R. WALTON.

Steam-Engine.

No. 220,320. Patented Oct. 7, 1879.

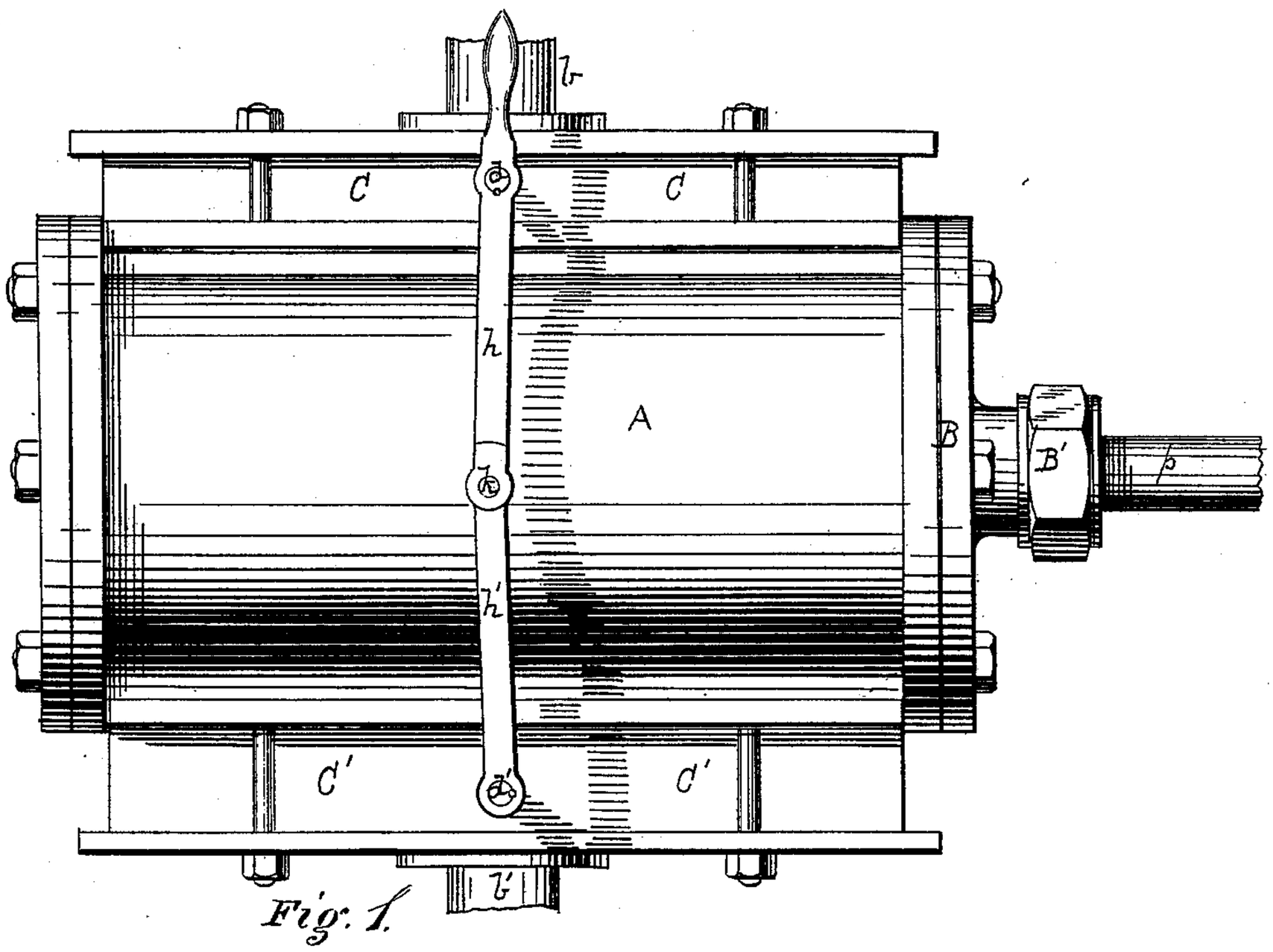

Fig. 1.

