J. L. KNIGHT.

HYDRAULIC ENGINE.

APPLICATION FILED JAN. 15, 1909

990,364. **Patented Apr. 25, 1911.**

Fig. 1

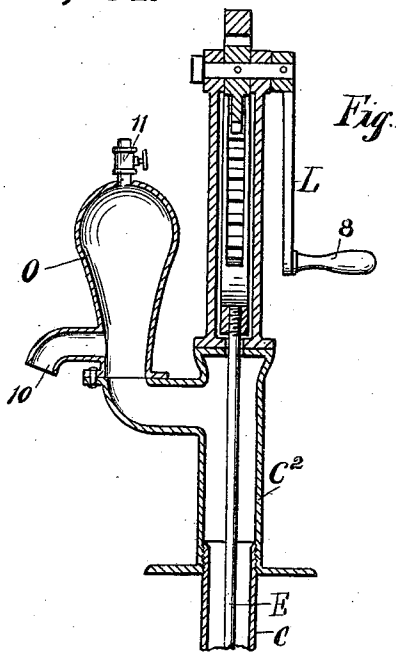


Fig. 2

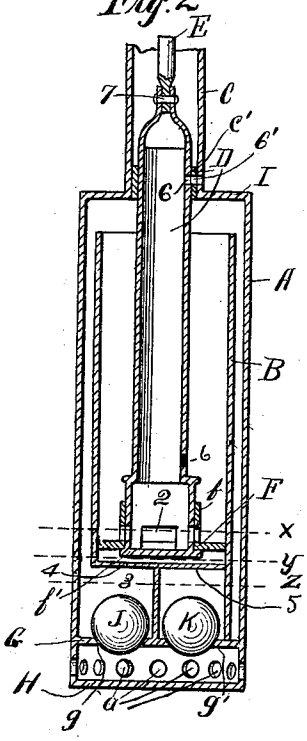


Fig. 3

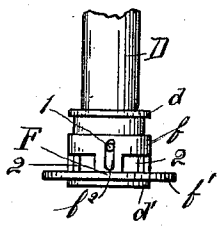


Fig. 4

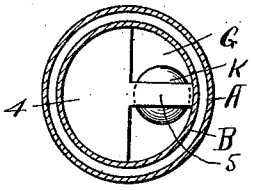


Fig. 5

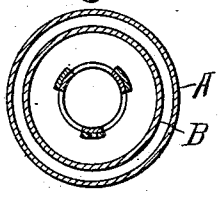
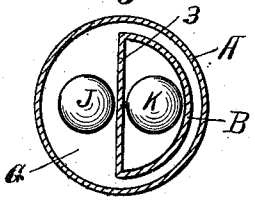


Fig. 6



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HYDRAULIC ENGINE.

990,364. Specification of Letters Patent. Patented Apr. 25, 1911.

Application filed January 15, 1909. Serial No. 472,441.

To all whom it may concern:

Be it known that I, JONATHAN LEE KNIGHT, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented a new and useful Hydraulic Engine, of which the following is a specification, reference being had to accompanying drawings, which form part of the same.

My invention as described and illustrated in this application, is specifically a pump, but from the wide field in which the fluid moving mechanism is adapted to be applied, may be generically designated as a hydraulic engine.

The objects of the invention are to supply a fluid moving mechanism which shall be of low cost of production; require reduced amount of power for its operation; comprise few parts, all of simple form; and so united as to require no valve packing with the extra power to overcome the friction of such valve packing; while at same time the device shall maintain perfect efficiency, and be interchangeable at pleasure of the user, from a lift pump for ordinary wells or cisterns, to a force pump of enormous power for raising oil or water from deep wells, rock bored, of very small diameter, or forcing such fluid long distances through horizontal or variously inclined pipes—shall be adapted to be operated by any kind of power, and constructed of any size, from a miniature toy to an engine of gigantic proportions, and available for use wherever fluids are required to be moved. I accomplish these various and useful objects by means of the mechanism herein described and illustrated by the drawings which accompany and form part of this specification, and in which like reference letters and numerals indicate like parts and details throughout the several figures and views, principal parts taking letters, and auxiliary parts, modifications, and details of construction, taking numerals as reference indices.

