

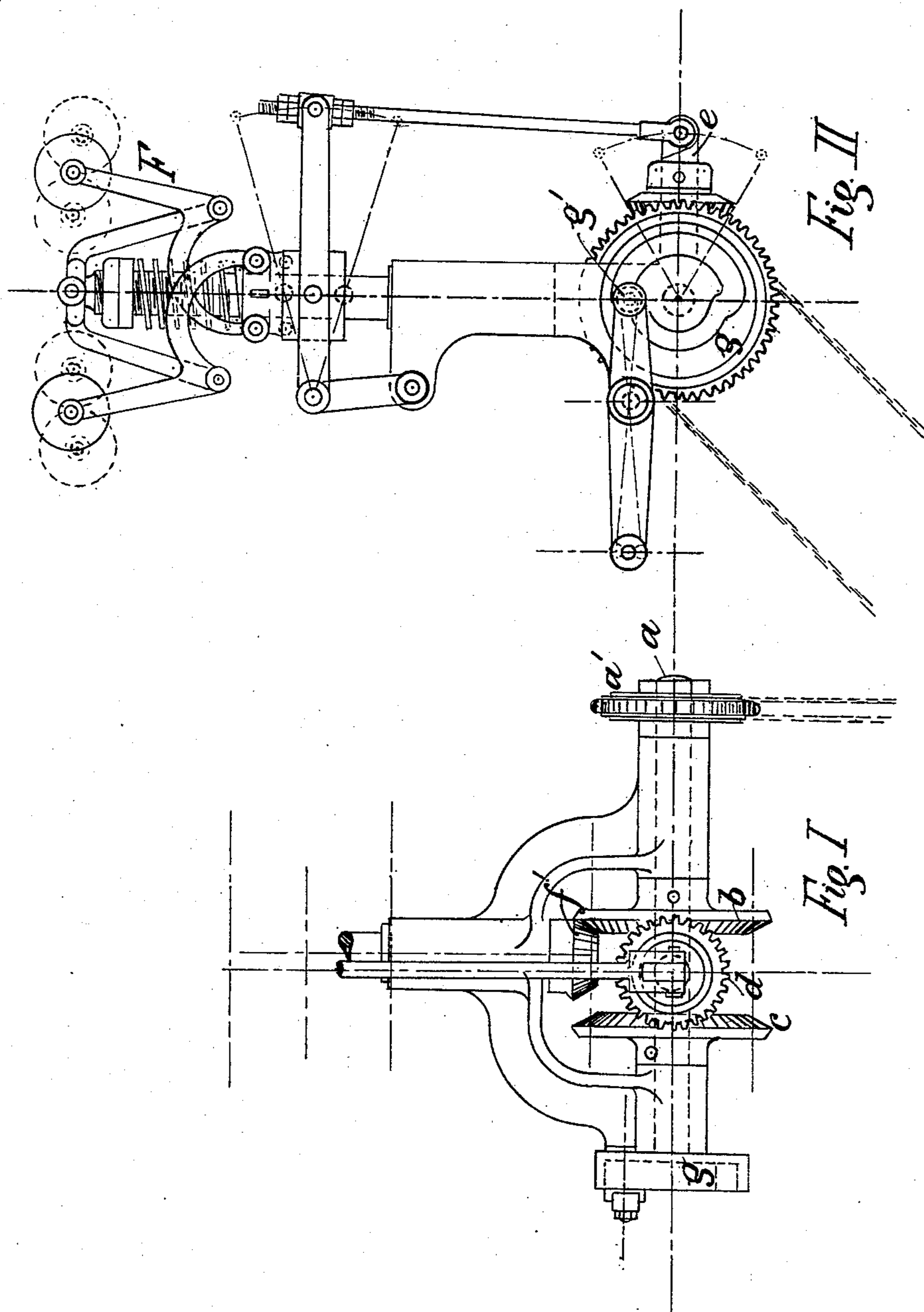
(No Model.)

2 Sheets—Sheet 1.

T. & R. LEES & W. LEES, Jr.
CUT-OFF VALVE GEAR.

No. 472,658.

Patented Apr. 12, 1892.



Witnesses
H. Harvey Muzzy.
E. J. Cressen.

Inventors
Thomas Lees
Ralph Lees and
Wm. Lees Jr.
by Wm. H. Babcock, Atty.

