(No Model.)

H. A. FLEUSS.

COMPRESSION OR EXHAUST PUMP.

No. 517,337. Patented Mar. 27, 1894.

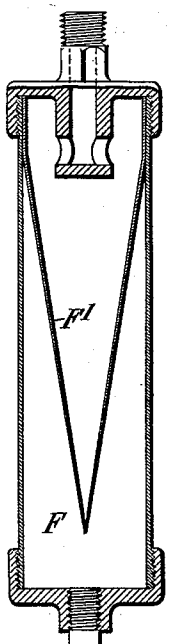


Fig. 1.

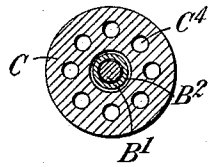


Fig. 3.

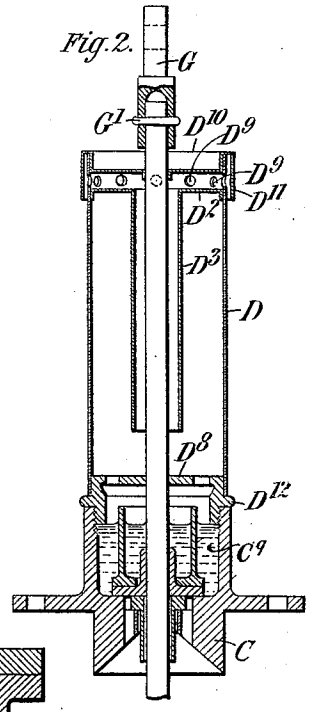
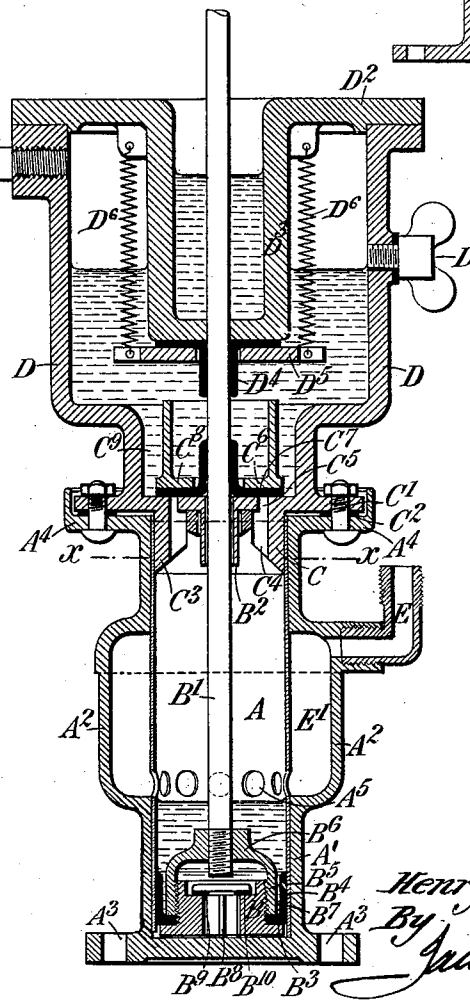


Fig. 2.



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COMPRESSION OR EXHAUST PUMP.

SPECIFICATION forming part of Letters Patent No. 517,337, dated March 27, 1894.

Application filed December 8, 1892. Serial No. 454,617. (No model.)

To all whom it may concern:

Be it known that I, HENRY ALBERT FLEUSS, engineer, a subject of the Queen of Great Britain, and a resident of Staines, London, England, have invented certain new and useful Improvements in Compression or Exhaust Pumps, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to pumps, and its object is to provide a pump which may be used either as a compression pump or as an exhaust pump for the production of high vacua. Mechanical pumps have not hitherto been used to any great extent for this latter purpose, the vacuum in Geissler tubes or incandescent lamp bulbs for example being generally obtained by the use of some form of mercury pump such as the well-known Geissler or Sprengel pump. Serious objections have been raised to the employment of mercury pumps chiefly on account of the time taken to exhaust even a moderate sized globe. Moreover for other practical purposes such as the production of ice by what is known as Carre's method mercury pumps are fragile and cumbersome and a mechanical pump which will easily and quickly produce a high vacuum is therefore very desirable.

My invention consists in the features of construction and the combination or arrangement of parts hereinafter described and claimed, reference being made to the accompanying drawings, in which—

Figure 1 is a sectional elevation of a pump adapted for use either as a compression or an exhaust pump, and constructed according to my invention. Fig. 2 is a longitudinal sectional view of the upper part of a similar pump but constructed to be used for exhausting only. Fig. 3 is a section on the line x, x Fig. 1.

A is the pump barrel. B is the piston or plunger; C the cover of the barrel. D is the compression or air-chamber. D′ is the delivery pipe; and E is the suction pipe.

