No. 779,907. PATENTED JAN. 10, 1905.

E. CHESHIRE.

MOTOR AIR PUMP.

APPLICATION FILED FEB. 13, 1904.

3 SHEETS—SHEET 1.

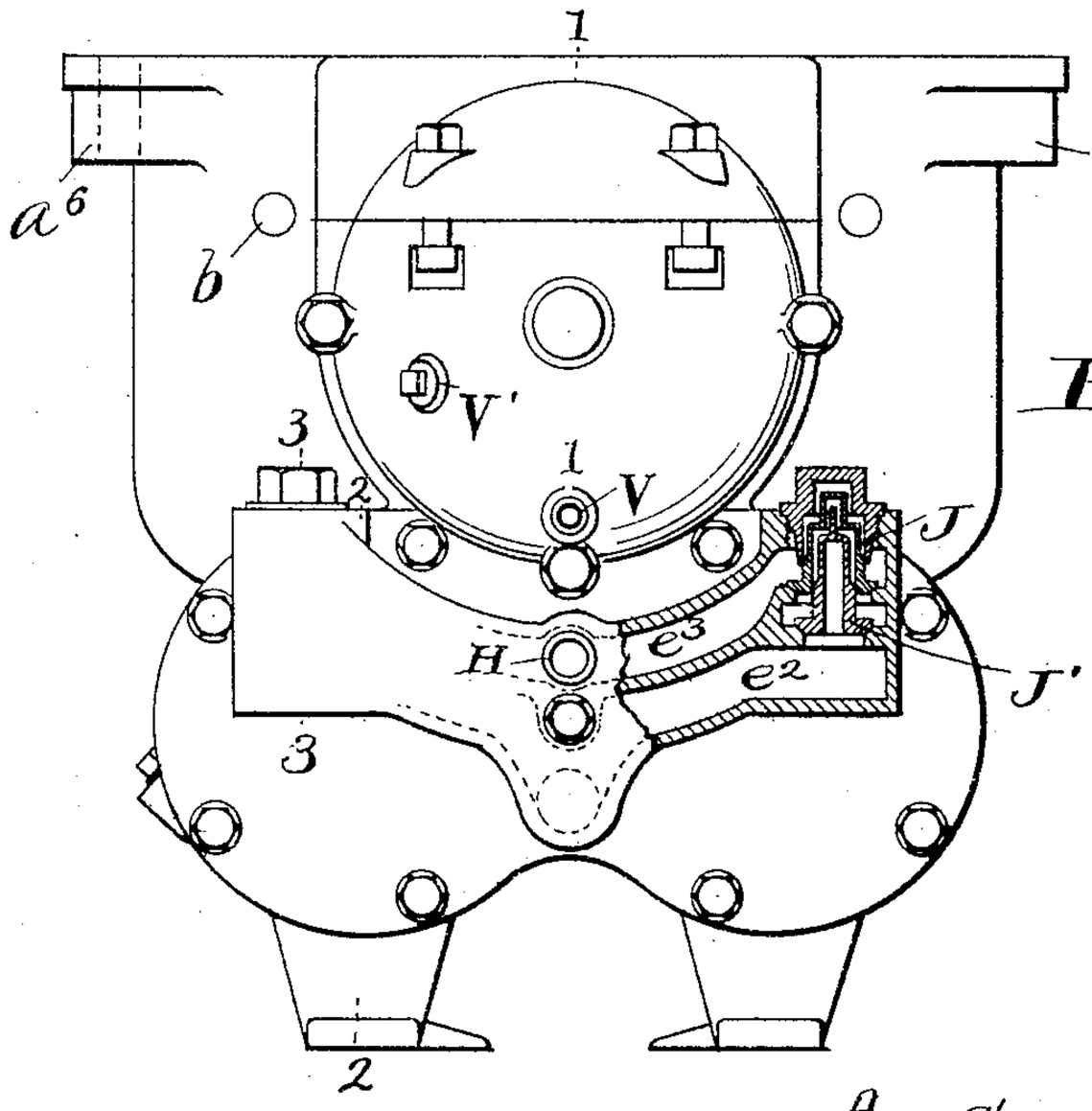


Fig. 1.

