

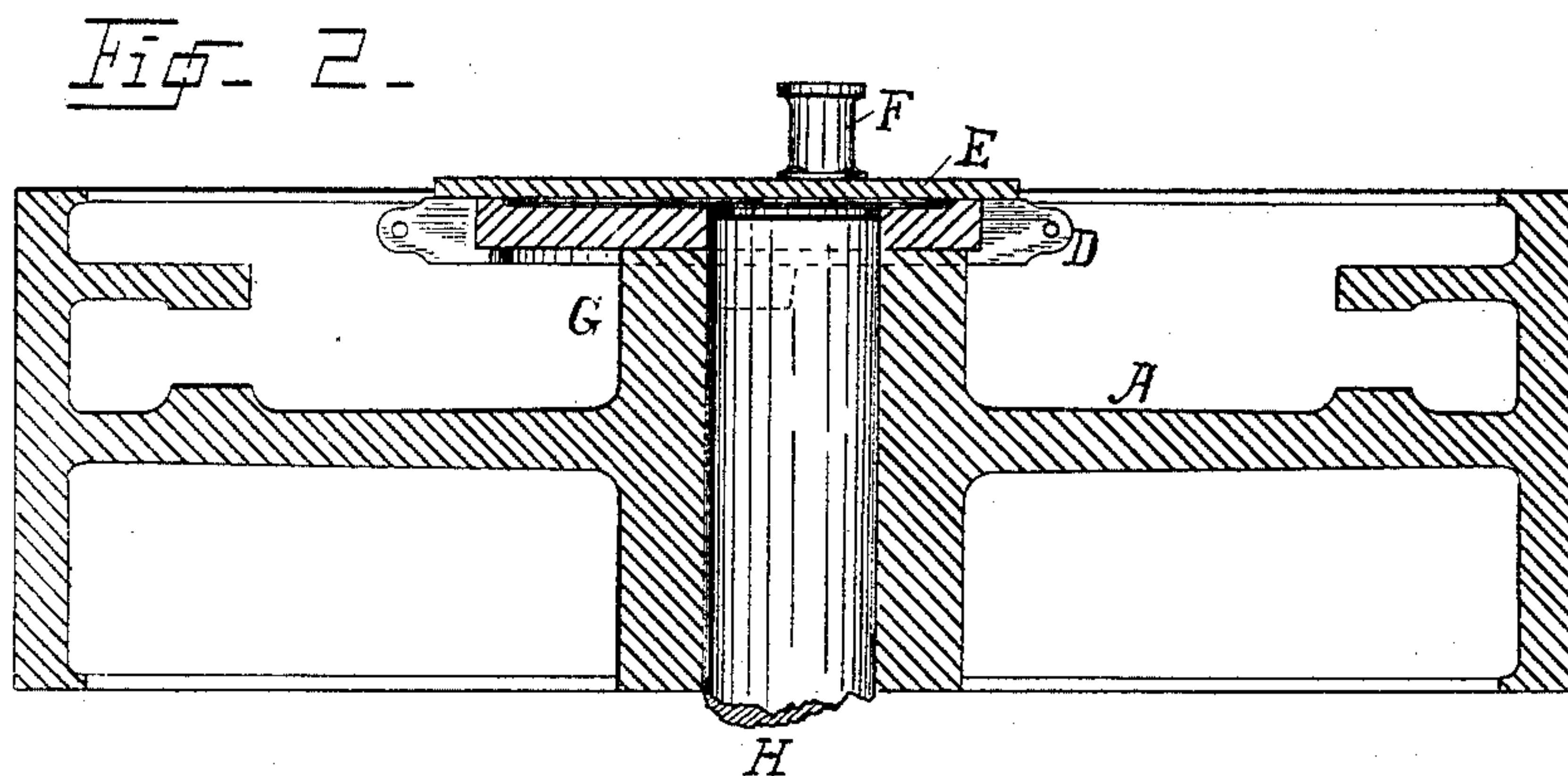
