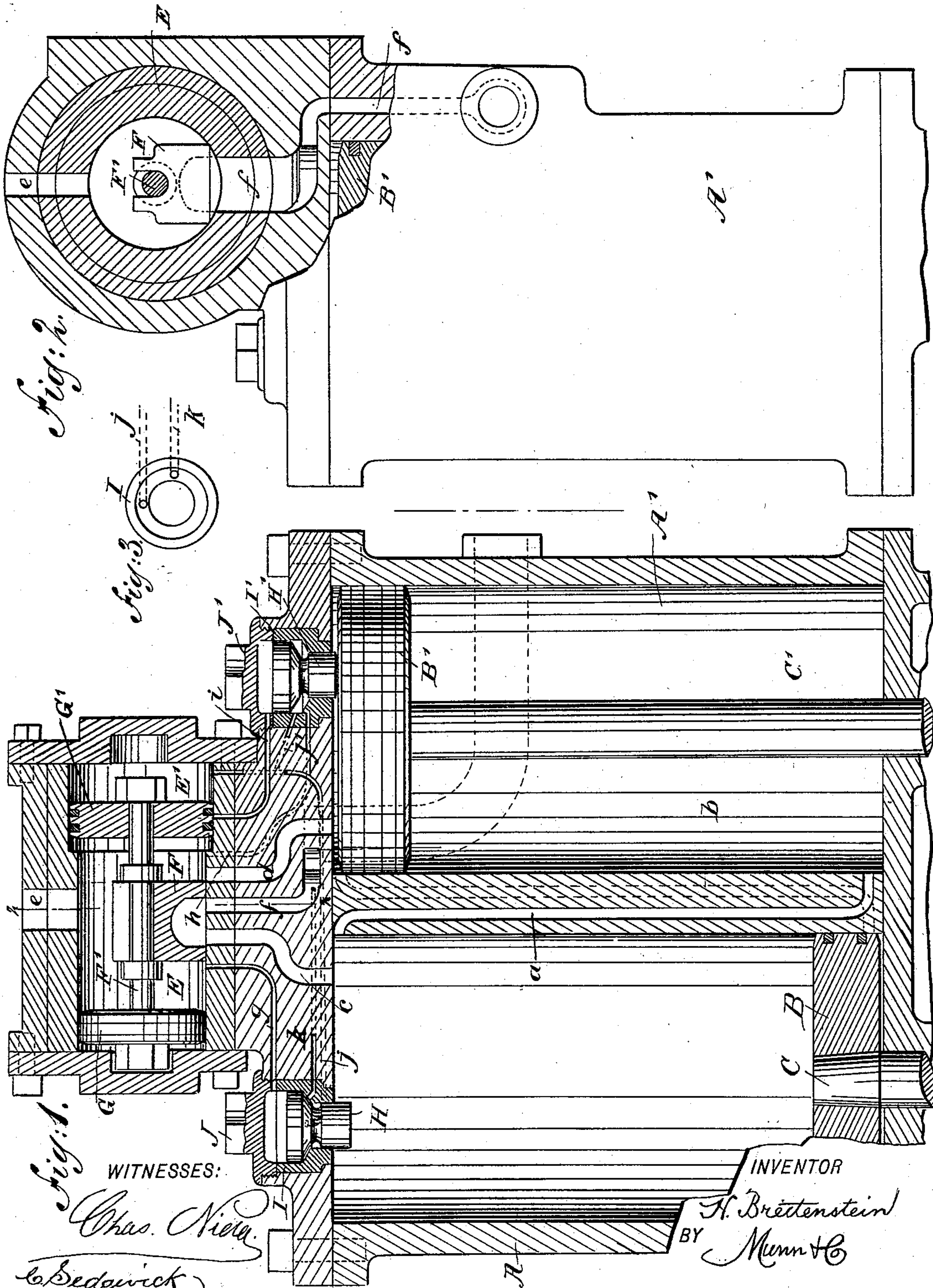


(No Model.)

H. BREITENSTEIN.  
STEAM ACTUATED VALVE FOR ENGINES.

No. 509,291.