Fig. 2.

Witnesses.
E. B. Gilchrist
S. B. Hull.

Inventor
Edward Cheshire,
By his Attorneys,
Thurston & Bates.

No. 779,907. PATENTED JAN. 10, 1905.

E. CHESHIRE.

MOTOR AIR PUMP.

APPLICATION FILED FEB. 13, 1904.

3 SHEETS—SHEET 2.

Fig. 3.

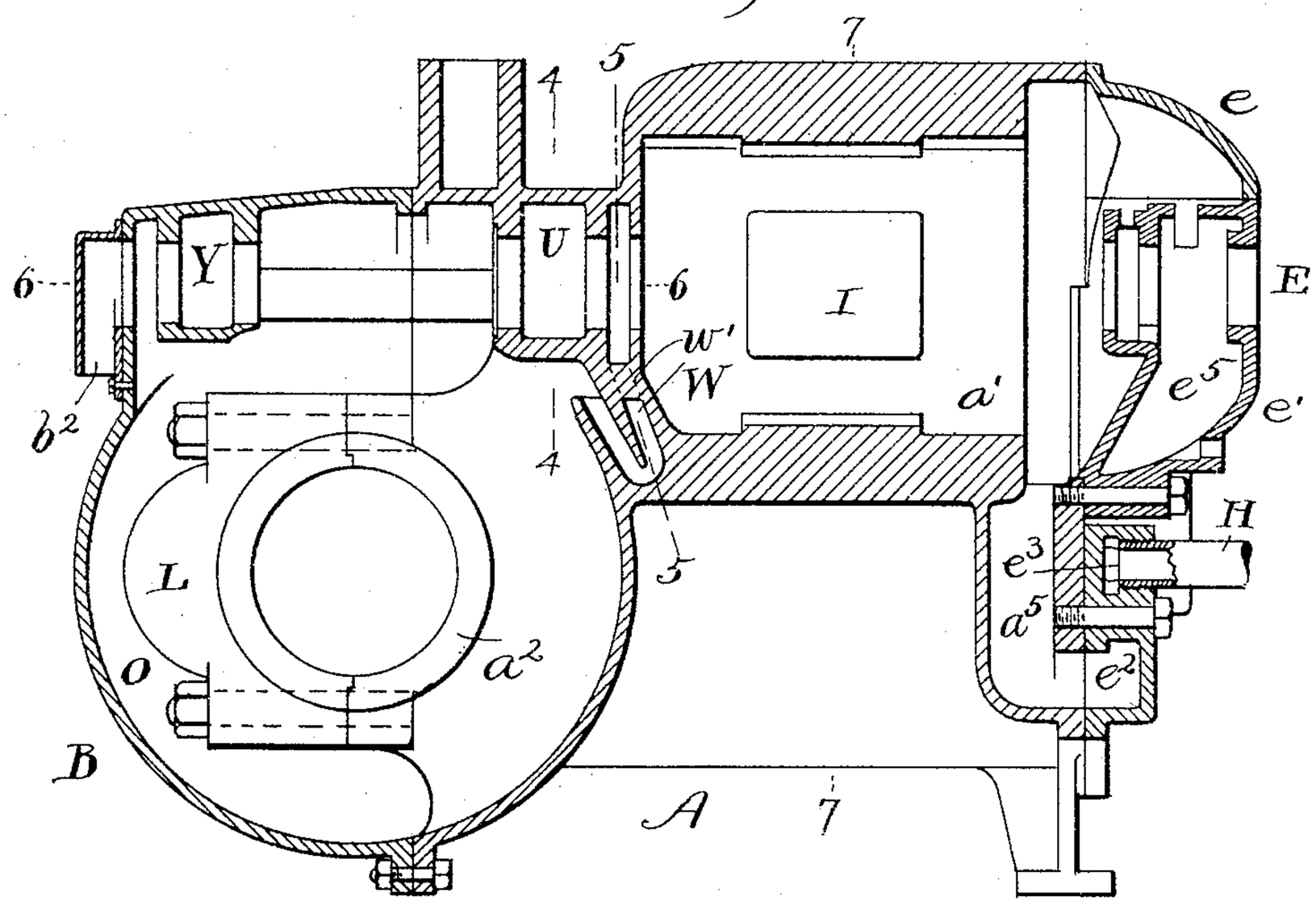


Fig. 4.

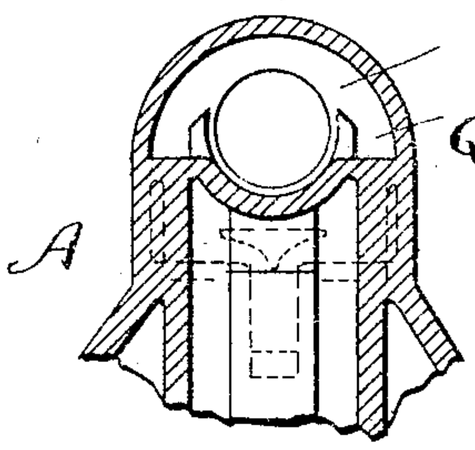
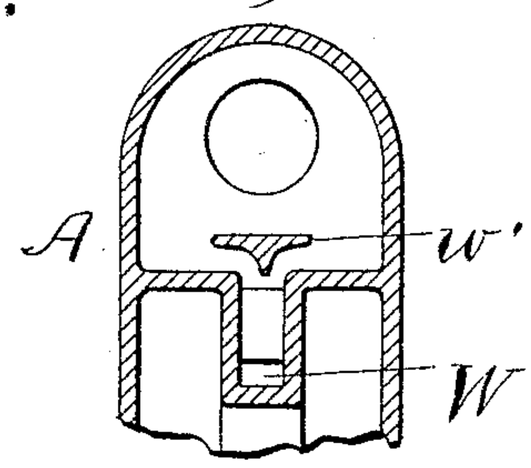


Fig. 5.



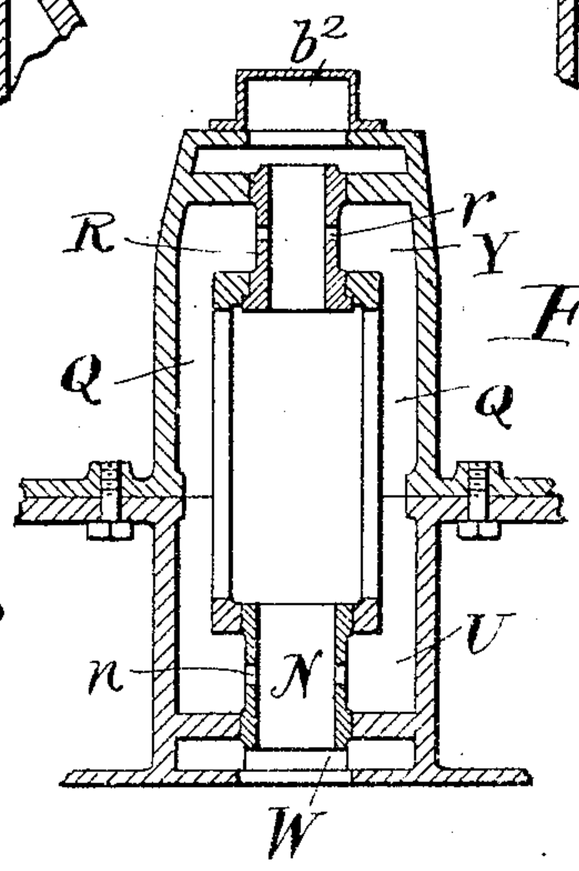


Fig. 6.

WITNESSES.