In the drawings, Figure 1 is a vertical sectional view of the power applying mechanism, taken through the center thereof, showing, also, the terminal portion of the conduit, with its air chamber, and the outlet spout and adjustable valve. Fig. 2 is a vertical sectional view, taken through the center of the fluid moving mechanism, showing outline form, and relation to each other, of the various metal parts. Fig. 3, is an elevation of the piston head, with part of hollow section, D, of its connected piston rod, showing the outline form and relations of each to the other. Fig. 4, is a horizontal cross sectional view, taken from the dotted line, *y*, and looking downward, of Fig. 2. Fig. 5, is a horizontal cross sectional view, looking downward, from the dotted line, *x*, of Fig. 2. Fig. 6, is a horizontal cross sectional view, looking downward from the dotted line, *z*, of Fig. 2.

Describing the mechanism in detail as shown in the drawings:—A, is the outer cylinder, or housing, being a part of, and inclosing other parts of the fluid moving mechanism.

C, is the stock, or conduit, through which the fluid passes in being moved from one point to another.

C′, is a bushing, or inwardly extending ring at lower end of the stock, or conduit, C.

D, is the lower section of the piston rod, formed of a hollow tube; and E, is the upper, or main section of the piston rod, preferably formed of a solid rod, the two sections being united by pivotal connection, 7.

F, is the plunger head, composed of two sections, the tubular vertical section, *f*, and the flange section, *f′*, extending outwardly, and at right angles to the tubular section.

G, is the inner, or secondary bottom, and H, is the true, or closure bottom, of the outer cylinder, A.

I, is the top, or closure lid of the outer cylinder, A.

The cylinder, A, may be of any desired size, and any suitable metal, non-corrodible under action of the fluid to be moved. This cylinder has fixed at its ends the true bottom, H, and the closure cap, I, the secondary bottom, G, being situated a sufficient distance from the true bottom, H, to allow free ingress between the two for the volume of fluid to be moved. The walls of this cylinder at this space between G, and H, are perforated by the small openings, *a*, *a*, *a*, &c., which serve as entry ports for the fluid, and may be made small enough to serve also as strainers, or to an extent, as filters.

The inner cylinder, B, like the outer, may be of any desired size or material. Its upper end is fully open, while about one half the area of its lower end is closed by the semicircular bottom plate, 4, and the other

half by the secondary bottom, G, to which the lower end half of the walls of B is fixed, one half of its wall being cut away at the portion between G and the half bottom, 4, and a partition, 3, extending from G, to 4, on diameter line of cylinder, is fixed by fluid tight joints to edges of wall, as also to G, and 4. The valve seat plate, G, has two circular openings, g, and g' which serve as seats for the ball valves, J, and K. Above the ball, K, and on level with the half bottom, 4, a wire rod, or other suitable stop, 5, is placed to limit upward movement of the ball, K.