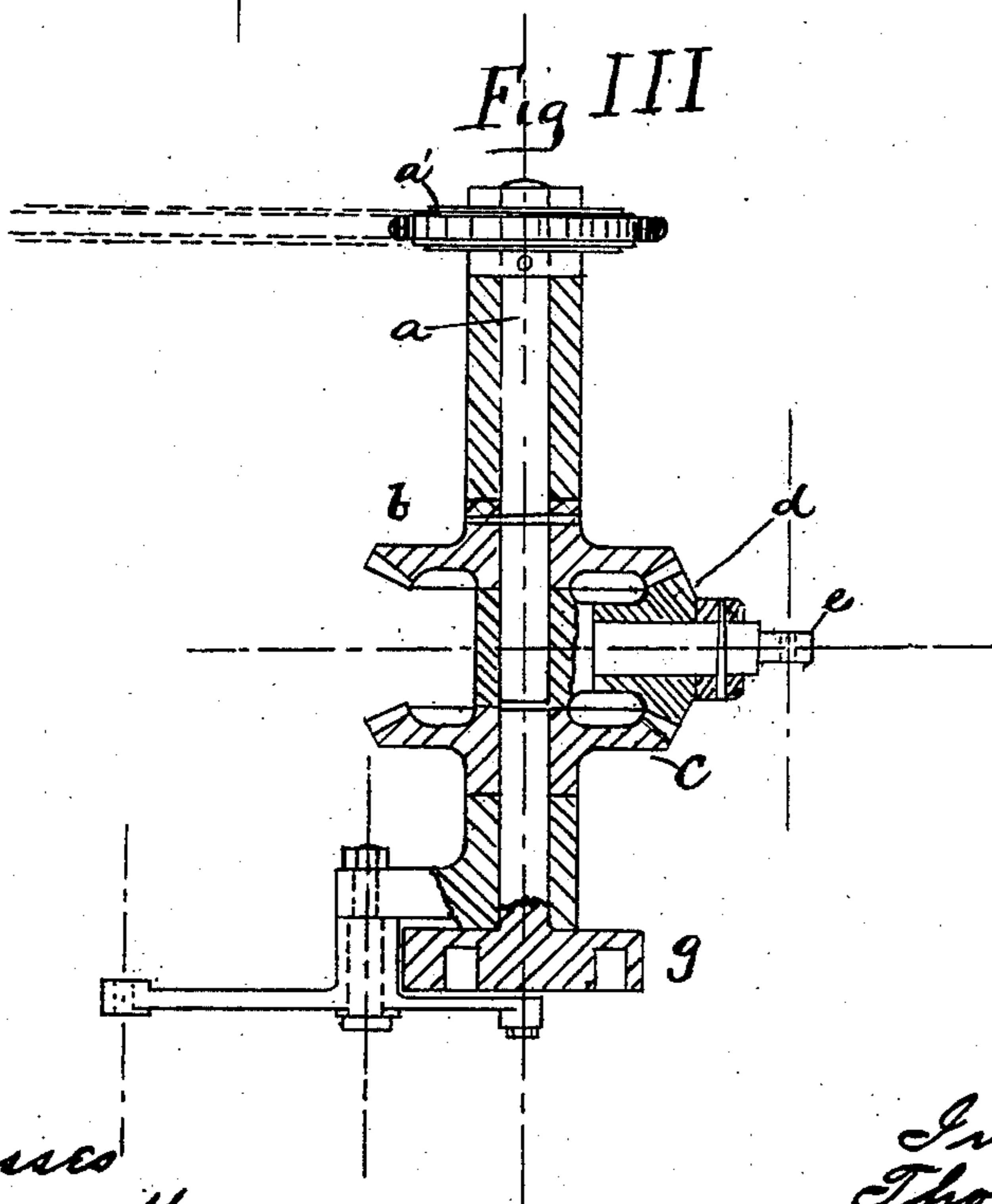
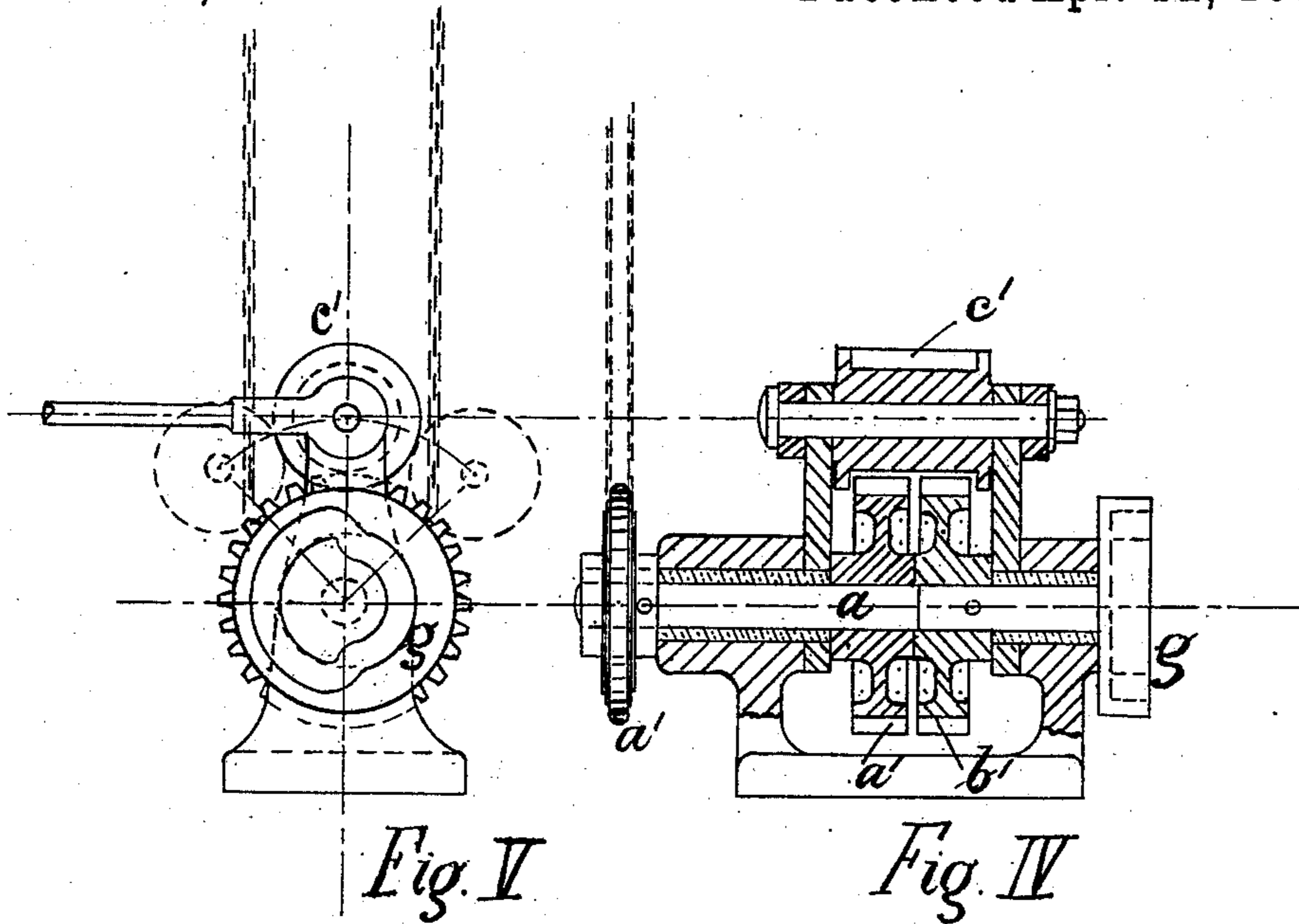
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2 Sheets—Sheet 2.

