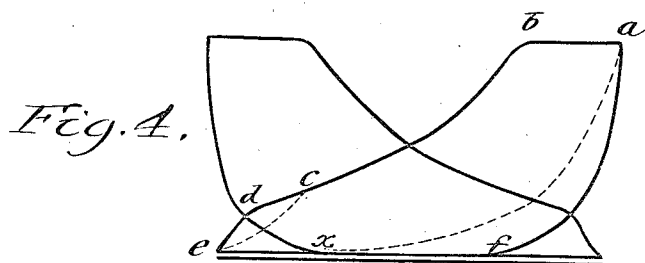
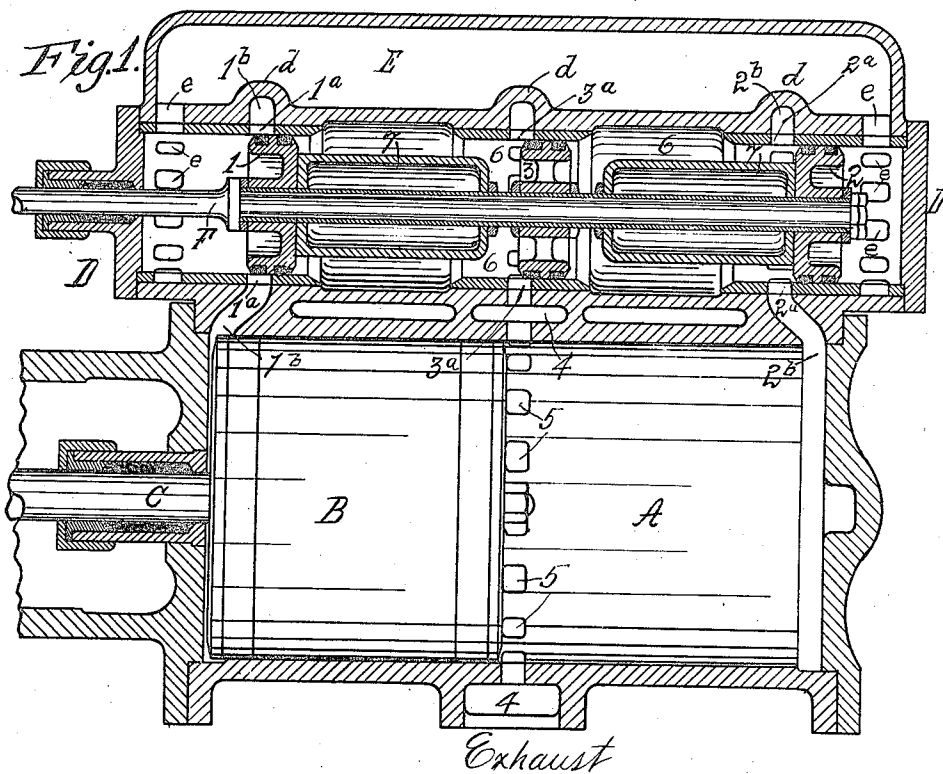


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APPLICATION FILED APR. 6, 1918.

Patented Dec. 10, 1918.
2 SHEETS—SHEET 1.

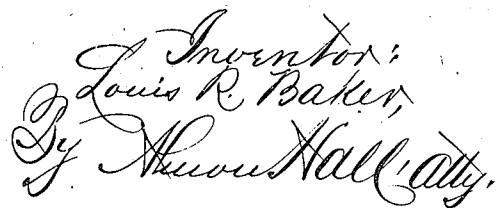


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UNITED STATES PATENT OFFICE.

LOUIS RALPH BAKER, OF SWANTON, OHIO.

VALVE FOR STEAM-ENGINES.

1,286,910.

Specification of Letters Patent.

Patented Dec. 10, 1918.

Application filed April 6, 1918. Serial No. 226,998.

To all whom it may concern:

Be it known that I, LOUIS R. BAKER, a citizen of the United States, residing at Swanton, in the county of Fulton and State of Ohio, have invented certain new and useful Improvements in Valves for Steam-Engines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to the valve and port construction of reciprocating steam engines of the uniflow and counterflow types, and is designed to provide simple and efficient means for maintaining low compression on the exhaust side of the engine-piston, and for securing as late a release or exhaust as may be required regardless of the point of cut off.

