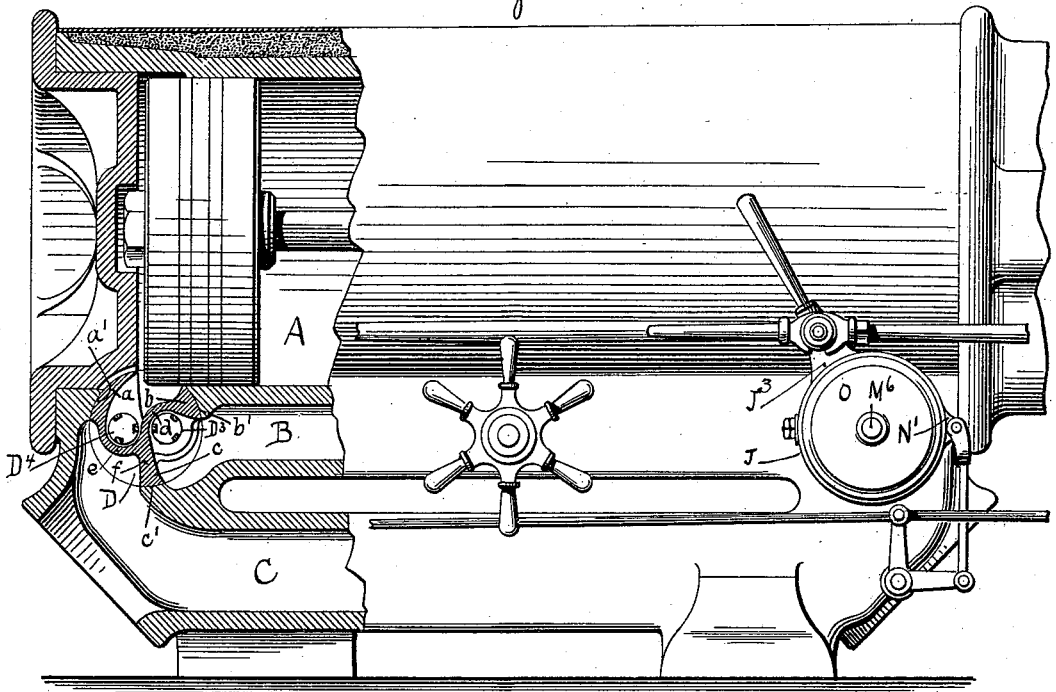
(No Model.) 2 Sheets—Sheet 1.

G. I. ROCKWOOD.

VALVE MECHANISM FOR ENGINES.

No. 523,999. Patented Aug. 7, 1894.

Fig. 1.



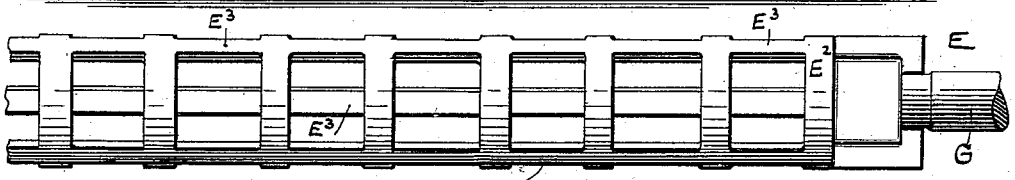


Fig. 2.

