seat therein just below or outside of the ports j^2. It is held normally to its seat by a spring *k*, the tension of which is adjusted by a screw *k'* in cap *j*. To the upwardly-projecting stem of each of the relief-valves K is fixed a piston L, which is fitted and adapted to work within the cage J between its inner end and ports j^2.

My improved air-compressor operates as follows: As the piston B moves from one end toward the other end of cylinder A, it tends to produce a vacuum in that end of the cylinder from which it is moving, thereby opening the inlet-valve G at that end of the cylinder and permitting air to enter through the same from the outside. At the same time the air contained in the other end of the cylinder, toward which the piston is moving, will be

forced through ports *e* and *f'*, and, opening the outlet-valve H, will enter chamber D. When the movement of the piston is reversed, the adjacent outlet-valve H will be closed and the inlet-valve G opened, while the outlet-valve H at the opposite end of the cylinder will be opened, and the corresponding inlet-valve closed, during the return stroke of the piston. Thus the reciprocation of the piston alternately opens and closes the inlet and outlet valves G and H at opposite ends of the cylinder, admitting air from the outside into that end of the cylinder from which the piston is moving, and forcing it from that end toward which it is moving, into the chamber D. The tension of the spring *k* having been adjusted, by means of the screw *k'*, to sustain, for example, a pressure of fifty pounds per square inch, when the air-pressure in chamber D for any cause rises above that point, acting upon the pistons L it will open the relief-valves K, thus admitting outside air through the holes *j'* and ports *j²*, *i*, *f'*, and *e* into one end of the cylinder, and permitting the air to be discharged from the other end of the cylinder in the reverse direction through the corresponding ports and openings, without increasing the pressure in chamber D. Fresh outside air being thus drawn into and immediately discharged from the cylinder tends to cool it. As soon as the pressure on pistons L becomes less than the tension of spring *k*, the relief-valves K will be automatically seated, and the pump will resume its normal action.

The inlet and outlet valves, as herein shown and described, are constructed and arranged to be seated by gravity; but they may be otherwise closed and held to their seats. In short, various changes in the details of construction and arrangement of the component parts of my improved compressor may be made within the spirit of my invention.

I claim—

In an air-compressor, the combination with the piston and the cylinder formed or provided with an air-chest, and with adjoining valve-chambers communicating with each other and with the ends of the cylinder—of cages inserted in said chambers, and opening at the ends into the compressed-air chamber and into the outside air, and at intermediate points into the valve-chambers in which they are inserted; inlet and outlet valves seated in one of the cages at each end of the cylinder; an outwardly-opening relief-valve seated in the other cage at each end of the cylinder; springs tending to hold the relief-valves to their seats; screws for adjusting the tension of said springs; and pistons attached to the relief-valve stems and adapted to work within the relief-valve cages, with one side exposed to the compressed-air chamber, substantially as and for the purposes set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

FRANK W. MERRITT.

Witnesses:
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