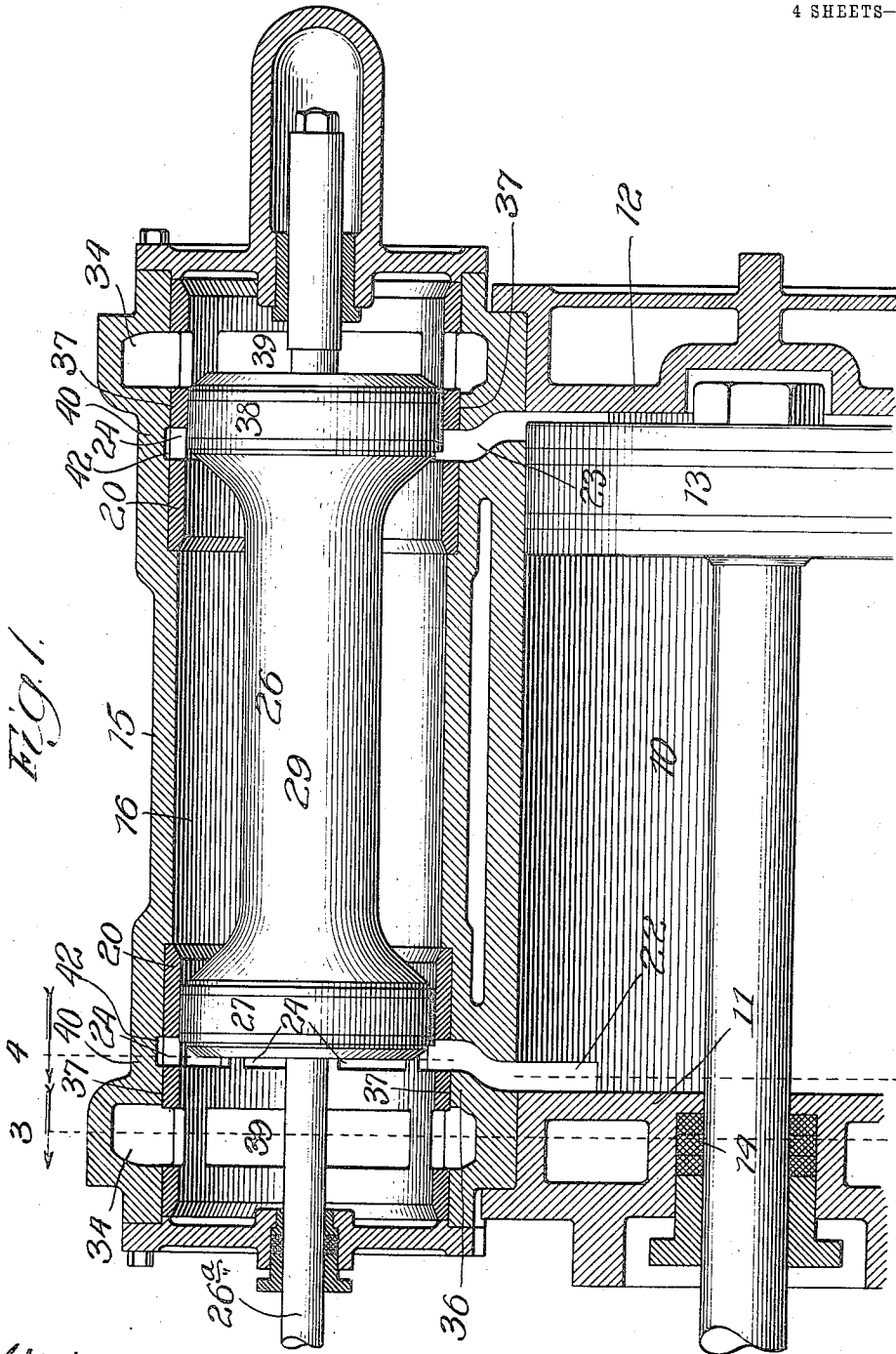


E. H. ALLFREE.
VALVE FOR ENGINES.
APPLICATION FILED MAR. 18, 1912.

1,032,039.

Patented July 9, 1912.

