

(No Model.)

2 Sheets—Sheet 1.

M. E. HALL.  
VALVE GEAR.

No. 406,835.

Patented July 9, 1889.

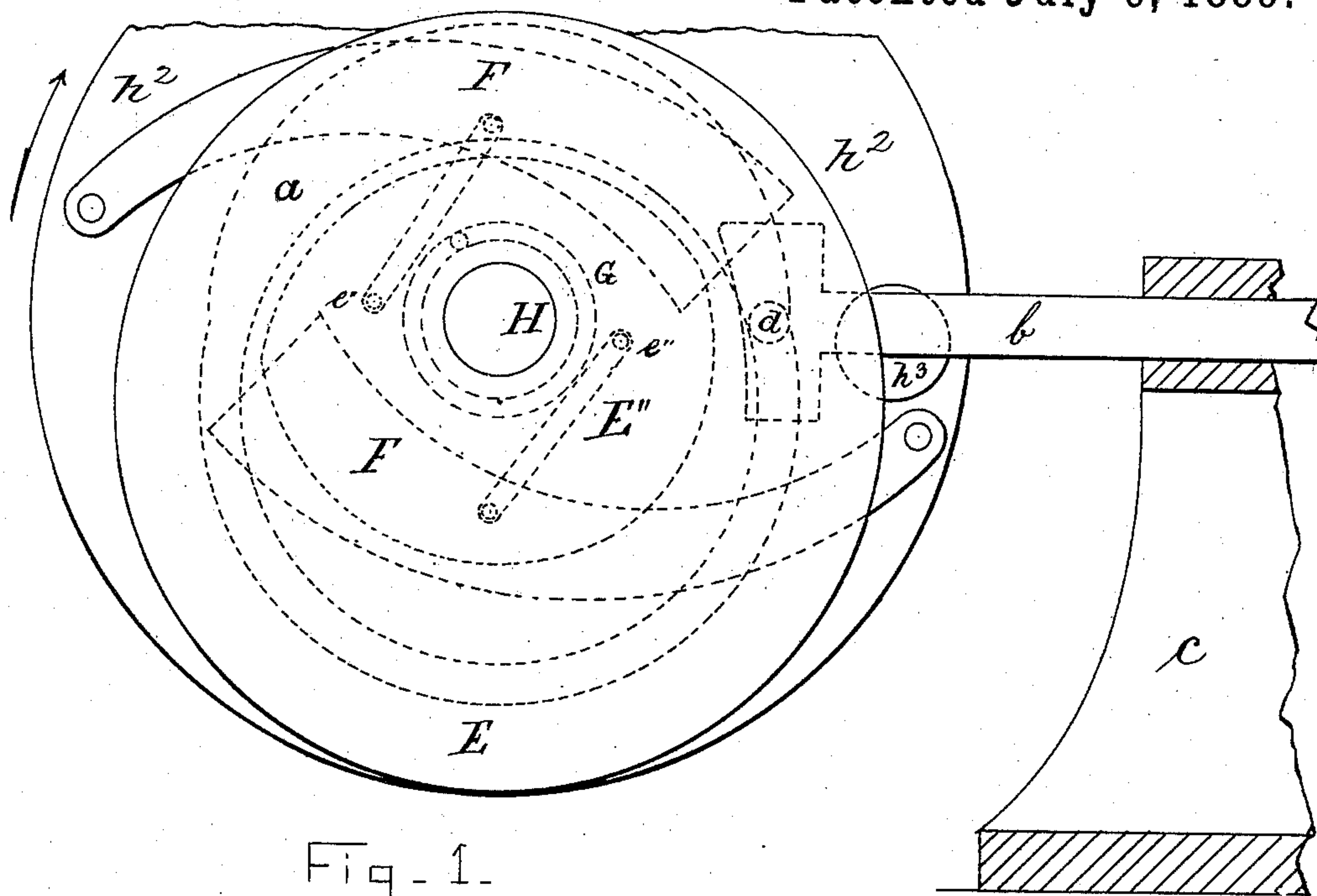


Fig. 1.

