(No Model.)

H. A. JAMIESON.

PUMPING ENGINE.

No. 252,110. Patented Jan. 10, 1882.

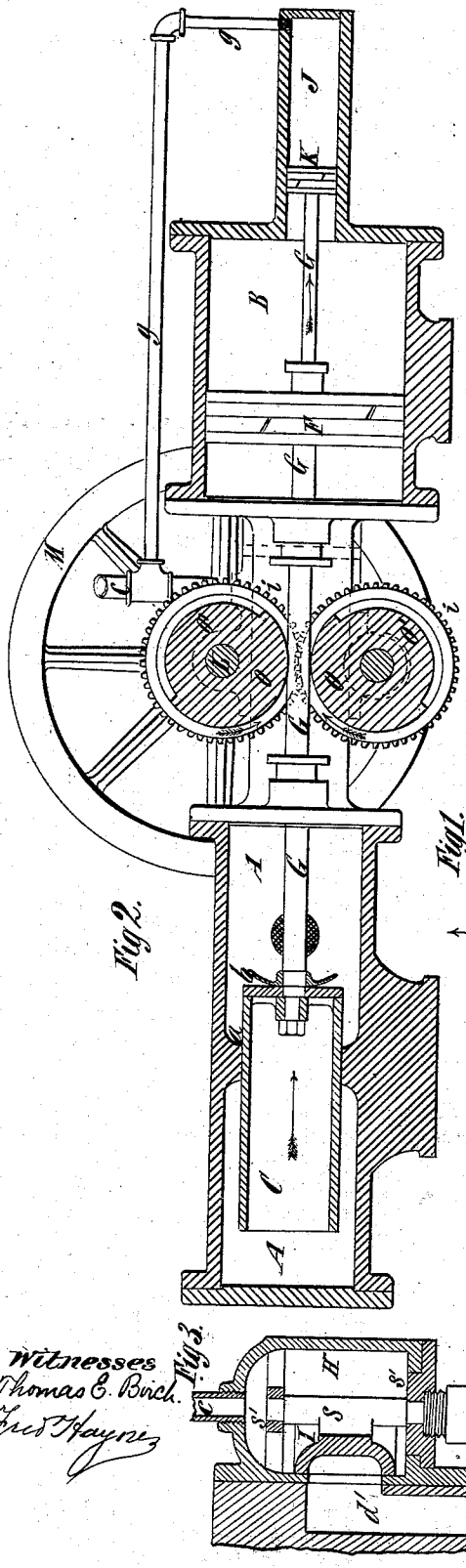

Fig. 2.