E. B. Gilchrist

J. B. Hull.

INVENTOR

Edward Cheshire,

By his Attorneys,

Thurston & Bates.

No. 779,907. PATENTED JAN. 10, 1905.

E. CHESHIRE.

MOTOR AIR PUMP.

APPLICATION FILED FEB. 13, 1904.

3 SHEETS—SHEET 3.

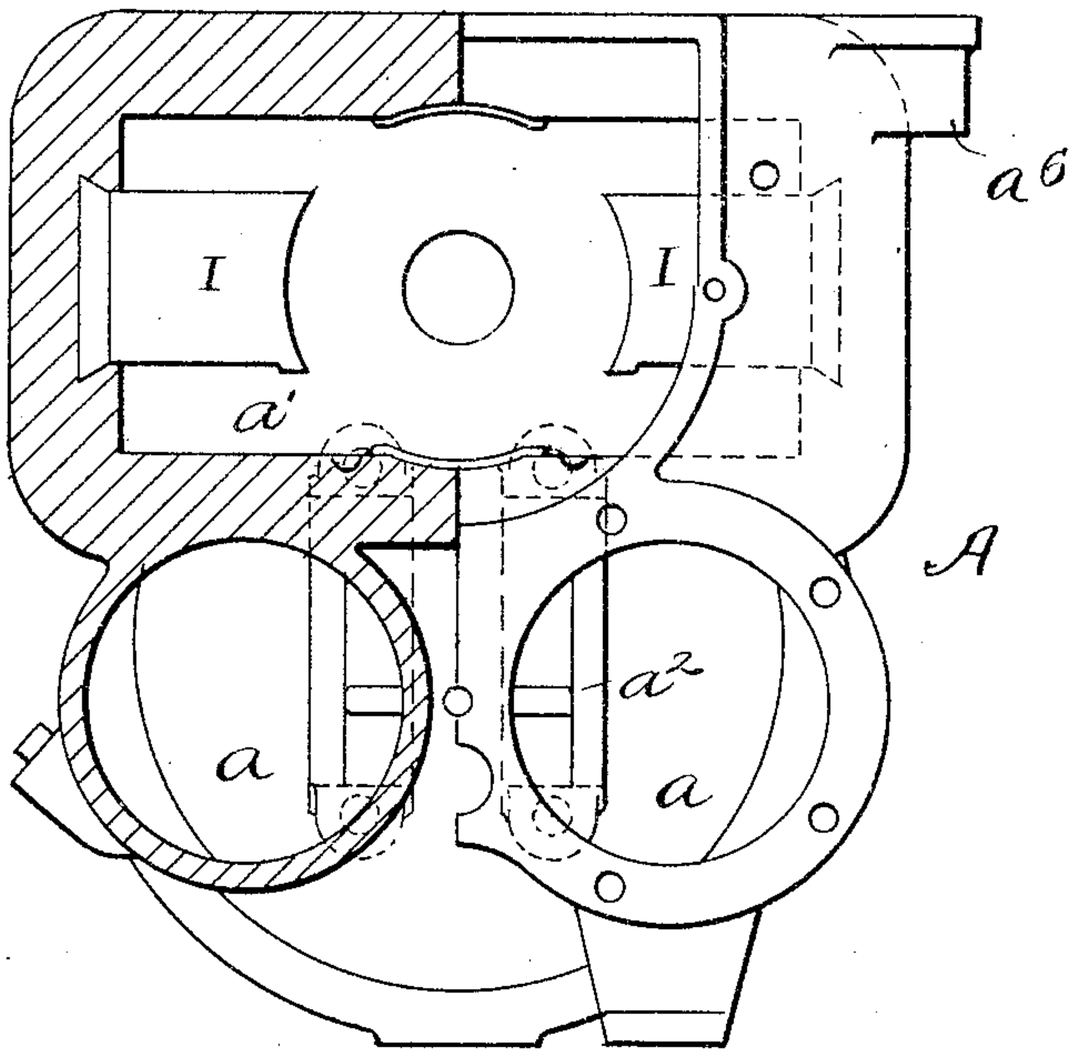


Fig. 7.