4 SHEETS—SHEET 1.



Witnesses:
E. E. Chyford,
J. F. Chas.:

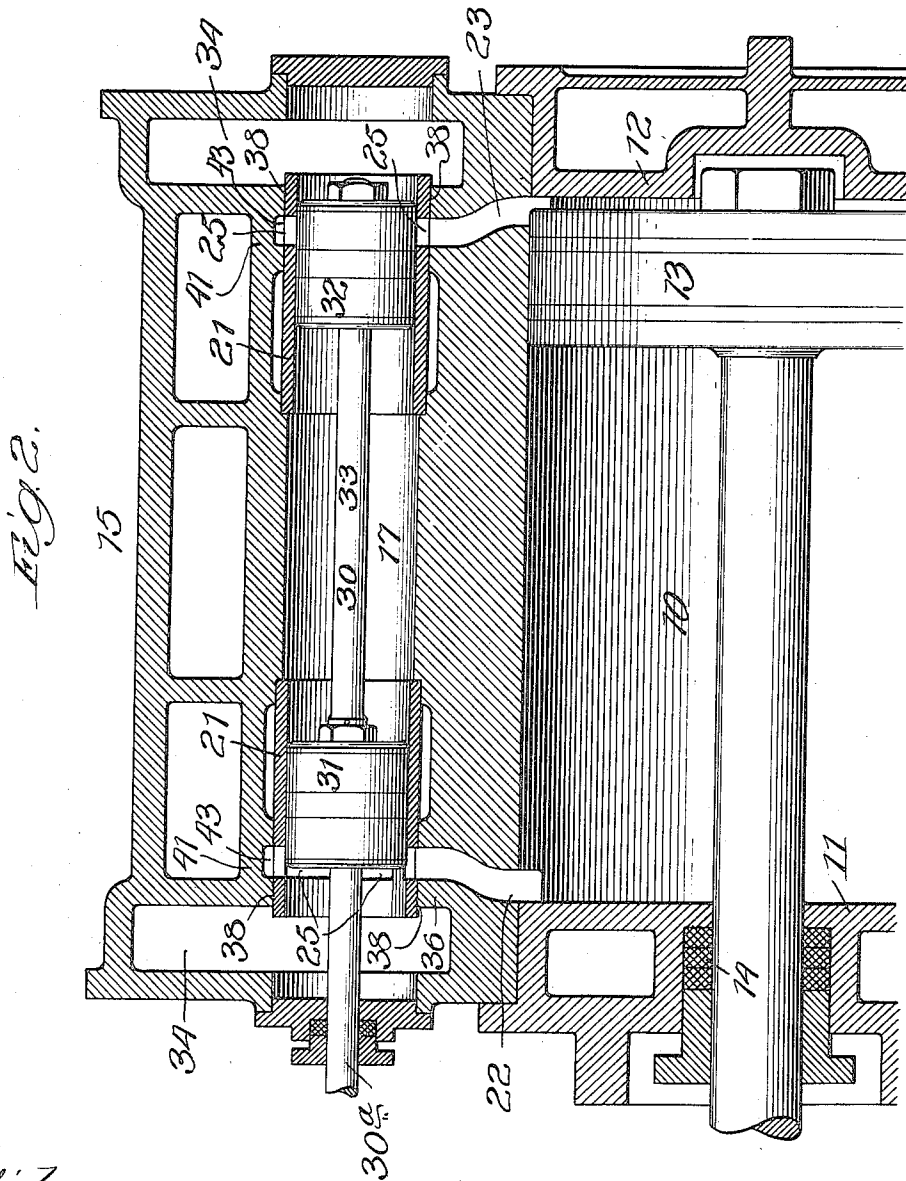
Inventor:
Edwin H. Allfree,
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4 SHEETS—SHEET 2.



Witnesses:
E. H. Allfree,
G. F. Chase.

