April 21, 1931. F. S. BARKS 1,801,259

MOTOR

Filed Dec. 6, 1926 2 Sheets-Sheet 1

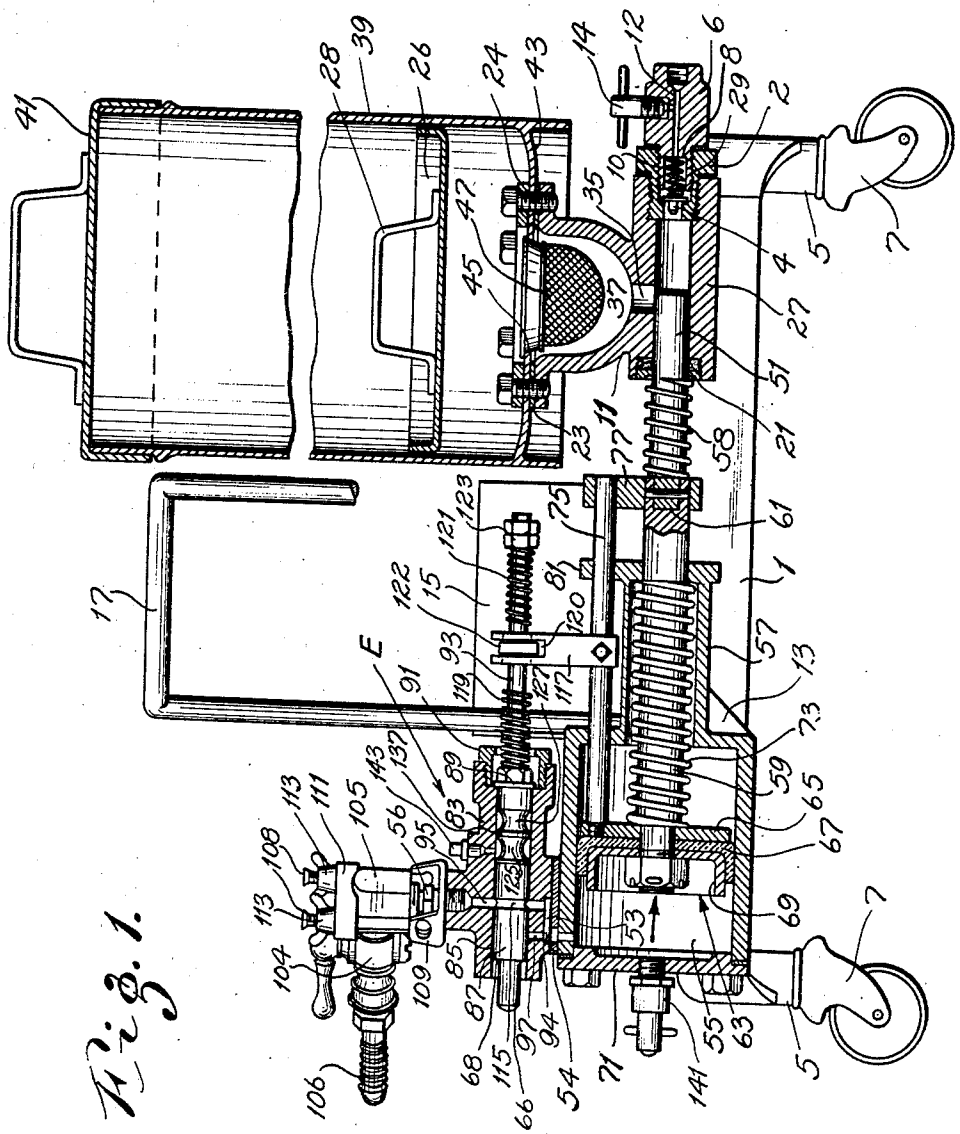


Fig. 1.

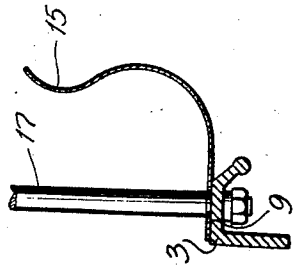


Fig. 5.

