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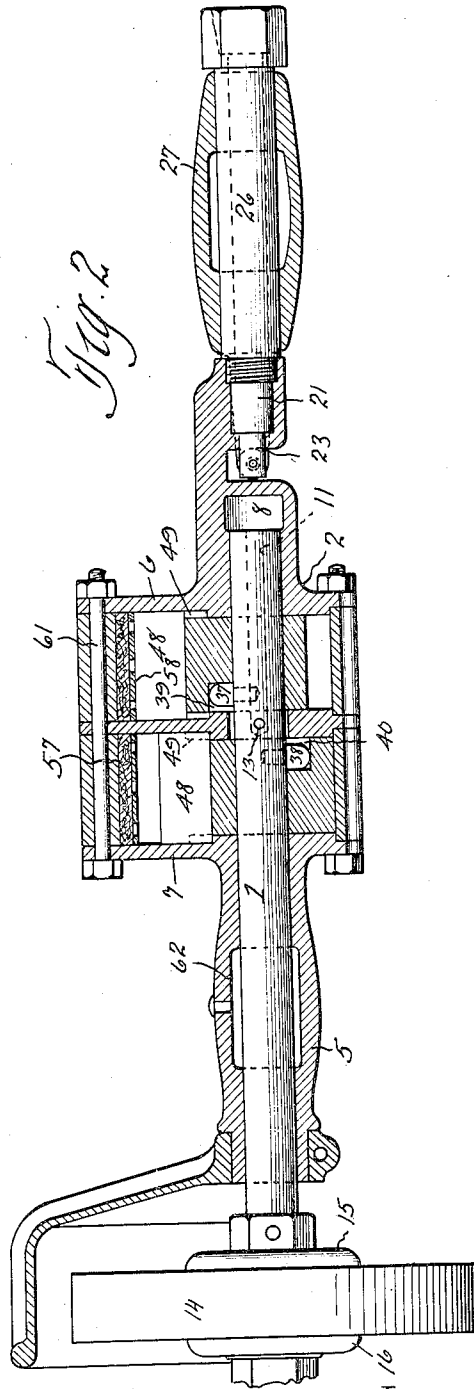
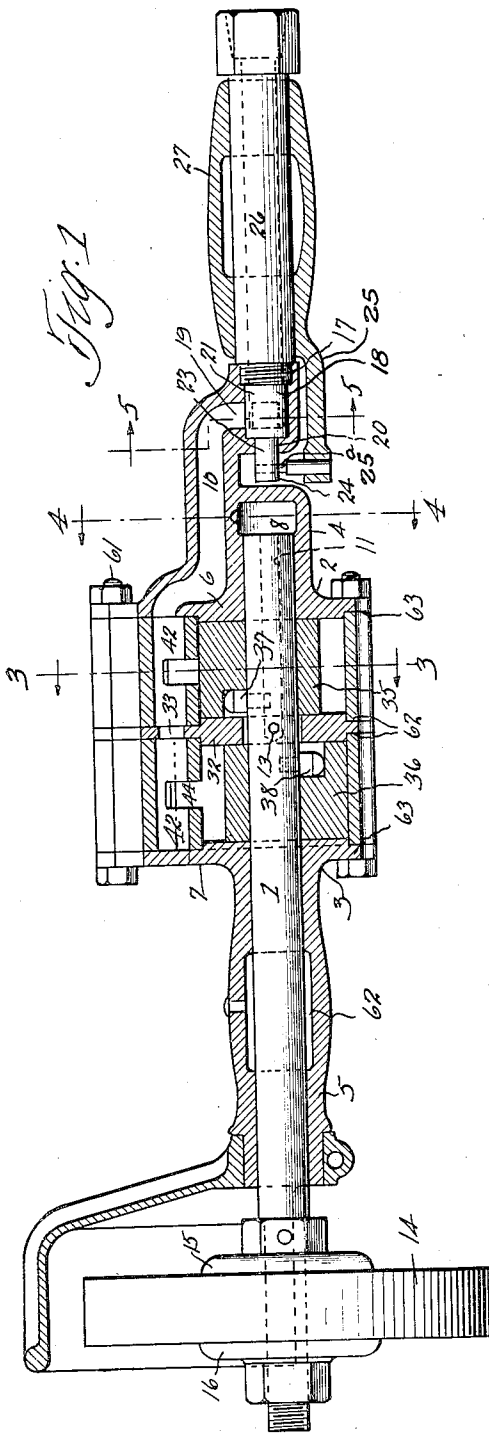
E. J. MOORE ET AL

