W. H. LIEBER.

MOTOR COMPRESSOR.

APPLICATION FILED NOV. 19, 1908.

961,085.

Patented June 7, 1910.

4 SHEETS—SHEET 1.

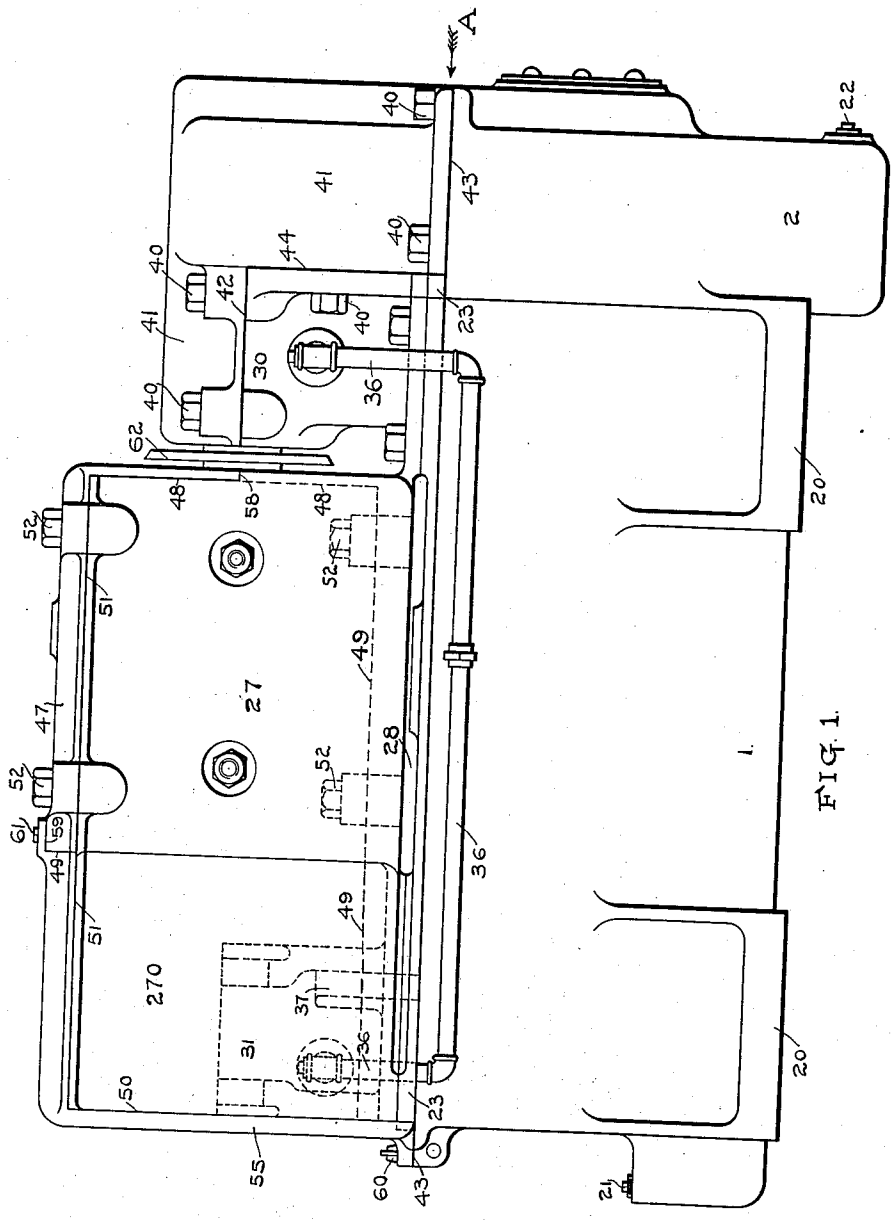

FIG. 1.

WITNESSES:

Ella Brickell

H. C. Case

W. H. Lieber INVENTOR

BY G. J. DeWein ATTORNEY.

