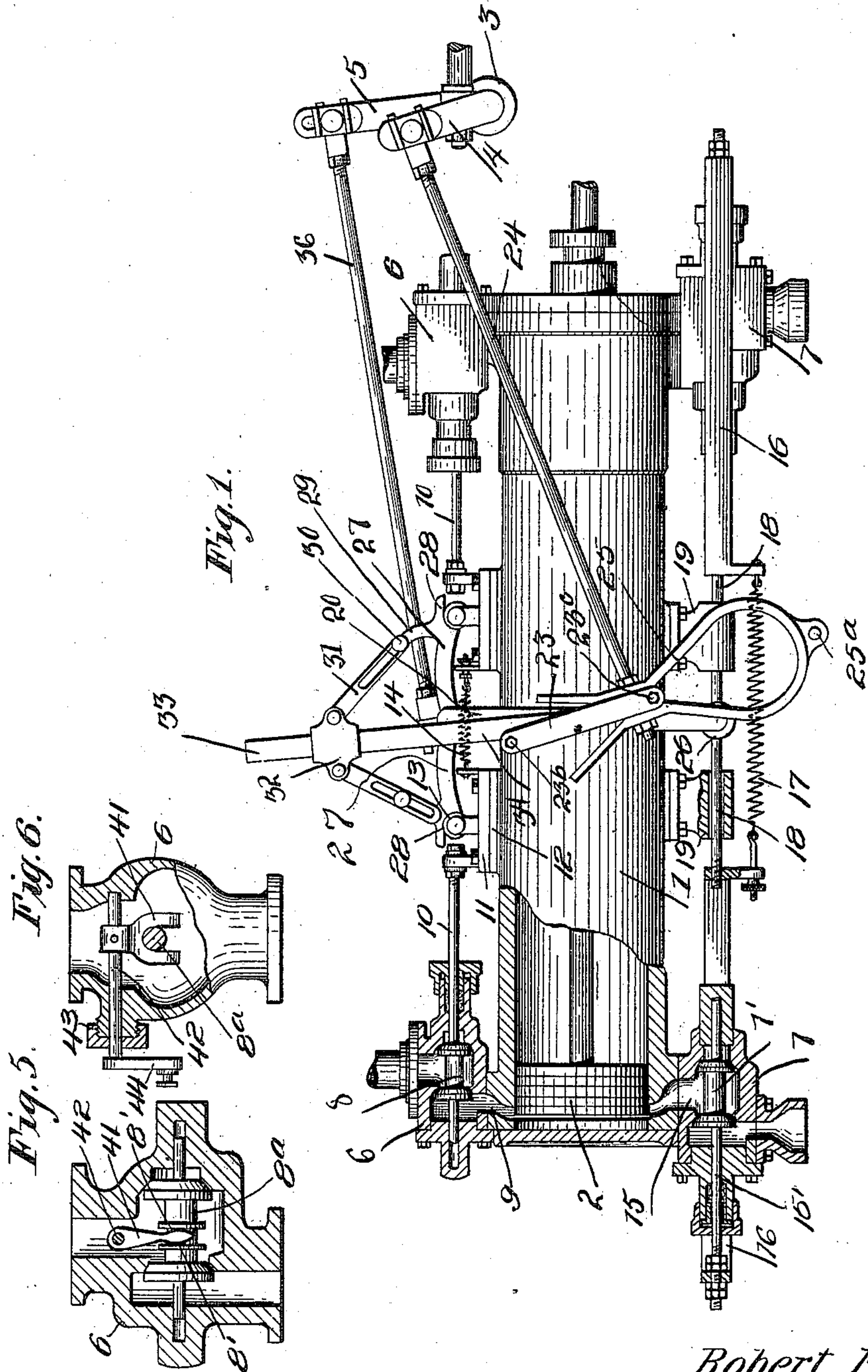


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R. EATON.
VARIABLE CUT-OFF.
APPLICATION FILED SEPT. 29, 1909.

Patented Jan. 31, 1911.

2 SHEETS—SHEET 1.



Witnesses:

F. H. Gibson.
C. C. Hines.

Inventor:
Robert Eaton.

By *Victor J. Evans*
Attorney.

