

(No Model.)

2 Sheets—Sheet 1.

S. A. GOODWIN.
CUT-OFF VALVE GEAR.

No. 251,016.

Patented Dec. 13, 1881.

Fig. 1.

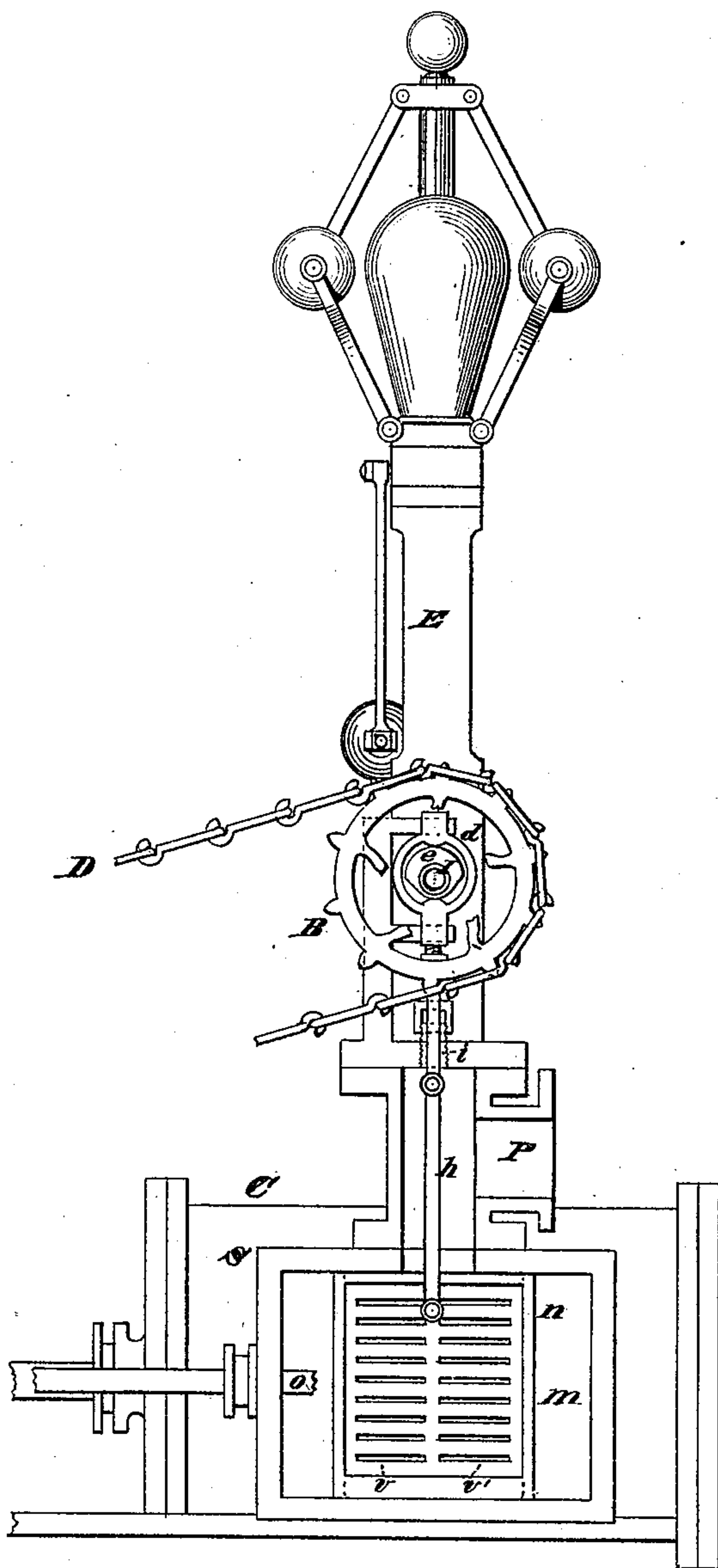
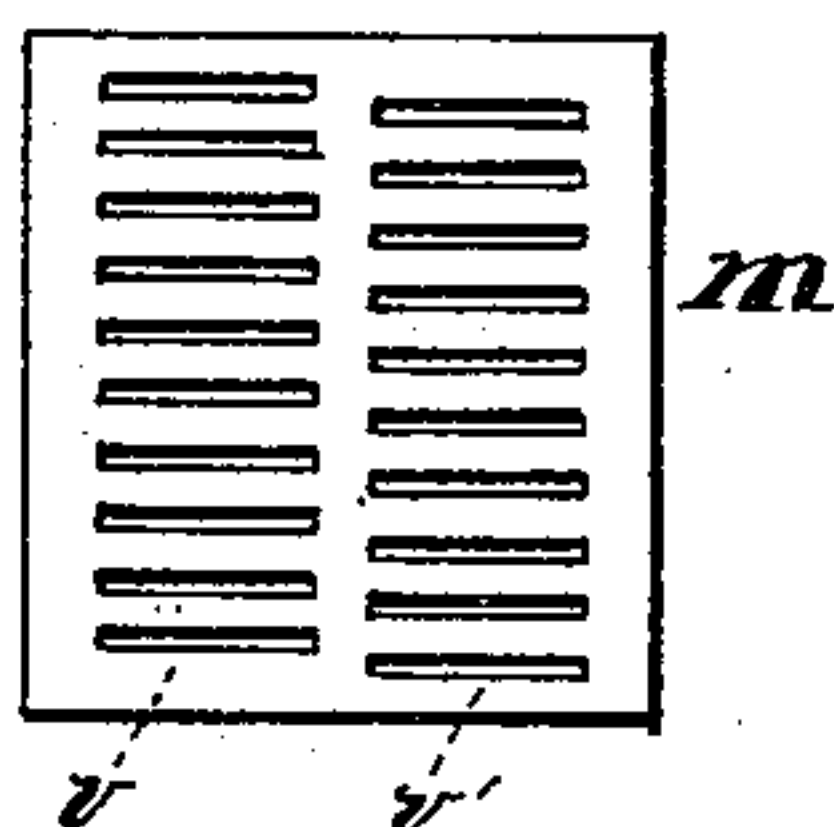