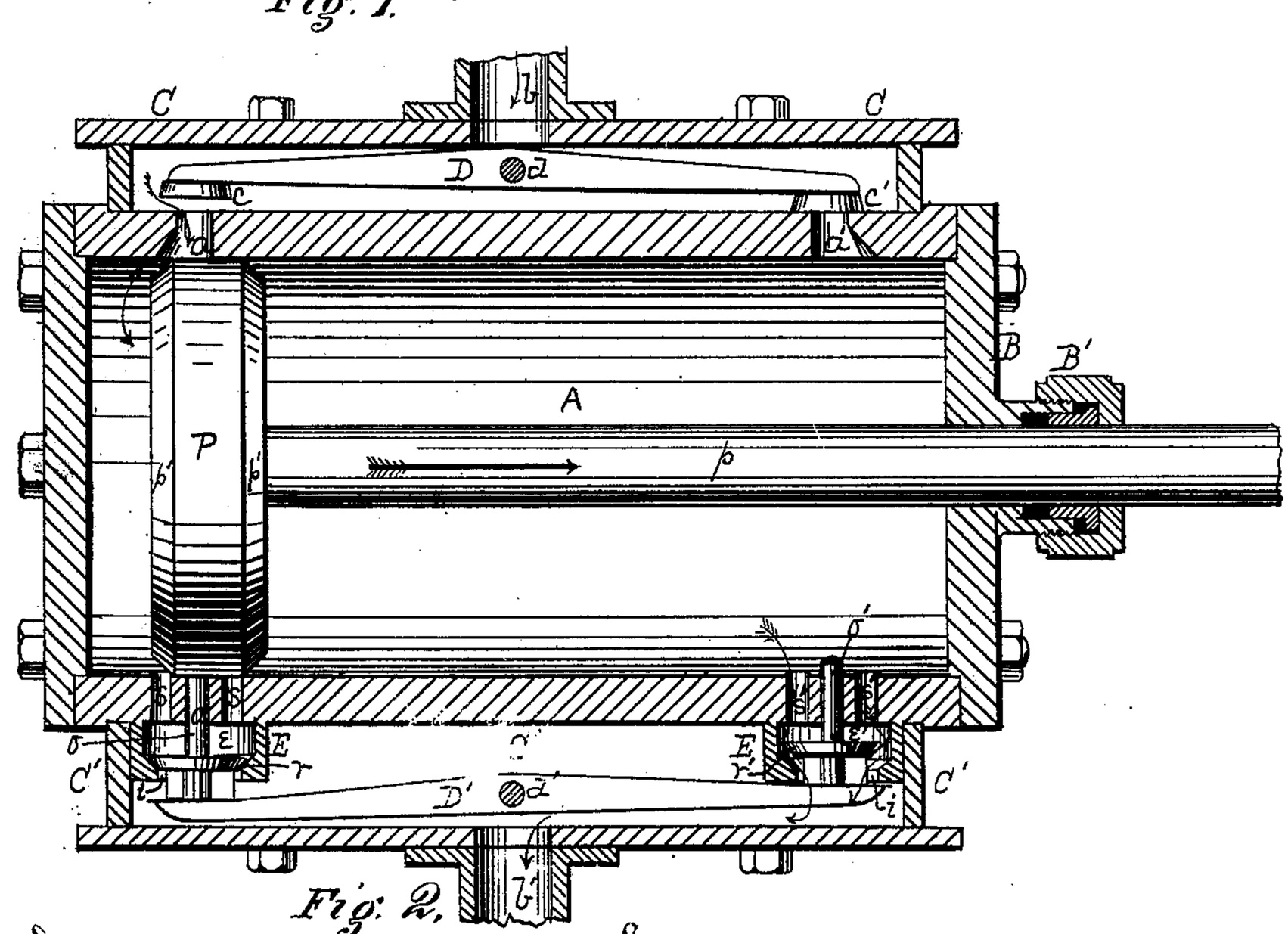

Fig. 2.

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UNITED STATES PATENT OFFICE.

RICHARD WALTON, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN STEAM-ENGINES.

Specification forming part of Letters Patent No. **220,320,** dated October 7, 1879; application filed July 21, 1879.

To all whom it may concern:

Be it known that I, RICHARD WALTON, of Pittsburg, county of Allegheny, State of Pennsylvania, have invented or discovered a new and useful Improvement in Steam-Engines; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—like letters indicating like parts—

Figure 1 shows a side elevation of a steam-engine cylinder and valve-gear illustrative of my invention, and Fig. 2 shows a longitudinal vertical section of the same.