WITNESSES.
E. B. Gilchrist
J. B. Hull.

INVENTOR
Edward Cheshire,
By his Attorneys,
Thurston & Bates.

No. 779,907. Patented January 10, 1905.

UNITED STATES PATENT OFFICE.

EDWARD CHESHIRE, OF MILWAUKEE, WISCONSIN.

MOTOR AIR-PUMP.

SPECIFICATION forming part of Letters Patent No. 779,907, dated January 10, 1905.

Application filed February 13, 1904. Serial No. 193,360.

To all whom it may concern:

Be it known that I, EDWARD CHESHIRE, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a certain new and useful Improvement in Motor Air-Pumps, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to machines which include an air pump or pumps, an electric motor, and mechanism by which the motor operates the pumps. Such machines are most used on cars for supplying the compressed air for the air-brakes; but their usefulness is not confined to that field. When used for the specific purpose referred to, the machines are commonly secured beneath the cars, where they are exposed to the dust, dirt, water, ice, &c. It is desirable, therefore, that they shall be sealed, so as to exclude dirt, water, &c., from the mechanism, that said mechanism shall be automatically lubricated and shall be capable of continuous or intermittent operation without attention except at determined intervals, and that the mechanism be capable of being easily inspected or removed for the purpose of repair.

This invention is designed to provide a novel machine of this class having the characteristics specified.

The invention may be here summarized as the combinations of parts shown in the drawings and hereinafter described, and set forth definitely in the claims.

In the drawings, Figure 1 is a front end elevation of a machine embodying the invention. Fig. 2 is a rather complex sectional side elevation of said machine, the upper part of the figure being sectioned in the plane indicated by line 1 1 of Fig. 1, the lower part being sectioned in the plane of line 2 2, and the valve mechanism being sectioned in the plane indicated by line 3 3, all of said lines being found on Fig. 1. Fig. 3 is a central vertical longitudinal section of the body or frame member. Fig. 4 is a sectional view on line 4 4 of Fig. 3. Fig. 5 is a sectional view on line 5 5 of Fig. 3. Fig. 6 is a sectional view on line 6 6 of Fig. 3, and Fig. 7 is a half-section on line 7 7 of Fig. 3.

Referring to the parts by letters, A represents the main frame or casing-body. In it are formed the pump cylinder or cylinders *a a* (two being shown) and above them a recess *a'*, which serves as a housing for the electric motor. This housing is open at the forward end for obtaining access to the same, while its rear end is provided with an opening for permitting the passage of the motor-shaft. The cylinders are open at both ends, and at the rear end of this frame member are two half-cylindrical brackets a^2 a^2, which, together with the removable caps L L, secured thereto, furnish bearings for the crank-shaft D of the pumps. The pump-pistons C are connected by the usual connecting-rods F with the crank-shaft.

The side walls of the housing *a'* serve as field-frames for supporting the field-magnets I of an electric motor. A cap or head E, preferably made of two separable parts *e* and *e'*, is bolted to the front end of the body A, thereby closing the front ends of the motor-housing and the cylinders. In this cap is a port e^2, through which air is drawn into the pump-cylinders through openings a^4, and another port, e^3, through which the compressed air discharged through the openings a^4 is led to the discharge-pipe H.

Suitable valves J J', preferably puppet-valves, are placed in these ports, which open and close automatically in the usual way. In the body A is another port, a^5, which connects the motor-housing with the port e^2. The rear end of the motor-housing is provided with an opening *b* for supplying air thereto. The air to be compressed is all drawn through the motor-housing, thereby keeping the motor cool and ventilated.