T. & R. LEES & W. LEES, Jr.
CUT-OFF VALVE GEAR.

No. 472,658.

Patented Apr. 12, 1892.



Witnesses
W. Harry Muzzy.
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UNITED STATES PATENT OFFICE.

THOMAS LEES, RALPH LEES, AND WILLIAM LEES, JR., OF HOLLINWOOD,
NEAR OLDHAM, ENGLAND.

CUT-OFF-VALVE GEAR.

SPECIFICATION forming part of Letters Patent No. 472,658, dated April 12, 1892.

Application filed October 13, 1891. Serial No. 408,612. (No model.)

To all whom it may concern:

Be it known that we, THOMAS LEES, RALPH LEES, and WILLIAM LEES, Jr., subjects of the Queen of Great Britain and Ireland, and residents of Hollinwood, near Oldham, in the county of Lancaster, England, have invented a certain Improved Cut-Off-Valve Gear, of which the following is a specification.

Our invention relates to a device or apparatus to be employed in conjunction with the governor of a steam-engine for operating the subsidiary or "cut-off" valves used, as is well understood, for the purpose of automatically controlling the speed of the engine by causing the supply of steam to be cut off earlier or later in the stroke, according as the work to be performed by the engine may vary. This has been effected by various combinations of gearing and other mechanism.