Patented Nov. 21, 1893.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

HENRY BREITENSTEIN, OF LARAMIE, WYOMING.

## STEAM-ACTUATED VALVE FOR ENGINES.

SPECIFICATION forming part of Letters Patent No. 509,291, dated November 21, 1893.

Application filed February 8, 1893. Serial No. 461,469. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY BREITENSTEIN, of Laramie, in the county of Albany and State of Wyoming, have invented a new and Improved Steam-Actuated Valve for Engines, of which the following is a full, clear, and exact description.

The invention relates to direct-acting duplex engines, and its object is to provide a new and improved engine, which is simple and durable in construction, very effective in operation, and arranged to utilize the motive agent to the fullest advantage.

The invention consists of two cylinders, each connected at one end with the opposite end of the other cylinder, pistons moving in opposite directions in the said cylinders, a slide valve controlling the inlet and exhaust ports for the said cylinders, puppet valves actuated by the said pistons, and differential auxiliary pistons carrying the said slide valve and controlled by the said puppet valves.

The invention also consists of certain parts and details, and combinations of the same, as will be hereinafter described and then pointed out in the claims.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a sectional side elevation of the improvement. Fig. 2 is a transverse section of the same on the line 2—2 of Fig. 1; and Fig. 3 is a plan view of the seat of one of the puppet valves.

The improved direct-acting duplex engine is provided with the cylinders A and A', containing the pistons B and B' respectively, secured on the piston rods C and C' respectively, connected with the main driving shaft or pump pistons in the usual manner. The cylinder A is connected near its upper end by a port a, with the lower end of the other cylinder A', and the latter is in a like manner connected near its upper end, by a port b with the lower end of the other cylinder A. The cylinders A and A' are connected at their upper ends by the ports c and d, with the cylindrical valve chest E, provided with the usual inlet e for the active motive agent. In the steam chest E is mounted to slide a slide valve F operating over the ports c and d, and

also operating over an exhaust port f, leading to the outside and connected with the usual exhaust pipe. The slide valve F serves to alternately open the ports c and d to the steam chest E to admit live steam to the respective cylinders A and A' by the respective ports c and d, and the cylinder A or A' again permits part of the live motive agent to pass through the respective port a or b, to the other end of the other cylinder A' or A. Thus, when live steam is admitted into the upper end of one cylinder it forces the piston therein downward, and as part of this live steam passes to the lower end of the other cylinder, the piston of this other cylinder is forced upward at the same time that the other piston moves downward. The slide valve F is held on a stem F', which forms the piston rod for two auxiliary pistons G and G', of which the piston G is mounted to slide in the steam chest E, and the other larger piston G' is fitted to slide in an enlargement E' extending on one side of the steam chest E, and forming part thereof. In the upper ends of the cylinders A and A' are mounted to slide puppet valves H and H' fitted in seats I and I' respectively, closed by suitable caps J and J' respectively, as plainly shown in Fig. 1. The upper end of the valve seat I is connected by a port g with the steam chest E, between the slide valve F and the auxiliary piston G, and the lower end of the other puppet valve seat I' is connected by a port h with the said steam chest E between the valve F and the other piston G'. The upper end of the valve seat I' is connected by a port i with the enlarged end E' of the steam chest E, and this port is adapted to be closed or opened by the piston G'. The lower end of the valve seat I is also connected with the outer end of the enlargement E' containing the auxiliary piston G', by means of a port j into which opens a branch port j', from the lower end of the seat I'. From the lower end of the valve seat I leads a port k to the exhaust port f, as illustrated in Fig. 1.

