W. H. BLAKE.

STEAM ACTUATED VALVE.

APPLICATION FILED MAY 12, 1908.

**1,052,452.**

Patented Feb. 11, 1913.

2 SHEETS—SHEET 1.

Fig. 1.

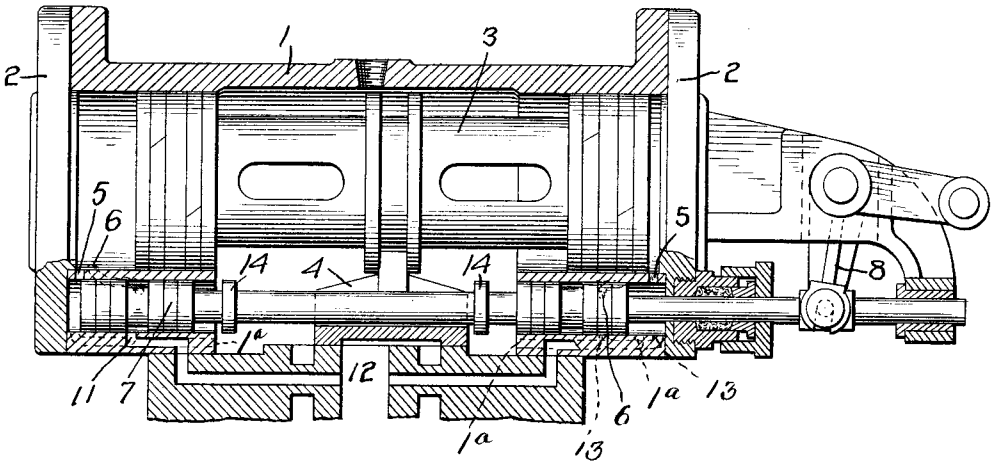



Fig. 2.

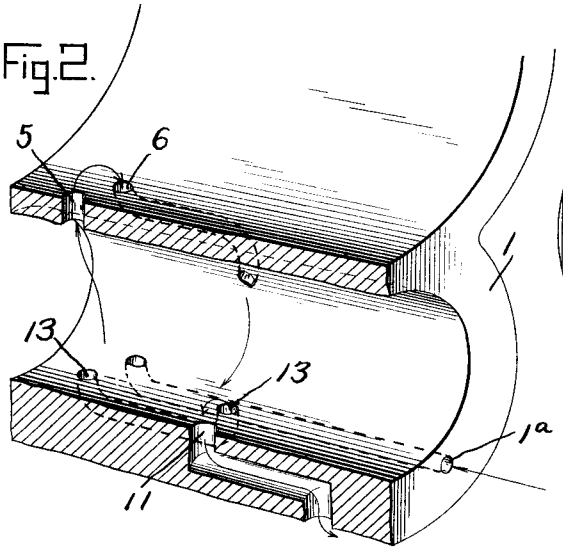
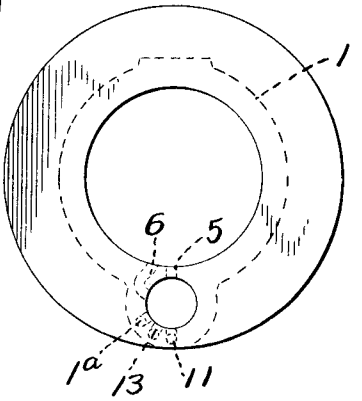



Fig. 3.




Witnesses

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2 SHEETS—SHEET 2.

Fig. 4.

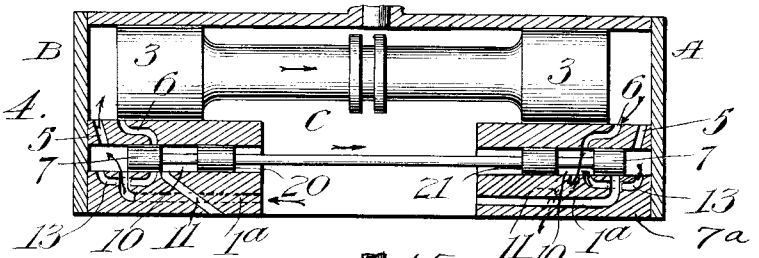



Fig. 5.