My invention relates to the construction and arrangement of valves and valve-gear of steam-engines.

In works of various kinds, and especially in and about oil-refineries, it is often necessary to conduct steam a long distance through pipes from the generating-boilers to the engine or place of use. During such passage the steam unavoidably loses considerable heat, and, condensing, forms water both in the pipes and in the cylinder of the engine. Unless this water is in some way removed from the cylinder it causes serious trouble, often resulting in forcing off the cylinder-heads, or so straining them as to cause leaking.

As engines have been constructed heretofore the only way of getting rid of water of condensation is to churn or force it out through the exhaust-ports, which, along with the inflow-ports, have been placed upon the top or at the side of the cylinder, or, on the other hand, it must be blown out through the waste-cock, which is usually provided. Either method of clearing the cylinder of water is a slow and tedious one, and on this account is often neglected or only partially done, and the engine consequently injured.

I effectually overcome this difficulty by my improvement, as by the construction and arrangement of the exhaust valves and ports water is effectually prevented from accumulating in the cylinder, and the engine may consequently be run with comparatively cold steam without danger or inconvenience. Also, the valves for both supply and exhaust ports are arranged and operated in such way that during their movement they are surrounded on all sides by equal or nearly equal pressure of steam, and they can therefore be operated promptly at the expense of but very little power.

The construction and arrangement of my improvement are as follows:

In the drawings, A represents a steam-engine cylinder; P, the piston working therein; *p*, the piston-rod, which passes through cylinder-head B and a packing or stuffing box, B′, which may be of any known or suitable construction adapted to perform the usual functions of such devices. All these parts may be of the usual or any convenient construction, except as hereinafter stated.

On the top and bottom of cylinder A, I make chests or boxes, preferably of rectangular form, the upper one, C, being the steam-supply chest or inflow-valve chamber, and the lower one, C′, being the exhaust chest or chamber. These chambers C C′ may be constructed, secured in position on and under the cylinder, and made steam-tight in any convenient way. Their vertical depth should, however, be made sufficient to permit of the vertical movement of the valves, as presently described.

The steam-supply pipe is connected with the opening *b*, and supplies steam to the chest. Ports *a a′* open from this chest into the steam-cylinder, preferably at or near either end, and these ports are opened and closed by lifting valves *c c′*, which are attached to the ends of a centrally-pivoted lever, D, so that as either port is closed by its valve, the other will be opened, and vice versa.

The lever D may be pivoted by a rod, *d*, passing through the lever and through the sides of the chest, suitable packing being employed to prevent leaking; or this lever may be pivoted to a suitable post which is wholly inclosed within the steam-chest. I prefer the former arrangement, however, on account of convenience in operating the valves, as hereinafter described.

The valves *c c′* may have a rigid connection with the ends of the lever D, and their faces ground and fitted in such way as to properly close their respective ports when seated; or a link or other jointed connection may be made between the valves and the ends of the lever such that the valves may adjust themselves

somewhat to the surface of their respective seats, and thus when worn or otherwise changed from their original form will still close their ports against passage of steam.

The exhaust-ports *s s'* lead directly from the bottom of cylinder A at either end through the valve-chambers *e e'* to the exhaust chest or chamber C', and discharge at *b'*, as desired.

Instead of a single port opening at each end of cylinder A, two or more smaller openings may be made, as shown.