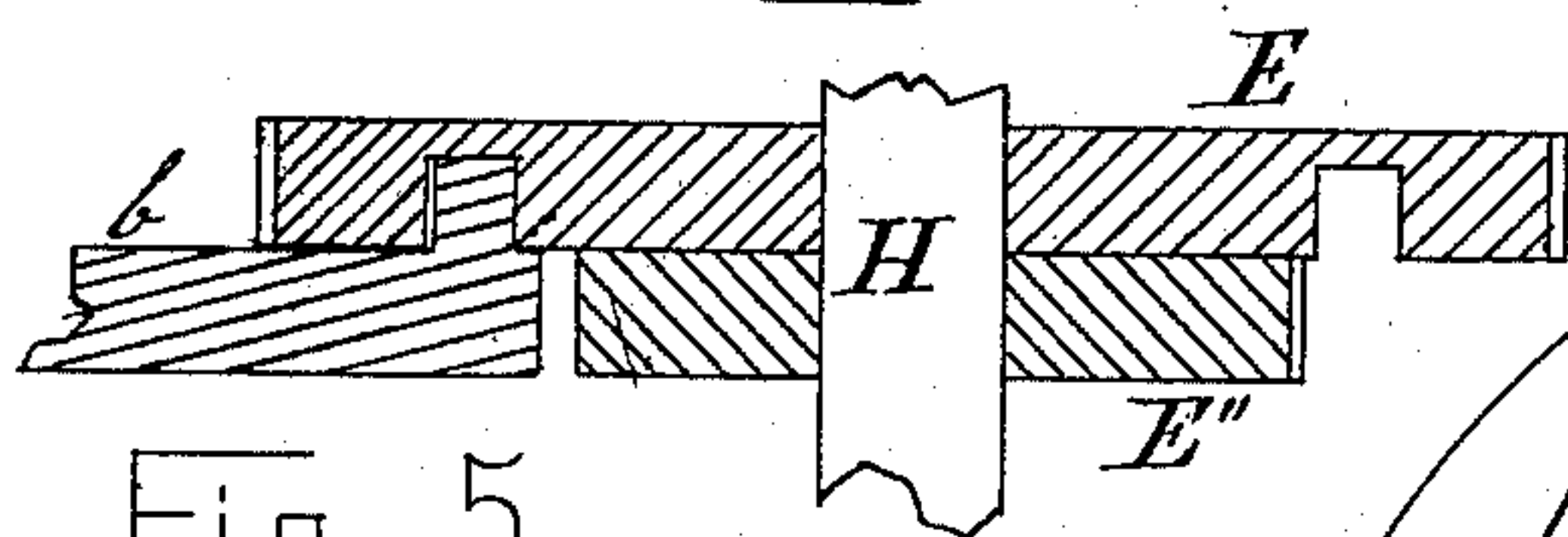


Fig. 5.