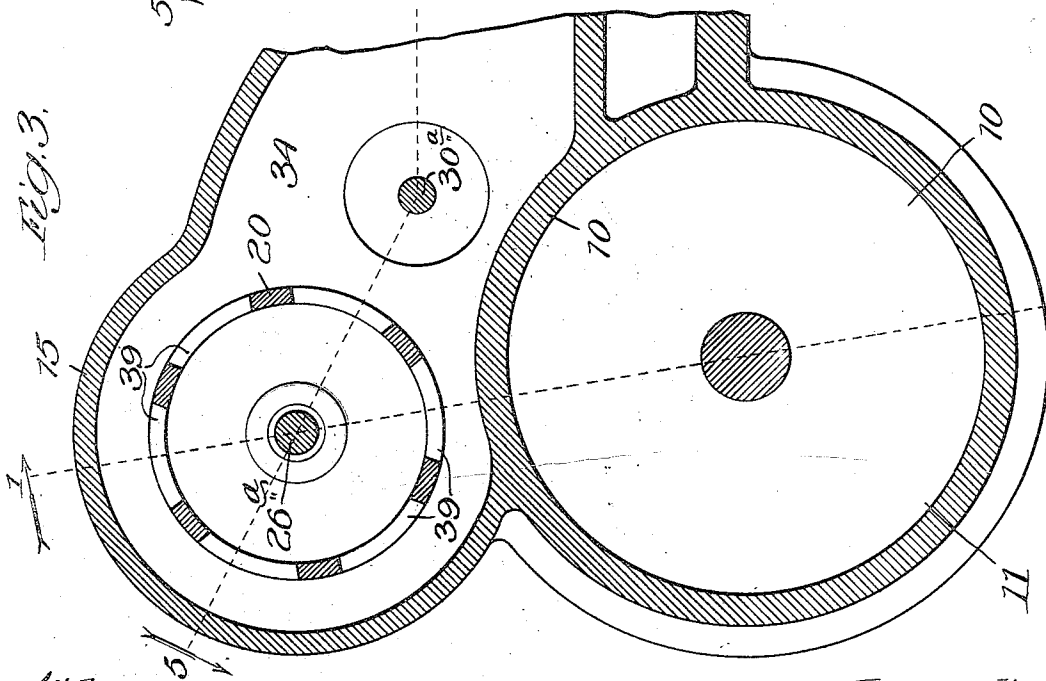
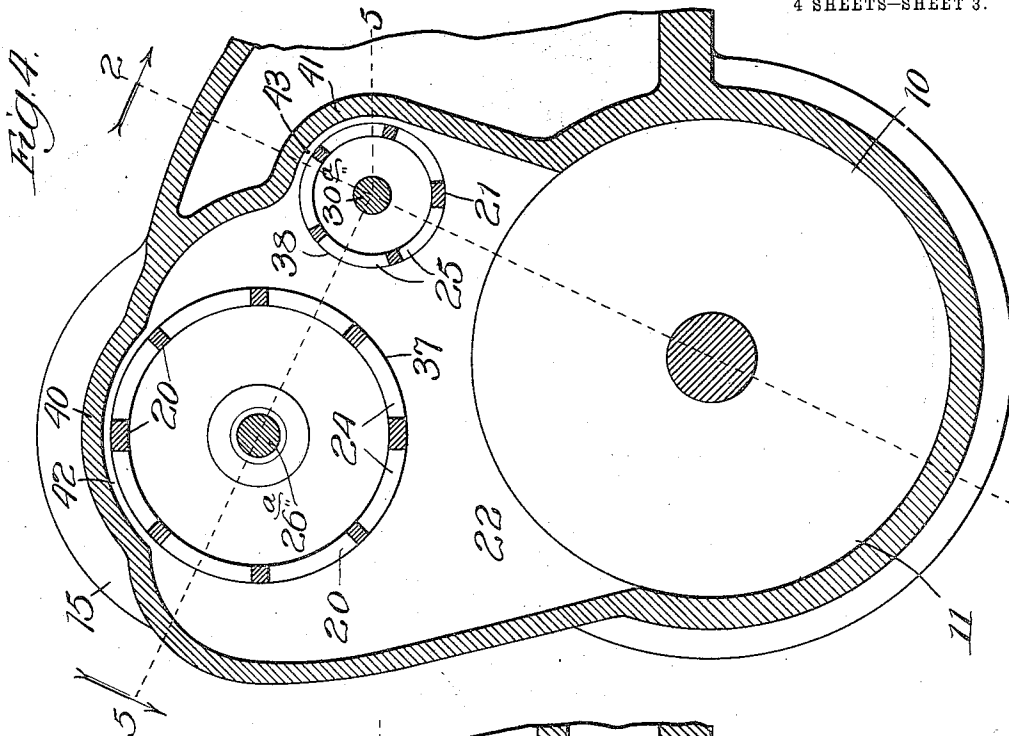
Inventor:
Edwin H. Allfree,
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4 SHEETS—SHEET 3.



Witnesses:
G. F. Chas. J. Chas.

