

(No Model.)

2 Sheets—Sheet 1.

H. F. HODGES.
MOTOR OR PUMP.

No. 417,387.

Patented Dec. 17, 1889.

Fig. 1

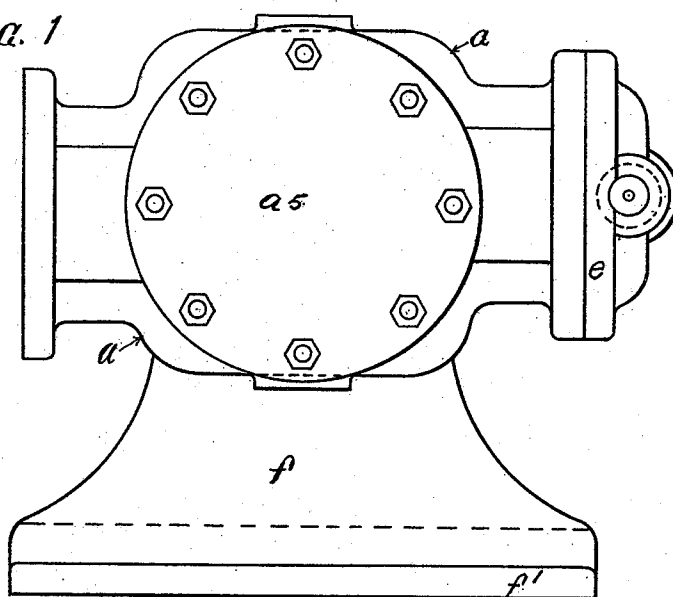
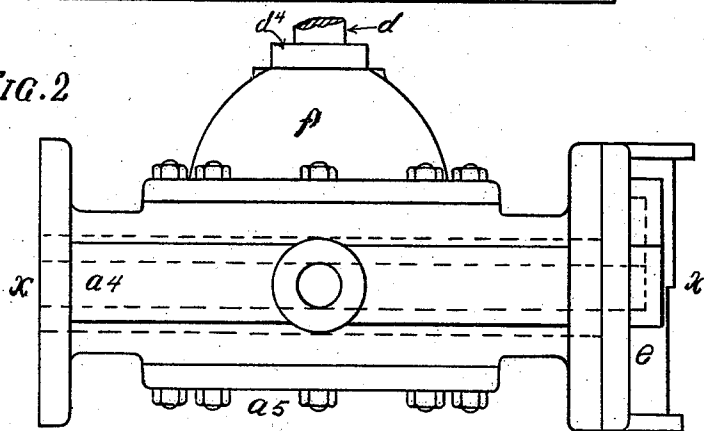


FIG. 2



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(No Model.)

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FIG. 3

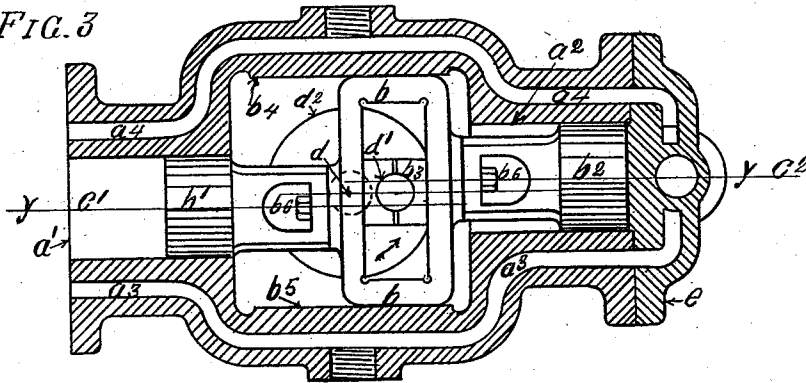
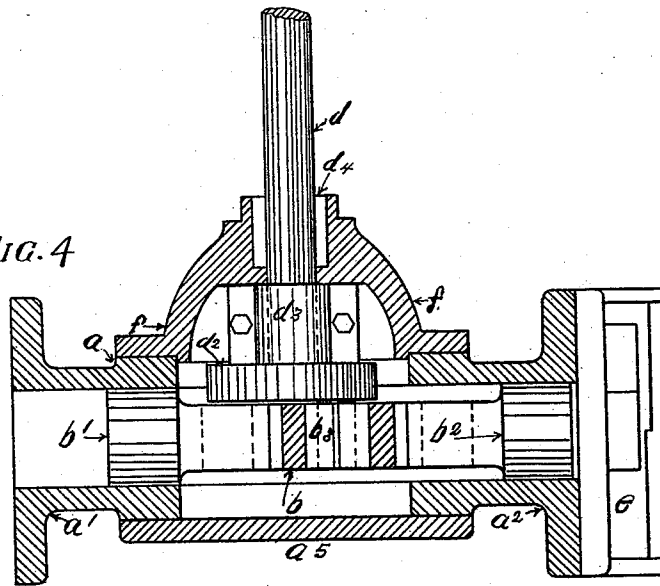


FIG. 4



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UNITED STATES PATENT OFFICE.

