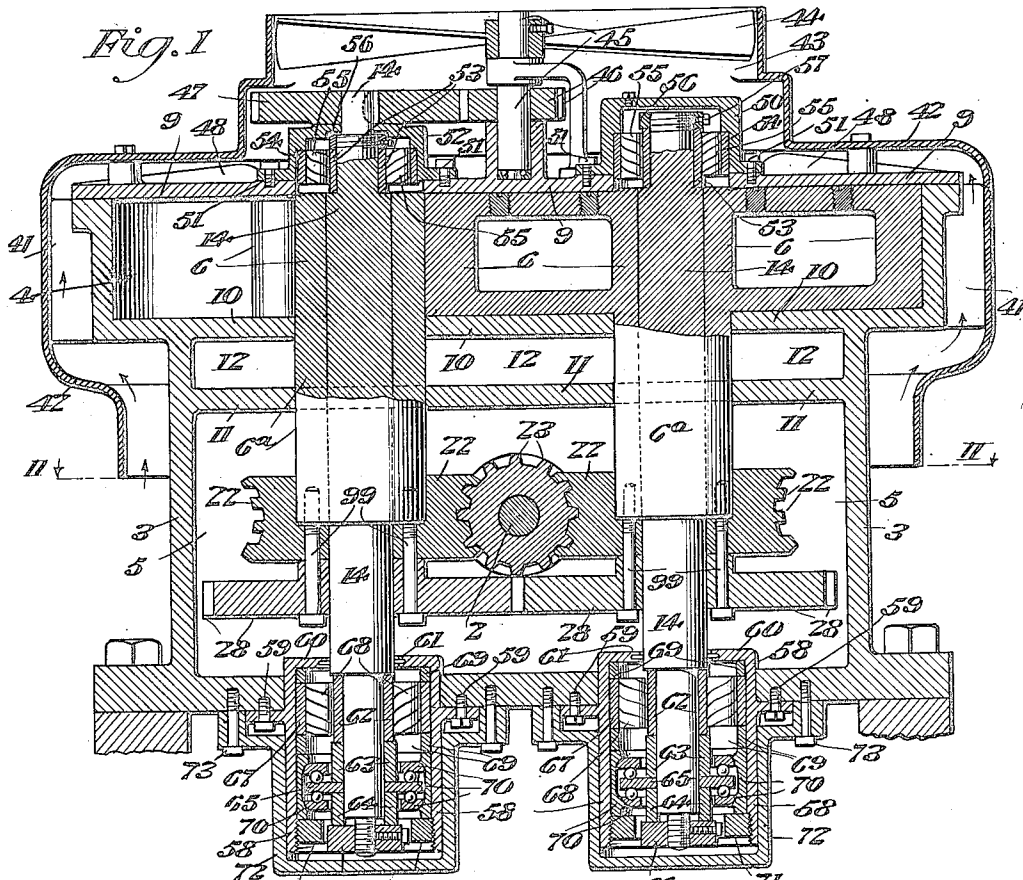
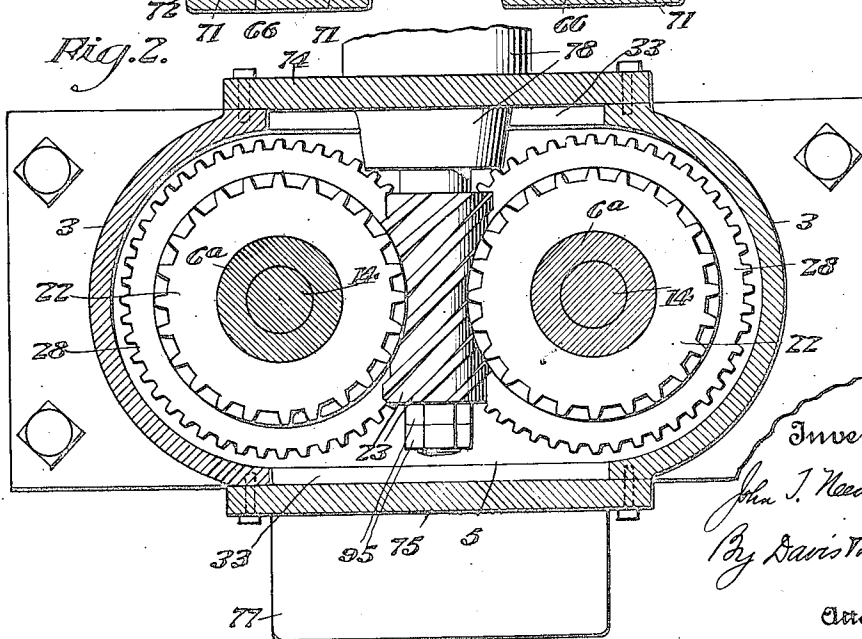


J. T. NEEDHAM.
 ROTARY BLOWER.
 APPLICATION FILED AUG. 14, 1919.

1,386,792.