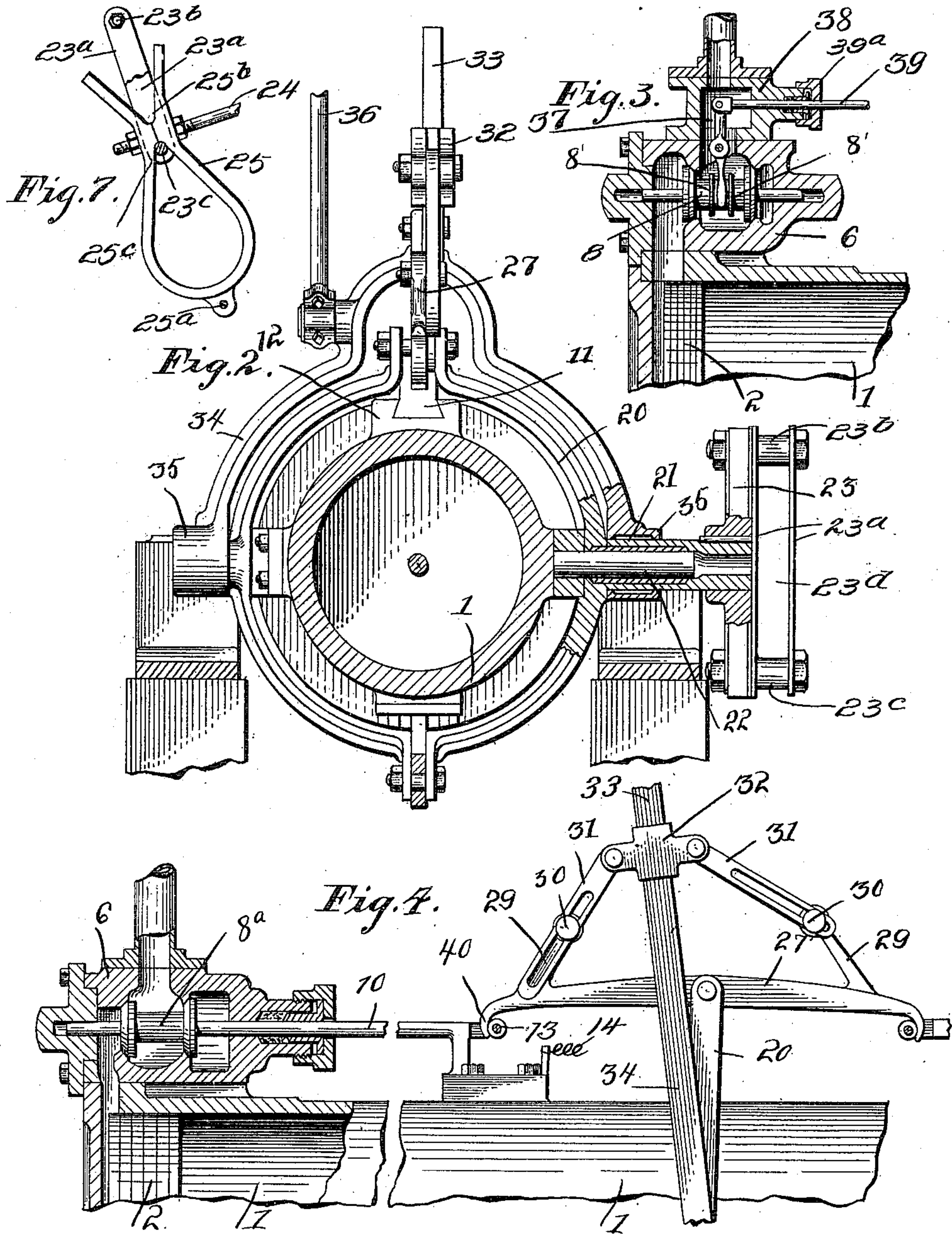
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UNITED STATES PATENT OFFICE

ROBERT EATON, OF LAKE CITY, MINNESOTA.

VARIABLE CUT-OFF.

983,222.

Specification of Letters Patent.

Patented Jan. 31, 1911.

Application filed September 29, 1909. Serial No. 520,163.

To all whom it may concern:

Be it known that I, ROBERT EATON, a citizen of the United States, residing at Lake City, in the county of Wabasha and State of Minnesota, have invented new and useful Improvements in Variable Cut-Offs, of which the following is a specification.

This invention relates to improvements in variable cut-offs for the steam engines of stern and side wheel steamboats.

The object of the invention is to provide a simple and effective construction of balanced-valve cut-off which controls both the admission and exhaust valves and may be readily adjusted to vary the point of cut-off.