HORACE F. HODGES, OF BOSTON, MASSACHUSETTS.

MOTOR OR PUMP.

SPECIFICATION forming part of Letters Patent No. 417,387, dated December 17, 1889.

Application filed October 10, 1888. Serial No. 287,775. (No model.)

To all whom it may concern:

Be it known that I, HORACE F. HODGES, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Motors or Pumps; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention relates to that class of machines wherein liquids, vapors, or gases either propel or are propelled by pistons reciprocating in two or more cylinders, and in which said liquid, vapor, or gas acts or is acted upon by one end only of said pistons; and its purposes are, first, to provide an arrangement of cylinders, pistons, and valves in a motive engine or pump which shall lessen the intense strains generally brought to bear upon its beds or girders by bringing the two important centers of force—the cylinder-heads and the crank-shaft bearing or journal-box—nearer together; second, to modify the injurious effect of the angular motion of the crank-pin; third, to provide a means of effectually and thoroughly lubricating the main shaft-journal, crank-pin, and cylinders; fourth, to lessen the "clearance-spaces" between the valves and piston-heads, and, fifth, to provide against the liability of said parts getting out of alignment. Its novelty and the means by which I accomplish these ends will be more clearly understood by reference to the accompanying drawings, forming a portion of this specification, in which—

Figure 1 represents a side elevation of a machine constructed according to my invention. Fig. 2 is a plan view of Fig. 1. Fig. 3 is a vertical section of Fig. 1 on the line $x x$ of Fig. 2, showing arrangement of pistons and means by which motion is conducted to or from main shaft d . Fig. 4 is a horizontal section on line $y y$ of Fig. 3, with same object as Fig. 3, and to show pillow-block f and main-shaft bearing.

Similar letters refer to similar parts on the various figures.

a is a connecting-shell, having the cylinders $a' a^2$ cast as a portion of it or rigidly attached thereto. As will be observed, the center lines $c' c^2$ of these cylinders are not coincident with each other or with the center of main shaft d . Said center lines are parallel and tangent to opposite sides of an imaginary circle drawn around the center of crank-shaft d , said circle having preferably a diameter equal to one-half of the travel of the pistons $b' b^2$ at each reciprocation, though it may be greater or less than this. The purpose of this arrangement is to divide the angular motion of the crank-pin d' in its forward movement in the direction of the pistons $b' b^2$ equally between the two sides of the center lines of said pistons, respectively. The outer ends of the cylinders $a' a^2$ are flanged for the attachment of cylinder-heads e in the ordinary manner.

$a^3 a^4$ are passages for conducting the propelled or propelling fluid, vapor, or gas to or from the said heads e , in which induction and eduction valves are located. These passages open upon the faces of the flanges of the cylinders $a' a^2$, as shown, Fig. 3, and are provided midway of their lengths with suitable apertures for the attachment of suitable conducting-pipes for the same purpose.

a^5 is a cover or hand-hole plate whereby access is obtained to the parts within the shell a .

b is a yoke placed within the shell a , by which motion is transmitted to or from the crank-shaft d from or to the pistons $b' b^2$. It is provided centrally with a slot or ways, wherein a link-block b^3 reciprocates at right angles to the motion of said pistons, said link-block at the same time rotating upon the crank-pin d' , upon which it fits. These ways are provided with means for adjustment for wear. (Not shown in the drawings, being no part of this invention.) Said yoke b is also provided above and below it with ways or guides $b^4 b^5$, Fig. 3, for the purpose of resisting or maintaining the vertical strain thereon incident to the motion of the link-block b^3 and to maintain it in a vertical position.

$b' b^2$ are pistons of customary forms, but rigidly attached to the yoke b at points which are offset from each other in such a manner as to conform to the peculiar arrangement of

the cylinders $a' a^2$, in which they are intended to reciprocate.

b^3 is the link-block before referred to, made square externally to fit the slot or ways in the yoke b and to present a broad wearing-surface thereto. It is provided internally with a bearing for the crank-pin d' , and is preferably made in two parts, as shown.

$b^4 b^5$ are ways or guides fitting above and below the yoke b and attached to the inner part of the shell a , and its office is to maintain the said yoke in its proper position. They are preferably made adjustable to compensate for wear. The yoke b is attached to the pistons $b' b^2$ by removable bolts b^6 , in order that said yoke may be removed at any time to facilitate repairs or adjustment through the hand-hole covered by the plate a^5 .