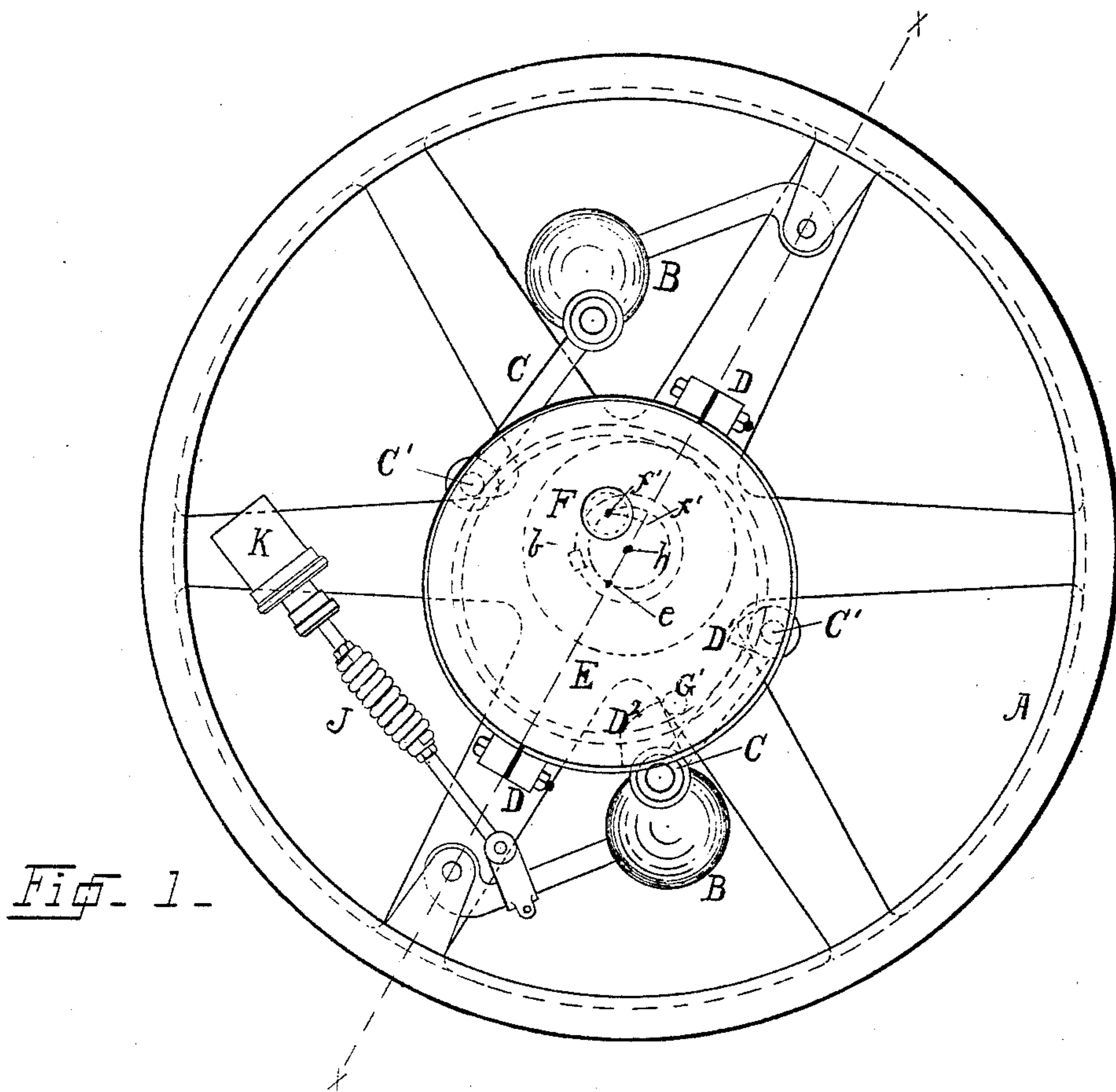
(No Model.)