Inventor:
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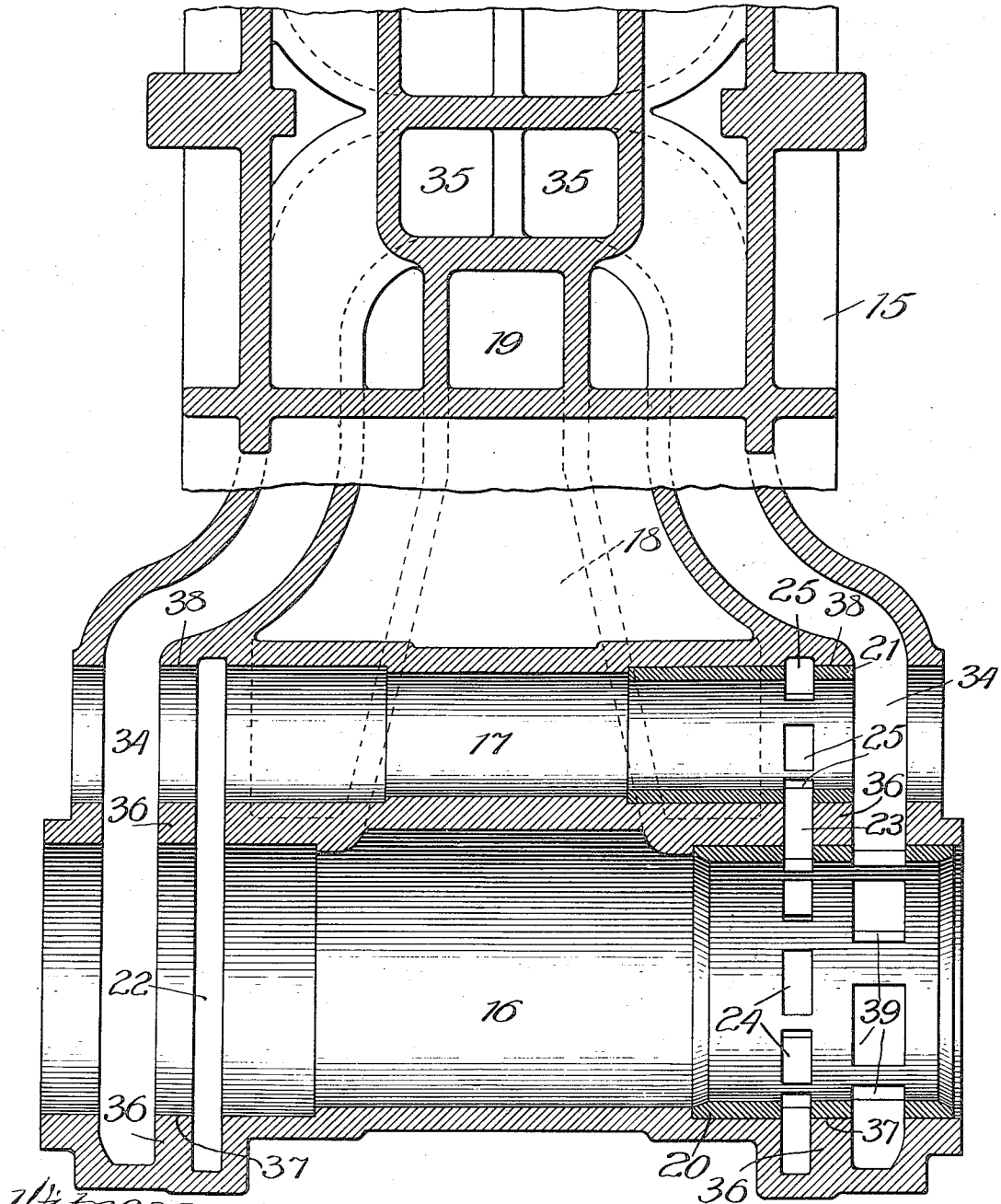
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1,032,039.

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4 SHEETS—SHEET 4.

Fig. 5.



Witnesses:

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UNITED STATES PATENT OFFICE.

EDWIN H. ALLFREE, OF CHICAGO, ILLINOIS.

VALVE FOR ENGINES.

1,032,039.

Specification of Letters Patent.

Patented July 9, 1912.

Application filed March 18, 1912. Serial No. 684,578.

To all whom it may concern:

Be it known that I, EDWIN H. ALLFREE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Valves for Engines, of which the following is a specification.

