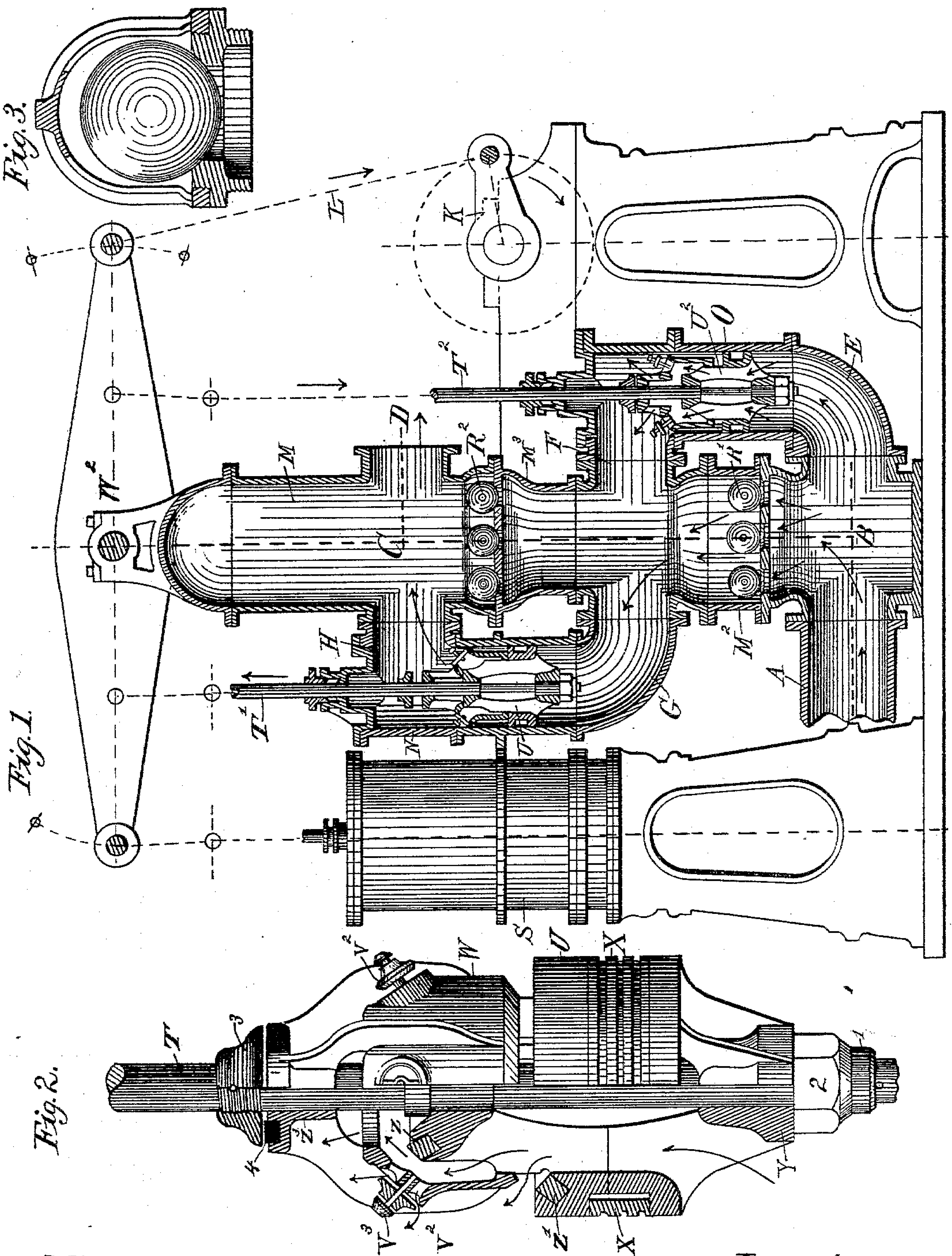
(No Model.)

A. J. L. LORETZ.

HIGH SERVICE PUMPING ENGINE.

No. 411,724. Patented Sept. 24, 1889.



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HIGH-SERVICE PUMPING-ENGINE.

SPECIFICATION forming part of Letters Patent No. 411,724, dated September 24, 1889.

Application filed January 30, 1889. Serial No. 298,147. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR J. L. LORETZ, of the city of Brooklyn, in the county of Kings and State of New York, have invented a certain new and useful Improvement in High-Service Pumping-Engines, of which the following is a specification, reference being had to the accompanying drawings and letters of reference marked thereon, which form part of this specification.

My invention relates particularly to that class of pumping machinery used for raising large quantities of water to great heights and under variable and long inductions, varying from that of a vacuum to that of a hundred or more feet head. In order to produce an apparatus that will lift a column of water under such varying and difficult conditions, and prevent shocks resulting from water-hammer and the sudden impacts of the mechanical pump devices, due to their alternate reciprocation against such a moving column, it is necessary that the column of water from the moment it enters the inlet to the pump and until it leaves the outlet should be as lightly and gently opposed in the onward motion as possible, never attempting to reverse the pumped column of water while in motion for the purpose of applying the mechanical lifting force; also, making as few right angles as possible for the water to pass through between the aforesaid inlet and outlet. A proper insight into the manner in which water should be moved in such a pump may be had by comparing the moving column of water to the motion of a heavily-loaded train of cars on a track. Thus after the loaded train is once started and kept on in a forward course there will be no shock of impact caused by the pulling action of the motor while imparting motion to the various cars. Even should a portion of the cars be disconnected and dropped from the train while in motion such disconnection would cause no shock, but only a gradual increase of speed in the remaining portion; but should the train be suddenly stopped and a reverse course taken an immediate destruction of the entire train would follow, and if a reciprocating forward and backward motion were required its movements would have to become very slow and gradually cease before the reversing action could take place without a serious shock; also, numerous cushioning appliances would have to be brought into play to soften the impact between the cars, all of which actions involve a great expenditure and waste of power. Thus it will be seen why in many pumps the piston speed is so slow, the plungers also being brought to a state of rest before being reversed, valves forced down to their seats with springs, rubber and air cushions, and numerous other mechanism employed at the sacrifice of an immense waste of power, all contrived for no other purpose than to perpetually overcome the shocks due to the great error of starting, stopping, and reversing continuously a broken column or body of water inside of a pump for the purpose of raising it, instead of keeping it intact and in an onward motion between suction and delivery.