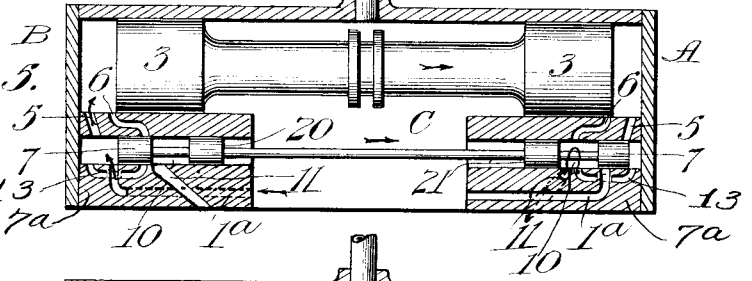



Fig. 6.

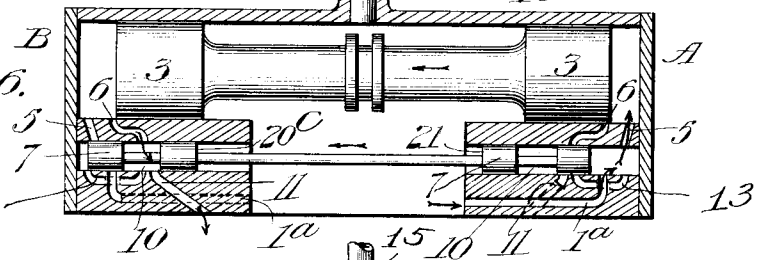
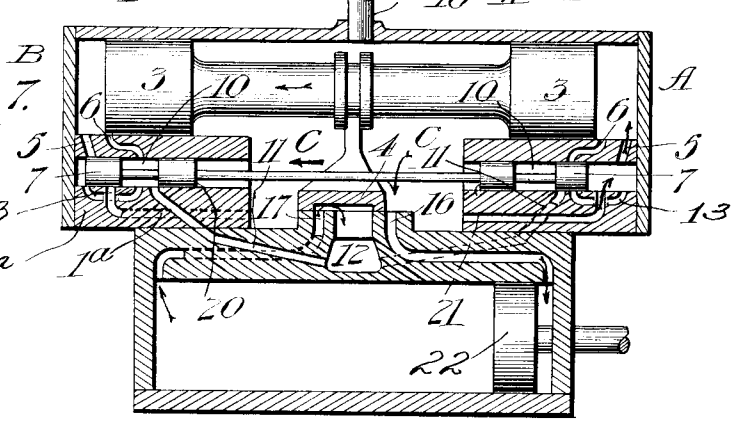



Fig. 7.

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# UNITED STATES PATENT OFFICE.

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## STEAM-ACTUATED VALVE.

1,052,452. Specification of Letters Patent. **Patented Feb. 11, 1913.**

Application filed May 12, 1908. Serial No. 432,516.

*To all whom it may concern:*

Be it known that I, WILLIAM H. BLAKE, a citizen of the United States, residing at Fitchburg, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Steam-Actuated Valves, of which the following is a specification.

The object of my invention is to produce a valve mechanism that will not flutter or short-stroke, and with this and minor objects in view my invention consists of the parts and combination of parts as will be hereinafter more fully set out.

In the drawing:—Figure 1 is a longitudinal sectional view of a valve embodying my invention, parts being in elevation; Fig. 2 is a detail sectional perspective view of the auxiliary piston chamber showing the ports on one end thereof; Fig. 3 is an end view of the same; and Figs. 4 to 7 are a series of diagrammatic views showing the parts of the device in various positions.

Referring to the drawings, the valve mechanism consists of a main piston valve cylinder 1, the ends of which are covered by the heads 2, inclosing a steam actuated piston 3, which is attached to and operates the main slide valve 4, which as will be seen, is of the D-type, and controls steam and exhaust from the main engine cylinder. The piston 3 is controlled by steam entering the chamber or steam chest, through the steam port 5 and exhausting through port 6. Exhaust port 6 opens into the main valve chamber some distance from the respective heads of said chamber and is placed in this position so that the piston 3 will travel over the same during its stroke prior to the throw of valve 7 as in Fig. 5 and cut off further escape of steam forming a cushion of trapped steam and preventing said piston from striking the chest head. The auxiliary piston valve 7 has its ends housed in an auxiliary valve case $7^a$ and is mechanically operated by means of the lever 8 to which it is connected and is thrown intermittently in opposite directions by any usual means, such for instance, as a reciprocating rod driven by the engine. Collars 14 suitably spaced apart assisting in starting valve 4, if need be, are carried by said rod. Each end of valve 7 has two heads leaving a space 10 between them. 11 are ports alternately connecting said spaces 10, with the main exhaust 12, when not closed by valve 7.