Frank S. Barks,
Inventor,
Delos G. Haynes,
Attorney

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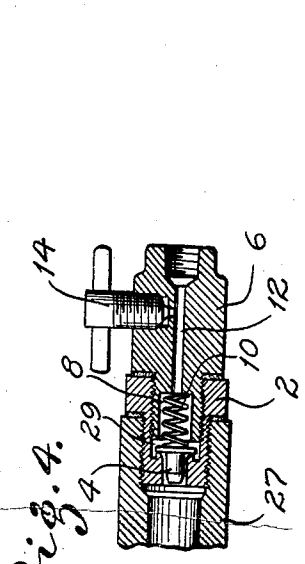


Fig. 4.

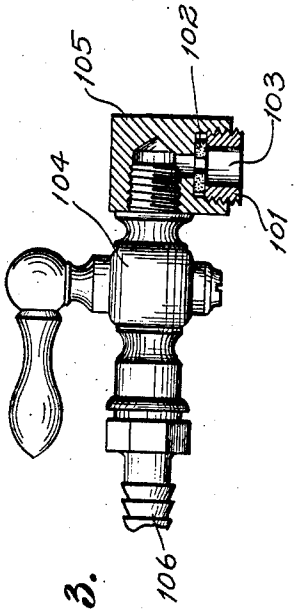


Fig. 3.

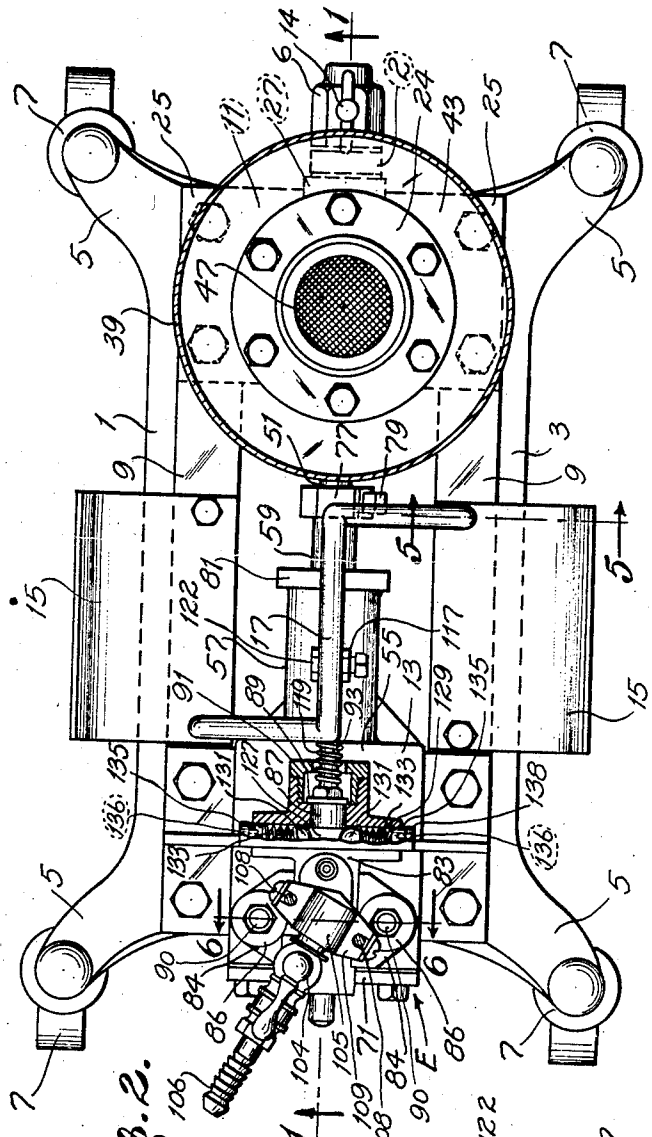


Fig. 2.