In patents granted to me, Nos. 134,689 and 144,852, devices were shown to overcome somewhat the difficulty; but the entire pumped column had to pass through the pumping mechanism, which consisted of valves placed in tubular plungers, and thereby increasing the friction as well as subjecting the lifting-valves directly to any sudden action or variation in the suction or supply.

Referring to the drawings, Figure 1 is a longitudinal section of the device; Fig. 2, a section of one of the buckets upon an enlarged scale, and Fig. 3 a detail of one of the valves.

In the present improvement any sudden action or change in the entire column does not affect the lifting mechanism, as will be readily seen by an examination of the diagram, Fig. 1. Any sudden momentum in the column entering at A passes directly through to the delivery by direction indicated by line A B through valves R′, line J through valves R^2, line C, and delivery D.

The lifting mechanism of the pumped column A B J C D, Fig. 1, is placed on the right and left, and consists of two working-cylinders N on the left and O on the right, each equal in sectional area to the pumped column entering at A. In each of these cylinders reciprocate alternately buckets U′ and U^2, operated by rods T′ and T^2 through the usual links from a beam W^2, resting on air-chamber M and receiving its motion from a steam-cylinder S, connecting-rod L, and crank and shaft K.

The central column B J M of the apparatus forms the connecting-link of the entire pumped column of water along the line A B J C D between suction at A and delivery at D, and consists of three sections—the upper or air chamber section M, provided with connecting and outlet nozzle H of upper pump-cylinder N, and general-delivery nozzle D, the middle section J, provided with valves R^2 and connecting-nozzles G and F of upper and lower pumps, and the lower section B, provided with valves R′ and main suction-nozzle at A and lower pump-nozzle E.

Fig. 2 represents, more in detail and on a larger scale, the complete bucket U as working in cylinders N and O, Fig. 1. This bucket is so constructed as to admit of as large a water-passage as possible without impairing its strength, is made in two parts so as to admit the packing-ring X, and secured together on pump-rod T between collar 1 and nut 2.

The upper half of the bucket U, Fig. 2, is provided with two seats Z and Z′, fitted with a double Cornish angular-faced valve W, with guide Z^3, the upper end of which at 4 and collar 3 on rod T regulates its lift. This valve W is supplied with a series of angular-faced disk relief-valves V^2, fitted around the upper circumference and working on spindles V^3. The seat area of these relief-valves V^2, compared to that of their inside face or portion of the valve acted upon to lift it, is made smaller in proportion to that of the large one W, in order that the small valve V^2 lift first, to relieve the large one and reduce the harshness in its lift, allowing more time for lift as the engine passes the centers as well as increase the entire valve area with a reduced lift, and thereby also lessen the impact in seating.

The action of the pump is as follows: Water entering at A under a pressure will follow the direct and unobstructed course A B R′ J R^2 C D and rise in the force-main to a height equal to its hydrostatic pressure. Now as the engine is set in motion by an upstroke of the steam-cylinder S on the left the rod T′ will carry the bucket U′ in pump-cylinder N, also on the upstroke, the water following the line A B R′ G under the bucket and H C D above, while any momentum in the water column greater than the speed of U′ produced from any other source and likely to disturb the harmony of the bucket action would fly through and follow the shortest and most direct line A B R′ J R^2 C to force-main D and air-chamber M. This will be the case when the engine-crank passes the dead-centers and the bucket U′ arrives toward the upper end of its stroke, its speed being then reduced below the average of that of the whole column from source to extreme delivery, the maximum speed having been imparted to the said column at the time of the buckets' greatest travel during the half-stroke period, as shown on Fig. 1. Now while the aforesaid action has been taking place in cylinder N, &c., the bucket U^2 in cylinder O is slipping gently and idly through the water, preparing itself to perform the upstroke similarly to that of bucket U′, when the water will follow bucket U^2, in a line A B E, and be lifted above it in a line F J R^2 C D, the excess momentum at the beginning and close of stroke forcing water through A, B, R′, J, R^2, C, D, or M, and the bucket U′ slipping idly through water-cylinder N.

Fig. 3 represents the manner in which the rubber-ball valves are secured in position, each by separate guards and seats of composition brass, and secured into sections M^2 M^3 of central column B J C in Fig. 1.

Having explained my improvement, what I claim as new, and desire to secure by Letters Patent, is—

1. The general arrangement of a central column B J C, subdivided into valve-chambers with valves R′ R^2, and air-chamber M, supporting-beam W^2, the whole forming a direct and continuous connection between suction and delivery nozzles A and D, in combination with pump-cylinders N and O, provided with connecting-nozzles E F G H, and buckets U′ U^2, operated by rods T′ T^2 from beam W^2, and fitted with valves W and V^2, all constructed to operate substantially as and for the purpose set forth.

2. In combination with a central column B J C, provided with ball-valves R′ R^2, two cylinders N and O, arranged with buckets U′ U^2, fitted with double-beat valve W and relief-valves V^2, all constructed substantially as and for the purpose herein described.

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