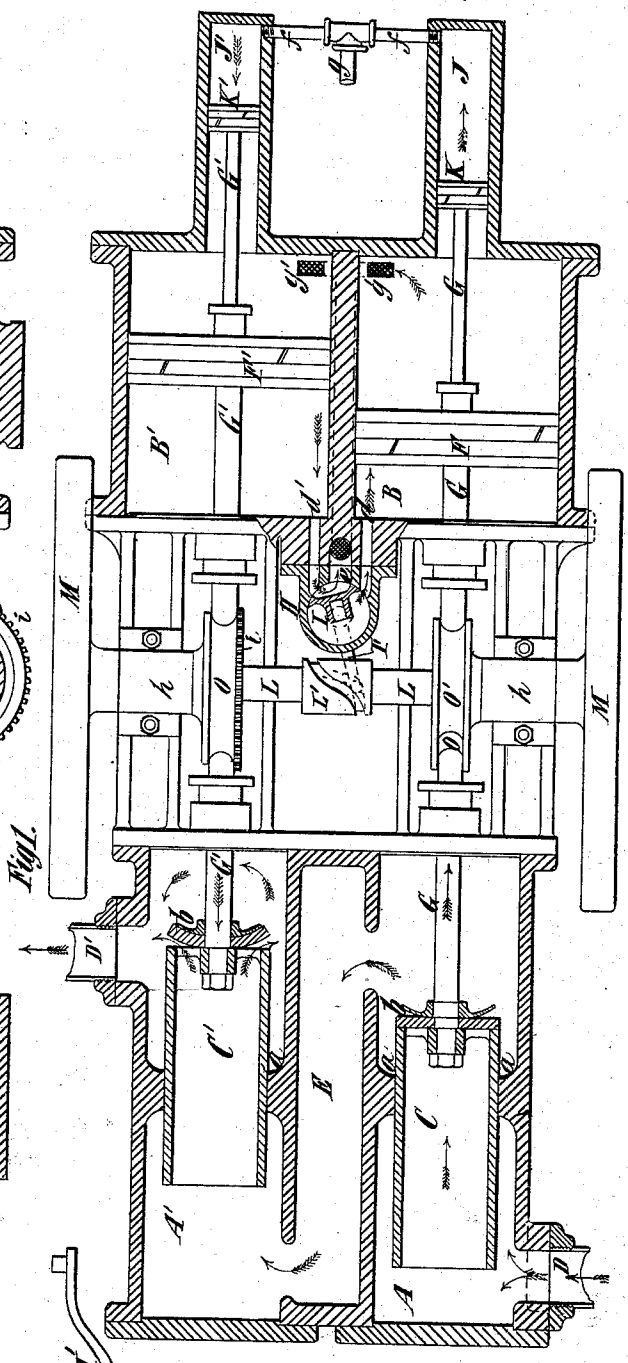

Fig. 1.

Fig. 3.

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HENRY A. JAMIESON, OF BROOKLYN, NEW YORK.

PUMPING-ENGINE.

SPECIFICATION forming part of Letters Patent No. 252,110, dated January 10, 1882.

Application filed May 4, 1881. (No model.)

To all whom it may concern:

Be it known that I, HENRY A. JAMIESON, of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Pumping-Engines, of which the following is a specification.

In most cases of water-supply obtained by pumps it is a great consideration to have a continuous and steady discharge which will not be affected by the reversal of the piston's stroke; and in order to secure a continuous and steady supply it is common to use accumulators or elevated tanks, into which water is delivered by the pumps, and from which the water is taken for use. This is particularly true of pumps employed to operate hydraulic elevators; and in order to secure an invariable supply for such elevators tanks are almost always placed at the top of the buildings in which they are located, and water is pumped into the tanks from the lower part of the buildings.

The object of my invention is to provide a pumping-engine of simple construction, which shall be free from the above-mentioned defects, and will deliver a continuous and invariable discharge, which renders it particularly desirable for operating hydraulic elevators without the use of elevated tanks, although applicable to other purposes.

To this end my invention consists in the combination, in a pumping-engine, with two single-acting pump cylinders and pistons arranged side by side, and having water-passages and valves arranged to provide for the discharge of water from one pump through the other, so that the direction of the current always remains the same, of two single-acting actuating cylinders and pistons, connected by separate piston-rods, one with each of said pump-pistons, and a valve for admitting steam or other motive agent to said actuating-cylinders alternately to make the working-stroke of the pump-pistons, while the return of the pump-pistons, which is only resisted by friction, may be produced by weight if the pumps be arranged vertically, or by smaller cylinders containing pistons which are fixed to the piston-rods of the pump and actuating-pistons, and upon one side of which steam or other motive agent constantly acts and returns the pump-pistons alternately and quickly as soon as their working-strokes are completed.

The invention also consists in the combination, with the above, of a fly-wheel shaft and mechanism of a novel character for causing the two piston-rods upon which are fixed the pump and actuating pistons to impart rotary motion to the said shaft during each working-stroke of the pump-pistons, and yet leave said pistons free to make their return-strokes independently of the said shaft.

The invention also consists in a novel method of operating the valve which admits steam or other motive agent to the actuating-cylinders, as hereinafter more fully described.

In the accompanying drawings, Figure 1 represents a longitudinal section upon a horizontal plane of a pumping-engine embodying my invention. Fig. 2 represents a longitudinal section thereof upon a vertical plane, and Fig. 3 represents a vertical section of the steam-valve upon a larger scale.

Similar letters of reference designate corresponding parts in all the figures.

A A′ designate two pump-cylinders, and B B′ designate two opposite actuating-cylinders, connected with said pump-cylinders by suitable framing to render them both rigid. Each pump-cylinder A A′ has a portion, *a*, of contracted diameter, which forms a seat for a pump-piston, and C C′ designate two tubular pistons fitting said seats, and each having a valve, *b*, at its inner end.

The suction-pipe D is connected with the cylinder A, and all water must pass through the valve *b*, from which it passes into the water-chest E between the two pump-cylinders. The water-chest E communicates with the cylinder A upon the inner side of its piston-seat *a* and with the cylinder A′ upon the outer side thereof, as clearly seen in Fig. 1, and after entering the cylinder A′ the water passes through the tubular piston C′ and out through the discharge-pipe D′.