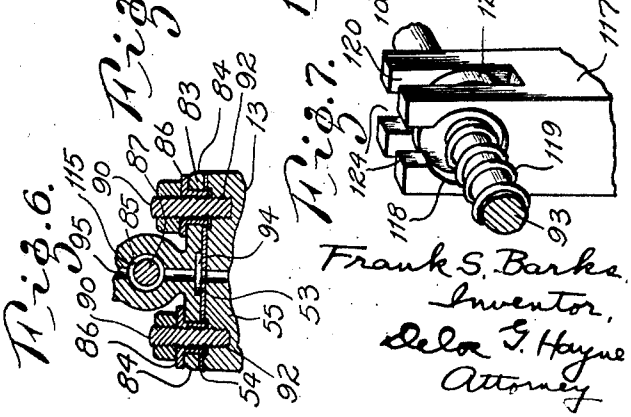


Fig. 7.

Fig. 6.

Frank S. Barks
Inventor.
Delos F. Hayne
Attorney

Patented Apr. 21, 1931

1,801,259

UNITED STATES PATENT OFFICE

FRANK S. BARKS, OF ST. LOUIS, MISSOURI

MOTOR

Application filed December 6, 1926. Serial No. 152,791.

This invention relates to motors, and with regard to certain more specific features to an improved pneumatic pump for forcing grease or the like.

Among the several objects of the invention may be noted the provision of portable grease pumping apparatus which is instantly operable to pump quantities of grease; the provision of an improved, demountable valve system for apparatus of the class described, which is adapted to substantially increase the capacity of the apparatus; the provision of improved means for self-oiling whereby the above ends are augmented; and the provision of a device of the class described which is economical of manufacture, light of weight, yet subject to little or no derangement in operation. Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly comprises the elements and combination of elements, features of construction, and arrangements of parts which will be exemplified in the structure hereinafter described and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings, in which is shown one of various possible embodiments of the invention,

Fig. 1 is a longitudinal vertical section of the apparatus taken on line 1—1 of Fig. 2, showing certain parts in full;

Fig. 2 is a top plan view of the apparatus showing the cover and plunger removed and certain parts broken away;

Fig. 3 is an enlarged side elevation of an inlet cock with parts broken away;

Fig. 4 is an enlarged longitudinal section of an outlet check and relief valve assembly;

Fig. 5 is an enlarged fragmentary detail section taken on line 5—5 of Fig. 2;

Fig. 6 is a fragmentary section taken on line 6—6 of Fig. 2 showing a method of fastening the valve system; and

Fig. 7 is a perspective view showing means for driving a valve stem.

Similar reference characters indicate corresponding parts throughout the several views of the drawings.

Referring now more particularly to Figs 1 and 2 of the drawings, there is illustrated at numerals 1 and 3, a pair of longitudinal side frames or rails. Each of the frames or rails 1 and 3 is formed with a leg 5 at the front and rear and each leg 5 is provided with a swivel caster 7. The casters 7 are adapted to stay with the legs 5 when the device is picked up, as will be hereinafter described.

The rails 1 and 3 are provided with upper horizontal flat and/or machined surfaces 9 for the purpose of receiving bolted thereto, at the forward ends, a laterally formed pump casting 11. Rearwardly the surfaces 9 of the frames 1 and 3 have bolted thereto a laterally formed engine casting 13. The frames 1 and 3 and castings 11 and 13 form a unit.

Sidewardly extending and oppositely placed horns or hose clips 15 are bolted to the mid-portions of the side rails 1 and 3 and serve the purpose of holding cradled therein the delivery line of the apparatus, when said delivery line is not in use. The delivery line is not shown in the drawings. The clips 15 are held partly by conventional bolts and partly by means of the threaded ends of a handle or grip 17. The threaded ends of the grip 17 are provided with shoulders and have conventional nuts threaded thereto. The purpose of the handle or grip 17 is to provide means by which the device as a whole may be lifted and transported about.

Referring now more particularly to the forward pump casting 11, it may be seen that said casting comprises flanges 25 whereby it is bolted to the side frames 1 and 3, as described. Longitudinally and centrally of said flanges and formed therewith is a bored plunger cylinder 27 provided at its forward end with a check valve 29. As indicated in Fig. 1, the rear end of said plunger cylinder is fitted with a packing gland assembly 21. The packing in the gland assembly is arranged to engage a plunger working in the cylinder 27 for only a short distance along the length of said plunger, whereby the frictional effect of the packing is reduced.

