

A. M. KJAERGAARD & C. S. J. WIESE.
AIR PUMP.

APPLICATION FILED DEC. 1, 1908.

932,143.

Patented Aug. 24, 1909.

2 SHEETS—SHEET 1.

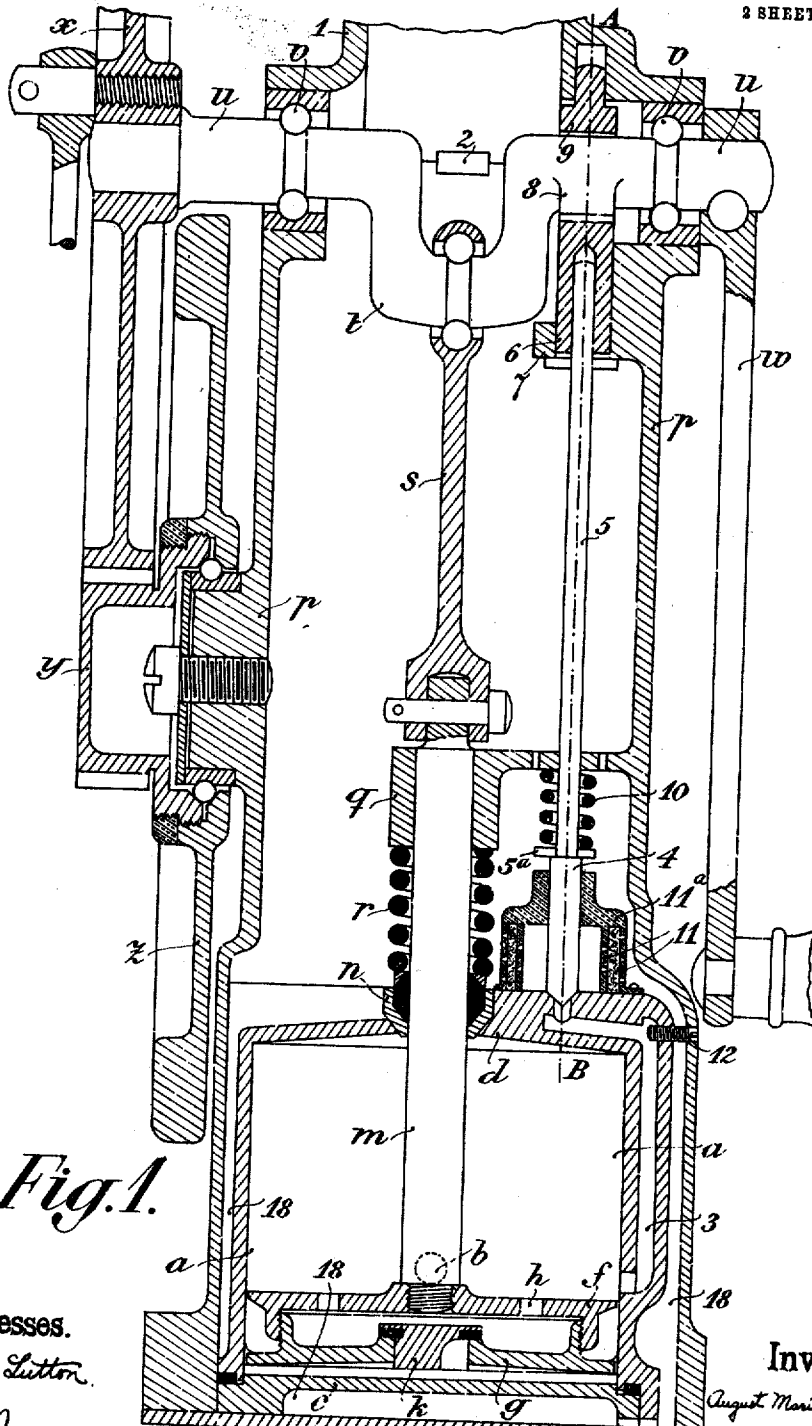


Fig. 1.

Witnesses.