In the front head E is a bearing K for the front end of the armature-shaft M, the bearing N for the rear end thereof being a part of the body. A cap B is bolted to the rear end of the body, and this cap is of such form that it completes a chamber O, in which are the crank-shaft D and its bearings and all of the mechanism for transmitting power from

the motor-shaft to the crank-shaft. A worm-shaft P is placed in axial alinement with the armature-shaft M. Its front end, in which is a transverse slot *p*, telescopes into the armature-shaft, to which it is coupled by a pin *m*, which lies in said slot and is secured to the armature-shaft. This coupling allows the armature-shaft to "float" or move endwise slightly to suit its center of magnetic pull without severing its operative connection with the worm-shaft. The rear bearing R for the worm-shaft is on the inside of the cap B. A worm-wheel S, secured to the crank-shaft, engages with the worm-shaft. The three bearings K, N, and R referred to for the armature-shaft and the worm-shaft are sleeves or bushings which are respectively secured to the front cap E, the body A, and the rear cap B. In the front cap is an oil-reservoir e^5, from which oil is automatically supplied to the shaft by an oil-ring T, which dips into the oil in the reservoir and rests upon the armature-shaft in a slot *k* in the bushing. The oil flowing from the ends of this bushing drains back into the reservoir, which may be drained and filled without removing the cap through suitable openings therein, which are ordinarily closed by plugs V V'.

The chamber O contains oil into which the worm-wheel S dips, which wheel carries oil to the worm. The worm throws the oil against the walls around it, and some of this oil running down is caught in trough-like pockets Q, formed on said walls. At one end these pockets discharge into an oil-chamber U, surrounding the middle part of the bushing N, where the bushing is provided with holes *n*, through which the oil in this chamber reaches the shaft. At one end of the bushing the oil drains directly into the chamber O, while at the other end it drains into an oil-trap W in the form of a passage having an upturned lower end, which discharges directly into the chamber O. This trap is primarily for the purpose of preventing the oily vapors due to the leakage of air around the pistons into chamber O from finding their way into the motor-housing. There is a downwardly-directed port or opening b^2 in the cap B, through which it is intended that such oily vapors and air may escape. In the oil-trap below the bushing R is a bridge-wall *w'*, which is V-shaped on its under side. In case the opening b^2 should become stopped up and the air under slight pressure should accumulate in chamber O the impulse of the piston might drive the oil up the trap W and into that part thereof surrounding the shaft. This bridge-wall deflects the oil and prevents it from being thrown directly against the shaft. It will spread out in the upper part of the trap and then run back down the trap.

At their rear ends the pockets Q discharge into an oil-chamber Y, surrounding the bushing R, and it reaches the shaft through holes *r* in said bushing. As it flows from the ends of the bushing it drains directly into the chamber O.

As has been stated before, the cap E is composed, preferably, of two parts, of which the upper part is separably fastened to the lower part by bolts or otherwise. This upper part may be removed to permit the inspection of the motor without removing the entire cap.

On the body A are four lugs or ears a^6, by means of which the entire machine may be suspended from a support above it.

It will be understood many of the details herein described at length are not essential to the invention. Some of them are not new. Others are, and they are mentioned in some of the appended claims, but they, separately or collectively, may be changed in many respects without departure from the primary invention.

Having described my invention, I claim—

1. The combination of a frame member, containing a pump-cylinder and a motor-housing, both of which are open at both ends, and two caps removably secured to the ends of said frame member thereby closing the cylinder at one end and inclosing a chamber at the other end of the housing with which said cylinder and motor-housing communicate, with a pump-piston in the cylinder, an electric motor in the motor-housing, and power-transmission mechanism connecting said motor and pump-piston, a portion of which mechanism lies within said chamber and a portion of which passes through the opening which connects said chamber with the motor-housing, substantially as specified.

2. The combination of a frame member containing a pump-cylinder open at both ends, a cap closing one end thereof another cap closing the other end and inclosing a chamber, a crank-shaft carrying a worm-wheel, and a worm-shaft engaging with said worm-wheel, both of said shafts being mounted in bearings within said chamber, a pump-piston, connections between the pump-piston and crank-shaft, a motor supported by said frame member, there being an operative connection between the motor-shaft and worm-shaft, substantially as specified.

