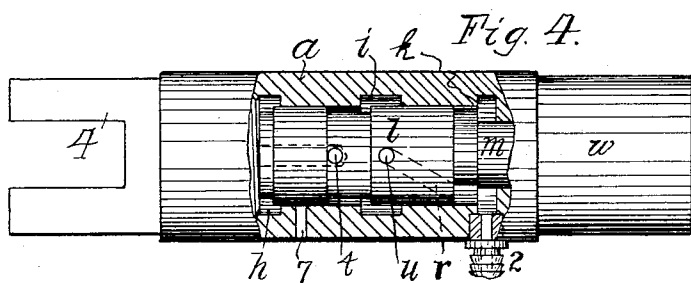
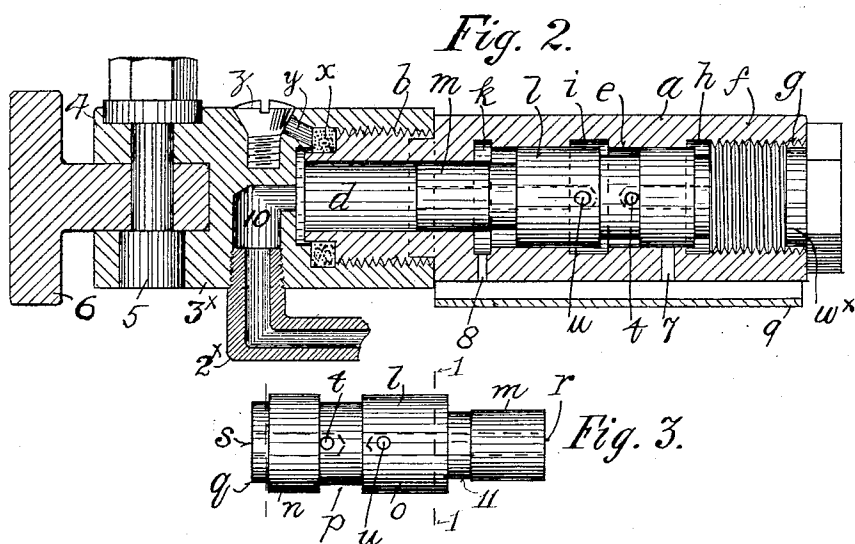
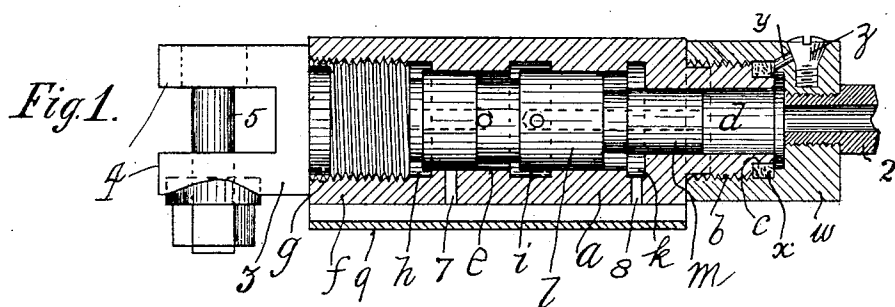


W. LEWIS.
VIBRATOR ENGINE.

APPLICATION FILED AUG. 21, 1902.

NO MODEL.



Witnesses
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UNITED STATES PATENT OFFICE.

WILFRED LEWIS, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE
TABOR MANUFACTURING COMPANY, OF PHILADELPHIA, PENNSYLVANIA,
A CORPORATION OF NEW JERSEY.

VIBRATOR-ENGINE.

SPECIFICATION forming part of Letters Patent No. 738,209, dated September 8, 1903.

Application filed August 21, 1902. Serial No. 120,607. (No model.)

To all whom it may concern:

Be it known that I, WILFRED LEWIS, a citizen of the United States, and a resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a certain new and useful Improvement in Vibrator-Engines, of which the following is a specification.

The present invention relates primarily to vibrator or rapping engines intended for use in connection with mold-making apparatus for the purpose of preventing the sand from adhering to the pattern during the operation of separating the pattern from the mold. Heretofore owing to the method of admitting fluid-pressure to such engines these engines have had to be formed from forged metal and their pistons have been very liable to get on a dead-center unless a spring is used to keep the piston in an initial or starting position.

One object of the present invention is to provide a vibrator or rapping engine wherein the piston may be started from all positions thereof in the cylinder.

Another object is to use rolled metal for the cylinder or barrel of such engine.

Other objects will appear hereinafter.

To these ends the invention consists of features of construction, arrangements, and combinations of devices hereinafter described and more particularly pointed out in the appended claims.