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Att. 2

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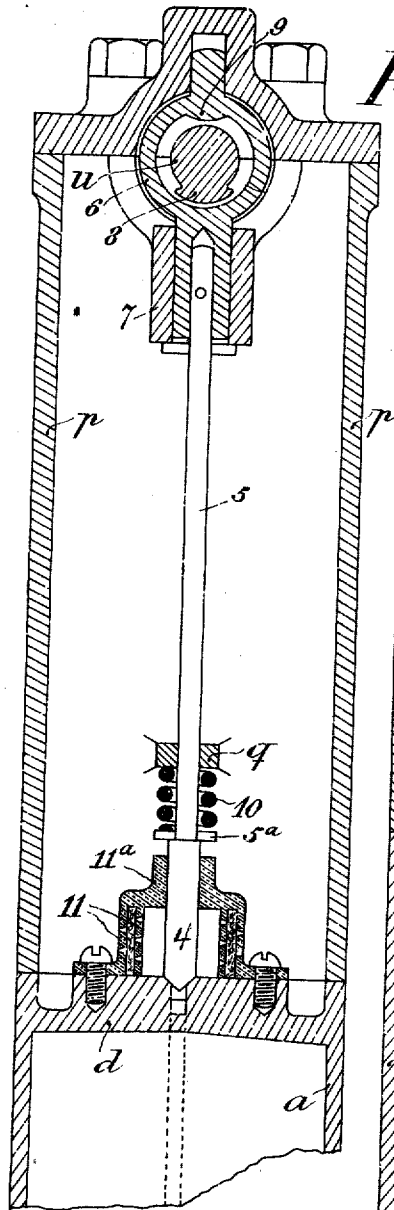


Fig. 2.

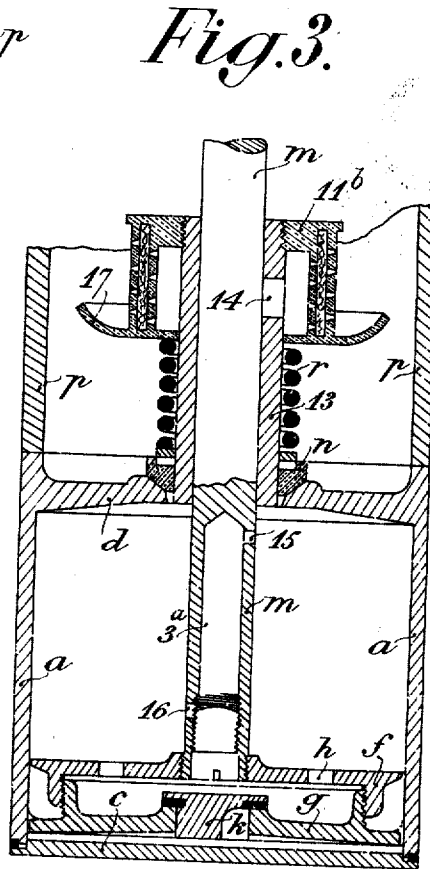


Fig. 3.

Witnesses.

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UNITED STATES PATENT OFFICE.

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AIR-PUMP.

982,143.

Specification of Letters Patent.

Patented Aug. 24, 1909.

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To all whom it may concern:

Be it known that we, AUGUST MARIUS KJAERGAARD, manufacturer, and CARL SOEREN JULIUS WIESE, managing director, citizens of Denmark, residing at No. 28 Fredrikssundsvej, Copenhagen, and No. 18 Vestergade, Odense, Denmark, respectively, have invented new and useful Improvements in Air-Pumps, of which the following is a specification.

The present invention relates to air-pumps of the kind in which a fluid such as oil or the like is used for filling the empty spaces below and above the piston whenever the latter reaches its extreme positions, the fluid being led together with the air through the valves of the pump. In these pumps a thorough mixing of the air and the oil takes place and a quantity of air-bubbles will be formed in the oil which with the fluid are forced from the pressure-side of the piston to the suction-side, where the compressed air-bubbles will expand and extensively counteract the vacuum, so that a vacuum cannot be brought down below a certain relatively high degree. A further deficiency is due to the fact that the pores in the pump-cylinder often open without any plausible reason, and further that small leakage will appear in the packing and connections due to the influence of alterations in temperature, so that a pump may work all right one day, while the next day it can produce but a very insufficient vacuum.