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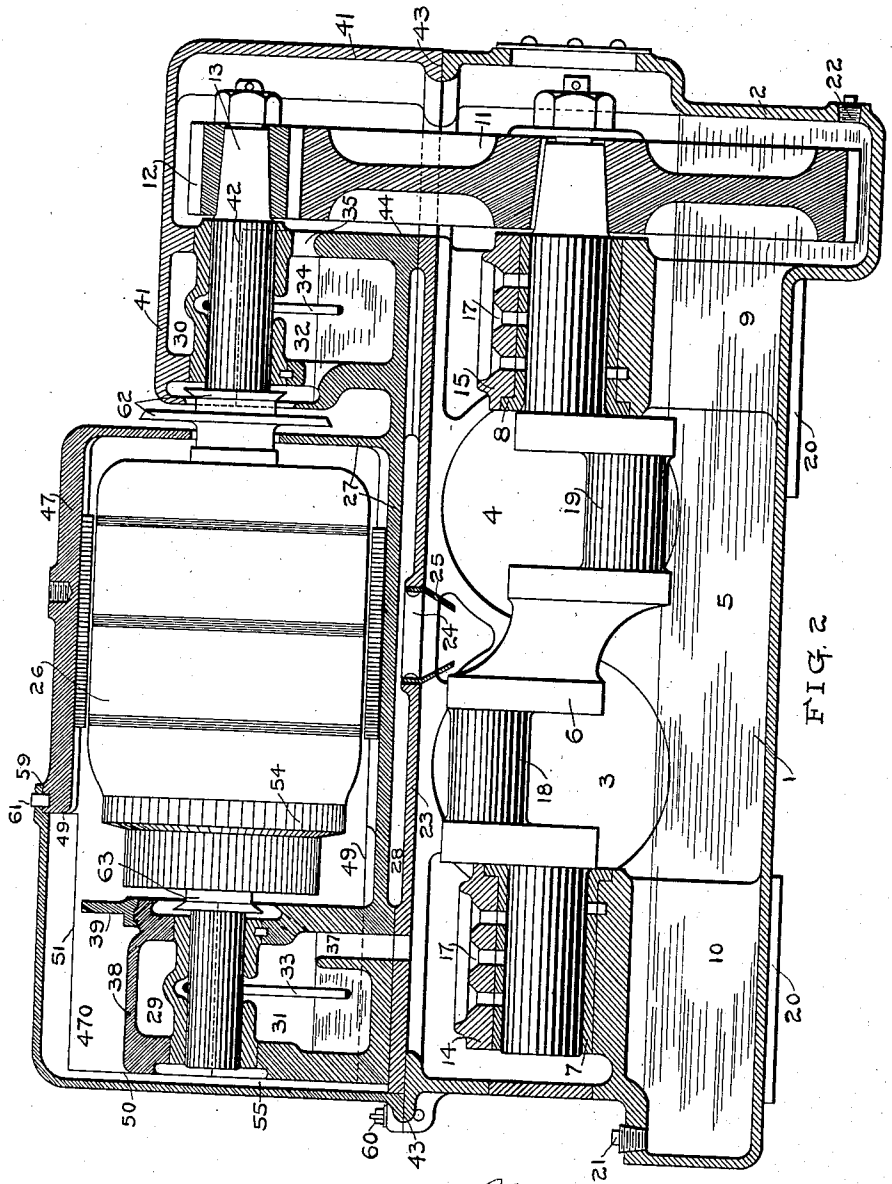

FIG. 2

WITNESSES:

Ella Brickell

H. C. Case

W. H. Lieber INVENTOR

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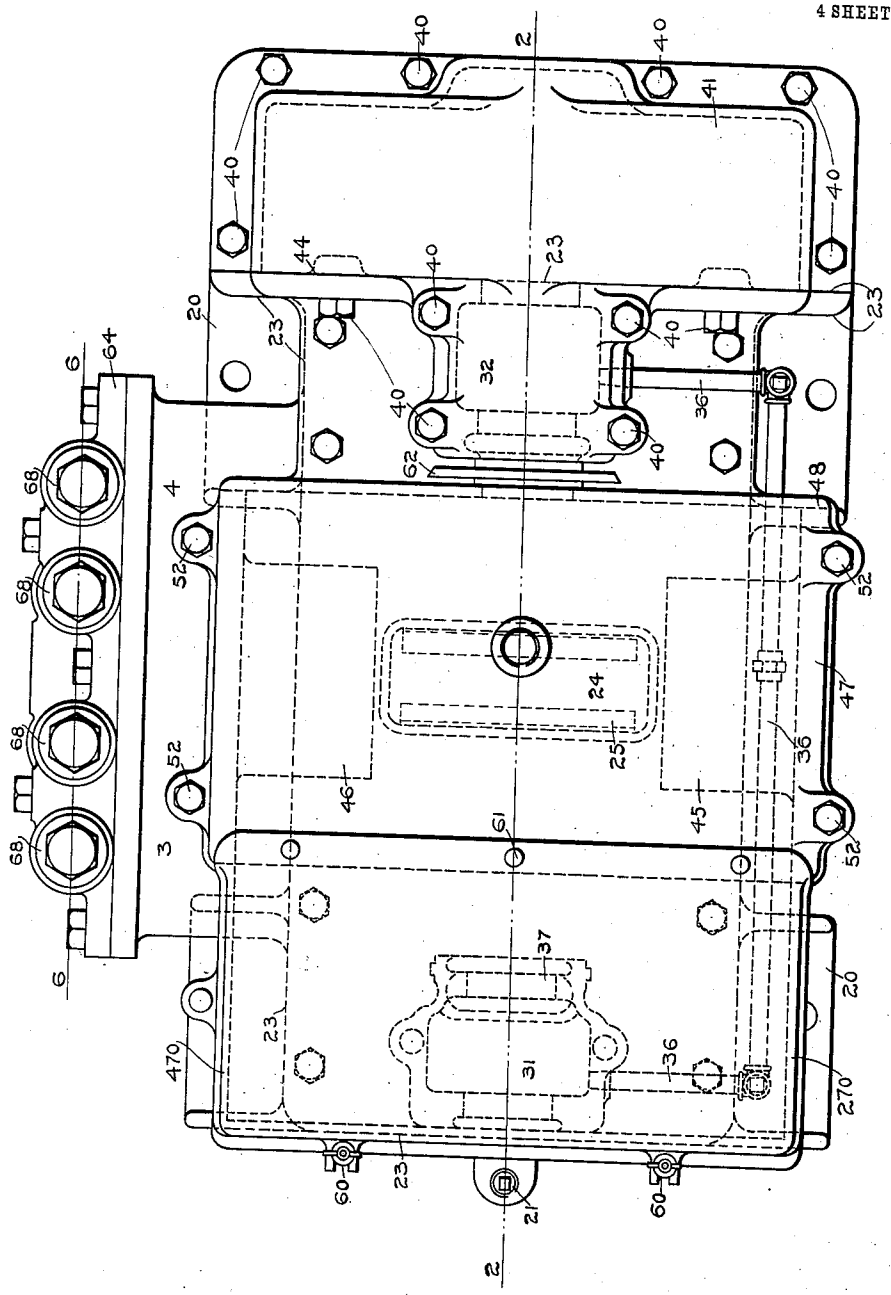

FIG. 3.

WITNESSES:
Ella Brickell
H. C. Case

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W. H. LIEBER.

MOTOR COMPRESSOR.

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4 SHEETS—SHEET 4

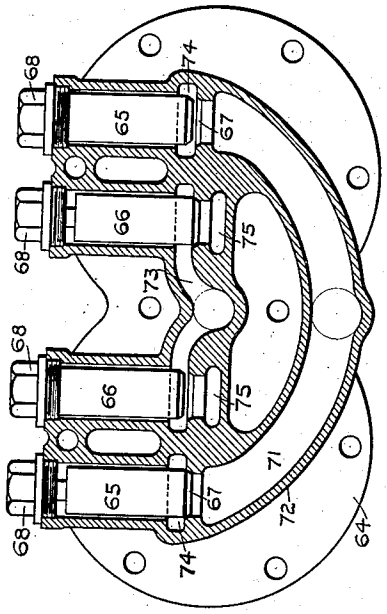

FIG. 6.

