A. L. IDE.

Steam-Pump.

No. 219,481. Patented Sept. 9, 1879.

Fig. 1.

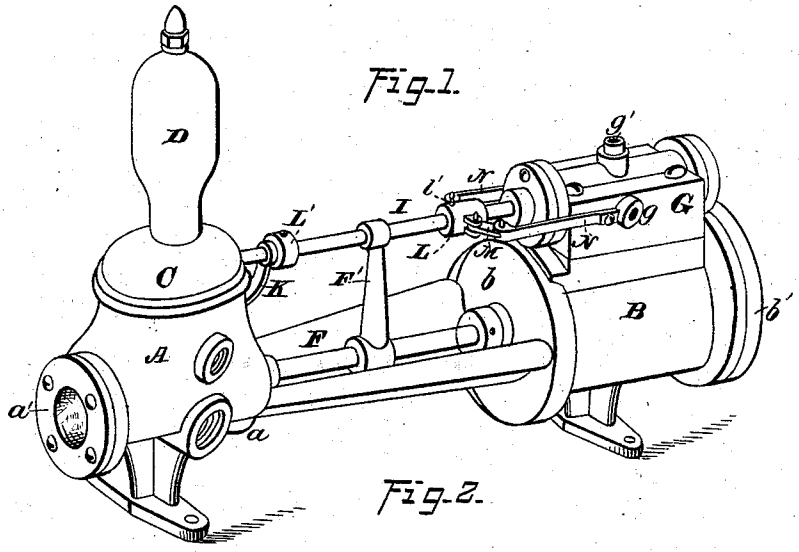

Fig. 2.

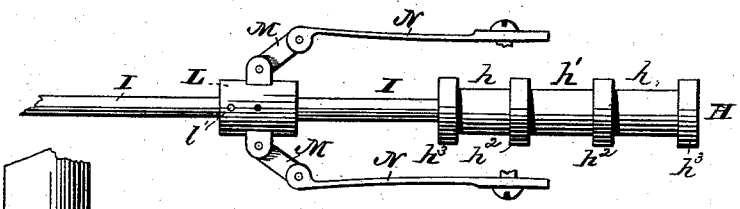

Fig. 3.

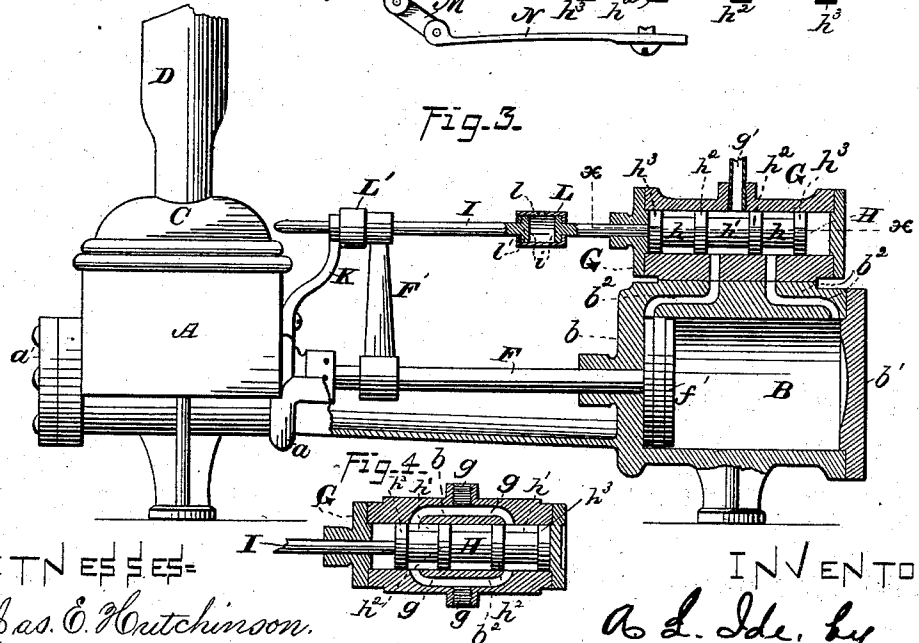

Fig. 4.

WITNESSES:

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UNITED STATES PATENT OFFICE.

ALBERT L. IDE, OF SPRINGFIELD, ILLINOIS.

IMPROVEMENT IN STEAM-PUMPS.

Specification forming part of Letters Patent No. **219,481**, dated September 9, 1879; application filed June 30, 1879.

To all whom it may concern:

Be it known that I, ALBERT L. IDE, of Springfield, in the county of Sangamon, and in the State of Illinois, have invented certain new and useful Improvements in Steam-Pumps; and do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a perspective view of my improved pump as arranged for use. Fig. 2 is a plan view of the steam-valve and its operative mechanism detached from the pump. Fig. 3 is a vertical longitudinal section of said pump upon a central line, and Fig. 4 is a horizontal section of the same upon line *x x* of Fig. 3.

