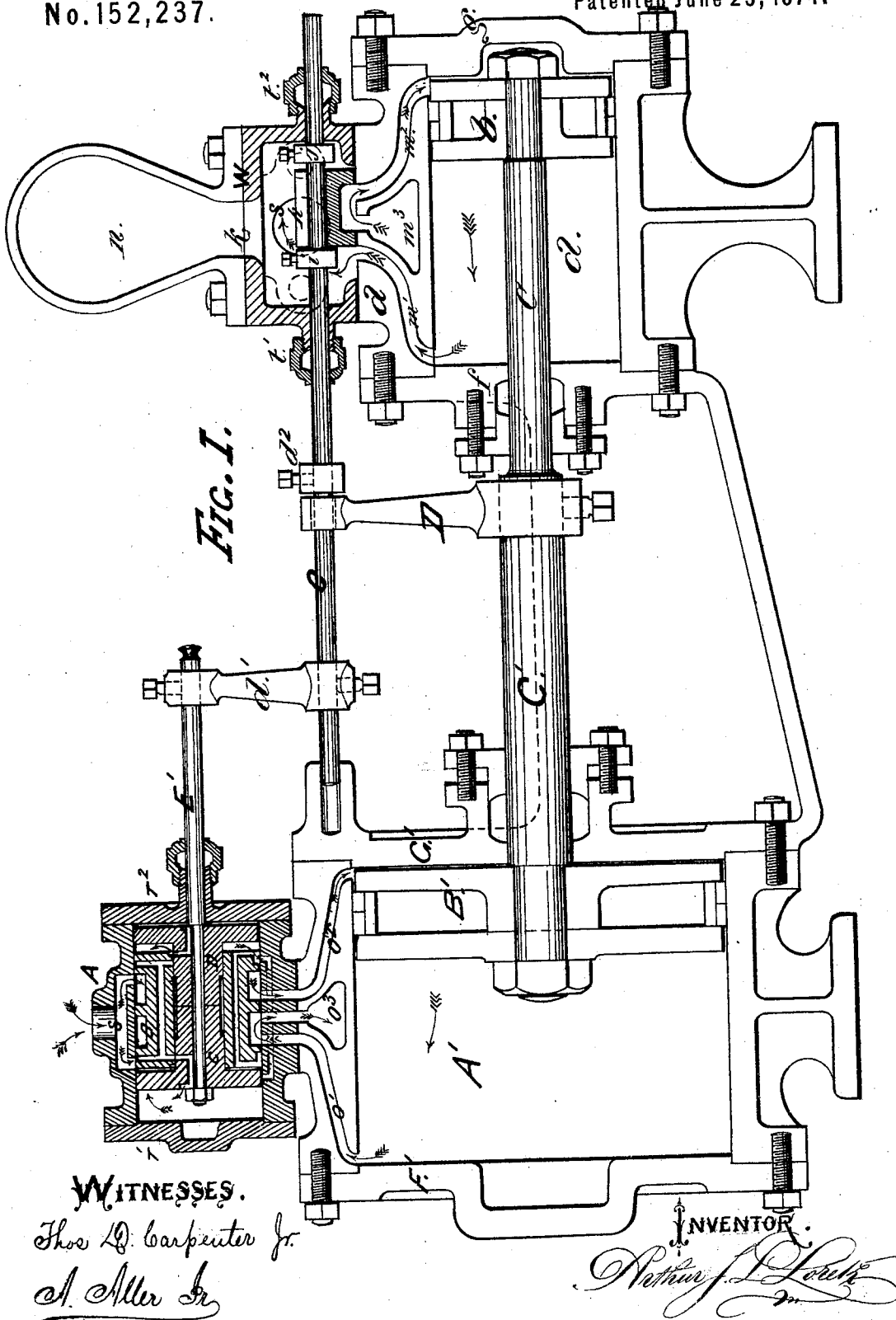


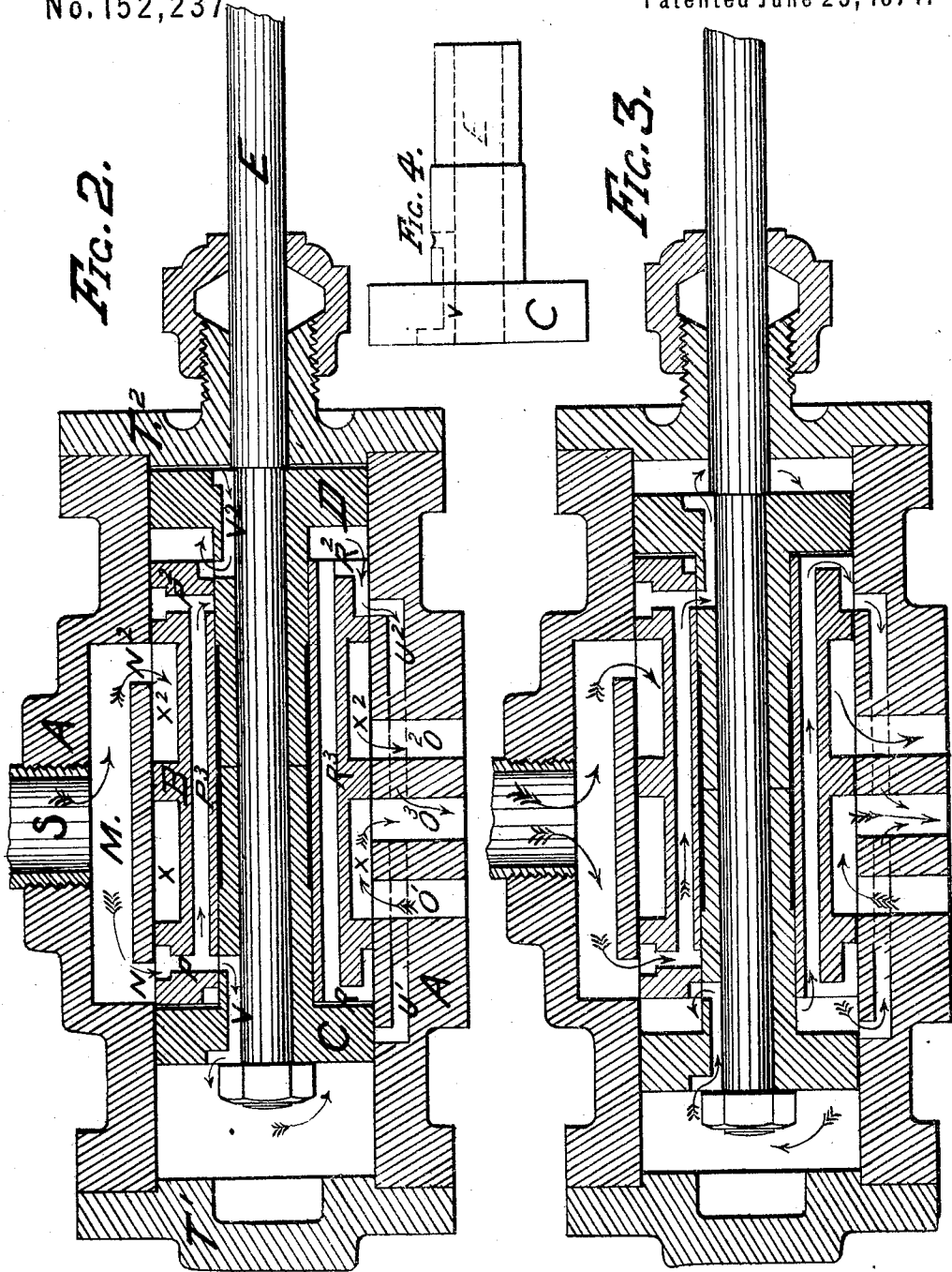
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Combined Engine and Pump Valves.
 No. 152,237. Patented June 23, 1874.