$c' c^2$ are the center lines of the pistons $b' b^2$, respectively, showing that they are offset, as hereinbefore explained, vertically but not horizontally.

d is the main shaft. To it is firmly attached the crank-disk d^2 , sustaining the crank-pin d' . Said shaft rotates in the bearing d^3 and extends through the stuffing-box d^4 , as shown, the latter providing a means of preventing the escape of the lubricating-fluid contained within the shell a , as hereinafter described. To its outer end may be attached suitable pulleys for conveying motion to or from it, and it may rest in an outer bearing of any appropriate form.

e is a cylinder-head designed to be secured to each of the cylinders $a' a^2$. Its construction will be the subject of another application. It is intended to show that induction and education valves are placed in it, thereby in a motor reducing clearance-spaces to a minimum.

f is a pillow-block for supporting the frame or shell a and its attachments, and it is so constructed that it forms a cover or head to one side of said shell a as the hand-hole plate a^5 does to the other side, thus converting the said shell, with the help of the pistons $b' b^2$, into a closed box, which I have denominated the "center space." The pillow-block f also forms a support for the shaft-bearing d^3 and stuffing-box d^4 , which form a part of it. It is also provided at f' with a foot or flange for attachment to a suitable foundation, as shown in Fig. 1.

The action of this mechanism is obvious; but to make it perfectly clear I will suppose it employed as a motor, when its operation will be as follows: The motive agent enters at e , by means of the passage a^4 , into the cylinder a^2 , and forces the piston b^2 and yoke b against the link-block b^3 and crank-pin d' , causing the crank-shaft d to revolve one-half of a revolution in the direction of the arrow, Fig. 3. In moving with the pistons b^2 and b' the crank-pin d' and link-block b^3 also move vertically in the slot or ways of the yoke b . Now it will be noticed that the crank-pin d' at the commencement of this stroke or reciprocation is not opposite the center of piston

b^2 , as in the ordinary arrangement of cylinders, but below it a distance equal to one-half of its angular or vertical motion during one-half of a revolution of the shaft d . As the shaft revolves the crank-pin d' rises till at or about one-quarter of said reciprocation of pistons $b' b^2$ it is opposite the center line c^2 of piston b^2 , at one-half stroke it is as much above said center line as it was below it at the beginning of the stroke, at or near three-quarters stroke it is again opposite center line c^2 , and at the completion of the stroke it is again as much below center line c^2 as at the commencement of the now completed stroke. On its return reciprocation, in consequence of the admission of the motive agent to cylinder a' , the crank-pin d' bears the same relation to center line c' as it did to center line c^2 . By these means the angular motion of the crank-pin d' from the center lines c' or c^2 of the operative piston is never more than one-quarter of the stroke. When employed as a pump or compressor, the motion of the shaft d will be the reverse of the arrow. The center space is thus inclosed that it may be wholly or partly filled with a lubricating-fluid reaching all the important bearings of the machine.

I am aware that certain forms of engines employ a crank-case containing a lubricant, but are not so constructed that they may be closed entirely, as the pistons therein do not move in unison, and the capacity of the case is therefore variable; but in my invention the center space is entirely inclosed, as the capacity, owing to the pistons $b' b^2$ moving in unison, is unvarying. Moreover, this crank-case is so arranged that the lubricant covers all wearing parts within it, which is not the case with other machines employing a crank-case containing a lubricant.

The necessary valve arrangements and connections designed for my invention I reserve for subsequent applications, merely noting that the head e contains suitable valves operated by appropriate means.

It is my purpose to make the machine herein described duplex by arranging two mechanisms such as described, one on either end of the shaft d , with the pulley and fly-wheel between, thus forming a duplex engine or pump either half of which may be operated separately or both conjoined. In such case the crank-pins on the opposite ends of shaft d would be set one ninety degrees in advance of the other, giving four equidistant impulses to a revolution; also to use one end of such arrangement as a pump, while the other is employed as a motor to operate it.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a motor or pump, the combination, with a shell a , provided with two oppositely-arranged but offset independent cylinders, and with a central closed chamber or center space between said cylinders adapted to re-

tain a lubricating-fluid, of a yoke fitted to
slide in ways in said chamber and having a
central opening or slot, a shaft having a crank-
pin entering said opening or slot, a block
5 fitted to slide in said opening or slot and sur-
rounding said crank-pin, and pistons working
in said cylinders and connected to the op-
posite sides of said yoke at points which are
offset from each other, substantially as set
10 forth.

2. The combination, with the shell *a*, pro-
vided with the independent cylinders *a'* *a''*,
and the central closed chamber or center
space between said cylinders, of the yoke

sliding in said chamber, the shaft having a 15
crank-pin working in said yoke, pistons work-
ing in said cylinders and having offset con-
nections with said yoke and the pillow-block
f, and the man-hole plate *a''*, completely clos-
ing the sides of said chamber and rendering 20
the same fluid-tight, substantially as set forth.

In testimony that I claim the foregoing I
have hereunto set my hand this 6th day of
October, 1888.

HORACE F. HODGES.

Witnesses.

CHARLES H. PELL,

DAVID J. HAVENSTRITE.