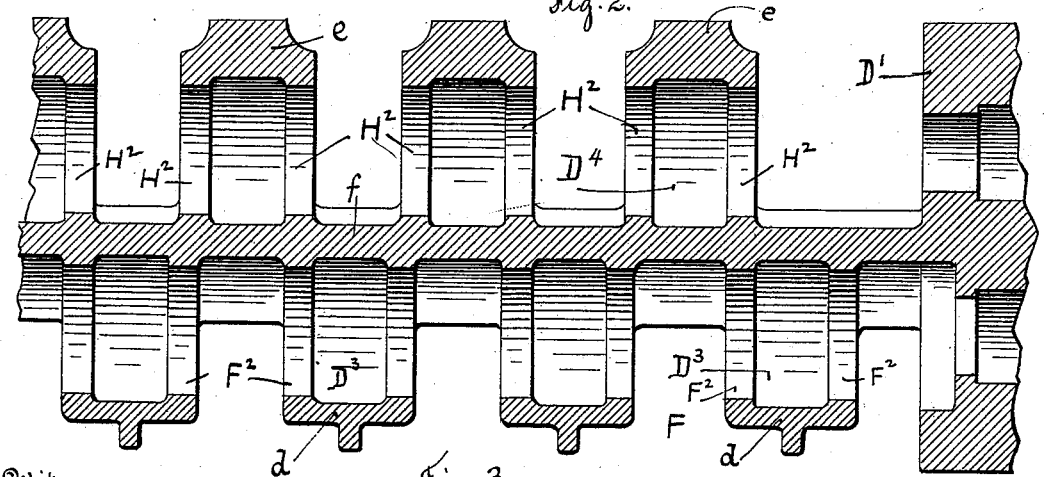


Fig. 3.

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(No Model.) 2 Sheets—Sheet 2.

G. I. ROCKWOOD.

VALVE MECHANISM FOR ENGINES.

No. 523,999. Patented Aug. 7, 1894.

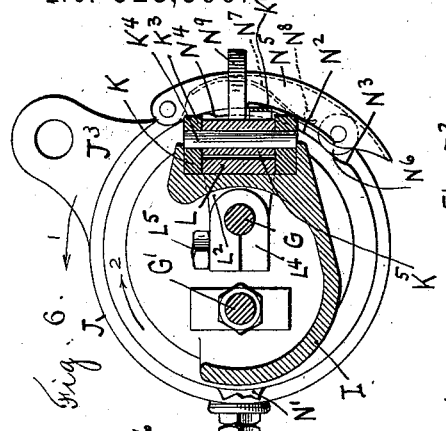

Fig. 6.

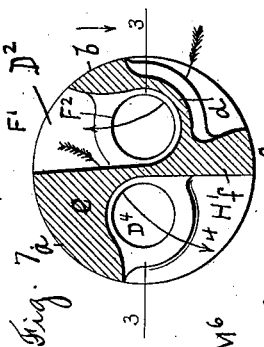

Fig. 7.

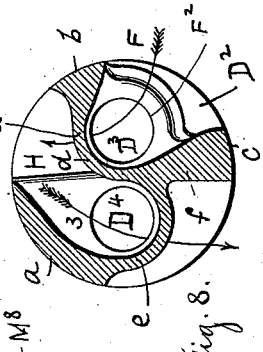

Fig. 8.

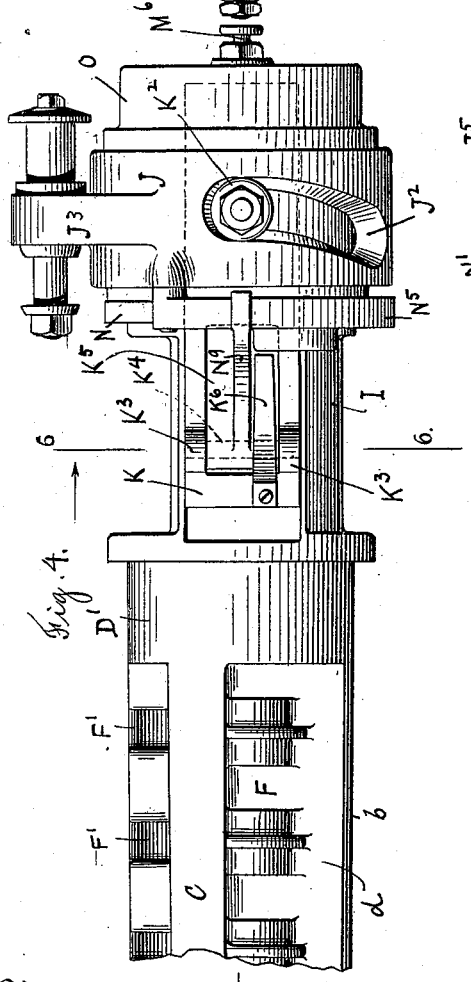

Fig. 4.