13 are two passages connecting the spaces 10 respectively with the extreme outer ends of the valve chamber for valve 7, said passages also being controlled by that valve.

Live steam enters chamber C through the steam pipe 15 and passes to one side or the other of piston 22 in the main cylinder of the engine, through passages 16 and 17 alternately depending on the position of the slide valve 4, controlled by the valve piston 3.

It has been found heretofore that a valve thus moved intermittently and subjected to steam within the cylinder in which it is mounted is liable to flutter or receive a premature movement under the pressure of the steam. In the present invention this disadvantage is avoided by subjecting the valve to steam pressure which holds it at the end of its throw, until such time as this reverse throw is mechanically imparted to it, imparting a starting movement in the direction of its throw, when the direction of the steam pressure on one of the extremities of the valve is reversed completing the throw and holding it at the end until the cycle is repeated. This is accomplished by the following means. When the auxiliary valve 7 moves to the position shown in Figs. 1 and 6, live steam from the main valve chest passes through the port $1^a$ into the auxiliary valve cylinder at the end thereof designated A, thence across the right hand end of the valve 7 to the port 5 through which it enters the right hand end of the main valve chamber to develop the throw of the main valve which is about to take place in Figs. 1 and 6. Steam having been introduced from the boiler at 15 fills all the space C and presses equally upon the exposed opposite ends 20 and 21 of the auxiliary valve 7. This steam is employed primarily, in driving a main piston as shown diagrammatically in Fig. 7, but forming no part of the present application. The piston 3 having been displaced toward the left from the position shown in Fig. 6 to that in Fig. 7 and the valve 7 thrown in the same direction as the steam pressure on its left hand end as shown in Fig. 7 closing exhaust port 6 at the end A, port 6 is opened at the left-hand or end B as shown in Fig.

6, permitting the steam to exhaust at that end through ports 11 into main exhaust 12, and closing ports 5 and 1ª at the same end. When piston 3 has arrived into the position shown in Fig. 7, it has closed port 6 on the left, whereby a cushion of steam is formed for the piston at B. The auxiliary valve 7 is thereupon thrown to the right by lever 8, thereby opening ports 1ª and 5 at B, letting in fresh steam from chamber C behind piston 3 at B, simultaneously closing port 6. At the A end, port 1ª has at the same time been closed, and port 6 and passage 13 have been opened, whereby exhaust steam is permitted to escape from in front of piston 3 and valve 7 into the main exhaust by way of space 10 and passage 11, as the arrows show. In Fig. 5, valve 7 and piston 3 have moved still farther to the right, whereby the latter has closed the right-hand port 6, so that a cushion is formed in front of piston 3. When now again mechanical pressure is exerted through lever 8, valve 7 moves to the left, opening ports 5 and 1ª at the right hand end as shown in Fig. 6 and ports 6 and 13 at the left-hand end of the auxiliary valve case, but closing the corresponding ports at the right hand end of said case whereby steam is admitted at the end A of the main valve casing completing the throw of the auxiliary valve 7 and displacing it to the position shown in Fig. 7. Valve 7 does not fully close the end B of passages 13 adjacent to the heads of the auxiliary valve casing as shown in Fig. 6 and the outlet to passage 13 is spaced a sufficient distance from the respective heads of the auxiliary valve casing to provide a cushion of steam between the auxiliary valve and the head of the casing should said auxiliary valve for any reason pass beyond the opening of passage 13 adjacent to said heads. Slide valve 4 is positively thrown through its connection with piston 3. Should it stick under the steam pressure actuating piston 3 it receives a further impulse from collars 14 mounted on the auxiliary valve stem. The live steam will then be carried to one side or the other of the piston 22 of the engine according to which passage 16 or 17 is opened by the slide valve 4, the other of these passages exhausting simultaneously to the main exhaust 12.

Having thus described my invention, what I claim as new therein and desire to secure by Letters Patent is:—

1. In a steam actuated slide valve, a valve actuating main piston, an auxiliary piston valve for controlling the supply of steam to opposite ends of the main piston and means delivering steam pressure to the auxiliary piston valve in opposition to the direction of each new throw of said main piston.

2. In a steam actuated slide valve, a valve actuating main piston, an auxiliary piston valve for controlling the supply of steam to opposite ends of the main piston and means delivering steam pressure to the auxiliary piston valve in opposition to the direction of each new throw of said main piston, and reversing the direction of such steam pressure, at the completion of each throw.