The lower, tubular section of the piston, D, has a stop-ring d, and a projecting fixed closure bottom plate, d', at its lower end. These limit the extent of movement of the piston head, F, as the piston passes freely up or down through the section, f, of plunger head, while the vertical slot, f^2, in which the fixed stud, 1, plays, prevents the plunger head from turning on the piston, keeping the entry ports, 2, 2, always in vertical alinement. The projecting flange section, f', of the plunger head, F, extends to, and fits loosely within the walls of the inner cylinder, B. The length of the piston stroke gives this plunger head reciprocating movement through the cylinder, B, from a position near its upper end, to the fixed half bottom, 4, near its lower end. Through the walls of the section, f, of the plunger head, as also through the walls of the hollow section, D, of the piston, are provided the slot shaped openings, 2, 2, in vertical alinement, but by the short movement of the piston vertically through the plunger head, these openings, 2, 2, are brought into horizontal alinement either above, or below, the flange section f', of the plunger head. By this means the entry ports for passage of the fluid from the cylinder, B, to the hollow section of piston rod and thence to the conduit, C, are alternately opened or closed, either above or below the flange of the plunger head, and permit passage of the fluid, whether piston rod be moving either up or down. When the pressure of flange section is downward on the fluid in the cylinder, B, the ball, K, is seated and firmly held in place in the opening, g', closing that means of its escape, and it is forced into and upward through the hollow section of piston, and connected conduit. When the return, or up stroke is made, the pressure closes and holds in its seat, g, the ball, J, preventing the fluid returning to the reservoir, and forcing it into the hollow section of piston rod above the flange section, f', of the plunger head. By means of this adjustable alinement of the entry ports, 2, 2, portions of the fluid within the cylinder, B, whether below or above the plunger head, are given a continuous movement in same direction, and through the same conduit, from pressure in either direction. Thus, while the portion of fluid in the cylinder, B, below the bearing flange, f', of the plunger head is being pressed downward by the down stroke of the piston rod, it is forced through the openings, 2, 2, and entering the hollow section of the piston rod, moves in the opposite direction, upward, through the conduit, and at same time the portion which is in the space between the cylinders, A, and B, rushes over the open top of the cylinder, B, to fill the vacuum created by its movement. But this new portion thus entering the cylinder, B, is above the flange, f', of the plunger head, and in that position receives pressure upward by the return, or up stroke of the piston. The first fraction of the movement of the piston having opened the entry ports, 2, 2, above the flange section of the plunger head, this portion is now forced into the hollow section, D, of piston rod, and through it into, and upward through the conduit. This same first fraction of the upward movement of the piston has brought the openings, 2, 2, in the walls of the piston, above the flange of the plunger head, and into horizontal alinement with like openings in the vertical section of the plunger head, thus opening a passage way through which the fluid is forced into, and upward through the hollow section, D, of piston rod and conduit. While this is occurring, the fluid in the reservoir, entering through the openings, a, a, in walls of the outer cylinder, A, rushes in by its own gravity to fill the vacuum below the plunger head, caused by the removal of the portion above the plunger head, resulting from up stroke of the piston rod.

When the fluid moving mechanism, comprising the cylinders, A, and B, with their contained section of piston rod and its connected plunger head, is immersed in the fluid to be moved, such fluid, of its own gravity, enters through the openings, a, a, and a portion passing upward through the opening, g, under the ball, J, enters the space between the cylinders, A, and B, while another portion passing up through the opening, g', under the ball, K, enters the inner cylinder, B, thus filling the entire space between the cylinders, the inner cylinder both above and below the plunger head, and such parts of the piston rod and conduit as may be below the level of fluid in the reservoir. Thus the pump is always primed, and ready to move the fluid when the piston rod moves either up or down. Thus, also, it is seen that there is but an instantaneous stoppage of the flow of fluid through the openings, a, a, into the lower portion of the composite cylinder, and a like instantaneous stoppage of its entry into the hollow section of the piston rod, and thence upward through the conduit to the outlet spout, or

final point where its movement ceases. This brief stoppage occurs while the piston rod is making the first fraction of its movement either upward or downward, and in effect is the dead center passed in changing the direction of motion, continued a brief instant while the entry ports, 2, 2, pass the flange of the plunger head. This stoppage is so brief that the fluid flows through the conduit, and from the outlet spout in a continuous stream, its own momentum having transmuted the stoppage to a brief reduction of velocity.

Just above the stop collar, *d*, near lower end of piston rod, a small opening, 6, is provided, and through the wall of the conduit, C, and the collar, C′, a similar opening, 6′, the two being in horizontal alinement when piston rod is at end of its up stroke, and at rest, serve as seep hole through which the fluid left in the conduit or stock, passes out of its own gravity when motion of piston rod ceases, thus automatically emptying the mechanism down to the level of the fluid in the reservoir, and thus rendering the pump anti-freezing, as well as bringing the water or other fluid from the level of the reservoir at each time it is used. This is a very desirable and useful feature, especially in farm pumps in high latitudes.