At approximately the central portion of the bore of cylinder 27 is formed an inlet passage 35 which leads up to a chamber 37

cast integrally with the bored cylinder 27. Bolted to the flanged top of said chamber 37, in grease-tight fashion, is a grease container 39. The bottom of the container 39 and the flange of the chamber 37 are provided with a gasket 23 therebetween and an annular ring 24 is clamped down on the upper surface of said container bottom. An unwarped grease-tight connection is thus attained between the container 39 and the chamber 37.

The container is provided with a lid 41. The bottom 43 of the container is provided with an opening 45 which aligns with the upper opening of the chamber 37 and is adapted to receive the conical rim of a strainer 47 therein.

As will later be made clear, grease and the like is adapted to be drawn or forced from the container, through the strainer 47, chamber 37, passage 35, bore of cylinder 27, valve 29, to a supply line (preferably flexible not shown) made fast to the outlet end of the valved cylinder 27. A slidable plunger or follower 26 is provided in the container 39, whereby the grease therein may at intervals be pushed down manually as quantities are drawn from the bottom of said container. A suitable handle 28 is provided on the plunger 26.

In order to draw grease or the like from the bottom of the container 39, a plunger 51 is caused to reciprocate in the bored cylinder 27 so that its forward end crosses and recrosses the passage 35. The plunger is made to fit the cylinder 27 snugly and as the plunger recedes rearwardly, the check valve 29 automatically closes. Hence, a vacuum is drawn in the cylinder 27 and grease rushes into the cylinder 27. At the next forward movement of the plunger the grease in cylinder 27 is forced through the check valve 29 and out into the line (not shown). In starting the device, it may be primed by pouring oil into the passage 35 by way of the container 39.

It is evident that the reciprocating action of the plunger 51 may be continued indefinitely to draw grease from the container 39 and discharge it into the line.

The check valve 29 is of an improved construction comprising a bored member 2 screwed into the outlet of the cylinder 27 and counterbored to form a seat for the valve proper 4. The counterbored portion of the member 2 is threaded to receive an outlet member 6 which is counterbored at 8 for receiving a spring 10 which is adapted to normally hold the valve 4 against its seat in the member 2. A passage 12 in the member 6 leads to a threaded outlet to which the said outlet line is connected. The parts are so arranged and the spring 10 is of such strength and proportions as to prevent the valve from seating on its right hand side, so that when grease is pushed to the right (Fig. 1) ample cross sectional area is provided at all points to permit flow of said grease. A hand operable outlet plug 14 is provided whereby the passage 12 may be opened to communicate with the atmosphere.

In order to reciprocate the plunger, an air engine E is provided at the rear of the device. This engine is associated with, and cast (in part) with the said casting 13.

The air engine E comprises a work cylinder 55 to which is longitudinally cast, on center line, a spring retaining cylinder 57. These cylinders are adapted (as a unit) to be aligned on center line with the cylinder 27, at least approximately.

Passing through the cylinder 57 and into cylinder 55 is a piston rod 59. The rod 59 passes out of the forward end of said cylinder 57 and cooperates with the plunger 51 by means of a counterbore and cross pin combination 61. The stated combination 61 is permanent but during assembly permits of some misalignment between the cylinders 55, 57 and 27, in so far as the counterbore in the shaft 59 may be made somewhat larger than the diameter of the shouldered portion of plunger 51.

At the rear end, the rod 59 is provided with a driving piston 63. The piston comprises a backing plate 65, a leather piston 67 and a clamping cup 69, all held to a shoulder on rod 59 by means of a nut as shown. The cup 69 is flanged out farther than is the leather piston, so that the relatively soft piston cannot strike the head 71 of the cylinder 55. The piston 63 is normally held to the left or rear end of its cylinder by means of a spring 73 reacting between said piston and the front of cylinder 57 and a spring 58 on the plunger 51 reacting between the rod 59 and casting 11.