Letters of like name and kind refer to like parts in each of the figures.

The design of my invention is to increase the efficiency and simplify the construction of steam-pumps; to which end it consists, principally, as a means for operating the steam-valve of a pump, in a cross-head connected at opposite sides by toggle-bars to or with spring-bearings that are capable of movement at a right angle to the line of motion of the valve-rod, which cross-head is connected with the latter in such manner as to permit it to move over the same without engagement until the said toggle-bars are in a line with each other and said head is at the neutral point, substantially as and for the purpose hereinafter specified.

It consists, further, in the construction of the valve-operating mechanism, substantially as and for the purpose hereinafter shown.

In the annexed drawings, A represents the water-cylinder, and B the steam-cylinder, of my pump, which cylinders are connected together by means of a frame, and are preferably cast with and form part of the same.

The inner end of each cylinder A and B is permanently inclosed by means of a head, *a* and *b*, respectively, while their outer ends are inclosed by removable heads *a'* and b^1, respectively, while the water-cylinder is provided with a valve-chest, C, air-chamber D, and the usual system of valves.

A piston-rod, F, passes through suitable stuffing-boxes into each of the cylinders A and B, and upon the end contained within the water-cylinder has attached a plunger, while upon its opposite end, which is contained within the steam-cylinder, is secured a piston, *f'*, both of usual construction.

Upon the upper side of the steam-cylinder B is secured a steam-chest, G, which has a cylindrical interior that communicates with the interior of said cylinder by means of ports b^2, which extend from the ends of the latter upward toward each other, and thence upward, as shown in Fig. 3, and enter the lower side of the steam-chest upon each side of its longitudinal center.

At points midway between the ports b^2 and the ends of the steam-chest G, at each side of said steam-chest, exhaust-ports *g* pass outward, and thence toward each other, and, uniting at the longitudinal center of said steam-chest, pass laterally outward, as shown in Fig. 4, and when the pump is arranged for use connect with an exhaust-pipe.

Of course but one set of exhaust-ports is required for use, and the other may be closed.

Fitted within the steam chest G is a valve, H, which has the general form of a cylinder, and so closely fills the interior of said steam-chest as to render the joint between their contiguous surfaces steam-tight without interfering with perfect freedom of motion of said valve.

Within the periphery of the valve H are cut three circumferential grooves, *h h* and h^1, which divide said valve into four circumferential bearing-faces, h^2 and h^3, that are equidistant from each other, and have each a width slightly greater than the width of either of the ports b^2.

The ports b^2 are arranged at precisely the same distance apart as are the inner bearing-faces, h^2, so that when the valve H is placed midway between the ends of the valve-chest G said faces will cover said ports, while the exhaust-ports *g* are located midway between said faces h^2 and the outer faces h^3 when said valve occupies the position named.

The valve H has sufficient longitudinal motion to enable either of the ports b^2 to be uncovered and connected with the groove or recess *h* within the corresponding end of said valve, as shown in Fig. 3, and as said recess

is at all times in communication with the exhaust-ports g, such arrangement of said valve places one end of the cylinder B in communication with said exhaust-ports.

Steam is admitted to the steam-chest G through an opening, g', at its upper side and longitudinal center, which opening or port has such dimensions as to prevent it from being in any degree covered by either of the faces h^2.

The operation of the steam mechanism is as follows, viz: Upon the admission of steam to the steam-chest G, the valve H being at one limit of its motion, said steam passes through the recess h into the port b^2, which is in communication therewith, and through said port b^2 into the cylinder B, when it operates to move the piston f' to the opposite end of said cylinder. If, now, the valve H is moved to the opposite limit of its motion, the steam-port b^2, which was before in communication with the induction-recess h, is placed in communication with the contiguous eduction-recess h^1, and spent or dead steam is permitted to escape from the end of the cylinder B, where it has performed its legitimate office, while at the same time the opposite port, b^2, is placed in communication with said induction-port h, and live steam is admitted to the said port, and through the same to the corresponding end of said cylinder, where it performs the office before described.

The construction of parts shown enables the valve H to work as freely under a pressure of steam as where no pressure exists, said valve being perfectly balanced and free from the friction common to those of other forms.

In direct-acting reciprocating engines it is necessary that considerable space should be left between the piston and cylinder-heads at each end of the stroke, or that the steam-valve should be moved suddenly, so as to admit steam in front of the piston, for the purpose of checking its motion and returning it to the opposite end of the cylinder, as otherwise said piston is liable to be thrown against and break the cylinder-heads when moving at a high velocity, or to have its momentum arrested, before the valve is shifted, when moving at a low rate of speed.