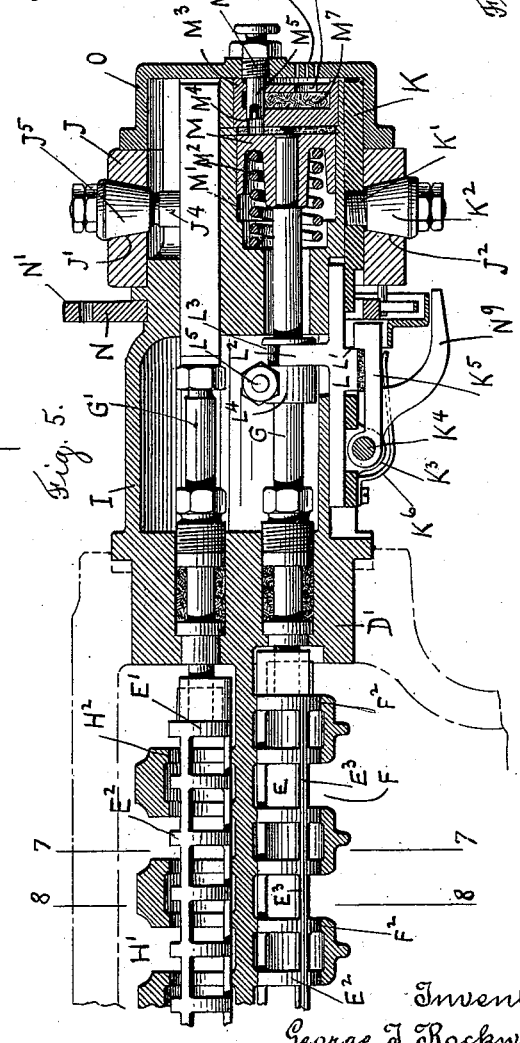

Fig. 5.

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UNITED STATES PATENT OFFICE.

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VALVE MECHANISM FOR ENGINES.

SPECIFICATION forming part of Letters Patent No. 523,999, dated August 7, 1894.

Application filed May 2, 1893. Serial No. 472,813. (No model.)

To all whom it may concern:

Be it known that I, GEORGE I. ROCKWOOD, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a certain new and useful Improvement in Valve Mechanism for Steam-Engines, of which the following is a specification, reference being had to the accompanying drawings, forming a part of the same.

My invention relates to certain improvements in that class of engine valves, in which the steam and exhaust valves are contained in a skeletonized plug, provided with valve seats and placed within an opening in the cylinder casting.

Figure 1 represents a side view of a steam engine cylinder having a portion broken away, in order to show the interior of the cylinder with its steam passages and representing the steam and exhaust valves in transverse sectional view. Fig. 2 represents one of the sliding valves. Fig. 3 is a longitudinal, central, sectional view of a portion of the skeletonized plug containing the valve seats shown on a larger scale, and on line 3, 3, Fig. 7. Fig. 4 represents a portion of the skeletonized plug, detached from the cylinder and shows a bottom view of the valve actuating mechanism. Fig. 5 represents the same parts in longitudinal, vertical, sectional view as are represented in Fig. 4. Fig. 6 is a cross-section on line 6, 6, Fig. 4. Fig. 7 is a cross-section, on line 7, 7, Fig. 5, and Fig. 8 is a cross-section, on line 8, 8, Fig. 5.

The object of my invention is to provide an improved actuating mechanism, by which the reciprocating valves of a steam engine can be moved to open and close the steam passages communicating with the cylinder and it consists in the construction and arrangement of the operating mechanism by which the valves are moved, as hereinafter described and specifically pointed out in the annexed claims.