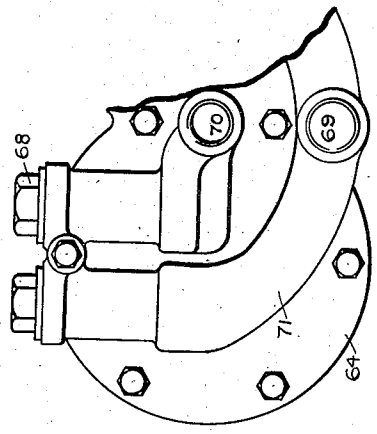

FIG. 5.

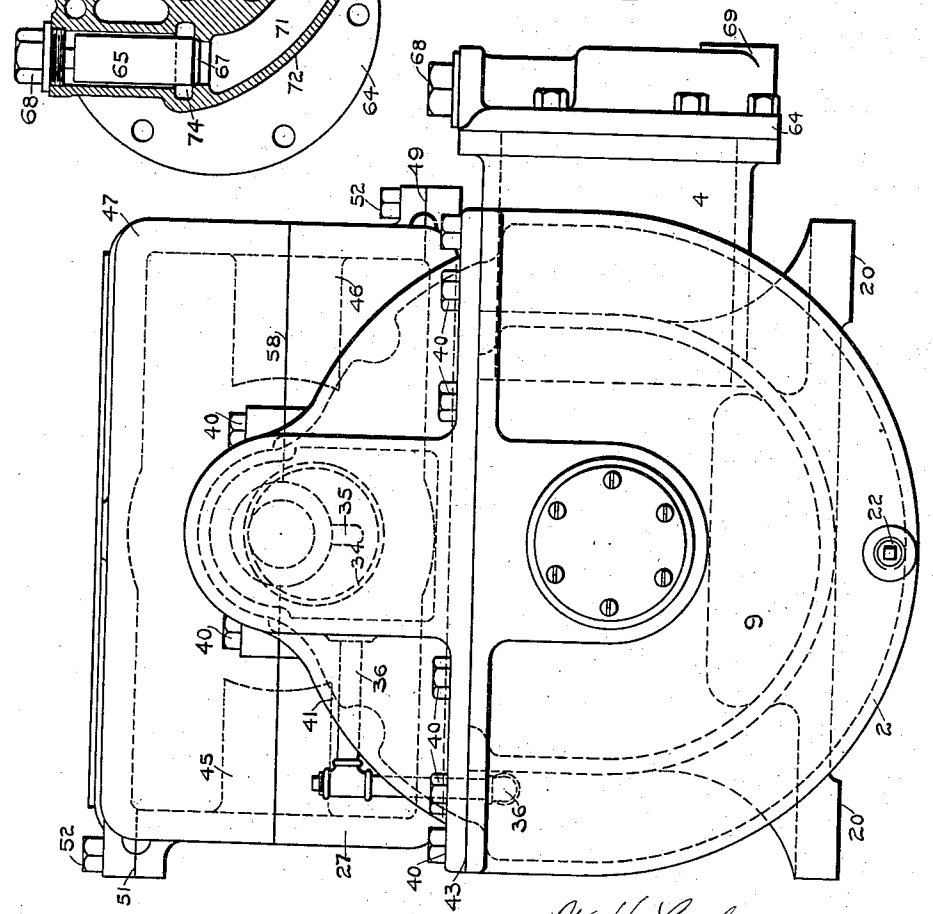

FIG. 4.

WITNESSES:

Ella Brickell

A. C. Cash

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BY G. J. DeWein ATTORNEY.

UNITED STATES PATENT OFFICE.

WILLIAM H. LIEBER, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO ALLIS-CHALMERS COMPANY, OF MILWAUKEE, WISCONSIN, A CORPORATION OF NEW JERSEY.

MOTOR-COMPRESSOR.

961,085. Specification of Letters Patent. Patented June 7, 1910.

Application filed November 19, 1908. Serial No. 463,401.

To all whom it may concern:

Be it known that I, WILLIAM H. LIEBER, 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 Motor-Compressor, of which the following is a specification.

This invention relates to various improvements in the construction of motor driven compressors, and particularly applies to that class in which the motor is mounted above the compressor casing.