Fig. 2.



Witnesses:

R. L. Joyner

M. J. Joyce.

Inventor:

S. A. Goodwin

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Fig. 3.

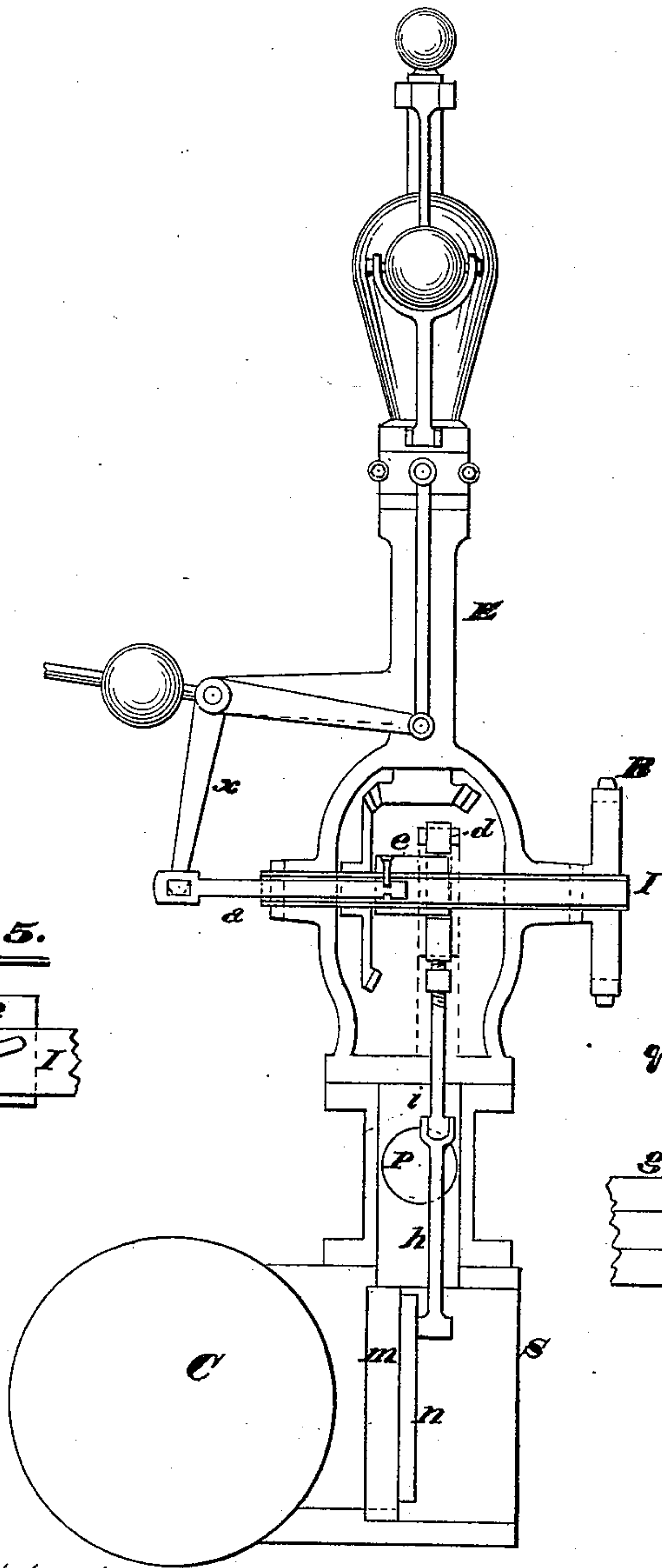


Fig. 5.

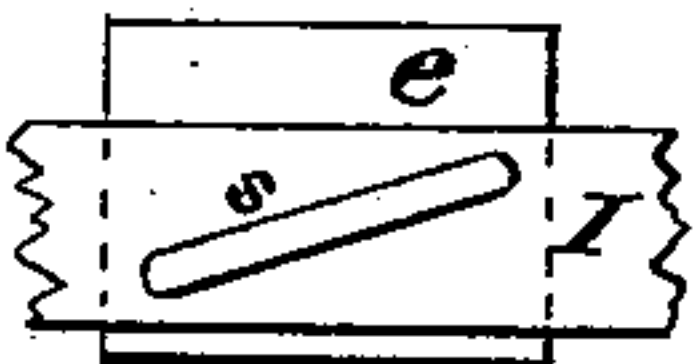
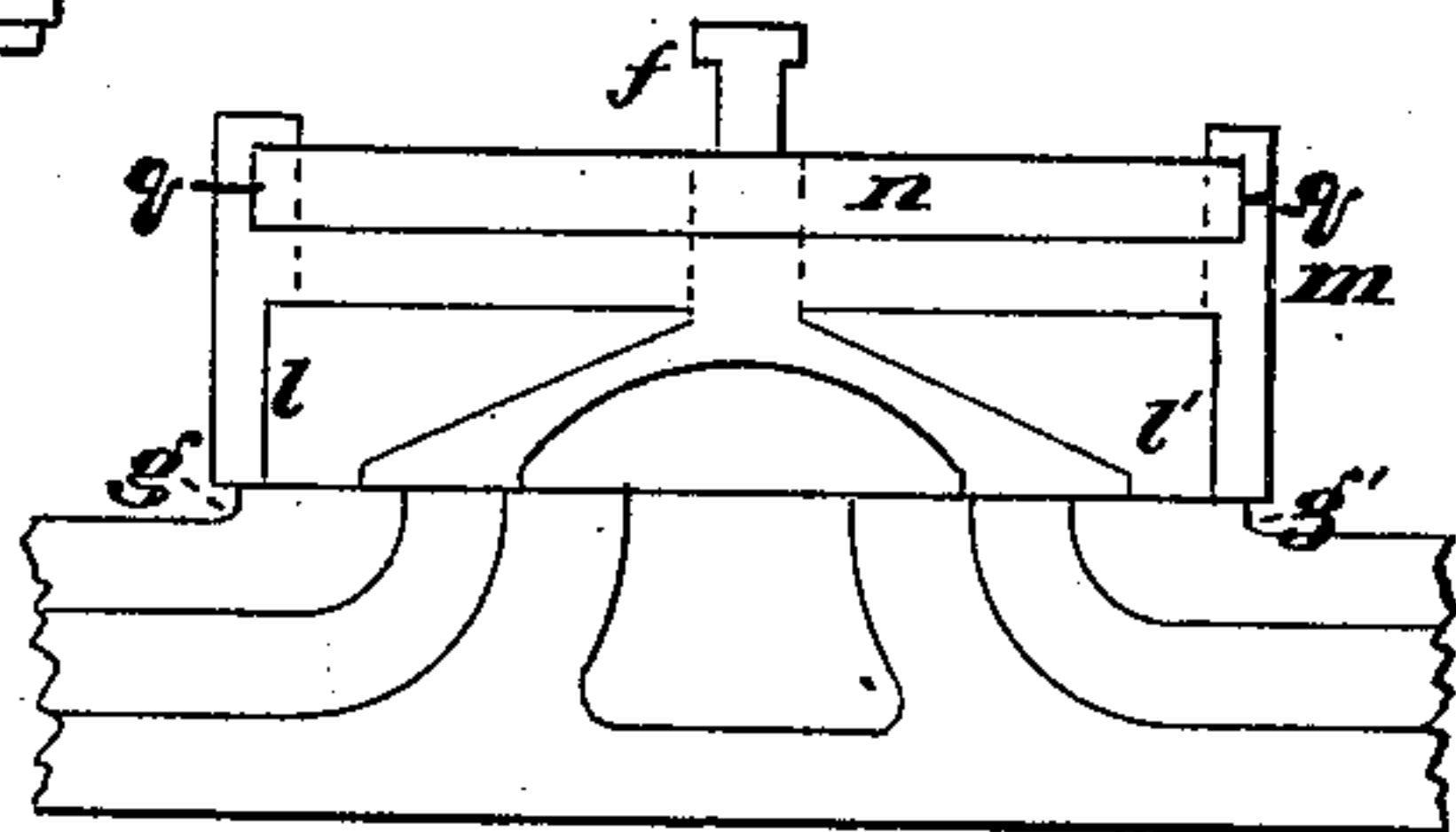