Referring to the drawings, A denotes the interior of the steam cylinder; B the steam chest and C the exhaust chamber, all inclosed by a single casting in the usual manner. The cylinder casting is provided with transverse holes at each end of the cylinder to receive a skeleton plug, preferably made slightly tapering, to fit closely in a tapering hole in the cylinder casting and within which are arranged the valve seats and valves. One of these skeleton plugs is shown in sectional view and in its proper position in the cylinder casting at D in Fig. 1 of the drawings. The skeleton plugs are provided with longitudinal bars *a*, *b*, *c*, having their outer surfaces lying in a common circle and in contact with the cylinder casting at *a'*, *b'*, and *c'*. The longitudinal bars *a*, *b*, *c*, are united at their ends by circular heads, one of which is shown at D', Fig. 4 and the other at D^2 in Figs. 7 and 8. The bars *a*, *b*, *c*, are also united throughout their length by webs *d*, *e* and *f*; and the webs *d* and *e* inclose circular chambers D^3 and D^4 to receive longitudinally sliding piston valves E and E', each of these valves consisting of a series of disks E^2 united by bars E^3. In the web *d* are a series of openings F, through which steam is admitted from the steam chest B to the valve chamber D^3 and upon the opposite side of the valve chamber D^3 are a series of openings F', through which steam passes from the valve chamber D^3 into the cylinder. The openings F' are not placed opposite the openings F, so that the steam entering the valve D^3 through the openings F, will be obliged to pass a short distance, lengthwise the valve chamber D^3 before escaping through the openings F' into the cylinder.

The web *d* forming the walls of the valve chamber D^3 is provided upon each side of the openings F, F', with raised annular valve seats F^2, accurately fitting the periphery of the disks E^2 of the valve E.

The valve E is provided with a stem G passing through the head D' and connected with valve operating mechanism, hereinafter described, by which a longitudinal sliding motion is imparted to the valve E, whereby the disks E^2 are made to coincide with the valve seats F^2, as represented in Fig. 5, by which the steam is prevented from passing along the valve chamber from the openings F to the openings F', thereby closing the valve to the passage of steam from the steam chest B to the interior A of the cylinder.

The web *e* incloses a circular chamber D^4

provided upon one side with openings H communicating with the interior A of the cylinder and upon the opposite side with openings H′ communicating with the exhaust chamber C. Upon each side of the openings H, H′, are annular valve seats H^2 fitting the periphery of the disks E^2 of the valve E′. The construction of the valve chamber D^4 with its steam passages, valve seats and sliding valve E′ are exactly like the construction of the valve chamber D^3 and its corresponding parts.

The valve E′ is provided with a valve stem G′ sliding in a bearing in the head D′ and connected with valve operating mechanism as hereinafter described.

In Fig. 5 the valve E′ is represented as open and allowing the steam to pass from the interior of the cylinder through the openings H to the valve chamber D^4 as indicated by the arrow 3, Fig. 8 and to pass lengthwise the chamber D^4 and over the valve seats H^2 and escape through openings H′, as indicated by the arrow 4, Fig. 7, into the exhaust chamber C. When the valve E′ is moved longitudinally so the disks E^2 will coincide with the valve seats H^2, the exhaust valve becomes closed and when the valve E is moved longitudinally from its position as represented in Fig. 5 half the distance between its valve seats F^2, it will be brought into a position corresponding with the position of the valve E′, as represented in Fig. 5 and the steam valve will then be open to allow the passage of the steam chest B to the interior of the cylinder.

It will be obvious that in whatever position the valves E and E′ may be placed, steam will be admitted upon opposite sides of the valve disks E^2, so that the pressure of steam will be exerted in opposite directions and the valve will become "balanced" so the pressure of steam will not resist the longitudinal movement of the valve, neither will the pressure of steam be applied to increase the pressure between the periphery of the disks E^2 and the valve seats F^2 and H^2. In this class of balanced steam valves, it has been customary to form the valve in the shape of a spool consisting of two heads united by a central body, but I prefer to unite the valve disks E^2 by connecting bars E^3 placed near the periphery of the disks, thereby leaving the central space between the disks free for the passage of steam.