The invention is illustrated in the accompanying drawings, forming part hereof, in which—

Figure 1 is a longitudinal sectional view of an engine in which the invention is embodied. Fig. 2 is a similar view of another form of the engine in which the invention is embodied. Fig. 3 is a side elevation of a piston, and Fig. 4 is a sectional side elevation of a modified form of the invention.

In the drawings the reference *a* designates a cylinder, and *l* a piston. The cylinder or barrel *a* is circular in section and may be made from rolled metal. This barrel is reduced in diameter at one end, which reduced end is provided with screw-threads *b*. The cylinder is further reduced at this same

end, as at *c*, for a purpose to appear hereinafter. The cylinder *a* is bored through centrally thereof, the bore being circular throughout, but being of different diameters in different places. Thus at the end *b c* the said bore *d* is of a relatively small diameter, while at *e* said bore is of a larger diameter, and the end *f* of the barrel *a* is screw-threaded internally on a diameter such that the piston *l* can be introduced into the cylinder through the opening. (See reference *g*.) The bores *d e* form two end-to-end chambers, and the bore of the cylinder is enlarged at *h i k* to form annular grooves or spaces of greater diameter than the chamber *e*, said grooves being at the ends and the central portion of the chamber *e*.

The reference 7 marks an air passage or vent through the wall of the cylinder *a* at a point in the bore *e* adjacent to the groove *h*, and 8 a similar passage or escape at the groove *k*, while 9 designates a guard secured to the cylinder *a* and protecting the openings 7 8 against accidental closure. The blast from the opening 7 spreads both ways therefrom, and part thereof is drawn into the opening 8 as the piston is driven forward by the constant pressure, as hereinafter set forth, and the guard prevents sand or dirt from being drawn into the opening 8.

The piston *l* comprises a cylindrical end *m*, which fits into the chamber *d*, and cylindrical parts *n o*, which fit into the chamber *e*. A groove *p*, extending around the piston, separates the parts *n o*, and *q* designates a reduced end of the piston outside of the part *n*. The piston in Figs. 1, 2, and 3 is bored longitudinally at *r s*, and these bores are intersected, respectively, by the cross perforations *u t*, the hole *u* opening through the part *o* adjacent to the groove *p* and the hole *t* opening in said groove *p*, as shown.

In the form shown in Fig. 1 the end *b c* of the cylinder *a* is closed by a screw-cap *w*, which has a threaded opening for a pipe-tap 2. A felt or other absorbent lubricant-holder *x* is held on the end of the part *c* by the cap *w*, and said cap has an opening *y* therein for the introduction of lubricant to the said holder *x*. A screw *z* closes the opening *y* tightly. The

lubricant passes from the felt ring *x* between the cap *w* (or 3^x in Fig. 2) and the end of the part *c* to the end of the chamber *d* and thence to the piston to lubricate the same. The end

5 *f* of the cylinder *a* is closed by a screw-plug on the block 3, which engages with the threads *g*. The block 3 is provided with jaws 4 and a bolt and nut 5 for attaching the engine to some part of a molding apparatus, as a pat-

10 tern support or carrier or vibrator-frame.

In the form shown in Fig. 2 the end *f* of the cylinder *a* is closed by a screw-plug *w*^x and the end *b c* is closed by a screw-cap 3^x, which is provided with jaws 4 and screw-bolt 5 for
15 attaching the engine to some part of the molding apparatus, as the flange of a frame 6. In this form of the invention the passage *y* and screw *z* are on the plug 3^x, and said plug has a passage 10, into which an elbow-pipe tap 2^x
20 screws, and the felt washer *x* is held in place by the plug 3^x. The tap 2^x should point away from the molding apparatus.

In the modified arrangement shown at Fig. 4 the air is admitted through a pipe-tap 2 into
25 the annular space *k* and passes by channels *ru* to the annular space *i* and thence through channels *ts* to the larger pressure area (end) of the piston *l*. The exhaust is at 7, and when the pressure is cut off by the covering of the
30 opening *u* the exhaust 7 is uncovered by the part *n*, whereupon the unbalanced pressure on the relatively smaller annular pressure area of the part *o* throws the piston from right to left, as will be explained hereinafter.