1,514,007

ROTARY MOTOR

Filed Oct. 18, 1920

2 Sheets-Sheet 1



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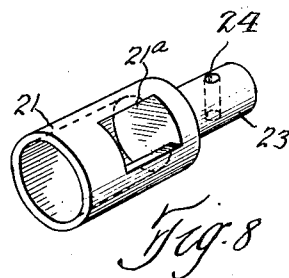
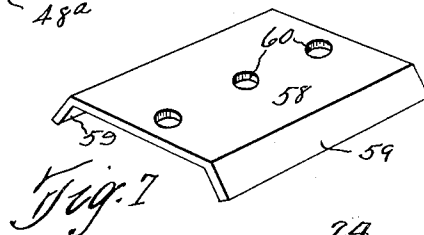
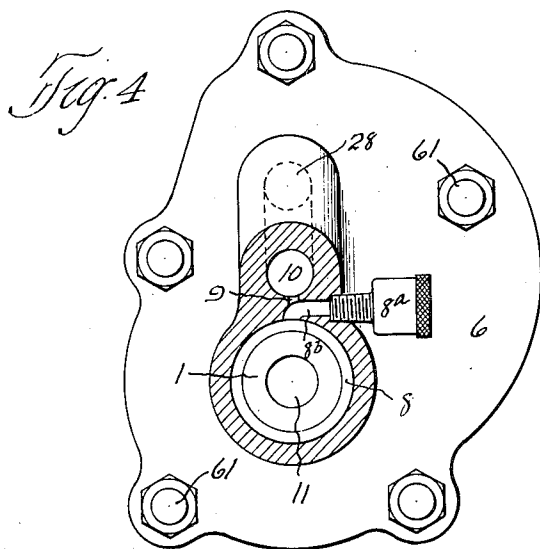
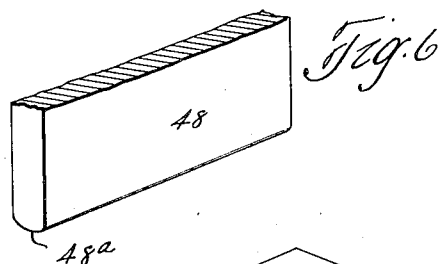
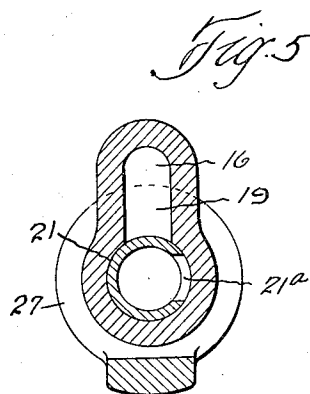
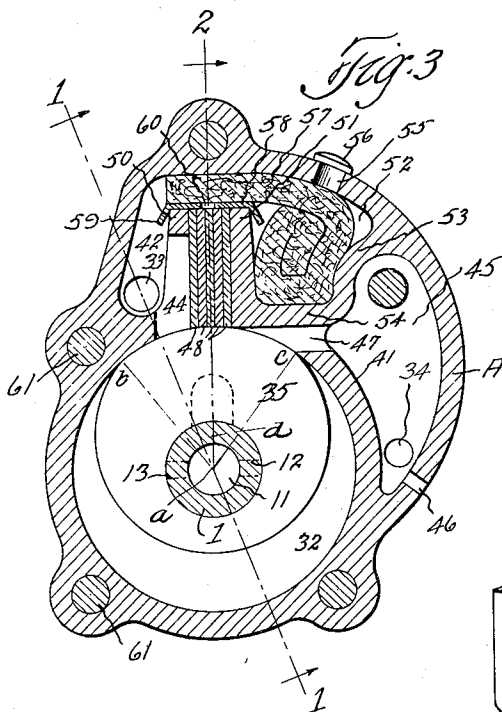
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ROTARY MOTOR

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2 Sheets-Sheet 2

1,514,007



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UNITED STATES PATENT OFFICE.

EDWARD J. MOORE AND RAYMOND H. MOORE, OF CLEVELAND, OHIO, ASSIGNORS TO
THE ROTOR PNEUMATIC COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF
OHIO.

ROTARY MOTOR.

Application filed October 18, 1920. Serial No. 417,547.

To all whom it may concern:

Be it known that we, EDWARD J. MOORE and RAYMOND H. MOORE, citizens of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Rotary Motors, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to fluid pressure motors of the rotary type and has for its general object to improve the operation and efficiency of such motors. Further and more limited objects of the invention will appear hereinafter and will be realized in and through the combinations of elements embodied in the claims forming part hereof.