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WITNESSES.

Thos. D. Carpenter Jr.
A. Miller Jr.

INVENTOR.

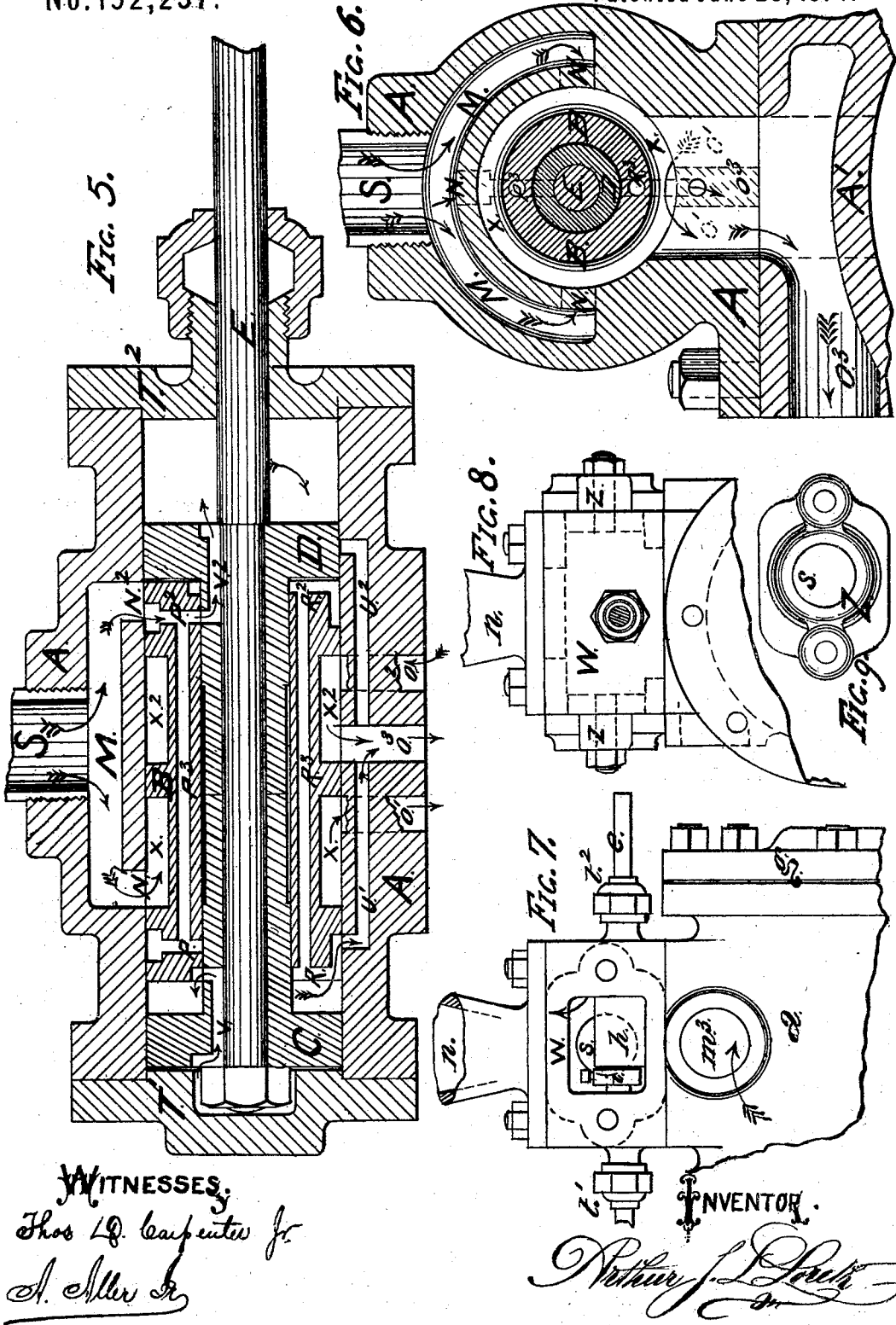
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UNITED STATES PATENT OFFICE.