Patented Aug. 9, 1921.

3 SHEETS—SHEET 1.



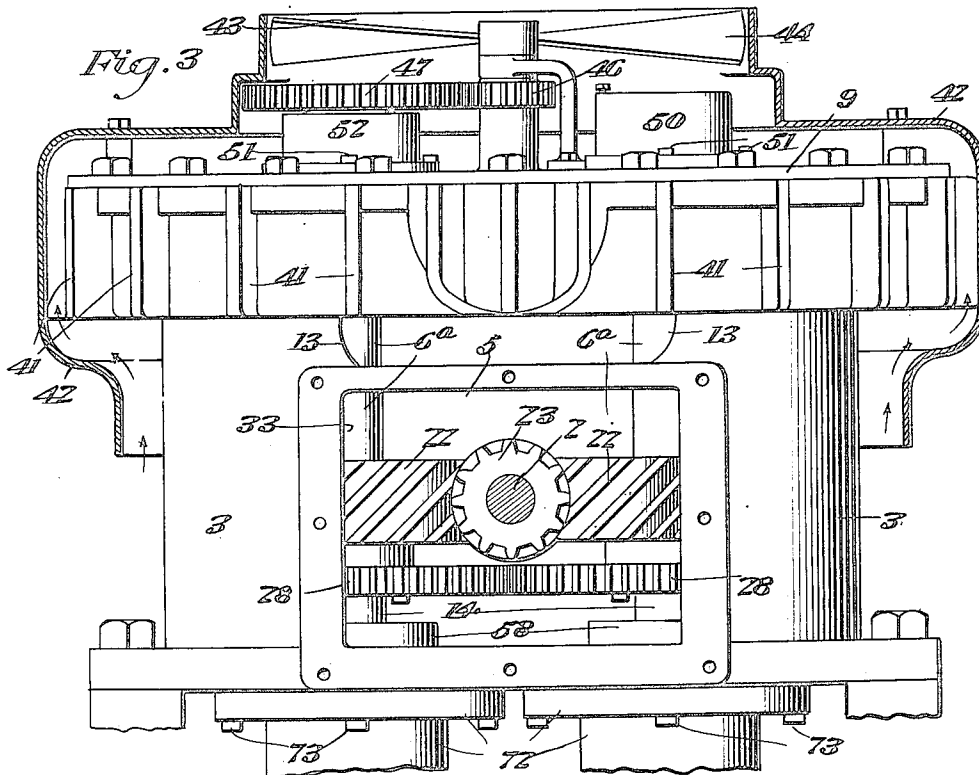
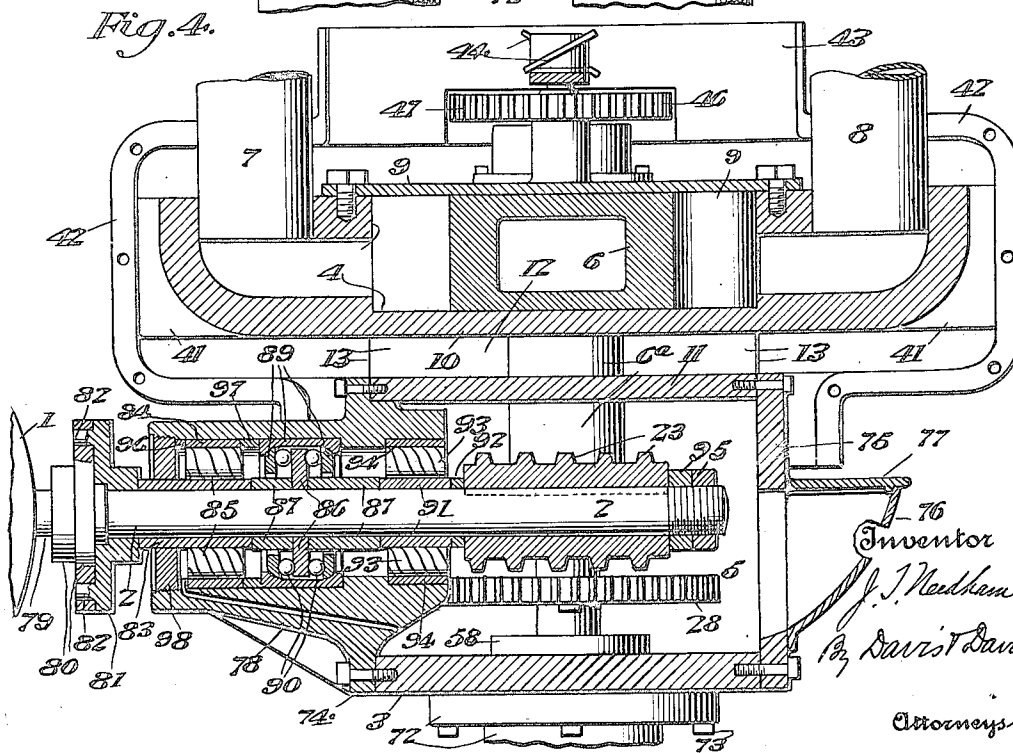
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3 SHEETS—SHEET 2.