The object of the invention is to produce a motor compressor which is simple in its construction as well as being efficient in its operation.

In order to insure satisfactory operation of compressors of this type, all of the working parts must be well lubricated.

A divisional application Serial Number 493,635 has been filed May 3, 1909, covering the system of lubrication herein disclosed.

A further feature is to provide a machine in which the parts are quickly and easily assembled and disassembled and cheaply machined.

A clear conception of the invention is obtained by referring to the drawings accompanying this specification, in which like reference characters designate the same part in different views.

Figure 1 is a front elevation of the device. Fig. 2 is a central vertical section on the line 2—2 of Fig. 3. Fig. 3 is a plan. Fig. 4 is an end elevation looking in the direction of the arrow A, while Fig. 5 is a fragmentary elevation, and Fig. 6 is a vertical section of the cylinder head taken on line 6—6 of Fig. 3.

As shown in Figs. 1, 2 and 4, the crank case 1, the gear case 2, and the cylinders 3 and 4 are cast in one piece. The crank case 1 and gear case 2 are cast with round bottoms, as shown in Fig. 4, in order to produce a stronger casting and give the connecting rods a better sweep through the oil 5 contained therein. The crank shaft 6 is supported by the bearings 7 and 8 in the crank case 1, and lies at right angles to the cylinders 3 and 4. The bearing 8 has an opening 9 thereunder, allowing oil 5 to pass from crank chamber 1 to gear case 2. Bearing 7 has a similar passage 10 thereunder, allowing oil 5 to pass therethrough and through the opening 21 while filling chamber 1 in the casing. The crankshaft 6 has keyed thereon at one end a gear 11 which extends into gear casing 2. The gear 11 extends above the top of the crank case 1 and gear case 2.

The crank shaft 6 is held into the bearings 7 and 8 by means of the bearing caps 14 and 15. These caps 14 and 15 are provided with oil basins through the bottoms of which oil holes 17 are drilled. These oil holes 17 provide the bearings 7 and 8 with the necessary oil for lubrication.

The cranks 18 and 19 of crank shaft 6 are located directly in front of and in line with the open cylinders 3 and 4, see Fig. 2. Connecting rods extend from cranks 18 and 19 to wrist pins in the pistons which reciprocate in the cylinders 3 and 4. The connecting rods, wrist pins and pistons are not shown because their construction is well known in the art. See Christensen 635,280, Oct. 17, 1899.

The combined crank and gear case and cylinders are furthermore provided with lugs or feet 20 by means of which the compressor may be fastened to a support. The gear case 2 is provided with an opening 22 as its lower extremity through which the oil 5 may be drawn off.

The pump base is provided with a cover 23 which extends only as far as the gear case 2, see Figs. 2 and 3, and has an opening 24 therein. This opening 24 serves as a vent and opens directly from the crank case 1 to the atmosphere. The opening 24 is preferably placed between the two cranks 18 and 19 and may have the shields 25 to keep any oil from splashing out due to the revolution of shaft 6.

The motor having the armature shaft 13 is mounted upon plate 23 with as much air space 28 between the motor base 27 and the cover plate 23 as can be allowed for a minimum over all height of machine. This air space 28 is to prevent any heat due to compression in cylinders 3 and 4 from passing to the motor 26.

The motor base 27 contains the two bear-

ings 29 and 30 which support the armature shaft 13. These bearings 29 and 30 contain oil pockets 31 and 32 in which can revolve the oil rings 33 and 34 supported by the armature shaft 13. There is an opening 35 in bearing pocket 32, and an overflow pipe 36 which connects with said pocket at a point at the level of the opening 35, see Figs. 1 and 4. This pipe 36 runs along the side of crank case 1 and enters bearing pocket 31 at a slightly lower level than it emerges from bearing pocket 32. Oil pocket 31 is provided with an overflow 37 which is so located that it will precipitate any overflowing oil into bearing cap 14 over bearing 7 of the crank shaft 6 within the crank case 1.