A driving stem 75 for the valve gear of engine E is supported with regard to, and moves with the piston rod 59. The stem is so supported for the said movement by screwing the rear end of it into the piston 63 and pinning the forward end into a vertical bracket 77, which bracket is held by means of a tight fit and set screw 79 to the forward jointed end of the piston rod 59. The said rod 75 slidably passes through a proper passage in the head end of the cylinder 55 and is steadied by passage through an ear 81 at the front end of the cylinder 57. It is evident that by means of the construction described, the piston rod 59 cannot twist out of its assembled position and a rugged aligning system is provided for driving the valve gear to be described.

A flanged cross-shape valve casting or fitting 83 is studded to the top of the work cylinder 55. The flanges 84 thereof are fitted with washers 86. These washers 86 have integral cylindrical liners which pass through and extend downwardly from the flanges.

They accommodate the studs 90, align the casting 83 by extending into counterbores 92 in the cylinder casting 55 and also serve to evenly distribute the pressure effect of the stud nuts on the casting 83 when said nuts are pulled down. The latter effect is accomplished by providing large flat heads on the washers. By this means, perfect and positive alignment of the valve parts is assured, as well as a good joint between the valve casting 83 and cylinder casting 55. The casting or fitting 83 is provided with a shallow counterbore counter-recess 94 which forms a passage 53 between the casting 83 and cylinder 55. A gasket 54 between the casting 83 and the cylinder prevents communication between the passage and the atmosphere but has an opening therein communicating with the passage 53 for purposes to be made clear.

The casting 83 is provided with a longitudinal bore 85 for slidably receiving a valve 87. A positive movement-limiting head 89 is provided at the front end of this valve. This head 89 engages the casting 83 to limit rearward movement of the valve and engages a cup 91 screwed to said casting 83 to limit the forward movement of the valve. The nut which holds this head 89 in place serves also to lock a valve stem 93 in position. The valve stem 93 is screwed to the valve. The said nut is adapted to pass through an opening in the cup 91 but the head 89 engages the cup and does not pass through said opening.

Vertically drilled across the valve bore 85 is a passage 95 serving inlet purposes. This passage leads downwardly to the said passage 53 and upwardly to a hollow inlet plug 56. To the left of the passage 95 is vertically formed a second passage 97 which communicates between the bore 85 and the interior of the work cylinder 55 crossing the said passage 53 and passing through said opening in the gasket 54.

In order to bring air to the inlet passage 95 an air nozzle 105 is provided (see Fig. 3). The said plug 56 which is screwed into the casting 83 is adapted to slidably engage an opening 103 in the nozzle 105 and to seat on a gasket 102 held in place in said nozzle 105. The gasket 102 is held in place by means of a threaded member 101 in which said opening 103 is formed. A cock 104 is screwed into the nozzle 105 and communicates with the opening 103. The cock 104 is provided with a roughened stem 106 which is adapted to receive a flexible air line, whereby compressed air may be brought to the apparatus.

In order to hold the nozzle 105 to the plug 56, a hinge block 109 is held to the lug 83 by means of a shoulder on the plug 56. To this block 109 is hinged an adjustable saddle member 111, which is adapted to swing in place over the nozzle for delivering air. Wing nuts 113 make removal of the saddle 111 from the nozzle 105 easy and handy, whereupon the nozzle may readily be removed by lifting. The swinging studs 108 are burred at their upper ends after the wing nuts 113 are applied. Loss of the nuts during service is thus prevented.

Returning to the valve construction, the drawings (Fig. 1) show that the valve 87 is provided with a groove 115 adapted to register with the said inlet passage 95 when said valve is in its rearward position. When the valve is in its forward position, the groove 115 does not register with the inlet passage 95. Hence, by positioning the valve 87 rearwardly, the inlet passage is open, whereby compressed air may pass from the inlet line, through the nozzle 105 (if the nozzle is open) plug 56, passage 95 and groove 115, passage 53, the lower part of passage 97 and to the cylinder 55, where work is done to press the piston forwardly against the reaction of spring 73. By this means the plunger 51 is made to take a grease forcing stroke as hereinbefore described.