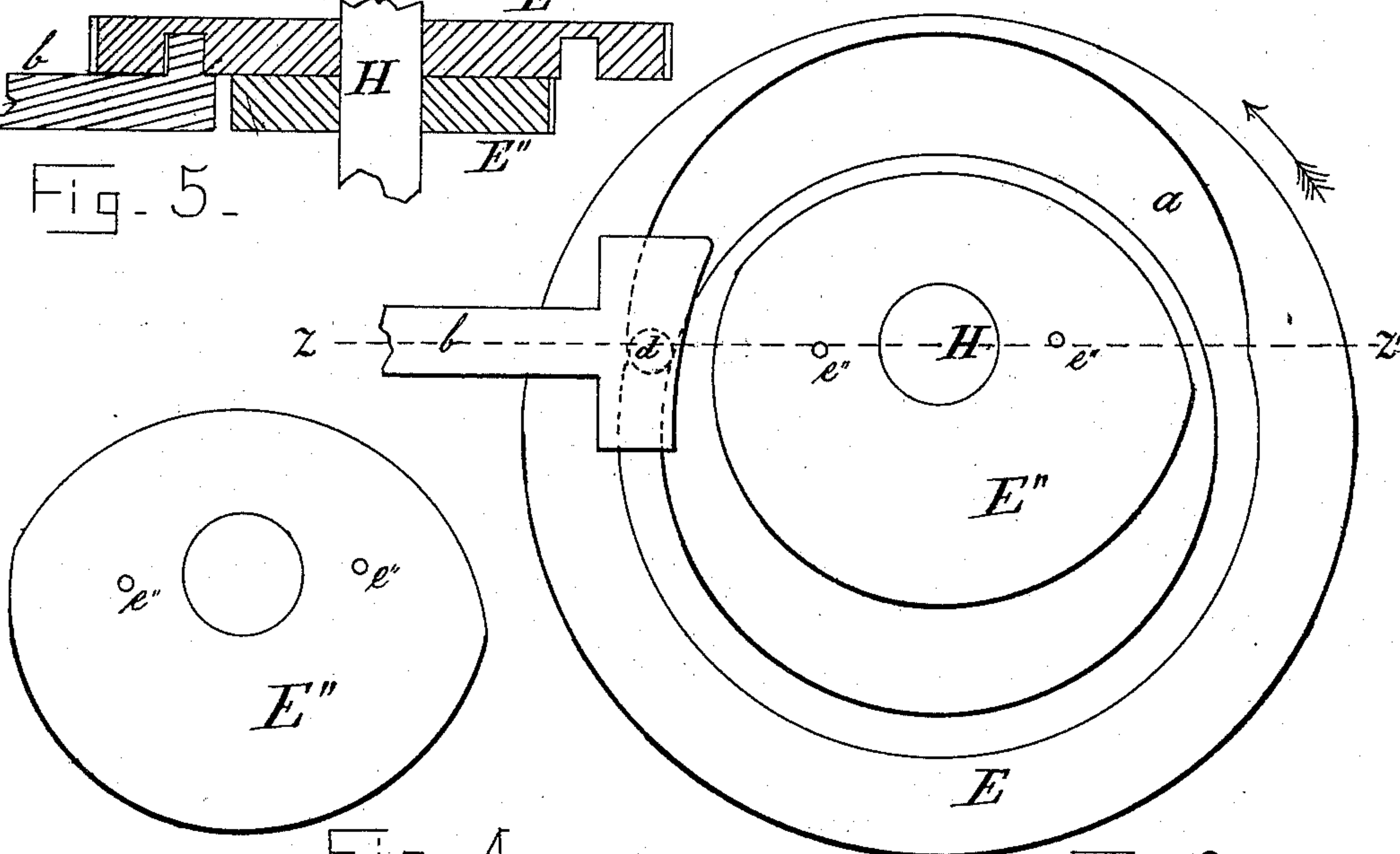


Fig. 4.

Fig. 3.

Witnesses.  
Henry Croyd  
Karl Roden

Inventor.  
Martin E. Hall.