The barrel proper preferably consists of a liner A inclosed in a casting A′ which is constructed with an enlarged part A^2 thus forming an annular space around the liner into which space the suction pipe E enters. The casting A′ is made with a flanged base A^3 by which it can be secured to the floor for example if desired. The said casting has a cupped flange A^4 at its upper end to which the cover C is secured by bolts C′. An elastic washer C^2 is provided between the cover and flange as shown. Oil may be placed in the cupped flange A^4 around the cover C to seal the joint. I prefer that the bolts C′ should have their heads below the flange, the nuts being screwed down on to the cover as shown, the leakage of the sealing liquid round the head of the bolt being thereby obviated. The cover C is coned internally at C^3 and is perforated with a ring of holes C^4 through which air and oil are swept out on the ascent of the piston B. The piston rod B′ is furnished with a loose flanged collar B^2 which can slide up and down in a central aperture in the cover C which is turned out as at C^5 to receive the flange of the said collar. The said collar is of such length that it makes contact with and is raised by the piston or spider hereinafter described just before the completion of the up stroke of the latter.

C^6 is a hat-leather which clasps the piston rod B′ and makes an airtight joint round the same, the flat part C^7 of the latter being spread over the holes C^4 to form a valve.

On the top of the flat or valve portion of the hat leather I place a ring C^8 having an upward extension the purpose of which is hereinafter more particularly described. The piston B is formed with a lower flange B^3 against which the flat part of a deep cup or bucket leather B^4 is secured by means of a ring B^5 screwed on the piston. The said ring is furnished with arms B^6 and the piston rod is secured thereto by screwing or by other suitable means. The bucket leather B^4 is adapted to fit against the barrel proper A and between it and the ring B^5 there is a considerable annular space B^7. I also provide a mushroom valve B^8 which opens upwardly in the piston and the stem of which projects downwardly through a hole B^9 in the bottom of the piston. The valve beds on to a leather washer B^{10} and has the extent of its lift controlled by the end of the piston rod which forms a stop to prevent the valve lifting too high. The valve when lifted opens a communication between the upper and lower portions of the pump barrel. The liner barrel

A is furnished with openings A^5 which afford a means of communication between the interior of the barrel and the annular chamber E'. The openings A^5 are chamfered or countersunk on the inside so as to prevent the leather B^4 being chafed. The space above the piston is filled to such a depth with oil, water or other suitable liquid that when the piston is at the bottom of its stroke the oil is on a level with the bottom of the orifices A^5. When the piston is raised, some of the oil flows into the annular chamber E' until the orifices A^5 are covered by the bucket leather B^4. The said annular chamber acts as a trap to prevent the oil or other liquid gaining access to the vessel to be exhausted or into the air. The piston now sweeps out the air from the barrel through the perforations C^4 until the top part of the spider B^6 comes in contact with the loose collar B^2 and raises the same and also the hat leather C^6 until the top of the spider comes in contact with and is arrested by the bottom of the cover C. A stop is provided for the ring C^8 which encircles the hat leather to prevent the same being lifted too high when commencing to work the pump. The piston will then be at the end of its upward stroke and most of the oil will have flowed freely through the perforations C^4 into the oil chamber C^9. The coned cover of the pump barrel insures that all the air shall be driven out of the pump barrel and that no air is mechanically entangled in the oil at the top of the piston. When the piston begins to descend the hat leather C^6 is kept in a raised position by the loose collar B^2 until the piston has traveled a short distance down so that the oil forced past the valve in the up stroke of the piston now flows back again to the top of the piston until it reaches the level it had before the collar was raised. When the collar reaches the lower limit of its travel the hat-leather valve shuts and no more oil is allowed to pass. While the piston is descending, the valve B^8 is open to allow the air and finally oil to flow from the bottom of the piston to the top and open communication between the upper part of the barrel and the annular space E'. The piston having reached the bottom of its stroke the valve closes, the orifices A^5 are uncovered and the annular chamber E' is put into direct communication with the upper part of the barrel. The upper or compression chamber of the pump is formed by a casting D, the lower part of which forms the cover C. The upper part of the casting D is furnished with a cover D^2 having a cylindrical part D^3 extending downward nearly to the bottom and the piston rod B' runs up through the said cylindrical part. A hat leather D^4 which forms the piston rod packing is fastened to a ring D^5 which is hung by springs D^6 to the cylinder. This part D^3 is filled with oil to form a seal and prevent leakage of air round the piston rod. A chamber F is provided in the pipe D' with an inverted cone of wire gauze F' through which the compressed air passes being thus freed from any oil.