Experience having shown that the best result is secured when the steam-valve is moved suddenly the full distance, I have adopted such method of operation, and employ the following described mechanism for accomplishing the desired result:

A valve-stem, I, is connected with the valve H, and passes through a suitable stuffing-box outward upon an axial line, and has its outer end contained within a guide or bearing, K, which is secured to and extends upward from the water-cylinder A.

Secured to or upon the valve-stem I at a point near the steam-chest G when the valve H is moved to the outer limit of its motion, is a head, L, which has pivoted to each side one end of a toggle-bar, M, the opposite end of which bar is pivoted upon a spring-bar, N, that projects horizontally inward from said steam-chest in a line with said valve-rod.

The length of each toggle-bar M is such as to enable the valve-rod I to reach either limit of its motion when the springs N occupy their normal positions; but when said valve-rod is moved from one end of its stroke to the opposite limit said toggle-bars will force said springs outward until said valve-rod has reached the center of its motion and said toggle-bars are in a line with each other, and after passing such point said springs will exert sufficient inward pressure to move said valve-rod from thence to the limit of motion in such direction.

The valve-rod I is moved in opposite directions by means of a tappet-arm, F′, which is secured to the piston-rod F, and, extending vertically upward, fits loosely around said valve-rod, as shown in Fig. 1. When moving toward the steam-chest G said arm engages with the head L and moves the same and said valve-rod in such direction, while upon the return stroke of said piston-rod said arm engages with a collar, L′, that is secured upon said valve-rod, and moves the latter in the same direction.

While the mechanism described will change the valve H with considerable celerity after it commences to act, it is liable to fail when the engine is running slowly, as in such event said valve might be moved sufficiently to cut off steam and cause the piston to stop without carrying the head L beyond the dead-point or neutral line, so as to enable the springs N to act and the movement of said valve to be completed. To obviate this difficulty the head L is provided with an axial cylindrical opening, l, which extends from its outer end nearly to its inner end, and is open at the first-named point.

The valve-rod I is divided transversely, and each of its contiguous ends is provided with an enlargement, i, which has substantially the radial dimensions of the opening l, the enlargement of the section to which the valve H is connected having such diameter as to enable it to move freely within said opening, while the enlargement i of the outer section fills closely the outer end of said opening l, and is secured therein by means of a pin, l', or other equivalent device. The length of the opening l within the head L, and consequently the amount of longitudinal motion given to said head upon the valve-rod I, just equals one-half the movement allowed to said head by the toggle-bars M and springs N, so that when said head is moved in either direction it reaches the neutral point before its motion is communicated to said valve-rod, and, as a result, the valve H is moved entirely and instantaneously by the action of the springs, the sole office performed by the arm F′ being to move said head L to and slightly beyond the point where the action of said springs commences.

In consequence of the construction described

the speed of the piston has no bearing upon the movements of the valve H, the changes of position of the latter being made in precisely the same time, whether the engine is run at a high or low rate of speed, so that said engine can be made to work perfectly while sufficient steam is used to move its piston, however slowly, from one end to the opposite end of its cylinder.

When the valve-gearing shown is employed it is impossible that the piston should strike either cylinder-head, as the instantaneous throw of the valve causes the full pressure of steam to be interposed between said piston and the contiguous head just before the limit of motion is reached in such direction, which pressure will correspond to the velocity of said piston, whether high or low, and produce the same result in each instance.

Having thus fully set forth the nature and merits of my invention, what I claim as new is—

1. As a means for operating the steam-valve of a pump, a head connected at opposite sides by toggle-bars to or with spring-bearings that are capable of movement at a right angle to the line of motion of the valve-rod, which head is connected with said valve-rod in such manner as to permit it to move over the same without engagement until the said toggle-bars are in a line and said head is at the neutral point, substantially as and for the purpose specified.

2. In combination with the steam-valve H, the sectional valve-rod I, provided at its inner ends with enlargements *i*, the head L, having an axial cylindrical opening, *l*, and engaging with said enlargements, the collar L′, the toggle-bars M, pivoted each at one end to said head, the spring-bars N, secured to the valve-chest G and furnishing pivotal bearings for the outer ends of said toggle-bars, and the tappet-arm F′, secured upon and moving with the piston-rod F, and arranged to impinge upon said head L and collar L′, said parts being combined to operate in the manner and for the purpose substantially as shown.

In testimony that I claim the foregoing I have hereunto set my hand this 10th day of April, 1879.

ALBERT L. IDE.

Witnesses:
HARRY L. IDE,
CHAS. A. ORR.