The rear end or extension 66 of the valve 87 is reduced in cross section by means of a shoulder 68. This shoulder is in such a position that when the valve 87 is positioned forwardly, then said shoulder is slightly to the right of the outlet passage 97. Hence, by positioning the valve 85 forwardly, the inlet passage 95 is cut off in the manner above described, while the outlet or exhaust passage 97 is open to the atmosphere. This action permits movement of air from the cylinder 55 through passages 97, 53 and out of the bore 85. Such movement of air is caused by the tendency of the air to re-expand after a working stroke and the expanding action of the spring 73, which pushes the piston 63 rearwardly. The exhaust port 97 is near the rear end of the cylinder so that said cylinder may be substantially emptied of air.

Movement of the piston 63 and rod 59 rearwardly results in an evacuating stroke of the plunger 51 whereby the grease cylinder 27 is again reloaded as hereinbefore described.

In order to automatically position the valve 87 at its said maximum forward and rearward positions, so that pumping may be continuous when desired, the following full-stroke mechanism is used:

Vertically fastened to the driving rod 75 is fastened a driving bracket 117 (Fig. 7) adapted to slidably engage the valve stem 93. This slidable engagement comprises a through bore 118 and a cross slot 120. The bore 118 accommodates the stem 93 and certain springs thereon (to be described) and the slot 120 accommodates a ring 122 which slidably engages the stem 93 but will not pass the openings constituting the bore 118. Openings 124 above the bore 118 permit removal of the stem while the slot 120 permits simultaneous removal of the ring 122, if the

valve assembly is unbolted for removal as a unit; yet an effective driving arrangement is maintained.

Springs 119 and 121 are placed over said stem 93 rearwardly and forwardly respectively. These springs 119 and 121 respectively engage the said head 89 and another head 123 of the stem 93. The bracket 117 causes the ring 122 to engage the springs in its travel back and forth along the stem 93. It is evident that upon engaging and compressing a spring to a given point, that the driving bracket (moving with the piston rod 59) will drive the valve rod 93.

In order to prevent the valve 87 from moving to reverse a given stroke of the piston 63 before the stroke is substantially finished, regardless of the predetermined length of said stroke, and to cause said valve to take a full stroke at every movement thereof it is recessed at points 125 and 127.

Formed preferably horizontally across the valve passage 85, at a point corresponding to the position of recess 127 when the valve 87 is in rearward inlet position, is a passage 129 (see Fig. 2). On each side of the valve 87 in one of the recesses 125, 127 is placed a ball 131. The balls are each backed by a compressed spring 133 reacting against a retaining plug 135. By this means the valve 87 may be resiliently held in either its exhaust or inlet position, depending upon which recess 125 or 127, the balls 131 are cooperating with. The retaining plugs 135 are provided with gudgeons 136 which are engaged by a clamping member 138, whereby the plugs are held in position.

When the driving bracket assembly 117 moves against the spring 119 (Fig. 1) and substantially compresses it, the rearward motion of the piston 63 is adapted to be about completed. In the meantime the recess 125 and balls 131 have caused the valve 87 not to be moved, despite the partial compression of spring 119. Finally at or near the end of the stroke of piston 63, the spring is adapted to have been compressed enough to overcome the holding power of the balls 131, and the valve 87 moves into its Fig. 1 position under action of the spring 119. The valve must move rearwardly its full stroke because, as the high ridge 137 between the recesses 125 and 127 passes the balls 131, the inward movement of the balls into the recess 127 forces the valve to full stroke position as described, although the spring 119 may by this time have expanded to such a position that it would not, without the full stroke feature, be able to move the valve to a position such that the groove 115 would align with port 95. As the valve opens the inlet air port 95, the motion of the piston is reversed to a forward direction, and reversal of the above events takes place. This time, however, the spring 121 comes into play, while spring 119 is idle. The reverse events will be obvious from the foregoing. Fig. 1 shows the device moving through a working stroke position. The valve 87 is admitting air during the period of the working stroke. The valve will full-stroke to the right so that the groove 115 will take a closed position. This will result in the shoulder 86 passing over the exhaust passage 97 whereby air may exhaust. The inlet passage 95 is now closed and the spring 73 causes a reverse action of the piston 63.