I may here remark that where the pump is designed to operate a hydraulic elevator all that is necessary is to connect the pipes D D′ with the supply and waste pipes of the elevator-cylinder by means of a valve, which may be operated to place either of the pipes D D′ in communication with either of the pipes lead-

ing to the elevator, thereby reversing the elevator while the pump is running continuously. When the piston C moves toward the left in the opposite direction to that indicated by the arrow, the valve *b* therein opens and permits the piston to pass freely through the water, while when the piston moves in the direction indicated by the arrow the valve *b* is closed by the action of the water, and the water upon the inner side of the piston is displaced and discharged into the water-chest E, and from thence into the other cylinder, A′. While the piston C is thus moving in the direction of the arrow the piston C′ is moving in the opposite direction with its valve *b* full open; and therefore it will be seen that the piston C is actually delivering the water directly into the discharge-pipe D′. Before the piston C completes its working-stroke the piston C′ commences its working-stroke and forces the water in the cylinder A′ upon the inner side of the piston directly into the discharge-pipe D′.

Referring now to the means employed to actuate the pump-pistons C C′, F F′ designate actuating-pistons fitting in the cylinders B B′, and connected with the pump-pistons C C′ by piston-rods G G′. The actuating-cylinders B B′ are supplied with steam or other motive agent only upon their inner sides, and are therefore single-acting, and the pistons F F′ only act in making the working-stroke of the pump-pistons.

H designates the valve-chest, which is supplied with steam, compressed air, or other motive agent through a supply-pipe, *c;* and I designates a segmental valve arranged to oscillate upon a vertical axis, and controlling the admission of steam or other motive agent through the ports *d d′* to the cylinders B B′ and the exhaust of steam from said cylinders through said ports and the exhaust-port or outlet *e*. (Seen in Fig. 1.) The valve-stem *s* is supported in suitable bearings, *s′*, in the top and bottom of the valve-chest H, and the valve is oscillated by a lever, I′, fixed to the stem *s*, as seen in Fig. 3. The manner in which the valve is operated will be explained hereinafter.

As before stated, the pistons F F′ only serve to actuate the pump-pistons during their working-stroke, and if the pumps were arranged vertically the pistons might be weighted to cause them to descend, as the friction of parts is about the only resistance; but where the pumps are arranged horizontally, as in this example of my invention, other means must be employed to return the pump-pistons.

Upon the outer ends of the actuating-cylinders B B′ are two smaller cylinders, J J′, in which are pistons K K′, fixed to the rods G G′, and steam is supplied constantly to said small cylinders, upon the outer side of their pistons, by a pipe, *f*, which communicates by a pipe, *g*, with the main supply-pipe *c*.

The pistons F F′ are of so much greater area than the pistons K K′ that so long as the former pistons are acted upon by the steam the opposed force of the steam acting upon the pistons K K′ has no effect; but as soon as the valve I is shifted so that the exhaust from either of the cylinders B B′ is open the steam at once actuates the piston K or K′, and thus makes the return-stroke quickly and before the other large piston, F or F′, can complete its working-stroke. In the cylinders B B′, on the outer sides of the pistons F F′, are ports *g′*, through which any steam which leaks past the pistons F F′ or K K′ may escape.

The engine might be worked without a shaft, and in such case a steam-actuated valve, instead of a valve operated mechanically, would be employed to admit steam to the actuating-cylinders B B′. Where a valve of the kind shown and described is employed a fly-wheel shaft is necessary, and it may be employed in all cases with advantage because of the steadiness of operation which it gives to the pumps.

L designates a fly-wheel shaft, adapted to rotate in suitable bearings, *h*, and carrying two fly-wheels, M. Upon the shaft L are friction-wheels O, having concave faces, as seen in Fig. 1, and immediately below them, and on the opposite sides of or below the piston-rods G G′, are similar wheels, also having concave faces. The wheels above and below the piston-rods G G′ form two pairs, which gripe the rods by friction between them, and as the rods are reciprocated the wheels are rotated, thus imparting motion to the shaft L. If the wheels O griped the rods during their whole revolution, the shaft L would be prevented from rotating, as the piston-rods moving or tending to move in opposite directions would act upon the shaft in opposite directions and prevent its rotating. The wheels O of each pair are only in engagement with their rod for a little more than half their revolution, as the wheels for almost half their circumference are of reduced radius, as seen clearly in Fig. 2, where the parts of reduced radius are designated by the letter O′. In order to maintain the wheels of each pair in proper relation to each other, the wheels of one pair are toothed at *i*, so that one cannot rotate without the other.