The operation is as follows: When the piston B' in the cylinder A' has about completed its up-stroke, as shown in Fig. 1, it has lifted the puppet valve H', while the other puppet valve H is seated in its seat I, and the piston B is at the end of its down-stroke. When the puppet valve H' rises to the position



shown in Fig. 1, steam from the steam chest E can pass through the port *h* into the valve seat I' and from the latter through the branch port *j'*, and port *j* into the enlarged outer end E' of the steam chest E, so that the preponderance of steam pressure is on the piston G', whereby the latter is forced to the left, thus shifting the slide valve F to the position shown in Fig. 1, so that the port *d* is uncovered, while the ports *c* and *f* are connected with each other by the slide valve F. Live motive agent can now pass from the steam chest E through the port *d* into the upper end of the cylinder A' to act on the piston B' to move the latter downward, and at the same time steam can pass from the upper end of the cylinder A', through the port *b* into the lower end of the other cylinder A, to act on the piston B, so as to force the latter upward. The exhaust from the cylinder A, now takes place through the port *c*, slide valve F, to exhaust port *f*, and the exhaust from the cylinder A' takes place through the port *a* and ports *c* and *f*. The steam which enters the valve seat I' by ports *h*, holds the puppet valve H' in an uppermost position with the assistance of the steam that acts on the piston B' and also acts on the bottom of the puppet valve H' until the piston B' is at its down-stroke, and the other piston B is at the end of its up-stroke, the latter piston then striking the puppet valve H, so as to raise the same, whereby the steam from the right-hand side of the auxiliary piston G' can pass through the port *j* to the valve seat I, and through the port *k* into the exhaust port *f*, so that the preponderance of pressure is on the left hand side of the auxiliary piston G', and the latter is forced to the right so that the slide valve F is moved in a like direction, and the ports *c* and *f* are disconnected, and the ports *f* and *d* are connected with each other, and at the same time, the port *c* is uncovered and opens to the steam chest E so that the motive agent can pass from the latter through the port *c* into the upper end of the cylinder A and through the port *a* into the lower end of the cylinder A'. When the piston G' travels to the right, then the port *i* is opened or uncovered by the said piston and live steam can pass from the steam chest E, through the said port *i* into the upper end of the valve seat I' to force the puppet valve H' therein downward into a lowermost position, so that the ports *h* and *j'* are closed. Live steam is always admitted from the steam chest E to the upper end of the valve seat I, so that the puppet valve H therein is moved downward and seated as soon as the piston B recedes. The exhaust of the cylinder A' then takes place through the port *d*, slide valve F and exhaust port *f*, and the exhaust from the cylinder A takes place through the port *b*, the upper end of the cylinder A' and ports *d* and *f*, by way of slide valve F.

The above described operation is repeated,

it being understood that the pistons always travel in opposite directions, and alternately actuate their puppet valves H and H', to cause the piston G' and valve F to shift, for opening and closing the inlet and exhaust ports in the manner described.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. An engine of the class described, comprising two cylinders, each connected at one end with the opposite end of the other cylinder, pistons moving in opposite directions in the said cylinders, a slide valve controlling the inlet and exhaust ports for the said cylinders, puppet valves actuated by the said pistons, and auxiliary pistons carrying the said slide valve and controlled by the said puppet valve, substantially as shown and described.

2. An engine of the class described, comprising two cylinders, oppositely moving pistons therein, a steam chest, a slide valve controlling the inlet and exhaust ports of the cylinders, differential auxiliary pistons on the stem of the slide valve, puppet valves controlled by the main pistons, ports leading from opposite sides of the larger auxiliary piston to the chamber of one of the puppet valves at the seat of the latter, a port connecting the chamber of the second puppet valve at its seat with that of the first puppet valve and with the back of the larger auxiliary piston, ports leading from the steam chest to the tops of the puppet valves, and a port leading from the seat of the said second puppet valve to the main exhaust, substantially as described.

3. An engine of the class described, comprising two cylinders, each connected by a port at one end with the opposite end of the other cylinder, pistons moving in opposite directions in the said cylinder, a slide valve controlling the inlet and outlet ports for the said cylinders, a steam chest containing the said slide valve and formed with an enlarged end, puppet valves actuated by the said pistons, and connected by ports with the said steam chest and with the exhaust port, and an auxiliary piston carrying the said slide valve and controlled from the said puppet valves, substantially as shown and described.

4. In an engine, of the class described, the combination with a slide valve controlling the inlet and outlet ports, of auxiliary pistons having different areas and carrying the said slide valve, and independent puppet valves controlled by the cylinder pistons, and connected with the said steam chest and the exhaust port, substantially as shown and described.

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Witnesses:

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