The pumping action by means of the engine E is then continuously automatic as long as certain other events, to be described, take place. When the nozzle 105 is removed from the engine E, no air is available to do work, and no grease is pumped to the line.

In order to control the pumping action of the device, the supply line leading from the valve 29 is provided with a manually operable valve (not shown). This valve may comprise any of numerous types. It has for its purpose merely the closing and opening of the line whereby pumping by the engine E is prevented, or permitted to take place as desired. If the line is positively closed, the air engine ceases to operate because grease cannot be ejected with the normal air pressure available. If the line is opened grease can pass and the air engine automatically commences operation and continues operation until said line is again closed. There is no dead point from which the operation of the engine could not be started. If the engine is exhausting when the valve is closed the spring 73 continues forcing the piston toward the head 71, insofar as the rearward action of plunger 51, due to the check valve 29, is independent of conditions in the line. The piston is then ready for forward travel whenever the line is opened to permit the predetermined air pressure in the inlet line to take effect. The fact that the air engine can be stopped by closing the valve in the outlet line does not imply that only low grease pressures are attainable in the outlet line, for if the said outlet line is connected with nearly clogged bearings, several thousand pounds per square inch of pressure may be brought to bear on the obstruction with only a nominal air pressure in cylinder 55. This is due to the ratio of the diameters of piston 63 and plunger 51. The closing of the valve, however, resists the high pressure.

An oiling nipple 141 is provided in the cylinder head 71 whereby the device can be operated to oil itself. The outlet line from the valve 29 is connected to the nipple 141 and the device started in the manner herein described. By this means the work cylinder 55 may be lubricated. A lubricating nipple 143 for light oil is provided on the full stroke valve mechanism.

The purpose of the relief plug 14 at the

check valve 29 is to relieve pressure in the outlet line, if it is desirable to do so.

In the present construction, the fresh inlet air takes one course and the exhaust air with its attendant accumulation of dirt, rust and the like takes another course, and the latter course is short, free and not through the valve stem. The result is that the abrasive rust and the like, which is bound to exist in the exhaust air, is ejected without functioning to grind away the valve fittings. It is prevented from repassing through the valve stem and is blown directly out of the cylinder without doing harm to the valve. The life of the machine is thus increased. The reduced extension 66 on the valve serves to deflect particles of rust and the like before they forcibly strike the wall of the bore 85. The short, free exhaust increases capacity.

The demountable valve assembly permits of ready replacements by inexperienced users. For instance, should a valve assembly fail, it may be removed merely by unstudding it and lifting it free as a unit. A new assembly (adjusted at the factory) may be installed. No fine adjustments or intricate assemblies are required of the operator.

In view of the above, it is believed that the various features of this invention will be clear without further elaboration, and it will be seen that with the apparatus herein described, the several objects of the invention are achieved and other advantageous results attained.

As many changes could be made in carrying out the above construction without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. An air engine having a valve fitting comprising a body, a valve passage through the body opening at one end to the atmosphere and having a valve therein intersecting an inlet and an exhaust passage, said valve being adapted to move into inlet and exhaust positions, a movement limiting head at one end of the valve adapted to engage the body to limit movement at inlet position, a cup held to said body adapted to be engaged by said head to limit movement at the exhaust position, the other end of the valve comprising a reduced shoulder forming an extension, the shoulder being adapted to uncover said exhaust passage, whereby the valve passage functions as an exhaust and said extension being adapted to deflect particles before striking the wall of said valve passage as they emerge to be exhausted.

2. An air engine having a valve fitting comprising a body, a valve passage through the body opening at one end to the atmosphere and having a valve therein intersecting an inlet and an exhaust passage, said valve being adapted to move into inlet and exhaust positions, movement limiting means at one end of the valve adapted to engage the body to limit movement at inlet position, means to be engaged by said movement limiting means to limit movement at the exhaust position, the other end of the valve comprising a reduced shoulder forming an extension, the shoulder being adapted to uncover said exhaust passage, whereby the valve passage functions as an exhaust and said extension being adapted to deflect particles before striking the wall of said valve passage as they emerge to be exhausted.

In testimony whereof, I have signed my name to this specification this 3d day of December, 1926.

FRANK S. BARKS.