Having thus fully described my invention, pointed out the novel and useful features embodied in it, and explained the methods and results of its use, what I claim as new, and desire to secure by Letters Patent of the United States, is:—

1. A hydraulic engine comprising a power applying mechanism connected to a fluid moving mechanism, said fluid moving mechanism comprising essentially two tubular cylinders of unequal diameter and length, the smaller cylinder rigidly fixed within the larger one, with an annular space between their walls; the outer cylinder having one end fully closed by a fixed bottom, its other end covered by a cap with central opening: the inner cylinder having its upper end entirely open, and in a position leaving an open space between the open end of the inner cylinder and the covering cap of the outer cylinder, approximately one half the area of the other, the lower, end of the inner cylinder being closed by a fixed, semicircular, half bottom; the other approximate half of its area covering a portion of a horizontal plate, or inner supplemental bottom fixed in the outer cylinder; a hollow section of a piston rod adapted to be moved reciprocally in the central portion of said inner cylinder; and a two-way valved piston head, composed of two sections—a vertical tubular section rigidly fixed in a horizontal flange section—all in the manner, and for the purposes as shown and described.

2. In a hydraulic engine comprising essentially a power applying mechanism connected to a fluid moving mechanism, as an elemental part of such fluid moving mechanism, the composite cylinder, formed by two tubular sections of unequal diameter and length, the smaller and shorter of said tubular sections rigidly fixed within the larger and longer section; the outer tubular section, or cylinder, having its lower end fully closed by a fixed or true bottom, and its upper end covered by a cap having at the center of said cap an opening, and said outer cylinder, at a suitable distance above its true bottom, having rigidly fixed an extra or inner bottom having therein two or more openings for ball valves, and the portion of its walls between its true bottom and its extra bottom, perforated with multiple openings, or entry ports for the fluid to be moved; the inner tubular section, or cylinder, having its upper end entirely open, and in a position leaving an open space between this end and the covering cap of the outer cylinder, and having approximately half its lower end closed by a semicircular fixed bottom, its wall from this half bottom being cut away down to the extra bottom of the outer cylinder, and a vertical plate, or partition, on its diameter line extending from the said half bottom of the inner cylinder to the extra bottom of the outer cylinder, to which, with the approximate half of the wall of said inner cylinder not cut away, the diameter line plate and end of half wall are rigidly attached, all substantially in the form and manner, and for the purposes as shown and described.

3. In a hydraulic engine comprising a power applying mechanism connected to a fluid moving mechanism, such fluid moving mechanism comprising a composite cylinder formed from two tubular sections of unequal diameter and length, the two-way valved piston head, adapted to be carried by, and move vertically upon the lower portion of a hollow piston rod, said piston head embodying a tubular vertical section and a flat horizontal section, with means for permitting a fluid to enter the hollow piston either above or below the horizontal flange section of said plunger head; all in the manner, and for the purposes as shown and described.

4. In a hydraulic engine comprising a power applying mechanism connected to a fluid moving mechanism, such fluid moving mechanism comprising a composite cylinder formed from two tubular sections of unequal diameter and length, the smaller section rigidly fixed within the larger section; and a two-way valved piston head adapted to move freely within the smaller cylinder, the combination of a composite piston rod formed of two sections pivotally connected together, one of said sections being formed of a hollow tube and having at its lower, or free end, a fixed bottom with projecting edges, its other section being formed of a solid rod,

and having one end pivotally connected to the end of the hollow section, the hollow section of said piston rod being adapted to move freely within the tubular section of the piston head for a limited distance vertically, and having through its walls openings adapted to be brought into horizontal alinement with openings in the walls of the tubular section of the piston head either above or below the flange section of said piston head, all substantially in the manner, and for the purposes as shown and described.

In testimony whereof I hereunto affix my signature, this 11th day of January, 1909. Done at Kansas City, in the State of Missouri, in the presence of two witnesses.

JONATHAN LEE KNIGHT.

Witnesses:
A. P. WOODSON,
ROXIE MAYES.