D^7 is a plug which can be removed to admit of oil being poured into the chamber D. Or oil may be poured into the suction pipe E while the pump is slowly working until it runs out at the hole for the plug D^7 which is then screwed in tightly. If the suction pipe E be connected to a closed chamber such for example as the bulb of an incandescent lamp it will be easily understood that on working the piston up and down in the pump barrel the air will be gradually drawn therefrom and forced into the compression chamber D whence it may be allowed to escape into the atmosphere, or may be stored in a suitable receiver. Thus I can by means of my improved pump exhaust the air or any other fluid from one vessel and force it into another vessel. If compressed air is required the exhaust pipe E may be opened to the atmosphere. If the pump be required for exhaust purposes only I prefer to construct the upper part of a lighter build since it is not required to withstand pressure, and I use oil or other liquid of very low vapor tension for the seals. This preferred form is shown in Fig. 2 where D is a metal tube firmly secured to a piece D^8 which is adapted to screw into the end of the cover C hereinbefore described. The cap D^2 with its cylinder D^3 is soldered a short distance inside the metal tube D and the part of the tube above the cap is perforated with holes D^9. The hat leather and other devices at the bottom of the cylinder D^3 may be dispensed with and an upper cap D^{10} through which the piston rod B' passes is slightly forced into the end of the tube D. The upper cap D^{10} has a downwardly depending flange D^{11} which extends so far as to cover but not close the perforations D^9 for the exit of the air.

The objects of the arrangement of the upper part of the pump hereinabove described is to prevent the oil or other liquid from splashing or spurting out when the pump is worked, and to prevent loss of the liquid should the pump be inverted. It is obvious that if the pump be inverted the oil merely fills the space between the tube D and cylinder D^3 but cannot run out of the air holes D^9 and when the pump is restored to its upright position the oil flows back to its proper receptacle.

It is easily understood that the hat leather C^6 forms both the valve in the pump barrel cover and also serves to pack the piston rod. The leather being always saturated with oil is maintained soft and supple and the pressure which exists in the upper part of the pump when being worked keeps it pressed tightly against the piston rod even if the latter be not turned quite true. I prefer that the piston rod should be attached to the handle or connecting rod G of the pump by a cotter as shown at G' so that the end thereof may be smooth without any screw threads. The hat

leather may then be slipped on without injury. The bucket leather B^4 forms a very efficient piston packing the annular space B^7 allowing it to give slightly to the inequalities if any in the sides of the pump barrel while the oil acts as a seal in a well-known manner.

When charging the pump having its upper part D constructed as shown in Fig. 2, with oil, said upper part is unscrewed from the lower by means of the milled part D^{12}. The chamber C^9 is then filled with oil and the upper part is replaced whereupon the pump is worked a few strokes; the upper part is again unscrewed and the oil chamber filled up and on screwing it down tightly again the pump will be ready for use.

In some cases it may be preferred to form the oil trap E′ from sheet metal soldered or otherwise secured to the pump barrel instead of constructing it in the manner shown, or the oil trap may be simply an enlargement in the suction pipe E which is large enough to contain double the quantity of oil used in the pump.

It is obvious that suitable piston rings may be used to pack the piston instead of using the bucket leather, but for the purpose of exhaustion especially when a high vacuum is required I prefer the method of packing shown.

Pumps constructed as above described may be used for a variety of purposes whenever a vacuum is required, such as for instance in artificial ice making and exhausting incandescent lamp bulbs. When using it in the manufacture of sugar in connection with vacuum pans, it may be immersed in a cold water bath, and the steam from the pans may be passed through a condenser in order to keep the pump cool. The pump in that case will exhaust or force both liquid and vapor or air indiscriminately.

What I claim is—

1. The combination of the pump barrel, the piston, piston rod, cover C forming a receptacle for oil and having outlet openings C^4, a valve closing said outlet openings and means whereby said valve is mechanically lifted by the piston when the latter reaches the upper limit of its travel, and kept lifted during part of the down stroke substantially as, and for the purpose, set forth.

2. The combination of the pump barrel, the piston, piston rod, cover C forming a receptacle for oil and having outlet openings C^4, a loose flanged collar B^2 surrounding said rod and adapted to be lifted by the piston when the latter reaches the upper limit of its travel, and kept lifted during part of the down stroke a hat leather C^6 surrounding said rod and supported by said flanged collar, said leather forming a valve adapted to close the outlet openings C^4 and to be raised from said openings when the collar is lifted by the piston, substantially as, and for the purpose, specified.

3. The combination, with the pump barrel, of the piston B, rod B′, coned cover C, loose flanged collar B^2, surrounding said piston rod and adapted to slide in a central aperture in the cover C; hat leather C^6 forming both valve and piston-rod packing, and supported by said collar, and the chamber D provided with a cover D^2 having a downwardly depending cylinder D^3, substantially as, and for the purpose, set forth.

4. In a pump, the combination of the piston rod, the hat leather D^4 forming a packing for the same, and the ring D^5 supporting the said hat leather and suspended by springs, for the purpose specified.

In witness whereof I have hereunto set my hand this 8th day of November, 1892.

HENRY ALBERT FLEUSS.

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