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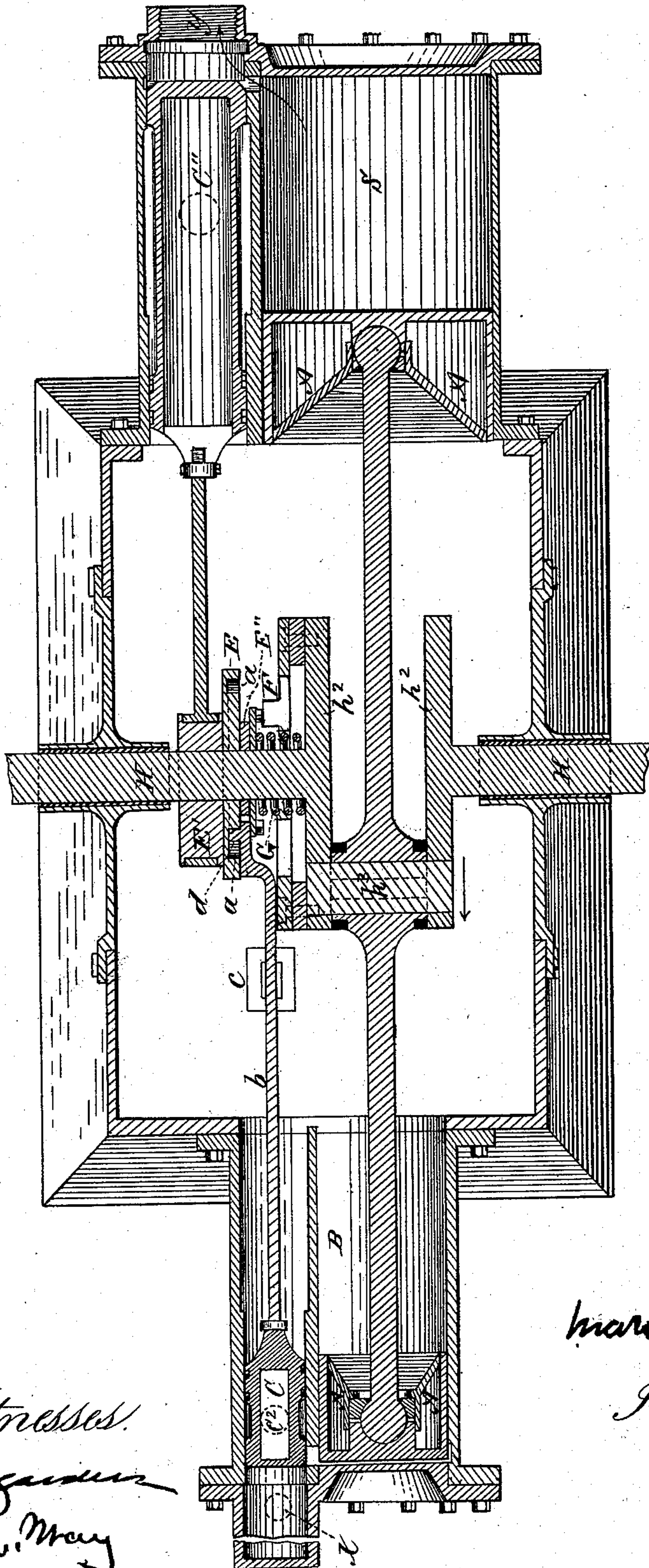


Fig. 2.

Witnesses:  
*J. B. Bogardus*  
*A. M. May*

*Martine Hall*  
Inventor.



# UNITED STATES PATENT OFFICE.

MARTIN E. HALL, OF THE UNITED STATES NAVY, ASSIGNOR OF ONE-HALF  
TO MARY C. HALL, OF LOWELL, MASSACHUSETTS.

## VALVE-GEAR.

SPECIFICATION forming part of Letters Patent No. 406,835, dated July 9, 1889.

Application filed March 7, 1888. Serial No. 266,495. (No model.)

*To all whom it may concern:*

Be it known that I, MARTIN E. HALL, of the United States Navy, have invented new and useful Improvements in the Valve-Gear of  
5 Steam-Engines, of which the following is a full, clear, and exact specification, reference being made to the accompanying drawings, in which like letters refer to like parts in all the figures.

10 My invention consists of improved mechanism for regulating the supply of steam through the valve of an engine or of cutting off such supply at varying points of the stroke of the engine when necessary to cause the engine to run with uniform speed and with an  
15 economical use of steam.

Figure 1 is a side view of my valve-gear and its governing devices. Fig. 2 is a longitudinal sectional plan of the same adapted and  
20 applied to a single-acting compound engine, in which the valve of the low-pressure cylinder is actuated by a separate fixed eccentric E of any ordinary type. Fig. 3 is a side view of the inner side of the grooved eccentric, the  
25 shifting-cam, and the valve-stem. Fig. 4 is a detached view of the shifting-cam; and Fig. 5 is a transverse section (on a reduced scale) through  $z z'$ , Fig. 3.