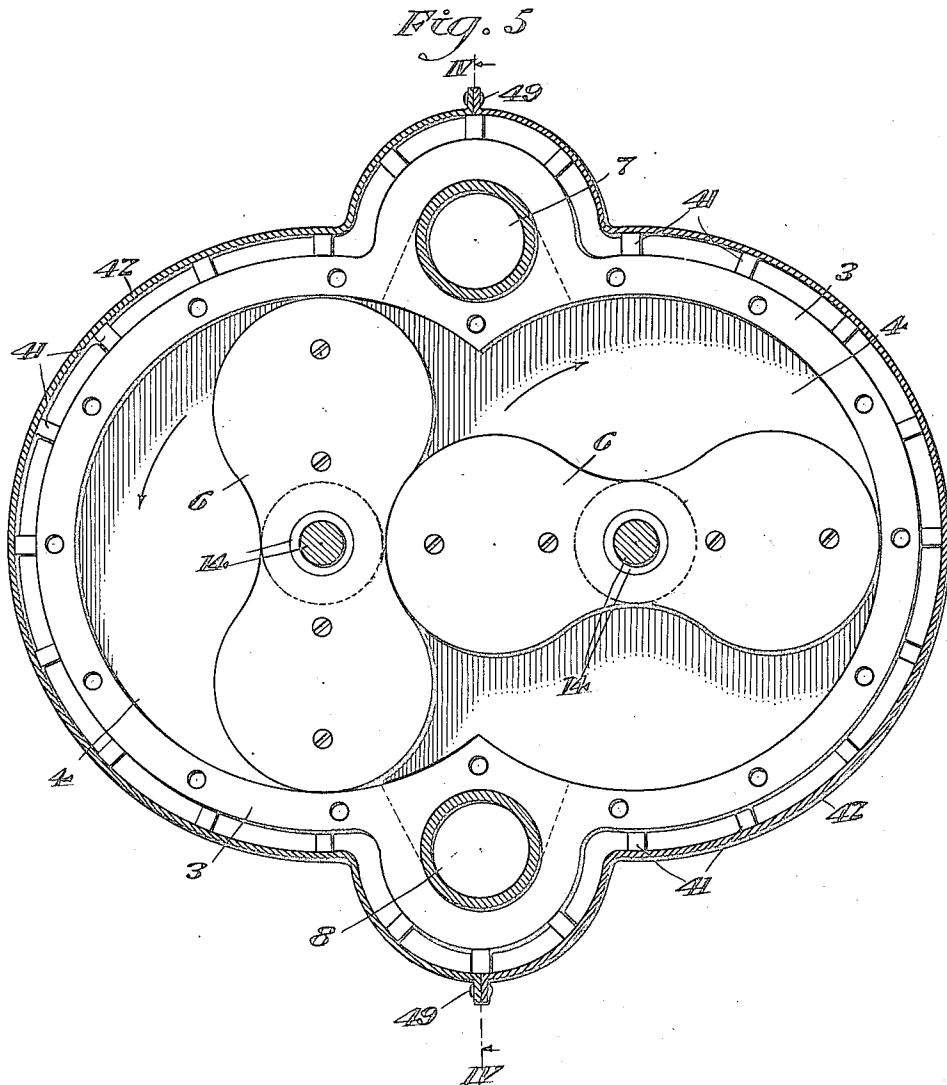
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UNITED STATES PATENT OFFICE.