In the drawings, Fig. 1 represents a longitudinal sectional view through a motor constructed in accordance with our invention, the said view corresponding to the line 1—1 of Fig. 3; Fig. 2 a similar view corresponding to the line 1—2 of Fig. 3; Figs. 3, 4 and 5 are sectional details corresponding respectively to the lines 3—3, 4—4 and 5—5 of Fig. 1; Fig. 6 a perspective view of one of the abutment members; Fig. 7 a similar view of a part of the lubricating mechanism; and Fig. 8 a detail in perspective of the throttle or controlling valve.

Describing the parts by reference characters—1 denotes the motor shaft, said shaft being mounted in a pair of heads indicated at 2 and 3, the head 2 being what is known to the trade as the "dead" head and the head 3 the "live" head. Each head comprises a sleeve portion indicated at 4 and 5 respectively, the said sleeve portions being connected with flat heads 6 and 7 respectively, which heads form the ends of the cylinder assembly. Each of these heads is of the general contour shown in Fig. 3. The sleeve 4 is provided with a chamber 8 to which lubricant may be supplied from a suitable receptacle, as a grease cup 8^a, through a port 8^b. This chamber is adapted to communicate by a smaller port 9 with a section 10 in the head assembly 2 of the conduit through which the pressure fluid is supplied to the cylinders. The shaft 1 is provided with a central bore 11 communicating at one end with said chamber and having ports 12 and 13 adapted to conduct lubricant from the chamber 8 to the working parts of

the motor, to be referred to hereinafter. The operating end of the shaft 1 may be provided with any suitable tool, a grinding wheel 14 being shown as secured to such shaft end by means of nuts 15 and 16.

The "dead" head of the motor is provided with a bore comprising an internally threaded portion 17, a cylindrical portion 18 adapted to communicate with the conduit section 10 through a port 19, and a reduced cylindrical portion 20. Rotatably mounted within the cylindrical chamber formed at 18 is a valve comprising a cylindrical cup 21 which is open toward the threaded section 17 of the bore, the opposite end of the cup being closed and adapted to abut against 18 and 20. From the closed end of the cup 21 there projects a cylindrical stem 23 which fits within the bore section 20, said stem having an opening 24 for the reception of a pin 25^a carried by the operating arm 25. A pipe connection 26, comprising a part or section of the conduit for the supply of pressure fluid to the cylinders, is threaded into the bore section 17. Mounted on this pipe connection is a sleeve 27 and the arm 25 projects from the said sleeve.

The cup 21 constitutes a throttle or controlling valve for regulating the volume of pressure fluid which may pass from the conduit 26 to the conduit section 10, the said valve being provided with a port 21^a, whereby, by rotation of the valve in the appropriate direction, the supply of pressure fluid to the conduit section 10 may be gradually increased and diminished.

32 denotes a head, similar in contour to the heads 6 and 7 and equidistant therefrom. This intermediate head is sleeved upon the shaft 1 and is provided with a port 33, preferably in alignment with the delivery end of the supply passageway 10, and with a port 34 the purpose of which will be explained hereinafter. On each side of the head or partition 32, the shaft 1 has mounted thereupon a rotary piston, indicated at 35 and 36, respectively, and arranged 180° apart on said shaft. Each of these rotary pistons is shown as secured to the shaft by means of a headed screw 37, 38, respectively, and entering recesses 39, 40, provided respectively therefor in each piston, each recess extending into its piston from the end which faces the intermediate wall or partition 32. The motor shown herein is a two-

cylinder motor, but it will be understood that we do not propose to limit our invention to any particular number of cylinders and pistons.

5 Each of the rotary pistons is mounted within a casting containing a distributing chamber, a cylinder, a muffler chamber, and a lubricating chamber, as shown in cross section in Fig. 3, each of these castings being interposed between the intermediate head or partition 32 and the heads 6 and 7, respectively. One of the cylinders is indicated at 41, the axis of said cylinder coinciding with the axis of the shaft 1. Cast with each cylinder is a fluid-distributing chamber 42, the chamber at the right hand of Fig. 1 communicating with the supply passageway 10 and also with the distributing chamber of the next cylinder through a port 33. 15 The distributing chamber of each cylinder communicates with a cylinder port 44.