The invention consists of the features of construction, combination and arrangement of parts hereinafter fully described and claimed, reference being had to the accompanying drawings, in which:—

Figure 1 is a side elevation, partly in section, of an engine cylinder and valve mechanism embodying my invention, showing the parts in position of opening one admission valve end and the exhaust valve associated with the other admission valve. Fig. 2 is a vertical transverse section of the same. Fig. 3 is a view showing a modified form of admission valve. Fig. 4 is a view showing a modified type of valve mechanism. Figs. 5 and 6 are sectional views of another modified form of admission valve. Fig. 7 is a view of the oscillating fork and rocker arm.

Referring to the drawings, 1 designates the engine cylinder and 2 the piston operating therein. 3 is a rock shaft forming a part of the engine mechanism and carrying crank arms 4 and 5.

At each end of the cylinder 1 is an admission valve chest or casing 6 and an exhaust valve chest or casing 7 arranged diametrically opposite each other. In the chest 6 operates a puppet valve 8 controlling a steam admission port 9 leading to the cylinder. The valve is movable outwardly to open the port and is provided with an inwardly projecting stem 10 connected at its outer end with a cross head 11 movable in a guide 12. Each cross head 11 carries a contact roller 13, and a spring 14 connects the two cross heads 11 and operates to move the valves inwardly and normally hold them closed.

In each casing 7 is an outwardly movable

valve 7' controlling the adjacent exhaust port 15 and its stem 15' projects beyond the chest and is connected with a reciprocating yoke 16 surrounding the chest. A spring 17 connects the yokes 16 of the two valves and acts to move said valves inwardly and hold them normally closed. To the inner ends of the yokes 16 are connected aligned rods 18 movable in guides 19 fixed to the cylinder. The valves all work in a direction parallel with the axis of the cylinder and the stems 10 of the valves 8 and rods 18 connected with the valves 7' are disposed respectively in longitudinal alinement, as shown.

A yoke or rocker member 20 preferably but not necessarily surrounds the cylinder and is provided at diametrically opposite sides with hubs or sleeves 21 mounted to oscillate on studs 22 projecting from opposite sides of the cylinder. One of said sleeves 21 is elongated and has keyed there-to a rocker arm 23 extending above and below said sleeve and provided with spaced plates 23^a connected by upper and lower cross pins or bolts 23^b and 23^c and forming a guideway 23^a for the passage of the end of a rod 24 extending from and pivotally connected with the crank 4. The rod 24 actuates a fork or reverse hook 25 pivotally connected in practice at its lower end as at 25^a with some suitable part manually-operable reversing mechanism, (not shown) and having diverging arms forming forked portions 25^b and 25^c to respectively receive and engage the bolts 23^b and 23^c. The lower end of the yoke 20 carries a contact roller or device 26 arranged between the rods 18, by which on the opposite rocking motions of said portion of the yoke the valves 7' will be alternately opened. In the present instance, I have shown the fork arms 25^c connected at their lower divergent ends and carrying the pivot member 25^a and in engagement at the angle of intersection of their upper convergent ends with the pin 23^c, from which it will be apparent that motion will be transmitted to the rocker arm 23 below its pivot to operate the exhaust valves properly when the engine is working in one direction. By simply shifting the pivot point 25^a to a higher point on the frame the fork portion 25^b may be shifted into engagement with the pin 23^b to transmit mo-

tion to the rocker arm above its pivot, whereby the exhaust valve gearing will be set to properly operate the valves when the engine is running in the reverse direction.

5 Fulcrumed upon the upper portion of the yoke are two valve actuating levers 27 extending longitudinally in each direction from their common pin in the center between the contact rollers 13 and cut out at their
10 ends to provide shoulders 28 to engage said rollers, and also cut away at their lower edges so that they may be lifted out of contact with the rollers at any part of the stroke of travel of the yoke. Extending upwardly
15 from said lever in convergent relation are arms or projections 29 carrying headed studs or bolts 30 which are slidably and pivotally engaged by longitudinally slotted links 31. These links 31 are carried by and pivotally
20 connected with a block or collar 32 slidably mounted on an arm 33 projecting from the upper portion of a yoke or rocker member 34 arranged outside of the yoke 20, which yoke 34 is provided with hubs or sleeves
25 35 to rock or oscillate on the sleeves 21 of the said yoke 20. A rod 36 connects the yoke 34 with the rocker arm 5, by which said yoke is oscillated in a direction longitudinally of the cylinder.