The bearing 29 at the commutator end of the armature shaft 13 is provided with a bearing cap 38 to which the brush yoke 39 is attached. See Fig. 2. The brushes are of ordinary construction and are not shown. A casting 41 forms a cap for the bearing 30 at the gear end of the armature shaft 13 and also forms a cover for the upper end of the gear case 2. This casting 41 is fastened directly to the gear case 2 and also to the bearing 30 of the motor base 27 by means of cap screws 40 and abuts the end of plate 23 in vertical plane 44. See Figs. 1, 3 and 4. The parting is along two horizontal planes 42 and 43 and one vertical plane 44. See Figs. 1 and 2.

The motor base 27 comprises in one casting the bearings 29, 30, see Fig. 2, and the polepiece 45, see Fig. 4. The remaining polepiece 46 is cast in one piece with the field frame 47. The field frame 47 and motor base 27 part along the planes 51, 48, 58 and 49, see Figs. 1 and 4, and are connected to each other by the cap screws 52. The armature is thus housed in at the gear end by an end wall, the upper half of which is an extension of the field frame 47, while the lower half is an extension of the motor base 27. The other end of the armature, the commutator and the bearing 29 are housed in by a cover 55 which joins the other parts of the machine along the planes 59, 49, 51, 50 and 43, see Figs. 1 and 2. It will thus be seen that the upper edge of the extension 270 on the motor base 27 and the upper edge of the motor base 27 itself, coact with the field frame 47 of the motor and with the cover 55 in a single-plane 51. This cover 55 is fastened to the machine at the edge adjacent the field frame 47 by dowel pins 61, and at the edge adjacent the crank case 1 by pivoted clamping bolts 60. The cover 55 is therefore easily removed by loosening and swinging back clamp bolts 60 and lifting the cover 55 bodily off the dowel pins 61. It should be noted that the cover 55 coacts along the major portion of its side edges with two walls 270, 470, one of which 270, is an extension and forms a part of the motor base 27, while the other 470, is an extension and forms a part of the field frame 47 and joins with the motor base 27 along the plane 49. See dotted line Fig. 1. The armature 56 is also provided with two oil throwers 62 and 63 which prevent any oil from entering the coils.

The cylinder heads shown in Figs. 5 and 6 are cast in one piece 64 and extend over the cylinders 3 and 4 and are fastened thereto by spaced bolts. The casings for the suction valves 65, and likewise the casings for the discharge valves 66, are formed in the cylinder heads. The passages 71, 73 leading to and from these casings are also formed directly in the casting 64. These valves 65 and 66 are of the type known as gravity valves and are limited in their downward travel by valve seats 67, and in their upward travel by caps 68. There is a single suction opening 69 leading to the cylinder heads, and a single discharge opening 70 leading from the heads. The suction opening 69 leads from the outer side of the cylinder heads into a passage 71 leading to the two suction valves 65 from directly underneath them and in line with their motion and connecting with the ports 74 leading directly into the cylinders 3 and 4, the suction opening being at a point in the conduit midway between said suction ports. The passage 71 passes between certain of the cylinder head bolts, so as to be free from interference therewith. Such construction of extending the suction opening 69 into the conduit 71 from the outer side of the cylinder head permits of easy attachment of the necessary suction piping. The location of the suction opening at a point in the conduit midway between the suction ports affords an additional means during casting of the heads of anchoring the core for the conduit 71. This mid-location also serves to equalize the suction for the two cylinders for during operation only half the conduit full of air has to be started into motion at the beginning of each suction stroke. The discharge opening 70 leads from a passage 73 leading from the two discharge valves 66 and connecting with the ports 75 leading directly from the cylinders 3 and 4.

During the operation of the motor compressor, the gear 11 revolving in gear case 2, serves as a pump and carries considerable oil to pinion 12, which oil as it strikes the pinion 12 is deflected endwise therefrom, part of it passing through opening 35 into pocket 32. The oil overflows from pocket 32 through the pipe 36 to pocket 31 in the bearing 29, from which it passes through the overflow 37 to bearing 7. After leaving bearing 7 it passes back to crank case 1 and mingles with oil 5 therein. The lubrication

of the piston, wrist pin and connecting rod is effected by the connecting rod which sweeps through oil 5 and throws it back against the wrist pin. Sufficient oil runs back from gear 11 onto bearing 8 to lubricate it. Thus an automatic oiling of every part is established and the machine needs no manual oiling when once assembled.