In the drawings,  $E''$  represents the cut-off  
30 cam placed loosely upon the shaft so as to turn freely thereon within the limits of action of the automatic governor. This cam is made to turn upon the shaft in one direction by the centrifugal force of suitable weights F, and  
35 in the other direction by the centripetal tension of a spring G. Said weights, together with the actuating-spring and the accompanying mechanism, being common to many of the well-known automatic engines, they require  
40 no further description in this connection.

E is a disk rigidly attached to the shaft H. In the side of this disk E is an eccentric groove  $a$ , wide on the steam side. This disk, with its  
45 groove, I denominate a "grooved eccentric."

$b$  is a valve-rod attached at one end of the valve C and extending through any suitable guide, as  $c$ . It engages with the groove  $a$  of the grooved eccentric by the pin  $d$ , project-  
ing from the valve-rod  $b$ .

The ordinary well-known actuating-weights 50  
F, Fig. 2, are linked to the bolts  $e''$ , Fig. 4, of the actuating-cam  $E''$ , so that as the weights (pivoted to one of the crank-disks  $h^2$ ) fly out they increase the angular advance of the cam  $E''$ . 55

The operation of my invention is as follows: Steam being admitted to the valve-chest through the steam-pipe  $x$ , it enters the cylinder B and gives motion to the shaft H through the piston A and its connecting-rod, and the  
60 engine moves at the desired speed. If from any cause—such as a decrease of the load upon the engine or an increase in the pressure of steam—the rotary movement of the shaft should be accelerated, the free ends of the  
65 weights F would move outward by the centrifugal force against the tension of the spring G, and by means of the connecting-links advance the cut-off cam  $E''$  so that part of its periphery is projected beyond the inner edge of the  
70 wide portion of the groove  $a$  of the disk E and against the end of the valve-rod  $b$ , moving the latter and the valve to which it is attached sufficiently to instantly and entirely  
75 close the valve and cut off steam at the desired point in the stroke to reduce the speed to the proper limit. Should the pressure of steam be decreased or a greater load be applied to the engine, the sudden decrease of  
80 speed in the rotary movement of the shaft H will permit the spring G to draw the weights inward again and to move the cam  $E''$  back again toward its former position, or partially or entirely out of action. In the latter case  
85 the valve would be actuated entirely by the grooved eccentric E. It will be seen that in this invention the valve travels normally up to the point of cut-off, being actuated thus far by the grooved eccentric alone. Now, if  
90 the speed of rotation should be sufficient to advance the cam beyond the inner edge of the wide portion of the groove  $a$ , the valve-rod  $b$  is suddenly impelled forward and the steam is cut off instantly, and the valve held in that position until the invariable point of  
95 release is reached, when the outer edge of the groove  $a$  engages with the valve-rod  $b$  by means of the pin  $d$  to draw it back and cause



it to resume its normal movement, so that the lead, release, and compression remain the same and invariable at all points of cut-off.

5 An ordinary eccentric may be used instead of the grooved eccentric, and the same actuating-cam E'' be used in connection therewith, as shown in Fig. 5, and the end of the valve-rod *b* may be kept in contact with the eccentric or cam, as the case may be, by the  
10 steam-pressure against the end of the valve.

It is the special object of this invention to attain a complete and instantaneous cut-off of steam with no change whatever in the lead, release, or compression.

15 Having thus described my invention, what I claim as new is—

The combination of a single valve and

valve-rod, a crank-shaft, a grooved eccentric (whose groove is widest on the steam side) rigidly secured thereto and directly actuating 20 said valve and valve-rod, whereby the admission, release, and compression are normally and invariably controlled, and a cut-off cam suspended loosely upon said crank-shaft and adapted to a rotary movement upon said shaft 25 and connected with and operated by an automatic centrifugal governor, whereby steam is cut off at varying points of the stroke by the said valve without change in its other movements, substantially as described.

MARTIN E. HALL.

Witnesses:

J. T. B. BOGARDUS,  
A. M. WAY.