In addition to the chamber 42, each cylinder casting is provided with a muffler chamber 45 at the opposite side thereof from the distributing chamber 42, each muffler chamber being provided with a plurality of exhaust outlets 46 in the bottom thereof and providing an enlarged expansion chamber for the exhaust fluid received from its corresponding cylinder. In a motor of about the dimensions shown in Fig. 3 of the drawings, two such exhaust outlets will be provided for each muffler chamber, each outlet being about 1/8 in. diameter. Each muffler chamber receives the exhaust fluid from its cylinder through an exhaust port 47. In order to facilitate the discharge of such gases, not only through the muffler chamber associated therewith but through the muffler chamber of the other cylinder, the port 34 is provided, said port establishing communication between both muffler chambers. With the parts of the dimensions shown in Fig. 3 of drawing hereof, this port will be about 1/8 in. diameter. 35

Each rotary piston 35, 36, is provided with an external cylindrical surface described from the axis *a* and which is of such extent as simultaneously to seal the inlet port 44 and the exhaust port 47 of such cylinder. From each side of this surface, shown in Fig. 3 as comprehended between the radii *ab* and *ac*, the outer surface of each piston is a cylindrical surface described about the point *d* as the center, the points *a* and *d* being about 1/4 in. apart where the parts are of the dimensions shown in Fig. 3 of the drawing. This will prevent the air (or other pressure fluid) admitted to the chambers 42 from blowing backwardly around the rotor and through the exhaust port 47 when the parts are in the position shown in Fig. 3. Assuming that the pistons are turning from right to left, it will be seen that the inlets 65 port will be closed until the point *c* on each

rotor passes the movable abutment, which will now be described.

In order to distribute the pressure fluid in operative relation to each piston, each cylinder is provided with an abutment comprising a plurality of narrow blades or laminations 48, each having its lower end rounded, as shown at 48^a, the said laminations being mounted in guides 49 provided in the heads 6 and 7, the intermediate partition 32, and between a pair of webs, which will now be described. 70 75

One of said webs, 50, forms one of the walls of each chamber 42 and is provided with the port 44. The other web 51 is parallel with the web 50 and forms a backing for its abutment. Each abutment, consisting of a plurality of blades or laminations 48, is thus mounted between the webs 50 and 51 and between one of the heads 6 or 7 and the intermediate head or partition 32. The ports 44 extend upwardly from their respective cylinders a distance sufficient to enable the tops of their respective abutments to be subjected to the pressure of the entering fluid throughout the major portion of the rotation of each piston, the fluid thus assisting in holding the abutments in contact with their respective rotors or pistons and serving to cushion the said abutment as it passes above such port. 80 85 90 95

For the purpose of efficiently lubricating the blades or laminations of each abutment, the interior of each cylinder, and the bearings provided between the ends of each cylinder and the heads 6 and 7 and the intermediate head or partition 32, we have provided the following construction. Above each cylinder and between the head 6 or 7 and the intermediate head or partition 32, a chamber 52 is formed, said chamber being provided by the web 51, a web 53 and a bottom web 54. Each chamber is provided with an opening 55 for the supply of oil thereto said opening being provided with a plug 56. In each chamber 52 is a wick 57 of capillary material, such as woven felt. Each wick extends beneath the top of each casing section and across the tops of the webs 50 and 51, bearing against said casing and against a cap plate 58 resting on top of said webs and having downturned flanges 59 for centering and supporting the same upon said webs. Each of these cap plates is provided with a plurality of apertures 60, located centrally thereof and above the central portion of each abutment. 100 105 110 115 120

The motor may be assembled by first placing the intermediate wall in its proper position upon the shaft 1. The rotary pistons will then be slipped over the respective ends of the shafts with their recesses 39 and 40 receiving the heads of the key screws 37 and 38, respectively. The casting section A having therein their respective abutments and 125 130

wicking will then be slipped over their respective pistons. The "live" and the "dead" head will then be applied to the shaft, and the said heads, cylinders, and the intermediate head will be secured together by means of the through bolts 61, it being noted that the said heads are provided with seats 62 and 63 for the ends of the cylinders and for the ends of the muffler chambers. The ends of the cylinders will be closed by the three heads and the ends of the muffler chambers 45 and of the distributing chambers 42 will also be closed by said heads, with the exception of the port 33 in the intermediate head.

The parts of the heads 6 and 7 which are provided with the guides 49 and the walls or webs 50 and 51 form housings for the abutments, which housings are open at their inner ends to permit contact between the inner ends of the abutments and their respective rotors. The outer end of each housing is yieldingly closed by its cap plate 59, except for the small holes 60; and the escape of the fluid pocketed between the top of each port 44 and its plate 59 is cut down by the capillary material 57.