While the pistons C and F are moving in the direction indicated by their arrows the rod G connecting them is griped tightly between one pair of wheels O, and rotary motion is imparted to the shaft L; but at the same time the pistons C′ F′, connected by the rod G′, are making their return-stroke and the reduced portions O′ of its pair of wheels are in proximity to the rod, and hence are free therefrom. Inasmuch, however, as the full parts of the wheels O are longer than their reduced parts, the pistons C′ F′ will commence their working-stroke before the pistons C F complete their working-stroke, and hence a continuous and invariable discharge will be produced and a steady rotation imparted to the fly-wheel shaft L. The said shaft furnishes the required motion for working the valve I, and has upon it a grooved cam, L′, with which the arm I′ upon the valve-stem *s* engages, as seen most clearly in Fig. 1. In order to get

the best effect, it is desirable that the valve I should have a little lead for induction, and hence its face should be a little short of the distance between the outer edges of the ports *d d'*.

Instead of the wheels O being made with smooth or merely frictional working-surfaces to come into engagement with the piston-rods, and the said rods being made with similar surfaces, the said wheels may be made with gear-teeth and the piston-rods be furnished with racks to gear therewith; or the said wheels and rods might be constructed in any suitable manner to engage or gear with each other during one-half or a greater portion of each revolution of the said wheels.

If the valve be constructed properly and the wheels O were made full for more than half—say three-fourths or more—of their circumference, steam might be worked expansively to a greater or less degree, both pistons working together through portions of their strokes, one having full steam, while the other is worked by expansion. In such case the return-stroke of each piston must be made quick enough to permit of their both working together for a portion of the stroke.

By my invention I provide a pumping-engine of simple construction, which will produce a continuous and invariable discharge, and which, when employed for operating a hydraulic elevator, will render unnecessary the use of an accumulator or elevated tank.

I am aware that it is a common thing to arrange two ordinary pumps with their steam-actuating cylinders and pistons side by side, both of said pumps being arranged to discharge separately into a common discharge-pipe, and not from one to and through the other; and I am also aware that it is old to arrange two pump cylinders and pistons on opposite ends of an actuating steam cylinder and piston, and to construct the pump cylinder and pistons with passages and valves, whereby they may discharge from one cylinder to and through the other. In the latter case, however, the two pump-pistons and the steam-piston are all attached to one common piston-rod, and hence the pump-pistons must terminate their strokes simultaneously. In order to provide for a continuous discharge, it is necessary that one pump-piston should commence its stroke before the other terminates its stroke; and it will be readily understood that this result cannot be attained unless two steam-actuating pistons are employed and are connected by separate piston-rods with the pump-piston.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a pumping-engine, the combination, with two single-acting pump cylinders and pistons arranged side by side, and having water-passages and valves arranged to provide for the discharge of water from one cylinder into and through the other, of two single-acting actuating cylinders and pistons connected by separate piston-rods one with each of said pump-pistons, and a valve for admitting steam or other motive agent to said actuating-cylinders alternately for making the working-stroke of the pump-pistons, substantially as and for the purpose specified.

2. In a pumping-engine, the combination, with two single-acting pump cylinders and pistons arranged side by side, and having water-passages and valves arranged to provide for the discharge of water from one cylinder into the other, of two single-acting actuating-cylinders and pistons connected by separate piston-rods one with each of said pump-pistons, a valve for admitting a motive agent alternately to said actuating-cylinders for making the working-stroke of the pump-pistons, and other actuating cylinders and pistons connected with the pump-pistons for effecting their return-stroke, substantially as and for the purpose specified.

3. In a pumping-engine, the combination, with two single-acting pump cylinders and pistons having water-passages and valves arranged to provide for the discharge of water from one cylinder into the other, of two single-acting actuating-cylinders and actuating-pistons connected with said pump-pistons, a valve for admitting a motive agent to said actuating-cylinders alternately, a fly-wheel shaft, and two pairs of wheels in engagement or gear with the piston-rods, and having portions of reduced radius, which permits each rod to make its return-stroke free, but transmit motion to the fly-wheel shaft during its working stroke, substantially as and for the purpose specified.

4. The combination of the pump-cylinders A A' and pistons C C', with their valves, the actuating-cylinders B B', and pistons F F', the piston-rods G G', the smaller actuating-cylinders J J', the pistons K K' upon said rods G G', the fly-wheel shaft L, and the pairs of wheels O in engagement or gear with said piston-rods, and having portions O' of reduced radius, substantially as specified.

5. The combination of the two single-acting actuating-cylinders B B', the pistons F F', the valve I, the shaft L, carrying a grooved cam, L', and the lever I', engaging with said cam and fixed to said valve, substantially as specified.

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