3. In a steam actuated slide valve, a main piston for actuating the valve, an auxiliary piston for controlling the supply of steam to the valve actuating piston, and passages through which said steam is supplied, made up in part of the ends of the auxiliary valve cylinders; the steam being delivered to said auxiliary valve cylinders at timed intervals which oppose beginning of each auxiliary valve stroke.

4. In a steam actuated slide valve, a main piston for actuating the valve, an auxiliary piston for controlling the supply of steam to the valve actuating main piston, and passages through which said steam is supplied, made up in part of the ends of the auxiliary valve cylinders; the steam being delivered to said auxiliary valve cylinders at timed intervals which oppose beginning of each auxiliary valve stroke but being reversed in direction after the beginning of such stroke and thereby assisting in the completion of the stroke.

5. In a steam actuated slide valve, a main piston for actuating the valve, an auxiliary piston for actuating the supply of steam to the valve actuating piston, and passages through which said steam is supplied, made up in part of the ends of the auxiliary valve cylinders; the steam being delivered to said auxiliary valve cylinders at timed intervals which oppose beginning of each auxiliary valve stroke but being reversed in direction after the beginning of such stroke and thereby assisting in the completion of the stroke, said auxiliary valve having a mechanical connection with the main valve piston, whereby it initiates the throw of the latter.

6. In a steam actuated slide valve, a valve actuating main piston, a case for said piston, an auxiliary piston valve for controlling the supply of steam to opposite ends of the valve piston, a casing for said auxiliary valve, passages controlling inlet and exhaust to and from opposite ends of main piston casing and said auxiliary valve having two opposed pressure surfaces of the same area and steam inlet and exhaust ports in the auxiliary valve case, located respectively to be covered and uncovered by the auxiliary valve as the latter approaches the end of its stroke.

7. In a steam actuated slide valve, a valve actuating main piston, a casing for said piston, inlet ports at the ends of said casing, exhaust ports at a distance from the

ends thereof, an auxiliary piston valve casing, an auxiliary valve reciprocable in said casing for controlling the admission and exhaust of steam to opposite ends of the valve piston and formed with opposed pressure surfaces of equal areas, one of said surfaces exposed to the action of steam after the opposite end of the auxiliary valve has passed the exhaust port and an exhaust duct at the respective ends of said auxiliary valve casing.

8. In a steam actuated slide valve, a main piston for actuating the valve, a valve casing inclosing said piston, exhaust ports independent of the inlet ports, an auxiliary valve casing, opposite pairs of auxiliary pistons in said casing, and annular spaces between each pair, ports through which steam may be admitted to and exhausted from the annular spaces between said pistons, passages through which steam can gain access to the outer face of the main valve piston.

9. In a steam actuated slide valve controlling the inlet and exhaust ports to the cylinder of an engine, a steam actuated main piston positively connected with said slide valve; an auxiliary mechanically operated piston having two pairs of piston heads and a space between each pair of heads; a casing for said slide valve and main and auxiliary pistons with a central steam chamber receiving constant steam supply from a steam pipe; said casing having cylindrical chambers for said main and auxiliary pistons; an inlet duct from said central chamber to the outer end of each of said auxiliary piston chambers; an inlet port at the extreme end of each of the main piston chambers connecting with the auxiliary chamber; an exhaust port back of said inlet port leading from each of said main piston chambers to the central part of said auxiliary chambers; an exhaust duct between the end part and the central part of each auxiliary piston chambers; an exhaust passage from the central part of each auxiliary piston chamber leading to the main exhaust of the engine; said ports, ducts and passages being controlled by said auxiliary piston, so that, with the auxiliary piston in a certain position, fresh steam will pass from said central chamber through an inlet duct, one of the auxiliary chambers and the corresponding inlet port to one of said main piston chambers; while exhaust steam passes from the other main chamber through the corresponding exhaust port, the space between the corresponding pair of auxiliary piston heads and the exhaust passage to the main exhaust, and exhaust steam also passing from the end part of the same auxiliary piston chamber through the exhaust duct, the space between the same pair of auxiliary piston heads and the same exhaust passage into the main exhaust; the other set of ducts, ports and passages being simultaneously closed by said auxiliary piston.

The foregoing specification signed at Fitchburg, Massachusetts, this twenty-third day of August, 1907.

WILLIAM H. BLAKE.

In presence of two witnesses:
WASHINGTON L. BLAKE,
WILTON M. GRANT.