2 Sheets—Sheet 1.

F. H. BALL.
CUT-OFF VALVE GEAR.

No. 454,447.

Patented June 23, 1891.



Witnesses.

E. Willis.

J. Reese Hallock. By Atty's *Hallock & Halladay.*

Inventor.

Frank H. Ball

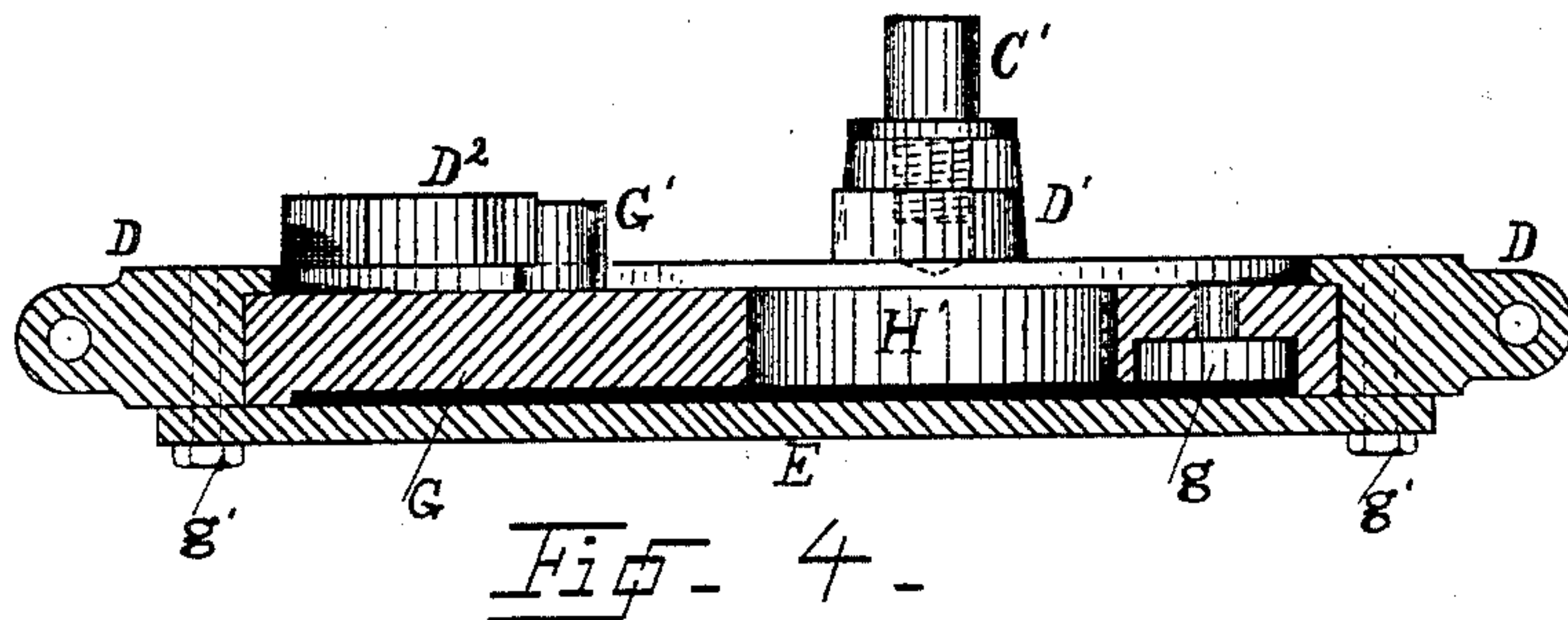
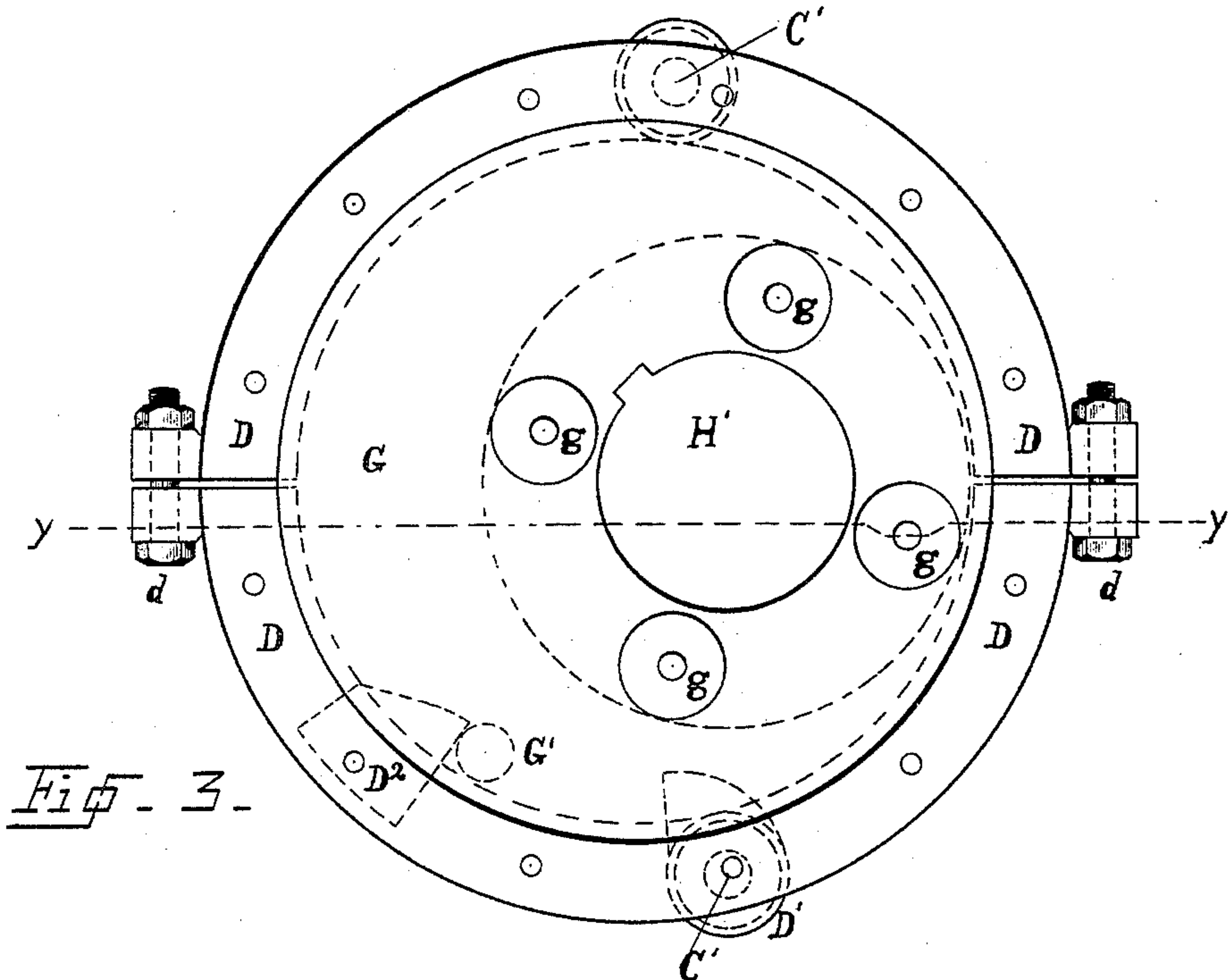
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UNITED STATES PATENT OFFICE.