Fig. 4.



Witnesses:

F. L. Joyce

Chas. J. Joyce

Inventor:

S. A. Goodwin

UNITED STATES PATENT OFFICE.

SIMEON A. GOODWIN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO JACOB O. JOYCE, OF DAYTON, OHIO.

CUT-OFF-VALVE GEAR.

SPECIFICATION forming part of Letters Patent No. 251,016, dated December 13, 1881.

Application filed September 28, 1880. (No model.)

To all whom it may concern:

Be it known that I, S. A. GOODWIN, of the city of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Cut-Off-Valve Gear for Steam-Engines, of which the following is a specification.

This invention relates to improvements in that class of steam-engines in which a main slide-valve performs the functions of admission and release, while the suppression is effected by an auxiliary or cut-off valve working upon the back of the main valve. In such engines the auxiliary valve is usually operated by a separate eccentric on the engine-shaft, and the travel is somewhat greater than that of the main valve. In the present case this eccentric is dispensed with, and the cut-off valve is operated, as well as controlled, by the governor, and the governor is, by preference, driven by chain-gear, as being the cheapest and most easily applied and sufficiently positive in motion to answer the peculiar requirements of the case. To reduce the travel to a minimum, so as to put as little labor as possible upon the regulating elements of the governor, the cut-off valve is made to ride upon and with the main valve, so that in relation to the former the latter is at rest. To the same end narrow multiple ports are employed in place of one wide port. These ports are at right angles to the main or cylinder ports, and the motion or travel of the cut-off is across or at right angles to that of the main valve. The cut-off valve, for reasons that will appear, is substantially in equilibrium while moving to close—an important condition.

The object proposed by this invention is to provide a simple and inexpensive, yet efficient and durable, automatic valve-gear that can be readily applied to old or existing as well as to new plain slide-valve engines.

Referring to the accompanying drawings, Figure 1 exhibits the governor with its chain-gear, the cam and its yoke and connecting-rods, cylinder, and valve-chest, with plan of the cut-off valve on the back of the main valve. Fig. 2 is a plan of the cut-off ports in the back of the main valve. Fig. 3 is a vertical section of the cylinder, steam-chest, and governor, taken

in a plane at right angles to Fig. 1. Fig. 4 is a vertical section of the main and cut off valves and main valve-seat and cylinder-ports on an enlarged scale. Fig. 5 is an enlarged section of the governor-shaft and cam, to show the oblique slot in said shaft.

Similar letters refer to similar parts throughout the several views.

The governor E stands upon the steam-pipe P; as in common practice with throttling-governors. It is driven by a chain-gear consisting of the sprocket-wheel A on the main shaft of the engine, chain D, having links of equal length, and sprocket-wheel B on the shaft I of the governor. These wheels are of the same size, in order to give the governor-shaft the same speed as the engine. This shaft is, by preference, tubular. It carries a movable cam, e, which imparts a reciprocating motion to its yoke d, and through the rod i and link h the said motion is communicated to the cut-off valve n, which works in grooves or guides on the back of the main valve m, which, in its turn, is operated by an eccentric in the usual manner. The rod i passes through a stuffing-box in the base-plate of the governor, as clearly represented in Fig. 1, and the link h is pivoted to the end of said rod. The regulating elements of the governor are connected with the cam e through the bell-crank x and rod a, as plainly shown in Fig. 3. The rod a, being loosely fitted within the hollow shaft I, has near its end a groove cut around its periphery, in which groove works the end of a steel pin, which is screwed through one side of the cam and passes freely through a slot in the shaft I, which slot is seen at s in Fig. 5. It lies obliquely to the axis of the shaft, being inclined in the direction of its rotative motion. The bell-crank x is connected with the lifting-sleeve of the governor by a link, as shown in Figs. 3 and 1.