35 The operation of the above-described apparatus is as follows: With the piston in the position shown the air on admission under pressure through pipe 2 or 2^x passes through the channel *ru* into the annular space *i*. Thence
40 it passes through the channel *ts* to the larger pressure area (end) of the piston. Since the end *q* has a greater area than the end *m* or the annular end of the part *o*, the excess pressure moves the piston toward the right in
45 Figs. 1 and 4 and toward the left in Fig. 2 until the end of the part *o* strikes the end of the chamber *e*, by which time the part *n* will have uncovered the port 7 and the holes *u* will have been closed by passing beyond the
50 space *i*, thus exhausting at the end *q*, but not elsewhere. Thereupon the pressure on the end *m* or the annular end of part *o* forces the piston back to the position thereof shown in the drawings, and the cycle begins again,
55 the end *q* striking against the plug closing the cylinder end. The passage 8 permits of the escape of any air that may leak into the space *k* and allows the piston to draw in and expel air without undue resistance. The
60 clamp 4 5 gives a firm and rigid grip upon the part to which the engine may be attached, and the rapid blows delivered by the piston cause an agitation of the sand such as prevents the adhesion thereof to the pattern.

65 For a better understanding of the action of engines of the class to which this invention

relates reference is made to Letters Patent of the United States Nos. 533,401 and 654,292, dated, respectively, January 29, 1895, and July 24, 1900.

70 It is noted that the air-pressure is introduced through the piston from its smaller end or from a smaller pressure area to the annular space at the central portion of the chamber *e* and that the piston by its endwise motion acts as a valve for controlling the admis-
75 sion to the larger end or pressure area thereof. There is thus always an unbalanced pressure in one or the other direction on the piston, whence it follows that there is no position
80 from which it will not be moved on turning on the pressure at the smaller end or pressure area, (annular.) It is noted also that the piston can be made to strike a blow at one end
85 only of its stroke, being cushioned by the air at the other end of its stroke. Thus the piston can be made single-acting, as stated, by removing or omitting the end *q*, the other parts of the piston and cylinder being un-
90 changed, or by removing or omitting a portion of the part *o*, as that portion thereof to the right of the line 1 1 in Fig. 3, as by turning down that portion of part *o* to the size
95 of the neck 11, the other parts of the piston and cylinder remaining as shown in the drawings, or by continuing the bore *e* beyond the groove *k* in Figs. 1 and 2.

What is claimed as new is—

1. The combination of a closed cylinder hav-
100 ing therein two end-to-end chambers of unequal diameters and annular spaces at and intermediate the ends of the larger chamber, said spaces being of greater diameter than
105 said larger chamber, a plunger-piston fitting in said chambers and having a circumferential groove in the larger part thereof, a channel connecting said groove with the larger
110 end of the piston, a channel connecting the smaller pressure area of the piston with the outside of the larger part of said piston near
115 said groove, and pressure inlet and exhaust openings in said closed cylinder, substantially as described.

2. The combination of a closed cylinder hav-
115 ing therein two end-to-end chambers of unequal diameters and annular spaces at and intermediate the ends of the larger chamber, said spaces being of greater diameter than
120 said larger chamber, a plunger-piston fitting in said chambers, and means, including channels in said piston, for maintaining continuous pressure on the smaller pressure area and for varying the pressure upon the larger pres-
125 sure area of said piston, substantially as described.

3. The combination of a barrel or cylinder
130 having a reduced end, a cap for closing said end, there being an annular space between the barrel end and the cap and also a like space surrounding the barrel end, an absorb-
135 ent for lubricant in the last-mentioned space, a plunger-piston in said barrel, and a pressure-

admission port in said cap, substantially as described.

4. The combination of a closed cylinder having therein two end-to-end chambers of unequal diameters, a plunger-piston fitting in said chambers, means including channels in said piston for maintaining continuous pressure on the smaller end and for varying the pressure upon the larger end of said piston, 10 a recess communicating with one of said chambers and with the source of pressure, and a lubricant-absorbent in said recess, substantially as described.

5. The combination of a closed cylinder having therein two end-to-end chambers of unequal diameters, a plunger-piston fitting in said chambers and having pressure areas of unequal sizes, and air-passages including annular passages in said cylinder and said piston for maintaining continuous pressure upon 20 the smaller pressure area and for varying the

pressure upon the larger pressure area of said piston, substantially as described.

6. The combination of a closed cylinder having therein end-to-end chambers of unequal diameters, a plunger-piston fitting in said chambers, means for causing said piston to reciprocate under the action of air-pressure, an exhaust-opening in said cylinder for said pressure, a vent for preventing undue resistance to the motion of said piston, and an open-ended guard covering both exhaust and vent and providing a space wherein the air is drawn in and expelled, substantially as described. 30

Signed at Philadelphia, in the county of Philadelphia and State of Pennsylvania, this 35 19th day of August, A. D. 1902.

WILFRED LEWIS.

Witnesses:

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E. H. MUMFORD.