The valve-chambers *e e'* are inclosed by cylindrical shells E, which have inwardly turned flanges on their lower ends, and the inner edges or faces of these flanges are suitably shaped to form seats *i* for the lifting-wing or puppet valves *r r'*, which open and close the exhaust-passages at *i*. The winged stems of these valves extend down through the ported seats *i*, thus serving as guides, and they rest upon or are jointed to the ends of a centrally-pivoted lever, D', so that the operation of one valve in either direction necessitates a reverse operation in the other valve. The lever D' may be pivoted as described with reference to D. I arrange to operate these valves *r r'* directly by the movement of the piston by means of pins or stems *o o'*, which extend from their respective valves up through the wall or shell of the bottom of the cylinder, and the length of these pins is such that when their respective valves are seated their upper ends are flush with the inner face of the cylinder, as at *o*. Consequently when either valve is raised its pin will project into the interior of the cylinder a distance equal to the vertical movement of the valve, as at *o'*. I also prefer to bevel or chamfer the corners or edges of the piston-head P, as at *p'*, so that as the piston approaches the end of its stroke in either direction, such beveled edges, pressing against or upon the valve-pin *o* or *o'*, as the case may be, shall depress it, seat the valve, and thus close the exhaust-port in front of the moving piston, and at the same time, through lever-connection D', unseat the other valve, and thus open the exhaust-port in rear of the piston. Such rear port being open steam will of course escape, and, owing to the position of these ports at the bottom of the cylinder, any water which may be present will also escape or flow freely from that part of the cylinder.

By changing the position of the valve-pins *o o'* and ports *s s'* these ports may be opened and closed at any desired part of the stroke of the piston, and such ports may be located at any desired distance from the ends of the cylinder, according to the work to be done.

A similar arrangement of valve pins or tappets may be employed with the inflow-valves *c c'*, whereby they may be operated by the piston P at any desired time independent of the exhaust-valves. I prefer, however, in most cases to so connect the two systems of valves above and below that the operation of one set, as the exhaust-valves, by the piston will cause the desired operation of the other set, or inflow-valves. This may be done in various ways.

I have shown lever-arms *h h'* extending from the ends of the pivot-rods *d d'*, and coupled together at their adjacent ends, as at *k*, by means of any suitable joint-connection, such as will allow vibration of the arms in the plane of their length, and also impart the vibratory motion of one arm to the other, and to this end the coupling *k* should be so made as to allow some endwise movement or elongation, and the rods *d d'* should be made fast in any suitable way to their respective levers D D', so that the rod *d'* may receive a rocking or oscillating motion from the lever D'; and, through the coupled arms *h h'* and pivot-rod *d*, a motion corresponding to that of lever D' will be imparted to lever D, but in reverse order, so that as exhaust-port *s* is closed and *s'* opened, the inflow-port *a* will be opened and *a'* closed, and vice versa. Great simplicity is thus secured in the gearing for operating the valves, and consequent cheapness.

It will be observed that while two of the valves are seated and thus closing their ports, the excess of steam-pressure upon them will suffice to hold them in place as against tendency to movement caused by steam rushing past the open valve. On the other hand it requires the exertion of but small force by the piston upon the pins *o o'* to overcome this excess of steam-pressure, and once overcome, and the valves started from their seats, they are surrounded on all sides by substantially equal steam-pressure, and during their movement toward and from their seats they are effectually balanced, so that while the movement of these valves is prompt and effective it is not violent, and is wholly free from sliding friction.

I have found by actual use that my improved engine can be run with comparatively cold steam at a high rate of speed without danger or injury and with very little attention.

The use for which I have particularly designed my improvement is with steam-pumps, and particularly such as are used in and around oil-refineries; but it may be adapted with advantage to many other purposes, as steam-hammers; and for this purpose, if desired, a cam or eccentric and link-motion connection may be employed between the supply and exhaust valves, whereby the movement of the piston may be arrested or reversed at any desired time or part of its stroke.

I am aware that it is not new to arrange a pair of water-drain valves in the under side of a steam-cylinder in such manner that the steam-pressure which actuates the main piston shall close one valve and by a lever-connection open the other; but the construction described herein possesses the advantage of performing the functions of opening and closing both the supply and exhaust ports, and thereby dispensing with the necessary use of the usual slide-valve, and also the valves, being operated by the piston, have a certain positive

motion not affected by variations of steam-pressure and friction.

I claim herein as my invention—

1. In combination with a steam-piston having beveled ends, the valves *c c'*, lever D, and valves *r r'*, having tappets or pins *o o'*, and lever D', and suitable lever-connections between the levers D and D' for imparting the motion of one to the other, substantially as set forth.

2. The combination of piston P, having beveled ends *p'*, valves *c c' r r'*, tappets or pins *o o'*, levers D D', and connections *h h'*, substantially as and for the purposes set forth.

In testimony whereof I have hereunto set my hand.

RICHARD WALTON.

Witnesses:

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