My invention relates to improvements in valve constructions of the type disclosed in United States Letters Patent No. 770,671, granted to James B. Allfree, and involving, generally stated, a main valve-device for controlling the inlet of the fluid-pressure to the engine and the primary exhaust therefrom; and an auxiliary valve-device constituting compression-controlling means, which operates to prolong the exhausting of the engine-cylinder; my invention constituting improvements in the construction disclosed in said patent. The valve mechanism of said patent when forming the fluid-pressure control of an engine operated through the medium of superheated steam, presents the disadvantage of its movable parts warping, with the consequent result of rendering the valve device leaky and impairing its functions and those of the engine.

My object is to provide a valve construction of the type above referred to which will be economical of manufacture, be capable of being readily and economically repaired in the event of undue wear of the bearing surfaces of the valve-casings, and which will not present the disadvantage of its parts warping, especially when incorporated in an engine operated by superheated steam; and another object is to provide for the minimum clearance in the exhaust passages between the cylinder and the points at which the valve closes the exhaust, commensurate with the amount of clearance required to be present in order that the proper cushioning of the piston in its final movements may be effected.

Referring to the accompanying drawings—Figure 1 is a broken view in longitudinal sectional elevation of an engine-cylinder equipped with valve mechanism of the type above referred to and embodying my improvements for controlling the introduction into and exhaust therefrom of the fluid-pressure for operating the piston therein, the section being taken at the line 1 on Fig. 3, through the main valve of the engine, and viewed in the direction of the

arrow. Fig. 2 is a similar view taken at the line 2 on Fig. 4 and viewed in the direction of the arrow. Fig. 3 is a section taken at the line 3 on Fig. 1 and viewed in the direction of the arrow. Fig. 4 is a section taken at the line 4 on Fig. 1 and viewed in the direction of the arrow; and Fig. 5, a section taken at the irregular line 5 on Fig. 4 and viewed in the direction of the arrow, the main and auxiliary valves, as well as the linings, or bushings, at one end of the steam-chest and which cooperate with the valves, being omitted.

As the construction illustrated is of the same general form and involves the same principle of operation as the construction disclosed in said patent, a general description of the present construction, so far as the features disclosed in said patent are concerned, will suffice. The cylinder of an engine is illustrated at 10 and is provided with the usual heads 11 and 12, the cylinder containing a piston 13, the stem thereof operating in a stuffing-box 14 in the head 11, the piston in practice being connected with the usual guided cross-head (not shown) as is the general practice in engine constructions. The portion of the cylinder-casting which contains the main and auxiliary valve-devices for controlling the introduction of the steam into the cylinder and the exhaust therefrom is represented at 15, and contains a main-valve chamber 16 and an auxiliary, or compression-controlling, valve-chamber 17 which are laterally offset with relation to each other, as illustrated in Figs. 3 and 4, the chamber 16 between its end connecting with a conduit 18 which has an inlet 19 through which the steam is introduced into the conduit 18 from the source of supply (not shown), and the chambers 16 and 17 having fitted into their opposite ends cylindrical sleeves, or bushings, 20 and 21, respectively. The casting 15 contains at its opposite ends ports 22 and 23 which open into the cylinder 10 at its opposite ends and into the chambers 16 and 17 through openings 24 and 25, in the bushings 20 and 21, respectively.

The main valve which is in the chamber 16 and controls the introduction of steam into the cylinder 10 from the chamber 16, for operating the piston in said cylinder, and controlling the opening and closing of the main exhaust of the cylinder 10, is rep-

resented at 26. This valve in the preferred construction illustrated comprises a pair of cylindrical heads 27 and 28 rigidly connected together by a bar 29, the heads 27 and 28 having sliding fit in the bushings 20. The auxiliary, or compression-controlling valve, through the medium of which the final exhausting of the cylinder 10 is controlled, is located in the chamber 17 and is represented at 30, this valve comprising a pair of cylindrical heads 31 and 32 rigidly connected together by a rod 33, the heads 31 and 32 having sliding fit in the bushings 21.

As the chamber 16 is connected with the conduit 18 intermediate the heads 27 and 28 of the valve 26 the steam supplied to the conduit 18 is alternately discharged by the reciprocations of the valve 26 into the opposite ends of the cylinder 10 through the ports 22 and 23 for driving the piston 13.