JOHN T. NEEDHAM, OF BAYONNE, NEW JERSEY.

ROTARY BLOWER.

1,386,792.

Specification of Letters Patent.

Patented Aug. 9, 1921.

Application filed August 14, 1919. Serial No. 317,506.

To all whom it may concern:

Be it known that I, JOHN T. NEEDHAM, a citizen of the United States, and resident of Bayonne, county of Hudson, and State of New Jersey, have invented certain new and useful Improvements in Rotary Blowers, of which the following is a specification.

This invention relates to that class of rotary blowers in which two intermeshing rotors or impellers are mounted within a casing, said rotors drawing air through an intake at one side of the casing and discharging the air through an outlet at the other side of the casing. The shape and operation of these rotors are well known and need not be particularly described herein. An example of this type of blower is shown in my former Patent No. 1,315,234, dated Sept. 9, 1919. The present invention relates principally to improvements in the construction and arrangement of the driving mechanism for rotating the impellers or rotors, to the construction of the blower casing, and to the arrangement of the rotors and various parts of the driving means in the blower casing.

One of the objects of the invention is to provide a driving mechanism for the rotors of simple and strong construction so designed that the strain will be equally distributed and simultaneously applied directly from the drive shaft of a prime mover, or a shaft section rotating therewith, to the rotor shafts, said driving mechanism being of such a character that it will serve as a speed reducing means and being so constructed that the various elements thereof may be readily assembled and dismantled.

In the drawings; Figure 1 is a vertical sectional view of the improved blower;

Fig. 2 a horizontal sectional view on the line II—II of Fig. 1;

Fig. 3 a side elevation of the blower, the air jacket being shown in vertical section, and the plate closing one end of the oil chamber being removed;

Fig. 4 a vertical sectional view on the line IV—IV of Fig. 5; and

Fig. 5 a plan view of the blower, the air jacket being shown in horizontal section.

Referring to the various parts by numerals, 1 designates an electric motor for driving the blower, which motor may be of any suitable construction and has its shaft directly connected to the driving shaft 2 of the blower. The blower casing 3 is formed with a compression or rotor chamber 4 at its up-

per end and with an oil chamber 5 directly under the rotor chamber. Two cooperating rotors or impellers 6 are mounted in the compression or rotor chamber 4 and are adapted to be rotated in opposite directions by the mechanism hereinafter described. The impellers rotate in the direction indicated by the arrows in Fig. 5 of the drawings and are adapted to draw air into chamber 4 through the passage 7 and discharge the air through the passage 8 in the usual manner of air compressors or blowers of this type.

The upper side of the compression or rotor chamber 4 is formed by a removable wall or plate 9. Between the bottom wall 10 of the rotor chamber and the top wall 11 of the oil chamber the blower casing is formed with an air space or chamber 12, which is open to the atmosphere at 13 as shown in Fig. 3. This air chamber 12 is thus freely ventilated so that there can be no accumulation of oil therein, and also serves to prevent oil creeping up the rotor shafts into the compression chamber.

The rotors or impellers 6 are formed with elongated depending hub portions 6^a which extend through the walls 10 and 11 and air space 12 and into oil chamber 5, said rotors being cast on rotor shafts 14 so as to become practically integral with the shafts, each rotor being thus securely held to its shaft to rotate in unison therewith. The rotor shafts 14 extend vertically through the chambers 4, 12 and 5, the hub portions 6^a of the rotors fitting closely in suitable apertures in the walls 10 and 11, and the ends of the rotor shafts projecting at their upper and lower ends through relatively large apertures formed in the top plate 9 of the rotor chamber and the bottom wall of the oil chamber.