By making the rear bearing cap and gear case cover in one casting 41, the upper section of the gear 11, the pinion 12 and the rear bearing 30 are exposed by the removal of one piece. Since the field frame 47 and motor base 27 are made of cast steel, the use of an unnecessary amount of cast steel is avoided by making the gear case cover 41 a separate casting.

It should be understood that it is not desired to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

It is claimed and desired to secure by Letters Patent,—

1. In a motor compressor, the combination of a crank case and a gear case together forming a pump base, a motor over the crank case, bearings for the motor rotor, a cap and gear case cover coacting with one of said bearings and with said gear case and a second cover coacting with the motor and crank case.

2. In a motor compressor, the combination of a crank case, a motor over the crank case, and a cover plate spaced from the motor and between said motor and the crank case, said cover plate having a port therethrough into said space for venting said crank case.

3. In a motor compressor, the combination of a crank case and a gear case together forming a pump base, a cover plate on the crank case, a motor on the cover plate, a gear case cover and a second cover coacting with said pump base for inclosing working parts.

4. In a motor compressor, a motor, an extension on the motor field frame, a second extension on the motor base, and a cover, all coacting to form a casing for the commutator end of the motor.

5. In a motor compressor, a crank case and a gear case together forming a pump base, a motor mounted over said crank case, a crank shaft within said crank case, said motor being geared with said crank shaft, a bearing for said motor said bearing lying over said crank case, and a gear case cover over said gear case said cover extending upwardly from a level at least as low as the bottom of said motor and said cover being separate from said bearing and having an extension over said bearing forming a cap therefor.

6. In a motor compressor, a pump base including a gear case, a motor over said pump base, bearings for said motor formed in one piece with the motor frame, a gear case cover and a second cover each coacting with the pump base and with the motor and each cover separately and alone detachable from the pump base and motor.

7. In a motor compressor, a crank case and a gear case together forming a pump base, a motor mounted over said crank case, a crank shaft within said crank case, said motor being geared with said crank shaft, cover elements comprising a cover plate between the motor and the crank case, a gear case cover, and a second cover, all three of said cover elements coacting with the crank case in a single plane.

8. In a motor compressor, a pump base, a motor over said pump base, a bearing at the commutator end of said motor formed in one piece with the motor frame, and a plurality of covers each coacting with an upper surface of said pump base and of said motor, for inclosing working parts including said commutator.

9. In a motor compressor, a crank case and a gear case together forming a pump base, a motor mounted over said crank case, a crank shaft within said crank case, said motor being geared with said crank shaft, and an extension on the field frame for inclosing working parts, the lower edge of the extension and the lower edge of the field frame coacting with the motor base in a single plane.

10. In a motor compressor, a crank case and a gear case together forming a pump base, a motor mounted over said crank case, a crank shaft within said crank case, said motor being geared with said crank shaft, a cover, and an extension on the motor base for inclosing working parts, the upper edge of said extension and the upper edge of the motor base coacting with the field frame of said motor and with the cover in a single plane.

11. In a motor compressor, a plurality of horizontal cylinders, a head common to said cylinders, bolts for fastening said head to said cylinders, separate suction and discharge ports formed in said head for each of said cylinders, valves in said head for controlling said ports, and a conduit formed in said head connecting and directed to said suction ports in line with the motion of said suction valves at points near said ports, said conduit being gradually curved from one of said suction valves to another of said suction valves and passing between said bolts to be free from interference therewith and said head having formed therein from its outer side an atmospheric suction opening leading to said conduit at a point midway between said suction ports.

12. In a motor compressor, a pump base,

a motor over said pump base, and a plurality of covers, each coacting with said pump base in a single plane and with said motor, for inclosing working parts.

13. In a motor compressor, a pump base, a motor over said pump base, a cover plate between said motor and said pump base, and a second cover coacting with an upper surface of said pump base and an end surface of said motor.

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

WILLIAM H. LIEBER.

Witnesses:
G. F. De Wein,
H. C. Case.