(No Model.)

F. J. WEISS.

AIR PUMP.

No. 307,363. Patented Oct. 28, 1884.

Fig. 1

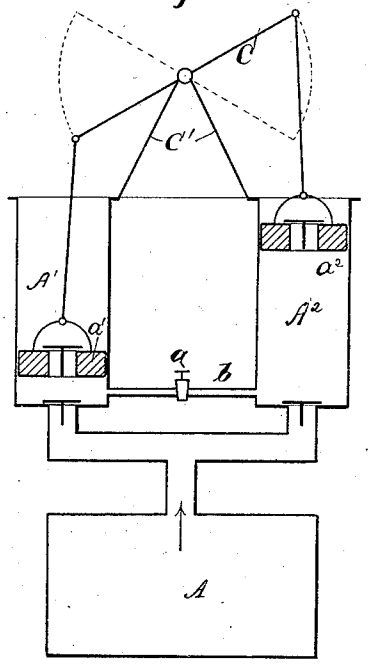
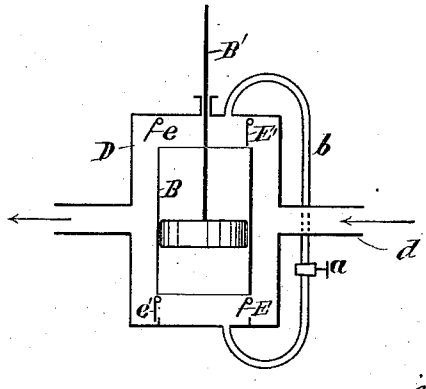


Fig. 2.



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UNITED STATES PATENT OFFICE.

FRANZ JOSEPH WEISS, OF BASLE, SWITZERLAND.

AIR-PUMP.

SPECIFICATION forming part of Letters Patent No. 307,363, dated October 28, 1884.

Application filed August 17, 1882. (No model.) Patented in Germany June 2, 1882, No. 21,253; in England July 26, 1882, No. 3,551; in Belgium August 16, 1882, No. 58,588, and in France October 30, 1882, No. 150,319.

To all whom it may concern:

Be it known that I, FRANZ JOSEPH WEISS, a citizen of the Republic of Switzerland, residing in the city and canton of Basle, and Republic of Switzerland, have invented a new and useful Improvement in Air-Pumps, which improvement is fully set forth in the following specification, reference being had to the accompanying drawings, in which—

My invention relates to pumps adapted for the compression or rarefaction of air or gases. The practical operation of pumps of this character, as heretofore constructed, have been defective, in as much as they are only operative up to a certain limit. In compression-pumps this limit is reached when the density of air in the reservoir prevents the opening of the induction-valves—that is, when the air in the reservoir is under a pressure equal to that which can be attained by a single stroke of the piston—and in exhaust-pumps the limit is reached when a stroke of the piston does not produce a greater rarefaction of the air under atmospheric pressure contained in the clearance-space of the pump-cylinder than has been produced in the receptacle from which the air is being exhausted.

Heretofore it has been proposed to relieve the pressure upon the induction-valves of compression-pumps by causing a current of air or other fluid to move away from said valve just at the time the compressing-piston commenced its stroke; but this involved the construction of a complicated and expensive pump, and was not applicable to pumps for the rarefaction of air or gases, because there was no reduction in the pressure of air under atmospheric pressure contained in the clearance-space of the cylinder.

The object of my invention is to extend the limit of operation of pumps of this class; and to this end my invention consists in the method of rarefying or reducing the pressure of the atmospheric air contained in the clearance-space of the pump-cylinder while the piston is at its dead-point.

I prefer to explain the principle of my invention in connection with an apparatus designed for the rarefaction of air or gases; but it will be readily understood by those skilled in the art how these principles can be applied in apparatus designed for compression.

In the accompanying drawings, Figure 1 illustrates two single-acting pumps arranged to carry out my invention. Fig. 2 represents a double-acting pump embodying my improvement.