3. The combination of a frame member containing a pump-cylinder, a cap removably secured to the end of said member and forming therewith a closed chamber capable of holding oil, with which chamber said cylinder communicates, an electric motor supported upon said member, a bearing for one end of the armature-shaft of said motor, which bearing is supported by said frame member in said chamber, a worm-shaft in said chamber in alinement with said armature-shaft, a connection between said shafts, a crank-shaft mounted in said gear-chamber, a worm-wheel secured thereto in mesh with said worm-shaft, there being on walls which are around said

worm-shaft, pockets adapted to catch the oil thrown from said worm-shaft, and means whereby said oil may be fed to the bearings of the worm-shaft and armature-shaft herein referred to, substantially as specified.

4. The combination of a frame member or body containing a motor-housing and a pump-cylinder, both open at both ends, a cap secured to one end of said frame member closing the corresponding end of the pump-cylinder and motor-housing, a cap secured to the other end of said frame member thereby forming an inclosed chamber with which said pump-cylinder and motor-housing communicate, an electric motor which is rotatable in said motor-housing, and whose armature-shaft extends into said chamber through the opening in one end of the motor-housing; a crank-shaft, and a worm-shaft both mounted in bearings within said chamber, said shaft being axially alined with the armature-shaft, a worm-wheel secured to the crank-shaft in mesh with the worm-shaft, a coupling between the armature-shaft and said worm-shaft, a pump-piston, and connections between said piston and crank-shaft, substantially as specified.

5. The combination of a frame member containing a pump-cylinder open at both ends, a cap closing one end thereof, another cap closing the other end and inclosing a gear-chamber, a crank-shaft carrying a worm-wheel, and a worm-shaft engaging with said worm-wheel both of said shafts being mounted in bearings within said gear-chamber, a pump-piston, and a connection between the pump-piston and crank-shaft, an electric motor supported upon said frame member, a driving-coupling between the armature-shaft of the motor and the worm-shaft which permits the limited endwise movement of the armature-shaft without disconnecting it from the worm-shaft, substantially as specified.

6. The combination of a frame member containing a pump-cylinder, a cap secured to the rear end of said frame member and forming therewith a closed gear-chamber, the worm-shaft mounted in bearings within said gear-chamber, a crank-shaft mounted in bearings within said chamber, a worm-wheel secured to said crank-shaft in mesh with the worm-shaft, an electric motor mounted upon said frame member with its armature-shaft in alinement with the worm-shaft, a coupling which connects said worm-shaft and the armature-shaft and permits the latter to have a limited endwise movement without breaking the operative connection, substantially as specified.

7. The combination of a frame member containing a pump-cylinder, a cap removably secured to said member and forming therewith a closed oil-holding chamber with which said cylinder communicates, an electric motor supported upon said member, a bearing for one end of the armature-shaft of said motor, which bearing is supported in said frame member in said chamber, a worm-shaft in said chamber in alinement with said armature-shaft, a coupling between said shafts, a crank-shaft mounted in said chamber, a worm-wheel secured thereto in mesh with said worm-shaft, there being, upon walls which are around said worm-shaft, pockets adapted to catch the oil thrown from said worm-shaft, and means whereby said oil may be fed to the rear bearing of the worm-shaft and the bearing of armature-shaft herein referred to, the oil which flows from said bearings being drained into said chamber, substantially as specified.

8. The combination of an inclosed motor, an air-pump, power-transmitting mechanism, and an oil-containing chamber in which said power-transmitting mechanism is inclosed, there being on the walls of said chamber pockets which catch the oil thrown against said walls by said mechanism, and which deliver said oil to one of the bearings of the motor-shaft, and an oil-trap below said bearing where it may catch the oil flowing therefrom, said trap having an upturned lower end which discharges into said chamber, substantially as specified.