30 It will be seen from the foregoing description that as the rocker arm 4 travels back and forth, motion will be transmitted to the yoke 20 and to the valve actuating levers 27, which rock upon their fulcrums
35 and are controlled by the connections between the same and the collar 32 to alternately bring their shoulders or engaging ends into contact with the rollers 13 of the valve stems 10 to alternately open the ad-
40 mission valves 8 on their reverse movements, the yoke 20 acting upon the opening of the admission valve at each end of the cylinder. The rocker arm 4 is arranged to have the same movement as an eccentric set on the
45 quarter with the crank shaft, from which it is apparent that in the position of the parts shown in Fig. 1 the admission valve at one end of the cylinder and exhaust valve at the opposite end of the cylinder are just
50 ready to be opened. From this it will also be apparent that both the exhaust and steam valves start operations when the engine is on the center, so that the valves will operate on full strokes.

55 The cut-off is controlled by the action of the yoke 34 driven by the rocker arm 5, whose motion is the same as that given by an eccentric set exactly on the center with the engine crank, which yoke actuates the
60 links 31, to control the action of the levers 27, as will be readily understood. As said yoke 34 travels back and forth, the links 31 engage the studs 30 and adjust the levers 27 to operate the valves 8 at various points of
65 the stroke of the engine, which may be regu-

lated according to the position of the collar 32 on the arm 33. In practice, a suitable lever mechanism and locking means therefor is provided to adjust the collar 32 and
70 lock the same in adjusted position to increase or decrease the effective length or range of action of the links 31 in actuating the valves for the cut-off action at any point in the engine stroke. If desired, the
75 arrangement may be such as to open and close the valve at some point other than when the engine is on the center, so as to give a lead on either the steam or the exhaust and also a position to give compression, which may be found desirable under
80 some conditions. As the yoke 20 travels back and forth as described above, it carries projection 33 in proper time and relation to the travel of the engine piston so that, sliding the block 32 to different posi-
85 tions on the projection 33, shortens or lengthens, as the case may be, the distance between the pivots of the links and the studs 30 and consequently the links 31 withdraw the levers 27 from contact with rollers 13
90 at various points of cut-offs, as desired.

In Fig. 3 of the drawings I have shown the admission or steam valve 8 provided with spaced annular flanges 8' engaged by the forked lower end of an intermediately
95 pivoted rod or lever 37 which extends upwardly into an auxiliary chest or casing 38 and is there pivotally connected with the inner end of a rod or stem 39 sliding through a stuffing box 39^a and which is designed to
100 be operated in the manner shown in Fig. 1 by the actuating lever, which in this case must be adapted to pull the stem inwardly for the valve opening movement.

In the modification shown in Fig. 4 the
105 admission valve 8^a is arranged to slide inwardly on its open movement and the roller 13 at the inner end of the valve stem is adapted to be engaged by a hook 40 on the adjacent end of the valve operating lever
110 27', it being understood that with this construction of parts the spring 14 moves the admission valve outwardly to closed position while the hooked end of the lever holds the valve inwardly to open position. The
115 parts may thus be constructed and arranged to move the valve either inwardly or outwardly for the opening movement.

In the modification shown in Figs. 5 and 6 the valve 8^a is of the construction shown
120 in Fig. 3, but its flanges 8' are engaged by a fork 41 mounted on a rod or stem 42 extending at right angles to the valve and outward through a stuffing box 43, the outer end of the rod being provided with a crank
125 44 for connection with the rod 39.

It will be seen from the foregoing description that my invention provides a simple and effective type of balanced variable cut-off valve mechanism which is efficient in
130

operation and may be readily adjusted for a cut-off at any point in the stroke of the engine.

I claim:—

5 1. In a variable cut-off, a valve, a rocking member, a valve actuating device fulcrumed thereon, a second rocking member, and a longitudinally adjustable connection between said second rocking member and the
10 valve actuating device for controlling the latter to regulate the point of cut-off.

2. In a variable cut-off, a valve, a rocking member, a valve actuating device fulcrumed thereon, a second rocking member, an arm
15 carried by the valve actuating device and provided with a headed stud, and a slotted link engaging said stud and adjustably connected with said second rocking member.

3. In a variable cut-off, a valve, a rocking
20 member, a valve actuating device fulcrumed thereon, an arm carried by said device and provided with a headed stud, a second rocking member, a collar slidably mounted thereon, and a slotted link engaging said headed
25 stud and pivotally connected with said collar.