The reduced upper ends of the rotor shafts 14 are surrounded by housing or bearing caps 50 and 52 detachably held to the removable top plate 9 of the rotor chamber by screws or bolts 51 and serving to prevent leakage of air around the shafts through the apertures in said top plate. A metallic sleeve or bushing 53 surrounds the reduced upper portion of each rotor shaft and concentric bushings 54 fit closely within the housings and surround the sleeves 53. A series of antifriction rollers 55 of any suitable construction are mounted in each housing between the bushings 53 and 54. The

- bushings 53 fit snugly on the reduced upper end portions of shafts 14 and are clamped tightly against the shoulders formed on the shafts at the lower ends of said reduced upper portions thereof so as to rotate with the shafts, said bushings being clamped in place by nuts 56 threaded on the rotor shafts. The nuts 56 are locked in place by set screws 57.
- The lower ends of the rotor shafts which project through the large apertures in the bottom wall of the oil chamber, as above described, are reduced in diameter and are surrounded by housings 58 which fit snugly in said apertures. The housings 58 are detachably held to the bottom wall of the oil chamber by screws or bolts 59, the upper ends thereof being formed with annular flanges 60 and the lower ends thereof being open and provided with internal screw threads. A felt or other packing strip 61 is held to each of the flanges 60, said strips 61 being adapted to permit oil to flow downwardly into the housings 58 from chamber 5 but serving to prevent particles of grit, metal or the like from entering the housings. Three metallic sleeves or bushings 62, 63 and 64 fit snugly upon the reduced lower end portions of each rotor shaft within each of the housings 58. The uppermost sleeves 62 abut against the shoulders formed on the shafts at the upper ends of said reduced lower portions of the shafts, the sleeves 63 abut against the lower ends of sleeves 62 and a thrust ring 65 is clamped between the adjacent ends of sleeves 63 and 64. The sleeves 62, 63 and 64 and thrust plate 65 are clamped end to end so as to rotate with the rotor shafts by nuts 66 threaded on the lower ends of said shafts and locked in place by suitable set screws, as shown. A bushing 67 fits closely within the housing 58 and surrounds the sleeve 62, and a series of antifriction rollers 68 are mounted between said bushing and sleeve. A pair of spacing rings 69 fit within the housing at opposite ends of the bushing 67 and a ball-bearing cage 70 fits within the housing below the lower spacing ring. The ball cage 70 embraces the thrust plate 65 and a series of antifriction balls is held against both the upper and lower faces of the thrust plate by said cage, the cage, plate and balls forming a duplex thrust bearing adapted to resist end thrust of the rotor shaft in either direction. The spacing rings, bushing 67, and cage 70 are removably locked in the housing 58 by a collar 71 screwed into the threaded lower end of the housing. In order to prevent waste of oil through the open lower ends of the housings 58, the open end of each housing is sealed by a closure cap 72 detachably held to the bottom wall of the oil chamber by screws or bolts 73.
- The casing 3 at opposite sides of the oil chamber 5 is provided with two large oppositely disposed openings 33 closed by removable plates or walls 74 and 75 held in place by suitable screws or bolts, as clearly shown in Figs. 2 and 4. A filling spout 76 is formed integrally with the plate 75 and communicates with the interior of the oil chamber, said spout having a removable closure or cover plate 77. The removable wall or plate 74 is formed with an elongated tubular portion or shaft casing 78 projecting at opposite sides thereof. The driving shaft 2 extends horizontally through the tubular casing or housing 78 and into the oil chamber 5 between the two rotor shafts 14. The shaft 79 of the motor 1 and the drive shaft 2 are arranged end to end and are provided with fixed coupling members or disks 80 and 81, said disks being separably interlocked to rotate in unison by means of pins or projections 82 formed on the disk 81 which engage in apertures in the disk 80. Two antifriction shaft supporting bearings are arranged in the housing 78 adjacent the inner and outer ends thereof. The outer bearing comprises a sleeve 83 embracing the shaft 2 and engaging the disk 81 at its outer end, a bushing 84 fitting closely in the shaft casing, and a series of antifriction rollers 85 located between the sleeve and bushing. A pair of spacing rings 96 and 97 fit within the shaft casing at opposite sides of the bushing 84. Intermediate the ends of the shaft casing is a duplex end-thrust bearing comprising a thrust plate 86 clamped between a pair of sleeves 87 and 88 embracing shaft 2, a ball bearing cage 89 clamped between the inner spacing ring and an internal shoulder on the shaft housing, and two series of antifriction balls 90 held against opposite sides of the thrust plate by the ball cage 89. The inner shaft supporting bearing comprises a sleeve 91 embracing shaft 2 and clamped between spacing ring 88 and a spacing ring 92, a bushing 94 fitting closely within the housing 78, and a series of antifriction rollers 93 confined between the sleeve 91 and bushing 94.
- A worm 23 is keyed on the inner end of the shaft 2, and said worm, the thrust plate 86, the sleeves 83, 87, 88 and 91, and spacing ring 92, are clamped end to end by lock nuts 95 threaded on the inner end of the shaft 2 so that said sleeves, ring and plate will rotate with the shaft. The rings 96 and 97, bushing 84, and ball cage 89 are clamped end to end by a collar or closure plate 98 threaded in the outer end of the housing 78.
- A pair of worm gears 22 are loosely mounted on the rotor shafts 14 within the oil chamber 5 in mesh with the worm 23 and serve to drive said shafts in opposite directions. Each worm gear 22 is formed with a recess or socket in its upper face in