Our invention consists in the combination of devices for effecting this result with great simplicity of construction and certainty of operation, substantially as hereinafter more particularly set forth and claimed.

The said device is illustrated by the accompanying drawings, in which—

Figure 1 is a side view, and Fig. 2 is an end view. Fig. 3 is a sectional plan; and Figs. 4 and 5 are respectively side and end views of a modification hereinafter referred to, Fig. 4 being in section.

a is a shaft deriving motion from the engine by means, for example, of a chain-wheel *a'*, driven by a chain from a corresponding chain-wheel on the crank-shaft. On the shaft *a* is secured the bevel-wheel *b*, hereinafter referred to as the "fixed bevel-wheel." In a line therewith, but rotating independently thereof, is another bevel-wheel *c*, of the same size as the fixed bevel-wheel and hereinafter referred to as the "loose bevel-wheel." Lying between the bevel-wheels *b* and *c* is a bevel-pinion *d*, rotating in a bearing formed in a swinging bracket *e* in such a manner that it may oscillate about the common axis of the bevel-wheels *b* and *c*.

F is the governor, of any suitable type and conveniently driven from the top of the bevel-wheel *b* by a pinion *f'*. To the sleeve or sliding part of the governor the bracket *e*,

carrying the bevel-pinion *d*, is connected by suitable links or levers in order that the pinion *d* may rise and fall as the speed of the governor varies. When the bracket *e* is stationary, the pinion acts as an idle-wheel and simply transmits the rotation of the fixed bevel-wheel *b* to the loose bevel-wheel *c* in such a manner that both bevel-wheels rotate at the same speed, but in opposite directions. If, however, the bevel-pinion is caused to make a partial revolution about the axis of the bevel-wheels and in the direction in which the loose bevel-wheel *c* rotates, the latter will be advanced in the direction in which it is rotating through an angular distance corresponding to the proper motion of the bevel-pinion, and, vice versa, if the bevel-pinion *d* makes a partial revolution about the axis of the bevel-wheels in the contrary direction the loose bevel-wheel will be retarded to a corresponding extent.

Secured to and rotating with the loose bevel-wheel *c* is a cam *g*, into a groove in which or against which takes a roller *g'* at the end of a lever or link connected either directly or through a suitable system of links or levers with the cut-off valve. The curves or acting surfaces of the cam *g* are so disposed that during one part of the rotation thereof the cut-off valve is in such a position as to cut off steam from the steam-inlet valve, while during another part of the rotation of the cam the cut-off valve is in such a position as to admit steam to the steam-inlet valve, which may be operated by an eccentric in the usual manner. The throw of the cam and the connecting mechanism between it and the cut-off valve will be determined by the amount of traverse the cut-off valve requires and the type of engine to which our invention is to be applied, as will be well understood. By the oscillation or partial rotation of the bevel-pinion about the axis of the bevel-wheels *b* and *c* under the influence of the governor, and the consequent angular advance or retreat of the loose bevel-wheel *c*, as hereinbefore described, that part of the cam which controls the moment of cut-off will receive a corresponding displacement forward or backward from its normal position, and the steam will

be cut off earlier or later in the stroke, according as the speed of the governor increases or diminishes.

5 In the foregoing description we have, in order to simplify the description, referred exclusively to the use of bevel-wheels. It is, however, to be understood that our invention is not limited to this particular shape of geared wheels. Spur-wheels, for example, as
10 shown at *a' b'*, connected by a spur-pinion *c'*, may be used. In this case, however, the wheels *a' b'* will revolve in the same direction. The spur-pinion *c'* rises or falls, according to the action of the governor, and the
15 resulting effect on the angular displacement of the cam *g* is the same as above described when referring to the action of the bevel-pinion *c*.

20 Although our invention is more particularly applicable to steam-engines, its use is in no wise confined thereto, but extends to all prime movers deriving their power from the expansion of gases or air.

What we claim, and desire to secure by Letters Patent of the United States, is—

25 In combination with a governor *F* and a suspended pivoted bearing *e*, connected thereto by links or levers for oscillating the said bearing, a bevel-pinion mounted on the latter, a pair of bevel-wheels engaged by the said bevel-pinion, one of said bevel-wheels being fast
30 on their shaft and the other being loose thereon, a cam turning with the said loose wheel, and devices engaged by said cam for operating a cut-off valve, substantially as set forth. 35

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

THOMAS LEES.

RALPH LEES.

WILLIAM LEES, JR.

Witnesses:

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