FRANK H. BALL, OF ERIE, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE BALL & WOOD COMPANY, OF NEW YORK, N. Y.

CUT-OFF-VALVE GEAR.

SPECIFICATION forming part of Letters Patent No. 454,447, dated June 23, 1891.

Application filed May 16, 1890. Serial No. 352,031. (No model.)

To all whom it may concern:

Be it known that I, FRANK H. BALL, a citizen of the United States, residing at Erie, in the county of Erie and State of Pennsylvania, have
5 invented certain new and useful Improvements in Automatic Cut-Off-Valve Gears for Steam-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others
10 skilled in the art to which it appertains to make and use the same.

This invention relates to that class of steam-engine-valve gears in which the action of the steam-valve is varied by shifting the position
15 of the eccentric or crank pin which moves it; and it consists in certain improvements in the construction of the same, as will be hereinafter fully set forth, and pointed out in claims.

The invention is illustrated in the accompanying drawings, as follows:

Figure 1 is a side elevation view of the fly-wheel of a steam-engine with my improved valve-gear in place therein, the main springs of the same being omitted, as the improvements, hereinafter to be described, in no way
25 relate thereto, and any of the many well-known forms of springs may be used. Fig. 2 is a horizontal section view, taken on the line $x x$ in Fig. 1, the balls and springs being
30 omitted. Fig. 3 is a side elevation view of the eccentric disk and yoke with the side plate E removed. Fig. 4 is a horizontal section view of the parts shown in Fig. 3 below the line $y y$, and having the side plate E shown
35 in place.

Like letters of reference indicate like parts in all the figures.

The construction and operation are as follows:

40 The fly-balls and main springs may be any desired construction.

My invention relates wholly to the construction of the valve-gear and not to the appliances by which it is moved.