In Fig. 1 of the drawings, A represents a vacuum apparatus or a receptacle from which the air or gas is to be exhausted. This apparatus is suitably connected with both of the pump-cylinders, A′ and A^2, arranged side by side, as shown, and respectively provided with pistons a' a^2, the rods of which are connected to the opposite ends of a lever, C, fulcrumed at its center in a standard, C′, supported between the cylinders. The lever C is actuated by any suitable means to give the pistons an equal and simultaneous traverse in opposite directions. The cylinders and pistons are provided with upwardly-opening valves, as shown. The cylinders are connected at a point below the limit of stroke of the pistons (the clearance-space) by means of a pipe, *b*, of small diameter, and this pipe is normally closed by a valve, *a*, which is designed to be opened only while the pistons are at the dead-point, or, in other words, during the momentary interval between the ending of one stroke and the commencement of the next. I have shown this valve *a* as provided with a hand-wheel, so that it may be operated at the proper times by an attendant; but it will be obvious to those familiar with mechanics that this valve may be arranged to be operated automatically by the lever C or other moving parts of the device.

In operation the action of the pump arranged to carry out my invention will be as follows: We will suppose the pistons are in the position shown in the drawings, having just completed a stroke. Under this condition of affairs the air in the suction-space of cylinder A^2 will be under a pressure lower or less than atmospheric pressure, and equal, or nearly so, to that in the vacuum apparatus, and that in the clearance-space of cylinder A′ will be at atmospheric pressure. Should the piston a' now commence a stroke, no air could be drawn or exhausted from the vacuum apparatus A until the air in the clearance-space was rare-

fied to a degree equaling that of the air contained in said apparatus—say, for instance, when the piston a' has completed a half-stroke—so that this piston would only be operative for rarefaction during half of its stroke; but if, on the other hand, the valve a in pipe b were momentarily opened before the commencement of the stroke, the air in the clearance-space in cylinder A′ would expand into the suction-space of cylinder A^2, thus equalizing the pressure in said cylinders and reducing the pressure in said clearance-space below atmospheric pressure, so that, say, a quarter-stroke of piston a' would reduce the pressure in the clearance-space to a degree equaling that in the vacuum apparatus, thus rendering said piston operative for the exhaustion of air from said apparatus during three-quarters of its stroke.

In Fig. 2 I have illustrated a double-acting pump, adapted to operate on the same principles as the two single pumps hereinbefore described. A pump-cylinder, B, open at both ends, is supported within a casing, D, communicating with the vacuum apparatus (not shown) by means of a pipe, d. The openings between the cylinder B and its casing D are normally closed by automatically-operating valves E e and E′ e'. The piston B′ is represented as making an up-stroke, thereby drawing air through valve E, and discharging it through valve e. The ends of the casing D are connected by the narrow pipe b, which is normally closed by the cock a. As the operation of this pump will be apparent to those skilled in the art, further explanation is here deemed unnecessary. As the air in the suction-space is at the same pressure, or nearly so, as that contained in the vacuum apparatus, it follows that the same result could be attained—that is, the reduction of pressure of the air in the clearance-space—by connecting said space with the vacuum apparatus by means of pipe b, instead of with the suction-space. In this way one of the pumps in Fig. 1 might be dispensed with or temporarily stopped for repairs.

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

1. In a piston cylinder-pump having two clearance-spaces, valves, and a pipe to connect with a vacuum apparatus, the combination therewith of a pipe provided with a valve and connecting the two clearance-spaces of the pump, substantially as and for the purpose described.

2. The combination of cylinders A′ A^2, containing valved pistons a' a^2, and connected by a pipe, b, having a valve, a', with said cylinders, and by a valved pipe to a vacuum apparatus, substantially as described.

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

FRANZ JOSEPH WEISS.

Witnesses:

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