With the parts constructed and arranged as described, the operation will be as follows: The valve 21 will be operated by means of the handle 27 to establish communication between the fluid pressure supply connection 26 and the passageway 10. The pressure fluid entering said passageway is supplied to both chambers 42 and through the ports 44 to the two cylinders of the motor. As each piston rotates, the abutments are pressed upwardly into contact with their common cap plate 58, compressing the wick thereabove and forcing a small quantity of oil there from and through the openings 60, which oil, being caught by the compressed air supplied through the port 33 and flowing through the said openings when the abutments move away from the plate, will be discharged in the form of a mist on top of the laminations or blades of each abutment. Owing to a slight relative movement between these blades, the oil thus supplied will be distributed between the same. Furthermore, some oil will be discharged as a mist from the end of the wick which opens into the chamber 42 by means of the compressed air supplied through the port 33 and will be carried by such air through the port 44 and into the parts with which such port communicates, lubricating not only the bearings formed between the ends of each piston and their cooperating heads or partitions but also the inner surfaces of the cylinders. Additional lubricant for the sides of the pistons adjacent to the head or partition 32 will be supplied from the chamber 8, duct 11 and ports 12 and 13. The shaft 1 is further lubricated

from a chamber 62 located in the handle 5.

The cap plates 58 are loosely applied to the outer ends of the walls 50 and 51, being yieldingly retained in position by the capillary material 57. This yielding movability of the cap plates permits them to withstand the impact of the blades 48 for a long period of time; and the efficiency and durability of the cap plates are enhanced by the provision of the yielding backing afforded by the felt or other wicking 57.

Reference has been made heretofore to the restricted outlet provided for the muffler chambers by the ports 46. This is to prevent the possibility of breaking the grinding wheel 14 by operating the same under full pressure when lifted from the work by the handles 5 and 27. With the muffler exhaust ports arranged as described and of approximately the size shown and described, when the shaft 1 has attained a speed of about 4,000 R. P. M., a back pressure will be developed within the muffler chambers which will prevent the racing of the motor materially above the speed mentioned and will thus prevent the bursting of the grinding wheel through centrifugal action.

As the abutment moves outwardly and passes the outer end of the port 44, some of the pressure fluid is trapped between the outer end of the abutment and the plate 58 and, escaping slowly through the openings 60 and the wicking 57, serves as a dash pot to check and cushion the blows of the abutment against the said plate and the wicking.

Having thus described our invention, what we claim is:

1. In a rotary motor, the combination of a cylinder having an inlet connection and an exhaust connection, a rotor in said cylinder, a housing interposed between the inlet and exhaust connections, and a laminated abutment slidably mounted in said housing and adapted to engage said rotor and to be reciprocated thereby, said housing having a port communicating with the inlet connection and adapted to admit pressure fluid to the outer end of said abutment when the latter is in its inward position and to be covered by said abutment when the latter is near its outward position, whereby the said abutment is held in engagement with the rotor and its movement toward the outer end of the housing is cushioned, said housing having a restricted opening in its outer end and a capillary medium adapted to conduct lubricant across said opening and to deliver the same to the inlet connection.

2. In a rotary motor, the combination of a cylinder having an inlet connection and an exhaust connection, a rotor in said cylinder, a movable abutment interposed between said connections and adapted to contact with the rotor, and means operated by the movement

of said abutment for supplying lubricant to the inlet connection.

3. In a rotary motor, the combination of a cylinder having an inlet connection and an exhaust connection, a rotor in said cylinder, a movable abutment interposed between said connections and adapted to contact with the rotor, and means operated by the movement of said abutment for supplying lubricant thereto.

4. In a rotary motor, the combination of a cylinder having an inlet connection and an outlet connection, a rotor in said cylinder, a movable abutment adapted to contact with the rotor and comprising a plurality of relatively movable members arranged side by side, said motor having a receptacle for lubricant, and capillary material extending from said receptacle across the ends of said members and arranged to be compressed thereby.

5. In a rotary motor, the combination of a cylinder having an inlet connection and an outlet connection a rotor in said cylinder, a movable abutment adapted to contact with the rotor, said motor having a receptacle for lubricant, and capillary material extending from said receptacle across the end of said abutment which is remote from said rotor.

6. In a rotary motor, the combination of a cylinder having an inlet and outlet connection, a rotor in said cylinder a movable abutment interposed between the said connections and adapted to contact with said rotor, guides for said abutment, a receptacle for lubricant in said motor, and a wick extending from said receptacle across the outer end of said abutment and in operative relation to said inlet connection and to said guides.