4. In a variable cut-off, a cylinder provided with an admission port, a sliding valve controlling said port, a rocking yoke
30 fulcrumed on the cylinder, a valve opening device fulcrumed thereon, a second rocking yoke fulcrumed on the cylinder, a member adjustably mounted on said second yoke, and a connection between said member and the valve opening device adjustable to control
35 the latter to regulate the point of cut-off.

5. In a variable cut-off, an engine provided with sets of sliding admission valves and exhaust valves, a rocking yoke, means
40 carried by the yoke for alternately opening the exhaust valves, a lever fulcrumed on the yoke and having portions arranged to alternately engage and open the admission valves, a second rocking yoke, a collar slidably mounted thereon, and sliding connections between
45 said collar and the engaging portions of the lever.

6. In a variable cut-off, a valve, a rocking actuating member, a valve operating device having a fixed pivotal connection therewith,
50 a second rocking actuating member, a connection between the same and the valve operating device, and means for varying the effective length of said connection.

7. In a variable cut-off, a valve, an actuating member, a valve operating member carried thereby, a second actuating member, and
55 a longitudinally adjustable connection between said second actuating member and the valve operating member for controlling the latter to regulate the point of cut off.

8. In a variable cut-off, a valve, an actuating member, a valve operating member fulcrumed thereon, a second actuating member,
60 an arm carried by the valve operating member and provided with a stud, and a slotted

link engaging said stud and adjustably connected with said second actuating member.

9. In a variable cut-off, a valve, an actuating member, a valve operating device fulcrumed thereon, an arm carried by said device and provided with a stud, a second actuating member, a collar slidably mounted
70 thereon, and a slotted link engaging said stud and pivotally connected with said collar.

10. In a variable cut-off, valves, a rocking valve-actuating member, valve operating devices carried by said actuating member for opening said valves alternately on the reverse movement of said valve-actuating
80 member, a second valve-actuating member, and connections between said second valve actuating member and the valve operating members adjustable to control the latter to regulate the point of cut-off.

11. In a variable cut-off, an engine provided with sets of admission and exhaust valves, a rocking valve actuating member, means actuated thereby for alternately opening the exhaust valves, valve-operating
90 devices carried by said actuating member for operating the admission valves, a second rocking valve actuating member, and adjustable connections between said second valve actuating member and said valve operating
95 devices for controlling the operation of the latter to regulate the point of cut-off.

12. In a variable cut-off, a sliding valve having a projecting stem, a rocking member movable in the direction of movement of the
100 valve, a pivoted valve actuating device adapted to engage the stem and movable into and out of engagement therewith, a second rocking member also movable in the direction of movement of the valve, a longitudinally adjustable connection between
105 said second rocking member and the valve actuating device, and means for adjusting said connection to regulate the point of cut-off.

13. In a variable cut-off, a valve, a rocking actuating member, a pivoted valve operating member carried thereby, a second actuating member coaxially mounted with relation to the first actuating member, an adjustable member on said second actuating
115 member, and a connection between said adjustable member and the valve operating member adjustable for controlling the latter to regulate the point of cut-off.

14. In a variable cut-off, a valve, a rocking actuating member, a pivoted valve operating device carried thereby, a second actuating member, an adjustable element carried by said second actuating member, an arm
125 connected with the valve operating device, and a connecting member pivoted to said adjustable member and having a slot and pin engagement in said arm.

15. In a variable cut-off, a sliding valve 130

having a projecting stem, a rocking actuating member movable in the direction of movement of the valve, a pivoted valve operating device carried by said rocking member, an arm projecting from said valve operating device, a second rocking actuating device also movable in the direction of movement of the valve, an adjustable element carried by said second actuating device, and a link connected with said adjustable member and having a slot and pin engagement with said arm.

16. In a variable cut-off, the combination with an engine cylinder having at each end thereof oppositely exposed inlet and exhaust valve casings, valves slidably mounted in said casing, means for normally holding the

valves closed, a rocking member movable in opposite directions to alternately open the exhaust valves, operating devices pivotally mounted upon said member and adapted upon the reverse movements thereof to alternately open the inlet valve, a second rocking member, an adjustable element on said second rocking member, and longitudinally adjustable link connections between said adjustable member and the valve operating members.

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

ROBERT EATON.

Witnesses:

GEORGE H. HAMMOND,

CHAS. E. BUCKMINSTER, Jr.