The object of the present invention is to obviate the above mentioned drawbacks by passing the fluid mixed with air, before it is led to the suction-side of the piston, through a filter where the air-bubbles are separated from the liquid. The whole pump-cylinder besides the packing and connections are surrounded by fluid in such a way that only a very small quantity of fluid may pass through leaks or open pores while any injurious entrance of air is avoided.

The invention is illustrated in the accompanying drawings in which—

Figure 1 is a vertical section of an air-pump specially adapted for freezing-machines. Fig. 2 is a section on the line A—B of Fig. 1, and Fig. 3 is a vertical section of the lower part of another form of construction.

a designates a pump-cylinder which com-

municates through an opening *b* with the chamber from which the air is to be exhausted. The cylinder *a* is closed by means of a separate bottom *c* and a slightly conical cover *d* formed in one piece with the walls. A piston is reciprocally mounted in the cylinder *a* and comprises a top-plate *f* and a bottom-plate *g*. The top-plate is provided with openings *h* while the bottom-plate has a valve *k* that opens into the interior hollow space of the piston. The piston is fixed to a piston-rod *m* that passes through an annular valve *n*, in the cover *d*, and into a crank chamber *p*.

The cylinder *a* is surrounded by a jacket 18 which is in communication at the top with the crank-chamber *p*. In said chamber *p* is arranged a bracket *q* which serves as a guide for the piston-rod *m* and as an abutment for a spring *r* which surrounds the piston rod and tends to close the valve *n*. Said piston-rod is connected by means of a rod *s* to the crank *t* of a driving shaft *u*, which may be driven by any suitable means, such as a crank *v* fixed on one end. The bearings *e* of this shaft are in the chamber *p* and may, as shown on the drawing, be ball-bearings. At the other end of the shaft *u* is a toothed wheel *x* gearing with a smaller toothed wheel *y* that is connected with a fly-wheel *z*.

The chamber *p* is closed on top by a cover 1 in which are openings 2.

In the wall of the pump-cylinder *a* is formed a channel 3, which connects the interior of the chamber *p* with the cylinder *a* and has its outlet in the latter immediately above the piston, when the latter is in its lowest position. The other end of the channel has its opening or port at the bottom of the chamber *p* and said port is controlled by a valve 4. The valve 4 has a rod 5 which passes through and is guided at one end by the bracket *q* and at its other end is connected to a yoke 6 which is guided in suitable bearings 7 and surrounds the shaft *u*. The valve is raised at each revolution of the shaft by means of a cam 8 on the shaft engaging a cam 9 on the interior of the yoke. The valve is returned to its seat by the action of a spring 10 which surrounds the rod 5 and abuts against the bracket *q* and a collar 5^a on the rod.

The filter is mounted on and secured to

the cover *d* of the cylinder over the inlet end of the passage 3 and comprises a casing having concentric perforated walls 11 forming a central chamber and an annular chamber 5 which latter is filled with felt or other suitable filtering material. Both chambers are closed at the top by a cover 11^a made integral with the walls and the valve 4 passes through said cover which is made to form a 10 fluid tight connection.

When the pump is in operation, the jacket 18 and the crank chamber *p* are filled with a fluid, such as oil, to about the point reached by the crank *t* at its down stroke. As soon 15 as the piston in the cylinder moves upward, from the position shown in Fig. 1, the air in the cylinder above the piston will be compressed and the air together with the oil will be forced through the port controlled by 20 valve *n*. At the same time air will be sucked in under the piston through the hole *b* and when the valve 4 is raised, oil will enter the channel 3, which oil has, before reaching the channel passed through the filter 11 and all 25 of the air-bubbles have been removed therefrom.