7. In a rotary motor, the combination of a cylinder having an inlet and an outlet connection, a rotor in said cylinder, an abutment comprising a plurality of relatively movable members arranged side by side and interposed between said connections, a wick for supplying lubricant in operative relation to the outer ends of the members of said abutment, and means for distributing lubricant from said wick to the members of said abutment.

8. In a rotary motor, the combination of a cylinder having an inlet and an outlet connection, a rotor in said cylinder, guideways interposed between the said connections, a movable abutment mounted in said guideways and adapted to contact with said rotor, a distributing plate arranged to be engaged by the outer end of said abutment and having openings therein, a wick extending across said plate in position to be compressed thereby through the outward movement of said abutment, and a source of lubricant supply for said wick.

9. In a rotary motor, the combination of

a cylinder having an inlet and an outlet connection, a rotor in said cylinder, guideways interposed between the said connections, a movable abutment mounted in said guideways and adapted to contact with said rotor, a wick extending across said abutment in position to be compressed thereby through the outward movement of said abutment and to discharge lubricant into said inlet connection, and a source of lubricant supply for said wick.

10. In a rotary motor, the combination of a cylinder having an inlet and an outlet connection, a rotor in said cylinder, a pair of webs interposed between said connections, an abutment mounted between said webs and adapted to contact with said rotor, a distributing plate mounted on said webs and having one or more apertures therethrough, a wick extending above said plate and arranged to be compressed thereby through the movement of said abutment between said webs, the said wick being adapted to deliver lubricant into the inlet connection, and a source of lubricant supply for said wick.

11. In a rotary motor, the combination of a cylinder having an inlet and an outlet connection, a rotor in said cylinder, a pair of webs interposed between said connections, an abutment comprising a plurality of relatively movable members mounted between said webs and adapted to contact with said rotor, a distributing plate mounted on said webs and having one or more apertures therethrough, a wick extending above said plate and arranged to be compressed thereby through the movement of said abutment members, the said wick being adapted to deliver lubricant into the inlet connection, and a source of lubricant supply for said wick.

12. In a rotary motor, the combination of a cylinder having an inlet connection and an outlet connection, a rotor in said cylinder, an abutment interposed between said connections and movable toward and from the axis of said rotor, and a guideway for said abutment having in the wall thereof and within the outer end thereof a port for supplying pressure fluid from said inlet connection to said cylinder, and means restricting the outer end of said guideway thereby to cause compression of the operating fluid by said abutment as it approaches the outer end of its stroke.

13. In a rotary motor, the combination of a cylinder having an inlet connection and an outlet connection, a rotor in said cylinder, an abutment interposed between said connections and movable toward and from the axis of said rotor, a compressible lubricant container arranged in operative relation to the outer end of said abutment, and means for cushioning the outward movement of said abutment.

14. In a rotary motor, the combination of a cylinder having an inlet connection and an outlet connection, a rotor in said cylinder, a housing interposed between said inlet and outlet connections and having a yieldable wall at its outer end, and an abutment slidably mounted in said housing and adapted to engage said rotor with its inner end and to contact with said yieldable wall with its outer end.

15. In a rotary motor, the combination of a cylinder having an inlet connection and an outlet connection, a rotor in said cylinder, a housing interposed between said inlet and outlet connections and having a movable wall at its outer end, a yieldable backing for said movable wall, and an abutment slidably mounted in said housing and adapted to engage said rotor with its inner end and to contact with said movable wall with its outer end.

16. In a rotary motor, the combination of a cylinder having an inlet connection and an outlet connection, a rotor in said cylinder, a housing interposed between said

inlet and outlet connections and having a movable wall at its outer end, a pad of yieldable material interposed between said movable wall and the cylinder wall adjacent thereto, and an abutment slidably mounted in said housing and adapted to engage said rotor with its inner end and to contact with said movable wall with its outer end.

17. In a rotary motor, the combination of a cylinder having an inlet connection and an outlet connection, a rotor in said cylinder, a housing interposed between said inlet and outlet connections, a cap plate yieldably applied to the outer end of said housing, a laminated abutment in said housing adapted to engage the said rotor with the inner ends of the members thereof and the cap plate with the outer ends of the members thereof, and a yieldable backing for said cap plate.

In testimony whereof, we hereunto affix our signatures.

EDWARD J. MOORE.

RAYMOND H. MOORE.