The casting 15 at its opposite ends, beyond the ports 22 and 23 contains exhaust-steam passages 34, the outlets of which are represented at 35, the passages 34 being separated from the ports 22 and 23 by walls 36, through openings 37 and 38 in which walls the bushings 20 and 21, respectively, extend, the bushings 20, which extend transversely across the passages 34, being provided about their peripheries with openings 39 which register with said passages, and the bushings 21, having their outer ends open and in communication with the passages 34 as represented in Fig. 2.

In practice, the valves 26 and 30 are connected at stems 26^a and 30^a thereon, with valve-gear of any suitable type, as for example that illustrated in United States Letters Patent No. 1,002,112, for producing the properly timed operation of these valves relative to each other and to the piston as set forth in said United States Letters Patent No. 770,671, the valve 26 operating to introduce steam alternately into the opposite ends of the cylinder 10 for driving the piston 13 and exhausting the cylinder; and the valve 30, which has a lagging movement relative to the main valve 26, serving to prolong the exhausting of the cylinder 10 after the main exhaust closes, sufficient to reduce to the minimum the compression encountered by the piston at the ends of its strokes, the steam in these operations of the valve 26 passing from the chamber 16 through the ports 22 and 23 alternately, into the cylinder 10, and the exhaust steam discharging through the ports 22 and 23, alternately, into the bushings 20 and 21 through the openings 24 and 25, respectively, therein, and thence through the openings 39 in the bushings 20, and the open ends of the bushings 21, into the passages 34, the steam thus exhausted discharging through the outlets 35, it being understood that the steam in the cylinder 10, with each

reciprocation of the piston 13 continues to exhaust therefrom until the compression-controlling valve closes the exhausts.

In those constructions wherein a compression-controlling valve is provided, the clearance required between the valves and the ends of the piston when at the limits of its strokes is of the minimum amount compared with those engines in which such a valve is not employed, and the clearance should be so minimized as to insure the proper compressing of the steam left in the clearance to cushion the piston 13. In view of this condition the valve-devices may be placed closely adjacent to the cylinder and relatively short ports be provided, and furthermore, in order that cylindrical piston-valves be employed to the best advantage as the fluid-pressure controlling means in a valve-device of the type to which this invention relates and the desired clearance be afforded, I so form the ports 22 and 23 as to cause portions of their inclosing walls to be brought into close proximity with the bushings 20 and 21 as represented at 40 and 41, Fig. 4, the walls 40 and 41 containing grooves 42 and 43 registering with the openings 24 and 25 in the bushings 20 and 21, whereby the steam in the ports 22 and 23 bears against the peripheries of the heads of the valves 26 and 30, equally in all directions and thus the valves are balanced.

It will be readily understood from the foregoing that any axial movement of the valve-heads relative to each other as might occur when the valves are subjected to the action of superheated steam, would have no impairing effect upon the proper operation of the valves as these heads would present the desired sliding fit regardless of their axial adjustment in the coöperating bushings. Furthermore, in the construction illustrated, the valves 26 and 30 are not only readily accessible and easily removed as units, from the valve-chambers, but in the event of undue wear of any part of the valve-chambers contacted with by the valves in their reciprocations, the same may be readily remedied by reason of the provision of the hereinbefore-described removable bushings in which the valves operate, which not only are inexpensive, but permit of ready substitution of one for the other.

What I claim as new and desire to secure by Letters Patent, is—

In a steam-engine, the combination of a cylinder, a single main-valve chamber communicating with a source of steam supply, a single auxiliary-valve chamber, ports at opposite ends of said cylinder communicating with said chambers, exhaust-passages beyond said ports and separated therefrom by walls containing openings in alinement with said chambers, cylindrical bushings in said chambers and said openings communicating

with said exhaust-passages and containing
openings about their peripheries communi-
cating with said ports, a main cylindrical
valve in said main-valve chamber and oper-
5 ating in the bushings therein for controlling
the admission of steam to said cylinders
through said ports and exhaust of steam
into said exhaust-passages, and a cylindrical
compression-controlling valve in said aux-
10 iliary-valve chamber operating in the bush-
ings therein and controlling the exhaust of
steam therethrough into said exhaust-pas-
sages, said bushings being spaced through-

out their peripheries from the walls of said
ports to cause the steam pressure against 15
said main and auxiliary valves, exerted
through the openings in the peripheries of
said bushings, to be balanced, and portions
of the walls of said ports which extend
transversely thereof, extending partially 20
around and closely adjacent to said bush-
ings for minimizing the clearance.

EDWIN H. ALLFREE.

In presence of—

J. G. ANDERSON,
O. C. AVISUS.