Valves of this class are usually formed with but two disks, or heads, fitting annular valve seats and closing the valve chamber to steam passages at the ends of the chamber and I believe it to be new to construct this type of balanced valves with a series of disks sliding in a common valve chamber, which is provided with openings upon opposite sides, each series of openings communicating with a common steam passage extending lengthwise the valve chamber, in the manner I have above described.

Projecting from the head D′ and preferably integral therewith is a shell I, supporting the valve operating mechanism, by which a determinate reciprocating sliding motion is given to the exhaust valve E′ and a reciprocating sliding motion of variable extent is imparted to the steam valve E. Journaled upon the exterior of the shell I is a cam sleeve J, provided with cam slots J′, J^2 placed obliquely to the plane of rotation of the sleeve J and having a lug J^3 connected with an eccentric rod in the usual manner, by which a definite oscillating motion is imparted to the sleeve J. The valve stem G′ carries a stud J^4 and cam roll J^5 entering the cam slot J′ in the sleeve J, so the oscillation of the sleeve will impart a reciprocating motion to the valve stem G′ and valve E′.

Sliding in ways in the shell I and within the sleeve J, is a plate K carrying a stud K′ and cam roll K^2, entering the cam slot J^2 in the sleeve J, so the oscillation of the sleeve will cause a reciprocating sliding motion to the plate K. The plate K is provided with lugs K^3 supporting a pin K^4, on which is pivoted a latch K^5 held up by a spring K^6 carried by the plate K. Sliding above the plate K is a plate L provided on its lower side with a shoulder L′ adapted to be engaged by the latch K^5 and upon its upper side with a fork L^2 engaging an annular groove L^3 in a collar L^4, which is split and clamped upon the valve stem G by a nut and bolt L^5.

The sliding motion of the plate K toward the left in Fig. 5, will also slide the plate L and valve E, causing the valve to be opened and steam to be admitted from the steam chest B to the interior of the cylinder. Attached to the end of the valve stem G is a piston M, sliding in a cylindrical chamber M′ formed in the shell, or casting I, and constituting a dash-pot. Between the piston M and end wall of the chamber M′ is placed a spiral spring M^2, which is compressed as the valve E is opened and the tension of this spring serves to reverse the motion of the valve and close it, when the latch K^5 is released by the cut-off mechanism. The chamber M′ is closed at its outer end by a plug M^3, which contains an opening M^4 to receive the plane end M^5 of a screw threaded bolt M^6. The end M^5 of the bolt is bifurcated to allow air to escape from the chamber M′, when the piston M is reversed by the action of the spiral spring M^2; the size of the air opening in the bolt being adjusted by the longitudinal movement of the bolt in the opening M^4. The escaping air passes through a chamber M^7 containing loose fibers of asbestus to break the force of the air current, thence, through the openings M^8 and M^9.

The cut-off mechanism consists of a ring N, journaled about the shell J and capable of an oscillating motion thereon in the same manner as the sleeve J. The ring N is provided with a projecting lug N′ by which the ring is connected with the governor rod, so the ac-

tion of the governor will serve to oscillate the ring in the usual manner.

A portion of the periphery of the ring N is cut away at N^3 forming the inclined shoulders N^3, N^4. Pivoted upon the side of the cam sleeve J is a curved lever N^5 carrying in its free end a roll N^6, which is held in contact with the periphery of the ring N by means of a spring N^7 shown by broken lines in Fig. 6, one end of the spring being attached to the curved latch and the free end of the spring hooking over a pin N^8 carried in the side of the sleeve J. As the cam sleeve J is oscillated by the eccentric rod, in the direction of the arrow 1 in Fig. 6, the roll N^6 will run along on the concentrically curved periphery N^2 of the ring N, without causing any angular motion of the curved lever N^5; if, however, the ring N be rotated a short distance in the direction of the arrow 2, bringing the shoulder N^4 into the path of the roll N^6, the free end of the lever will be carried outwardly against the bent finger N^9, depending from the under side of the latch K^5, causing the latch K^5 to be rocked on the pin K^4 and against the tension of the spring K^6, disengaging the latch from the plate L, thereby releasing the valve stem G and allowing the spiral spring M^2 to close the valve. While the steam valve E, will, therefore, begin to open with the beginning of the oscillating motion of the cam sleeve J, it will continue to open only until the roll N^6 is brought in contact with the shoulder N^4 and this period is determined by the oscillation of the ring N as controlled by the action of the governor.