The main valve has two independent series of narrow ports, v v', Fig. 2, through its back, each series uniting respectively in one port, l l', Fig. 4, in the face of the valve. The cut-off valve n, Fig. 1, has corresponding ports, v v', through it, so disposed in relation to those in the main valve that while one series, v, is open the other series, v', is closed.

The cam e is so shaped as to throw the cut-

off valve quickly, in order, first, to effect a sudden suppression of the steam, and, secondly, to complete the throw before the pressure of the steam in the cylinder of the engine, and consequently under the valve, has fallen off by expansion so as to accumulate an unbalanced pressure on the top of said valve, and thereby to impose a heavy load upon the governor. For it should be observed that when the cut-off valve commences to make its movement there is no unbalanced pressure upon it on the end that is open, because the steam is passing freely through its ports, and there should be none on the other end, because the main valve has already closed the main steam-port on that end before the cut-off valve has to move; but during the interval between the suppression by the cut-off and the suppression by the main valve in the previous movement the pressure in the port or mortise in the latter has been falling by expansion in the cylinder, and to restore this before the next movement the main valve-seat is recessed at $g g'$, in order to admit steam from the chest into said mortise or port for the purpose of restoring the equilibrium before the cut-off valve has to move.

The link h operates perpendicularly to the line of motion of the main valve, as clearly appears in Fig. 1. The vibrating motion of its lower end does not affect the motion of the cut-off valve.

The cam e is recessed or made smaller behind its working-face, so as not to bind between the points of its yoke, in order that it may be freely moved on its shaft by the governor.

Bearing in mind that the main valve, which has an invariable positive motion, admits and exhausts the steam, and that the cut-off valve has nothing to do but to suppress it first on one end and then on the other at variable times or points of the stroke under the control of the governor, the operation is readily understood. When the speed of the engine increases the balls of the governor fly farther apart, the sleeve of the governor rises, causing the bell-crank x to move the rod a to the right, and with it the cam e , and as the cam moves horizontally on its shaft it is caused to advance rotatively in relation to the motion of the engine by means of the oblique slot s . This causes the cam to operate sooner and the cut-off to take place earlier in the stroke of the engine, or, which is the same thing in

effect, it reduces the quantity of steam admitted to the piston, and thus reduces the speed. When the speed falls below its normal measure the operation of all these parts is reversed, the admission is prolonged and increased, and the velocity restored.

It is obvious that the common gear-wheels and shafting may be employed to impart motion to the governor-shaft without affecting the other parts of the invention; but the chain-gear is much the cheapest and most easily applied, especially to old or existing engines.

I am aware that this gear would not be sufficiently positive to operate a cut-off which is at the same time the admission-valve, for the last-named function must be performed with great and invariable accuracy; but I have discovered by actual experiment that it answers well the purposes of operating a slide-valve that is substantially in equilibrium, that has only to perform the single duty of suppressing the steam on the back of the main valve, as herein described.

I claim as my invention—

1. The combination of the yoke d , adjustable cam e , stem or rod i , link h , and cut-off valve n , substantially as shown and described.

2. The combination of the sprocket-wheels $A B$ and chain D with the yoke d , adjustable cam e , link h , stem i , and cut-off valve n , substantially as shown and described.

3. The combination of the yoke d , stem i , link h , and cut-off valve n with the cam e , adjustable by a governor, substantially as described.

4. In valve-gear, the link h , connected to the stem i and cut-off valve n and moving freely within a space or connecting-pipe between the governor and steam-chest, substantially as set forth.

5. In an automatic valve-gear for steam-engines, the combination of the following elements, viz.: a main slide-valve, operated by an eccentric, carrying upon its back a cut-off valve with multiple or narrow ports, the two valves moving thus together, and mechanism operated directly by the governor to impart an independent reciprocating motion to the cut-off valve by means of a pivoted link, substantially as and for the purpose described.

S. A. GOODWIN.

Witnesses:

FRANK C. HEADMAN,
WM. W. WOLFF.