which the lower end of the adjacent hub portion 6^a of one of the rotors engages. A pair of intermeshing spur gears 28 are loosely mounted on the shafts 14 below the worm gears 22 and serve as locking gears to maintain the rotors 6 in proper relation. The locking gears and worm gears are detachably held to the hub portions of the rotors by screws or bolts 99 which pass upwardly through the locking and worm gears and are threaded into the lower ends of the hub portions of the rotors. As the locking gears receive little or none of the driving strain they will not wear appreciably and consequently will maintain the rotors in proper relation notwithstanding wearing of the driving gearing.

To prevent heating of the walls of the compression or rotor chamber 4, the side walls of said chamber are formed with vertical cooling ribs 41 and the top wall 9 of the chamber is formed with cooling ribs 48. An air jacket 42 surrounds the sides of chamber 4 and extends over the top of the chamber. The lower or intake end of the jacket is open and the upper end thereof is formed with a circular opening 43 in which is mounted a fan or blower 44 adapted to draw air upwardly through the air jacket. The fan 44 is fixed on a stub shaft 45 journaled in suitable bearings on the top plate 9 of the rotor chamber. A pinion 46 fixed on shaft 45 is driven by a larger gear 47 fixed on the upper end of one of the rotor shafts 14 which projects through the top of the bearing housing or cap 52. The air jacket or shell 42 is preferably formed in two half sections secured together by bolts or rivets 49, as clearly shown in Fig. 5.

From the foregoing it will be observed that the several parts of the blower may be readily assembled, and that when desired the various bearings and other parts may be readily removed and renewed or repaired with a minimum of interference with or derangement of the remaining parts of the blower.

What I claim is:

1. A blower comprising a casing having a rotor chamber provided with a removable top wall and an oil chamber below the rotor chamber, a pair of rotor shafts extending through said chambers, a pair of rotors in the rotor chamber fixed on the rotor shafts and provided with integral hubs depending into the oil chamber, a horizontal drive shaft extending into the oil chamber between the rotor shafts, a worm held to said drive shaft, and a pair of worm gears loosely mounted on the rotor shafts within the oil chamber meshing with said worm and detachably held to the hubs of the rotors to rotate with said hubs.

2. A blower comprising a casing having

a rotor chamber, a pair of rotor shafts journaled in the casing, a pair of rotors in the rotor chamber cast on said shafts and formed with integral hubs extending from one face thereof through the adjacent wall of the rotor chamber, a drive shaft journaled in the casing exteriorly of the rotor chamber and extending transversely between the rotor shafts, a worm fixed on said drive shaft, and a pair of worm gears detachably held to the hubs of the rotors and meshing with said worm.

3. A blower comprising a casing having a rotor chamber provided with a removable top wall and an oil chamber below the rotor chamber, a pair of rotor shafts extending through said chambers, a pair of rotors in the rotor chamber fixed on the rotor shafts and provided with integral hubs depending into the oil chamber, a horizontal drive shaft extending into the oil chamber between the rotor shafts, a worm held to said drive shaft, a pair of worm gears loosely mounted on the rotor shafts within the oil chamber and meshing with said worm, a pair of spur gears loosely mounted on the rotor shafts within the oil chamber and meshing with each other, and means for detachably securing the worm gears and spur gears to the hubs of the rotors.