ARTHUR J. L. LORETZ, OF NEW BRUNSWICK, NEW JERSEY, ASSIGNOR OF ONE-HALF HIS RIGHT TO NORMAN HUBBARD, OF BROOKLYN, N. Y.

IMPROVEMENT IN COMBINED ENGINE AND PUMP VALVES.

Specification forming part of Letters Patent No. **152,237**, dated June 23, 1874; application filed December 29, 1873.

To all whom it may concern :

Be it known that I, ARTHUR J. L. LORETZ, of New Brunswick, in the county of Middlesex and State of New Jersey, have invented a Combined Engine and Pump for Direct-Acting Steam-Pumps, of which the following is a specification:

My invention relates to a class of engines and pumps known as the direct-acting kind, where the steam-valve is operated by steam, and the water-valves in the pump replaced by one slide-valve; and consists in the combination of devices more fully hereinafter set forth.

In my invention the steam-motor for operating the pump-valves is located in the steam-cylinder valve-chest, and also acts in combination with the main steam-valve as a positive motor for the induction and eduction of the steam in the steam-cylinder, the movement necessary for placing the auxiliary ports in position for operating the auxiliary motor by steam being derived from a combination, viz: The previous movement of the main steam-valve and the application of motion to the connection between the steam-motor and water-valve from the motion of the pistons occasioned by the admission and emission of steam in main cylinder by the main steam-valve; the auxiliary valve being formed by an arrangement of ports in the main steam-valve, and a connecting portion of the auxiliary pistons placed at each end of the main steam-valve passing through the center of the main steam-valve.

Figure 1 is a side elevation, representing the steam-valve and steam-cylinder, water-valve and water-cylinder in section, showing the whole pump complete, with pistons of both cylinders at the end of their course, and both valves in their proper position for the return stroke. Fig. 2 represents an enlarged section of the steam-valves, showing all the steam and exhaust ports of the main valve and auxiliary motor in position for the return stroke, immediately after the piston arrives at the end of its stroke, as in Fig. 1. Fig. 3 represents the same as Fig. 2, but at a time when the piston has nearly arrived at the end of the return stroke, the tappet attached to the main piston-rod having struck with its upper part the collar attached to the valve stem or rod connecting the two pistons, thereby bringing the ports

of the latter over or under those in the main valve. Fig. 4 shows an outside view of one of the auxiliary pistons. Fig. 5 represents the same as Figs. 2 and 3, but at a time when the piston has arrived at the end of the return stroke, thus showing the valve in position for the forward stroke. Fig. 6 is a cross-section through the center of Figs. 2, 3, or 5. Fig. 7 represents a side view of the water-valve chest, showing the openings on the side for the purpose of removing the valve. Fig. 8 represents an end view of the same. Fig. 9 represents the bonnets for covering the openings on the sides of the water-valve chest, they being provided with openings, to which the eduction-pipes are attached.

Similar letters of reference indicate similar parts.

Referring to the above-named figures, the operation of the engine and pump is as follows: The pistons B' and b , being both connected on the same rod $C C'$, having arrived at the end of their course toward the heads G' and g , and the tappet D , attached to the rod C' , having previously acted against the collar d^2 on the stem e , to which the arm d^1 of the stem E' is attached, will have drawn the auxiliary pistons $C D$ toward the head T^2 of the steam-chamber A , bringing the steam-ports V P and exhaust-ports V^2 R^2 over and under each other, thereby allowing the steam to enter from the semicircular chamber M , through ports N^2 P^2 P^3 P , and through V , into the space between head T^1 and piston C , forcing the latter ahead and pushing the valve B forward toward head T^2 , the steam for supplying the piston C from chamber M entering first by way of ports N^2 , P^2 , P^3 , and V , and then through N , P , and V ; the exhaust steam from the other piston, D , or space between D and T^2 , passing first through ports V^2 in and around the space between the main valve B and piston D to ports R^3 R^1 U^1 to main exhaust O^3 , and then through ports V^2 in and around the same space to port R^2 U^2 to main exhaust O^3 . The space between valve B and pistons $C D$ always is kept in equilibrium by connecting-port R^3 . The valve B is thus pushed forward by the action of the steam on piston C until the piston D strikes the head T^2 , when the main valve B will be in proper position for the re-