To these ends my invention consists of the devices, construction and arrangement of parts fully described in the following specification, and while, in its broader aspect, it is capable of embodiment in numerous forms, certain preferred illustrative embodiments thereof are shown in the accompanying drawings, in which—

Figure 1 is a longitudinal central sectional view of the main cylinder and valve-cylinder of a reciprocating steam engine of the uniflow type, together with the steam-chest, the engine-piston, the valves and the several passages and ports hereinafter referred to; Fig. 2, a central longitudinal section of my valve-mechanism in a modified form, as applied to a counterflow engine; Fig. 3 a like view of an engine of the counterflow slide valve type, in which is embodied a modified form of slide valve and port construction in accordance with my invention, and Fig. 4, an indicator-card taken from my engine, illustrated in Fig. 1.

Like letters and numerals indicate like parts throughout the drawings.

In the drawings, referring to Fig. 1, A designates the main engine cylinder in which reciprocates a piston B, having a piston-rod C. The piston is a hollow cylinder of half the length of the chamber of the main cylinder, minus the horizontal width of ports, a series of which lead from such chamber midway of its length, and the

stroke of the piston is equal to its own length plus the width of such ports. D is a valve-cylinder secured in operative relation to the main cylinder A, also to a steam-chest E, which has a steam supply through suitable connections, not shown. The steam-chest, through openings *e*, is in uninterrupted communication with both ends of the chamber of the valve cylinder D. In the valve-cylinder reciprocates a valve-rod F, which is actuated in harmony with the movement of the piston B by the usual or any preferred connecting mechanisms.

Upon the valve-rod F are secured three piston-valves 1—2—3. The intermediate valve-piston 3 has therethrough openings parallel with the valve-rod. These valves respectively work in an internal sleeve or bushing in the valve-cylinder, in which bushings are ports in operative relation to the valves. These ports open into annular passages, formed in annular ribs *d*, integral with the wall of the valve-cylinder. The ports governed by the respective valves are correspondingly designated as 1^a, 2^a, and 3^a, and the steam passages with which the ports communicate as 1^b and 2^b. The passage 1^b, controlled by valve 1, leads into one end of the piston-chamber A. The passage 2^b, controlled by the valve 2, leads into the opposite end of said chamber. The port controlled by valve 3 leads into an annular exhaust passage 4, formed in the wall of the cylinder A, which passage is in communication with the chamber of the cylinder A through a series of ports 5, formed in the wall of the cylinder midway of its length.

The interior of the valve-cylinder between the valves 1 and 2 may be regarded as a single chamber 6, since both ends of this space are in communication through the openings through the valve 3. Fixed upon the valve-rod F are hollow closed displacement members 7, which, for the purpose hereinafter explained, reduces the space between the valves 1 and 2 to predetermined proportions.

The operation of my device, as illustrated in Fig. 1, may be best explained by following the movement of the main piston and the valves through one stroke of the engine.

The engine is on dead center. The exhaust is taking place through ports, 2^a, 3^a and 5, which are open. The valve-rod F is moving to the right, and valve 1 is begin-

ning to uncover the port 1^a. This movement, effected by means of valve-rod connections, not shown, produces a quick opening of this port admitting steam to the left of the piston. The release of the exhaust is continuous until the valve-rod has completed its stroke and has traveled substantially one-half of its return stroke. The greater volume of exhaust steam having been released, port 3^a is now closed in advance of port 2^a permitting the remaining exhaust steam to be compressed through port 2^a into the chamber 6 between the valves 1 and 2, thus building up the pressure in the chamber 6. Just before valve 1 opens the port 1^a, as it passes to the left, the pressure in the chamber 6 is the same as in the cylinder. When the port 1^a is opened to chamber 6 the steam on the left hand side of the piston would be released,—as indicated by the dotted line *c—e* in the indicator card, Fig. 4,—were it not for the pressure built up in the chamber 6 and retained there by valve 3 and by the compression on the opposite side of the piston. The advancing piston early in its stroke has closed the ports 5. These ports are uncovered at the end of the stroke of the piston at about the same time the ports 3^a are uncovered by the further movement to the left of the valve 3. Thus, until near the end of the stroke, compression is negligible and a late release is obtained. It will be seen that were it not for valve 3 and ports 3^a compression would begin as soon as the engine piston had closed the ports 5, and that the effect would be as indicated by the dotted line *x—a* on the indicator card, Fig. 4. It will be understood that the return stroke of the piston with a repetition, in reverse, of the indicator card is obtained by an exact reversal of the valve movement above described.