45 I show balls B hung on the fly-wheel A and connected with the valve-gear by links C, and I also show an auxiliary spring J and dash-pot K, which are used in my engines; but these parts do not constitute any part of my
50 present invention. The valve-gear—that is to say, the parts by which the valve is moved

and its movements varied—consists of an eccentric disk G, which is secured to the end of the hub of the fly-wheel by bolts which pass through the countersunk holes g and tap into
55 the hub a yoke D, which embraces the eccentric disk G, a face-plate E, which is bolted to the side of the yoke D, and a crank-pin F or its equivalent—to wit, an eccentric or a cam—
60 on the side of the face-plate E.

The eccentric disk G is shown as bolted to the end of the hub of the fly-wheel; but it may be cast solid with it, or it may be keyed to the shaft and be distinct from the fly-wheel; but however it may be it should move integrally with the shaft and fly-wheel or other
65 frame, which may support the weights and springs of the governor.

The yoke D, together with the face-plate E, embraces the eccentric disk G and is movable
70 rotatively on said disk, and it is connected with the governor-weights by the links C C, which extend from the pins C' C' to said weights. The yoke and plate D and E are moved rotatively upon the disk G only when
75 the weights move in or out; but they have a constant rotating motion with the shaft H and disk G. A pin G' on disk G and lugs D' D² on the yoke D serve to limit the movement of the yoke upon the disk. In Fig. 1
80 the pin and the lugs just referred to are shown in dotted lines, and the position of parts is that which they occupy when the engine is at rest. The pin G' is shown in contact with the lug D². The other extreme position would
85 bring the lug D' into contact with the pin G'.

In Fig. 1, h marks the center of motion of the shaft, and e the center of motion of the yoke D and plate E as it is moved rotatively upon the disk G by the action of the weights.
90 The dotted line f represents the path or orbit of the center of the crank-pin F as the shaft revolves, and the arc-line $f' f'$ represents the path of the center of the crank-pin as it shifts from one extreme position to another by the
95 action of the weights moving the yoke D and plate E upon the disk G.

The yoke D, plate E, and pin F, taken as a whole, correspond in function with the eccentric of an ordinarily-constructed shifting eccentric valve-gear, but it differs quite materially from former constructions in its man-
100

ner of application and operation. It will be observed that it has its three centers, to wit: The center of the shaft *h*, the center of the crank-pin, (or its equivalent, if used,) and its geometrical center, all within its periphery, and that when it moves to shift the position of the crank-pin it moves around its geometrical center.

The beneficial results of this construction over former constructions are, first, that lost motion can be taken up when it occurs by reason of wear without changing the relative position of the three centers above named; second, that wear can be more easily taken up, and, third, greater compactness and cheapness of construction.

In the construction shown I have provided for the taking up wear as follows: The yoke *D* has bolts *d*, by which it can be clamped closely upon the disk *G*. To enable this movement the bolts *g'*, which fasten the plate *E* to the yoke, will pass through enlarged or elongated holes in the plate *E*, so that when they are loosened the two parts of the clamp can be moved. If side wear occurs the plate *E* can be removed and the side of the yoke be scraped down.

What I claim as new is—

1. In an automatic cut-off-valve gear for steam-engines, the combination, substantially as set forth, of a plate or disk bearing the crank-pin or other means for imparting reciprocating action to the valve, which is supported so as to move rotatively with the main

shaft, is pivoted so as to turn on its own center, which is eccentric to the shaft and has within its periphery the center line of the shaft, the center of the said crank-pin or its equivalent and its own pivotal center, and fly-balls so connected with said plate or disk by links as to move the same pivotally as they move radially.

2. In an automatic cut-off-valve gear for steam-engines, the combination, substantially as set forth, of the disk *G*, secured eccentrically on the shaft *H*, the yoke *D*, and plate *E*, concentrically journaled on said disk *G*, the crank-pin *F* or equivalent means for reciprocating the valve, secured on said plate eccentrically thereto and to the shaft *H*, and fly-balls *B*, connected with said yoke and plate by links *C*.

3. In an automatic cut-off-valve gear for steam-engines, the combination, substantially as set forth, of the disk *G*, secured eccentrically on the shaft *H*, the adjustable yoke *D*, and plate *E*, journaled on said disk, stop-lugs *D'* *D*² on said yoke and a stop-pin *G'* on said disk, a crank-pin *F* or its equivalent on said plate in a position eccentric to said plate and to the shaft *H*, and fly-balls connected with said plate or yoke by links *C*.

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

FRANK H. BALL.

Witnesses:

JNO. K. HALLOCK,
CLARK M. COLE.