The end of the shell I is covered by a cap, or casing O, which serves as a collar for one side of the cam sleeve J and thereby holding the sleeve in position and at the same time covering the operating parts of the mechanism at the end of the shell.

I am aware that a skeleton plug, provided with valve seats is not new and I am also aware that a rotating sleeve, similar to sleeve J and provided with oblique cam slots is also old and I do not claim either of these features.

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

1. The combination with a reciprocating valve provided with a valve stem, of a plate K, having a sliding motion in a path parallel with said valve stem, a stud carried by said sliding plate, an oscillating sleeve provided with a cam slot inclosing said stud, a latch pivoted on said sliding plate, and a second sliding plate intermediate between said valve stem, and said sliding plate K provided with an arm on one side engaging said valve stem, and a shoulder adapted to be engaged by said pivoted latch, substantially as described.

2. The combination with a reciprocating valve, provided with a valve stem and having an annular grooved collar, a sliding plate carrying a fork engaging said grooved collar and having a shoulder adapted to be engaged by a latch, a sliding plate, a latch pivoted upon and carried by said second sliding plate and engaging said shoulder, to move the valve stem in one direction, substantially as described.

3. The combination with a reciprocating valve provided with a valve stem, of a plate K, a latch pivoted on said sliding plate K, a sliding plate L intermediate between said valve stem and said sliding plate K and having a fork on one side engaging said valve stem and on its opposite side a shoulder adapted to be engaged by said pivoted latch, substantially as described.

4. The combination with a reciprocating valve provided with a valve stem, of a sliding plate K, a latch pivoted on said sliding plate, a second sliding plate intermediate between said sliding plate K and said valve stem, said intermediate sliding plate engaging said valve stem and having a shoulder adapted to be engaged by said pivoted latch, a spring by which said latch is held in engagement with said shoulder, a finger projecting from said latch, and releasing mechanism acting on said finger, substantially as described.

5. The combination with a reciprocating valve provided with a valve stem, of a sliding plate, a rotating sleeve provided with a cam slot, a stud carried by said sliding plate and inclosed in said cam slot, a pivoted latch carried by said plate and adapted to connect said sliding plate and said valve stem, substantially as described.

6. The combination with a reciprocating valve provided with a valve stem, of a split collar clamped upon said valve stem and provided with an annular groove, a sliding plate carrying a fork engaging said grooved collar, a latch engaging said plate and capable of a reciprocating movement by connected mechanism, whereby said valve stem can be adjusted relatively to said sliding plate, substantially as described.

7. The combination with a reciprocating valve provided with a valve stem, of a sliding plate, a latch pivoted to said plate, and detachably connected with said valve stem, a finger projecting from said latch, a lifting latch extending beneath said finger and an actuating cam by which said lifting latch is raised to move said finger and disconnect its attached latch from the valve stem, substantially as described.

8. The combination with a reciprocating valve, provided with a valve stem, of a sliding plate K, a latch carried by said plate and adapted to engage said valve stem and move the valve in one direction, a spring applied to said latch to hold it in operative engagement with said valve stem, a curved finger projecting from said latch, a pivoted lever moved transversely to said curved finger, and a ring N provided with a shoulder N^4, capable of being brought into the path of the free end of said pivoted lever by the oscillation of said

ring, whereby said lever is carried against said curved finger to release said latch and means by which the motion of said valve is reversed, substantially as described.

9. The combination of shell I, supporting the valve operating mechanism, a cam sleeve journaled upon the outside of said sleeve and a shell O, inclosing the outside of said shell and forming a collar to hold said cam sleeve in place, substantially as described.

Dated this 24th day of April, 1893.

GEORGE I. ROCKWOOD.

Witnesses:
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EMMA KESTER.