4. A blower comprising a casing having a rotor chamber provided with a removable top wall, a pair of vertical rotor shafts journaled in the casing and extending through the bottom wall of the rotor chamber, a pair of rotors in the rotor chamber fixed on the rotor shafts and having hubs extending downwardly through the bottom wall of the rotor chamber, a drive shaft extending transversely between the rotor shafts below the rotor chamber, a worm held to said drive shaft to rotate therewith, a pair of worm gears loosely mounted on the rotor shafts meshing with said worm, a pair of intermeshing gears loosely mounted on the rotor shafts below the worm gears, and fastening devices extending upwardly through the intermeshing gears and worm gears and threaded into the lower ends of the hubs of the rotors.

5. A blower comprising a casing having a rotor chamber and an oil chamber below the rotor chamber, said rotor chamber having a removable top wall and the oil chamber having a removable side wall formed with an elongated tubular shaft-housing portion extending transversely of the plane of said side wall, a pair of rotor shafts extending through said chambers, a pair of rotors in the rotor chamber fixed on the rotor shafts and having hubs depending into the oil chamber, a drive shaft journaled solely in the tubular shaft-housing formed on the removable side wall of the oil chamber, and extending between the rotor shafts, a worm held on said shaft,

a pair of worm gears meshing with said worm, and means for detachably securing said worm gears to the hubs of the rotors.

6. A blower comprising a casing having a rotor chamber and an oil chamber below the rotor chamber, said rotor chamber having a removable top wall and the oil chamber having a removable side wall formed with an elongated tubular shaft-housing portion extending transversely of the plane of said side wall, a pair of rotor shafts extending through said chambers, a pair of rotors in the rotor chamber fixed on the rotor shafts and having hubs depending into the oil chamber, a drive shaft journaled solely in the tubular shaft-housing formed on the removable side wall of the oil chamber, and extending between the rotor shafts, a worm detachably held on said shaft, a pair of worm gears meshing with said worm, a pair of spur gears meshing with each other, and fastening devices for detachably securing one worm gear and one spur gear to the hub of each rotor.

7. A blower comprising a casing having a rotor chamber, a pair of rotor shafts journaled in the casing, a pair of rotors in the rotor chamber cast on said shafts and formed with integral hubs extending from one face thereof through the adjacent wall of the rotor chamber, a drive shaft journaled in the casing exteriorly of the rotor chamber and extending transversely between the rotor shafts, a worm fixed on said drive shaft, a pair of worm gears meshing with said worm, a pair of intermeshing spur gears, and fastening devices for detachably securing one worm gear and one spur gear to the hub of each rotor.

8. In a rotary pump, a casing, a pair of parallel shafts each rigidly carrying a rotor, each rotor being provided with a hub affixed

to its shaft and extending out through the casing and terminating short of the end of the shaft to thereby form an annular abutment facing toward said end of the shaft, a pair of gears on each of the shafts at a point beyond said abutment, bolts passing through said gears and threaded into said annular abutment to thereby removably clamp the gears against said abutment, and means for driving said gears.

9. In a rotary pump, a casing, a pair of parallel shafts each rigidly carrying a rotor, each rotor being provided with a hub affixed to its shaft and extending out through the casing and terminating short of the end of the shaft to thereby form an annular abutment facing toward said end of the shaft, a pair of gears on each of the shafts at a point beyond said abutment, the gear adjacent the abutment being recessed to receive the end of the hub, bolts passing through said gears and threaded into said annular abutment to thereby removably clamp the gears against said abutment, and means for driving said gears.

10. In a rotary blower of the type set forth, a casing, a pair of parallel shafts extending therethrough and each being provided with a rotor, each rotor being affixed to its shaft, each shaft being provided with an annular abutment facing toward the driving-end of the shaft, a pair of gears on each shaft, each pair consisting of a worm-gear and a tooth-gear, these gears abutting against each other and against said annular abutment, a pair of bolts extending through each pair of gears and tapped into said abutment, the bolts lying parallel with the shaft, and means for driving said worm-gears.

In testimony whereof I hereunto affix my signature.

JOHN T. NEEDHAM.