When the piston moves down, the oil closes the opening *b* and the air below the piston passes with the oil through the valve 30 *k* and through the holes *h* of the piston. As soon as the piston reaches its lowest position, the oil will completely fill the space below the piston.

The cross-section of the channel 3 can be 35 regulated by means of a screw 12.

In the form of construction shown in Fig. 3 the channel 3^a is formed in the piston-rod *m*, which is surrounded above by a sleeve 13 40 fastened to the cover *d*. This sleeve also carries a filter 11^b. The top opening 15 of the channel 3^a is just opposite a hole 14 in the sleeve 13 when the piston has reached its highest position. The channel 3^a can in this 45 position be filled with oil that has passed through the filter. When the opening 15 is just opposite the hole 14, the bottom opening 16 of the channel 3^a will be closed by the sleeve 13, so that the air on top of the piston cannot pass out through the channel 3.

50 When the piston travels downward, the hole 16 will be opened, and the oil will be sucked into the cylinder *a*.

On the bottom of the filter 11^b is formed a flange 17 which prevents the air that passes 55 out through the valve *n* from influencing the passage of the oil to the filter.

We claim:

1. An air-pump comprising a cylinder 60 provided with an air-inlet, a fluid chamber communicating with the cylinder, means to convey fluid from the chamber to the cylinder, means to filter said fluid and means to discharge fluid and air from the cylinder into the chamber.

2. An air-pump comprising a cylinder 65 provided with an air-inlet, a piston in the cylinder, a fluid chamber communicating with the cylinder through a port, a valve normally closing the latter adapted to be actuated by pressure in the cylinder, a fluid 70 conduit connecting the casing and cylinder, and means to filter the fluid before it enters the cylinder.

3. An air-pump comprising a cylinder 75 provided with an air-inlet, a piston in the cylinder, a fluid chamber extending above the cylinder and communicating therewith through a port, a valve normally closing said port opening into the chamber and adapted to be opened during the pressure 80 stroke of the piston, a fluid conduit connecting the chamber and cylinder, and a filter in the chamber covering the inlet end of the conduit.

4. An air-pump comprising a cylinder 85 provided with an air-inlet, a fluid chamber extending above the cylinder and communicating therewith through a port, an annular valve closing said port, a piston in the cylinder having its rod extending through the 90 valve, a fluid conduit connecting the chamber and cylinder and having its discharge end opening into the latter near the bottom thereof, and a filter in the chamber surrounding the inlet to the conduit. 95

5. An air-pump comprising a cylinder provided with an air-inlet, a fluid chamber surrounding the cylinder and extending 100 above the same, a valved port connecting the cylinder and chamber, a fluid conduit connecting said cylinder and chamber, a filter in the latter mounted over the inlet to the conduit, a valve to close the latter, means to discharge the air and fluid from the cylinder into the chamber and means to open 105 the conduit during said discharge.

6. An air-pump comprising a cylinder provided with an air-inlet near its bottom and an outlet in the top, a fluid chamber surrounding the cylinder and extending 110 above the same, an annular valve opening into the chamber controlling the outlet, a piston in the cylinder having a rod extending through said valve, a crank shaft journaled in the chamber connected to said rod, 115 a fluid conduit connecting the casing and a valve to close the conduit connected with the crank shaft.

7. In an air-pump, the combination with a cylinder having inlet and discharge ports, 120 and a fluid chamber communicating with the cylinder through the discharge port, of a fluid conduit connecting the chamber and cylinder, and a filter interposed between the chamber and conduit. 125

8. In an air-pump, the combination with a cylinder having inlet and discharge ports, and a fluid chamber communicating with

the cylinder through the discharge port, of
a fluid conduit connecting the chamber and
cylinder, and a casing mounted in the cham-
ber comprising concentric perforated plates
5 having a filtering medium between them
and forming a central and annular chamber
surrounding the inlet to the conduit.
In testimony whereof we have signed our

names to this specification in the presence of
two subscribing witnesses.

AUGUST MARIUS KJAERGAARD.
CARL SOEREN JULIUS WIESE.

Witnesses:

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ERNEST BOUTARD.