9. The combination of an inclosed motor, an air-pump, power-transmitting mechanism, and an oil-containing chamber in which said power-transmitting mechanism is inclosed, there being on the walls of said chamber pockets which catch the oil thrown against said walls by said mechanism, and which deliver said oil to one of the bearings of the motor-shaft, and an oil-trap below said bearing where it may catch the oil flowing therefrom, said trap having an upturned lower end which discharges into said chamber, and a deflecting-wall in said trap below the motor-shaft, substantially as specified.

10. The combination of an air-pump, a motor-housing having an air-inlet near one end and an air-outlet near its other end, and an electric motor in said housing, with power-transmitting mechanism intermediate of said motor and the pump-piston, there being a closed port connecting the air-outlet of the motor-housing with the air-inlet of the pump, whereby the air to be compressed is drawn through the motor-housing to ventilate and cool the motor, substantially as specified.

11. The combination of an electric motor, an air-pump, the axis of whose cylinder is parallel with the axis of the motor-shaft, a worm-shaft in alinement with the motor-shaft, said shafts being telescoped the one into the other, and the inner shaft having a transverse slot in its end, and the outer shaft having a transverse pin which lies in said slot, and power-transmission mechanism intermediate of the worm-shaft and the air-pump piston, substantially as specified.

12. The combination of a frame member containing two parallel pump-cylinders, and a motor-housing, and having two rearwardly-

projecting brackets, caps removably secured to said brackets forming therewith shaft-bearings, a crank-shaft mounted in said bearings, pistons in said cylinders, connections between said cylinders and the crank-shaft, an electric motor in said housing, the field-magnets whereof are secured to the walls of said housing which thereby serves as a field-frame, a cap removably secured to the front end of said frame member over the ends of said cylinders and motor-housing, a cap secured to the rear end of said frame member and forming therewith a chamber, and power-transmission mechanism inclosed in said chamber connecting the motor with the crank-shaft, substantially as specified.

13. The combination of an electric motor, an air-pump, the axis of whose cylinder is parallel with the axis of the motor-shaft, a worm-shaft in alinement with the motor-shaft, a coupling between said motor-shaft and worm-shaft, power-transmission mechanism intermediate of said worm-shaft and the air-pump piston, and a casing by which all of the foregoing parts are inclosed, said casing having removable caps which permit the removal of such parts, substantially as specified.

14. The combination of a frame member containing a motor-housing and a pump-cylinder open at both ends, a cap removably secured to the front end, a cap removably secured to the rear end and forming therewith a chamber, an electric motor in said housing, the field-magnets whereof are secured to the walls or form a part of the housing, and the armature-shaft whereof is mounted in bearings secured respectively to the inside of said cap and to the frame member, worm-shaft alined with the armature-shaft and coupled thereto and mounted in bearings which are wholly inclosed, and mechanism wholly inclosed for transmitting motion from the worm-shaft to the air-pump piston, substantially as described.

15. A motor air-pump frame consisting of a cylinder open at both ends, a motor-housing integral therewith having an opening at one end whereby access may be had to the interior thereof, and an opening at its opposite end for the passage of a motor-shaft, a cap for the front end arranged to close the compression end of the pump-cylinder and said motor-housing and also to carry the bearings for one end of the motor-shaft, another cap for the rear end arranged to close the opposite end of the pump-cylinder and to carry a bearing which will be in alinement with the opening for said shaft.

16. A frame for a motor air-pump consisting of a pair of cylinders arranged side by side, a housing integral with the same arranged to receive the motor, the axis of which is parallel with the axes of said cylinders, said housing being open at its front end and having an opening in its rear end for the passage of the motor-shaft, a cap for the forward end of said frame carrying the pump-ports and valve mechanism and also carrying a bearing, another cap for the rear end of said frame arranged to close the remaining ends of said pump-cylinders, and carrying a bearing which alines with the opening in said motor-housing.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

EDWARD CHESHIRE.

Witnesses:

W. A. NUSSBAUMER,

A. L. VANNAMAN.