The pressure in the chamber 6 is varied and controlled by the size of the displacement-members 7.

In the indicator card "*a*" indicates admission, "*b*" cut off, "*c*" chamber 6 opened to port 1^a, "*d*" release at 5 and 3^a, "*e*" end of stroke, "*f*", valve 3 covers port 3^a, and "*f—a*" compression line.

If the expansion line on the indicator-card drops when the valve 1 or 2 opens to release, larger displacement members must be substituted to cut down clearance space and to increase the pressure in the chamber.

In Figs. 2 and 3 are omitted the ports in the wall of the main cylinder which, in Fig. 1, are covered and uncovered by the movement of the piston B, but the arrangement of the valves 1 and 2 and the intermediate valve 3 and their movement, relatively to their ports and to the piston, are otherwise substantially the same as hereinbefore described except that all the exhaust steam must flow back through live steam ports 1^a

and 2^a, and, as will be seen without further explanation, the intermediate valve 3 is designed to close its port in advance of the closing of either of the ports 1^a—2^a against complete exhaust, the compression thus produced is admitted to the expansion side of the piston and compression is thereby reduced and a late release is obtained.

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

1. In a valve-mechanism for steam engines, an engine-cylinder, a reciprocating piston therein, a valve-casing connected at each end with a steam supply and having near each end an admission and exhaust port in communication with the corresponding end of the chamber of the engine-cylinder, having also, midway of its length, an exhaust port leading to an exhaust passage in communication with each of said ports, for each of said three ports a valve the spaces between the middle and end valves being in communication through an opening in the middle valve, and a valve-rod adapted to actuate said three valves in harmony with the movement of the piston.

2. In a steam engine, a valve-casing adapted for connection at each end with a steam supply and having near each end a port for admission and exhaust, having, also, midway between its ends, an exhaust port, for each of said ports a valve, and a valve-rod operatively connected with said three valves, said intermediate valve being arranged to close its port in advance of the closing of either of the said end-ports against exhaust, the spaces between the intermediate valve and the end valves being in constant communication.

3. In a steam engine, an engine-cylinder having at each end of its chamber a passage for the admission and exhaust of steam, having, also, midway between its ends, an annular series of ports in communication with an annular exhaust passage in the wall of said cylinder, in the cylinder a piston having a stroke equal to its own length plus the width of said ports, a valve-casing in operative relation to the engine-cylinder having at each end steam inlet connections, having also, near each end, ports in communication with the corresponding passage at the end of the engine-cylinder, having also, midway of its length, ports leading into said annular exhaust passage, three valves which control the end and middle ports last mentioned, and a valve-rod for said three valves, the intermediate valve being arranged to close its port in advance of the closing of either of said end ports against exhaust, the spaces between the intermediate valve and the end valves being in constant communication.

4. In a steam engine, an engine cylinder,

5 a piston therein, a valve-casing adapted at both ends for connection with a steam supply and having near each end a port for admission to and exhaust from the engine, having also, midway of its length, an exhaust-port, an exhaust passage in communication with said several ports, a valve for each of said ports, and a valve-rod common to said valves, the arrangement being such that the intermediate valve is closed against exhaust in advance of the closing against exhaust of the end valve on the exhaust side of the piston, whereby compression takes place in the valve-chamber near the end of the stroke of the piston and such that by the movement of the end valve on the expansion side of the piston such compression is admitted to the expansion side of the piston.

10 5. In a steam engine, an engine cylinder, a piston therein, a valve-casing adapted at both ends for connection with a steam supply and having near each end a port for admission to and exhaust from the engine,

having also, midway of its length, an exhaust-port, an exhaust passage in communication with said several ports, a valve for each of said ports, a valve-rod common to said valves, the arrangement being such that the intermediate valve is closed against exhaust in advance of the closing against exhaust of the end valve on the exhaust side of the piston, whereby compression takes place in the valve-chamber near the end of the stroke of the piston, and such that by the movement of the end valve on the expansion side of the piston such compression is admitted to the expansion side of the piston, and, in the space between said end valves, displacement devices adapted by their size to control the extent of such compression.

In testimony whereof I affix my signature in presence of two witnesses.

LOUIS RALPH BAKER.

Witnesses:

SAMUEL ZIMMERMAN,
HILDA RETHINGER.