turn-stroke, as represented by Figs. 1 and 2. The steam then enters the chest A from the steam-pipe S into the semicircular chamber M; then passes through ports N², Figs. 1 and 2, in and around the groove X² of the valve B; then into port O², entering the cylinder between piston B' and head G', and driving the piston toward head F', the exhaust passing out from the space between F' and B' through port O¹ in the groove X of valve B, and from thence to main exhaust-port O³. Again, while the valve-stem *e* was moved by the tappet D acting against the collar *d*², thereby changing the ports in the auxiliary pistons for the purpose of throwing the main valve over, the collar *i* on the stem *e* in the water-cylinder chest W, Fig. 1, has moved toward the water-valve *h*, taking up the lost motion which is left between the two collars I and J and valve *h*, thus not moving the valve until the steam acts upon the main valve, changing the steam and water valves both at the same time. The water enters the cylinder *a* between the piston *b* and head *g*, through induction-port *m*³, valve *h*, and port *m*², Figs. 1, 7, and 8, and forces the water between piston *b* and head *f*, through port *m*¹ and past valve *h*, into water-chest W, and from thence through the openings S in the plates Z, the water-chest being provided with stuffing-boxes *t*¹ and *t*² for valve-stem *e*; also having an opening, K, in the top communicating with the air-chamber *n*, Figs. 1, 7, 8, and 9. Now, referring to Figs. 1, 2, 3, and 5, when the piston B¹ of the steam-cylinder A' arrives toward the end of its course toward head F', the tappet D on the rod C' will strike with its upper part the collar and arm *d*', moving the stem *e* toward the steam-cylinder, taking up the lost motion which exists between the collars *i* *j* and valve *h* in the water-cylinder W, bringing the latter collar close up to the valve. At the same time the arm *d*', fast to the stem E', has brought the pistons C D in the position as represented by

Fig. 3, bringing the ports V² P² in communication with each other; also port V communicating with the space between valve B and piston C. The steam enters the former, V², through P², and passes into the space between the piston D and head T², forcing the valve B over, as represented in Fig. 5, the exhaust between piston C and head T¹ passing off through port V in and around space between C and B; then first into port R³ R² U² into main exhaust-port O³, and then through R U¹ to main exhaust-port O³ in cylinder A', Fig. 1. The piston D, while pushing the main steam-valve B, also pulls the water-valve *h* over, thus placing all the valves (steam and water) at the same time in proper position for another forward stroke, and so vice versa.

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

1. The combination of valve B, provided with ports P¹ P² P³ R¹ R² R³ with the pistons C D, provided with ports V¹ V², and steam-chest, provided with ports U¹, U², and O³, substantially as described.

2. The valve-chest A, with its ports N¹ N² in chamber M, ports U¹ U² connecting with main exhaust-port O³, in combination with valve B, having auxiliary ports P¹ P² P³ and R¹ R² R³, and auxiliary pistons C D with their ports V¹ V² and connecting-stem E', all arranged for operation as and for the purpose set forth.

3. The combination of valve B, provided with ports P¹ P² P³ R¹ R² R³, and the pistons C D with ports V¹ V², and the steam-chest, provided with ports U¹, U², and O³, and stem E', and valve *h* in water-chest, all substantially as and for the purpose herein described.

ARTHUR J. L. LORETZ.

Witnesses:

THOS. D. CARPENTER, Jr.,
A. ALLER, Jr.