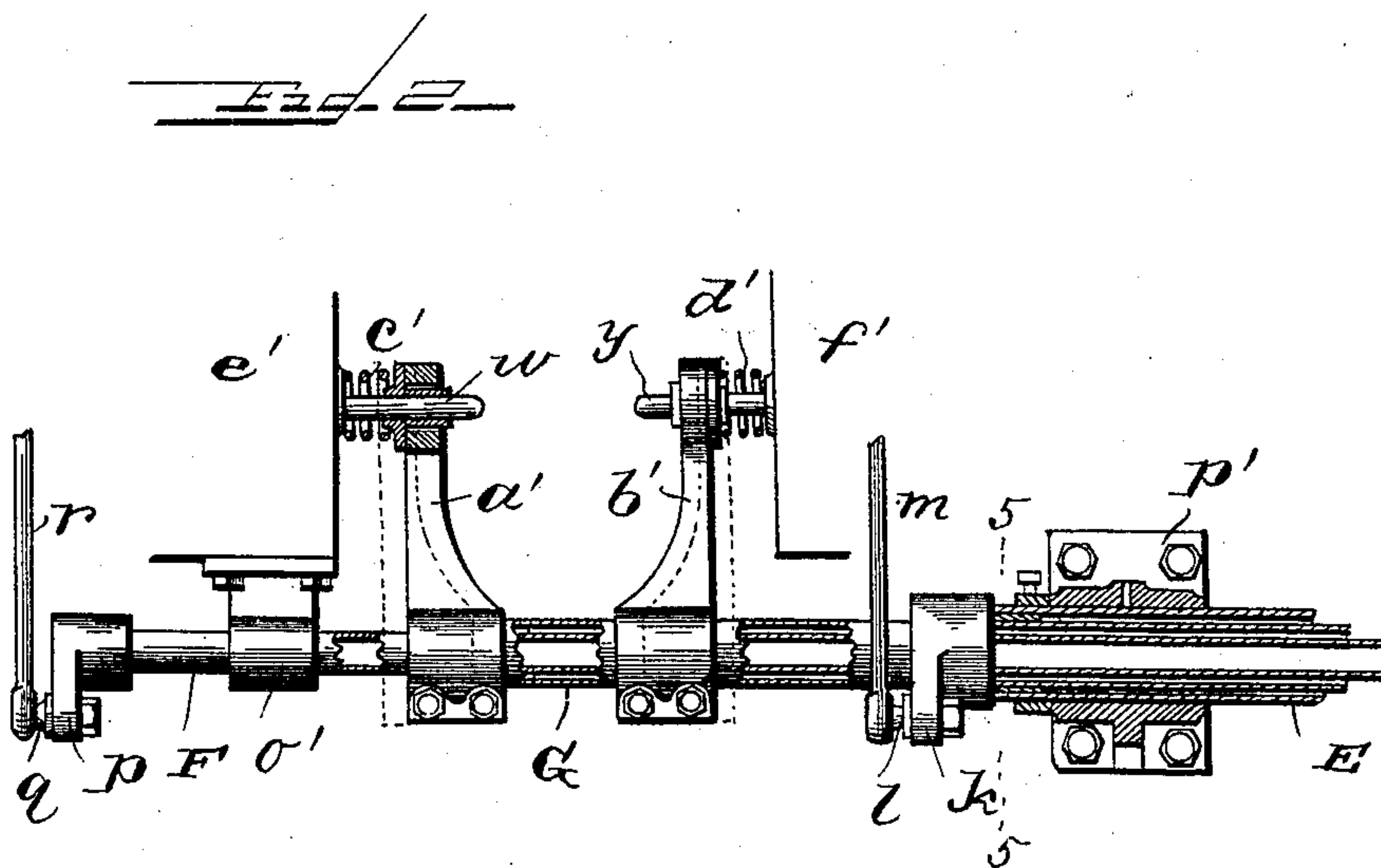
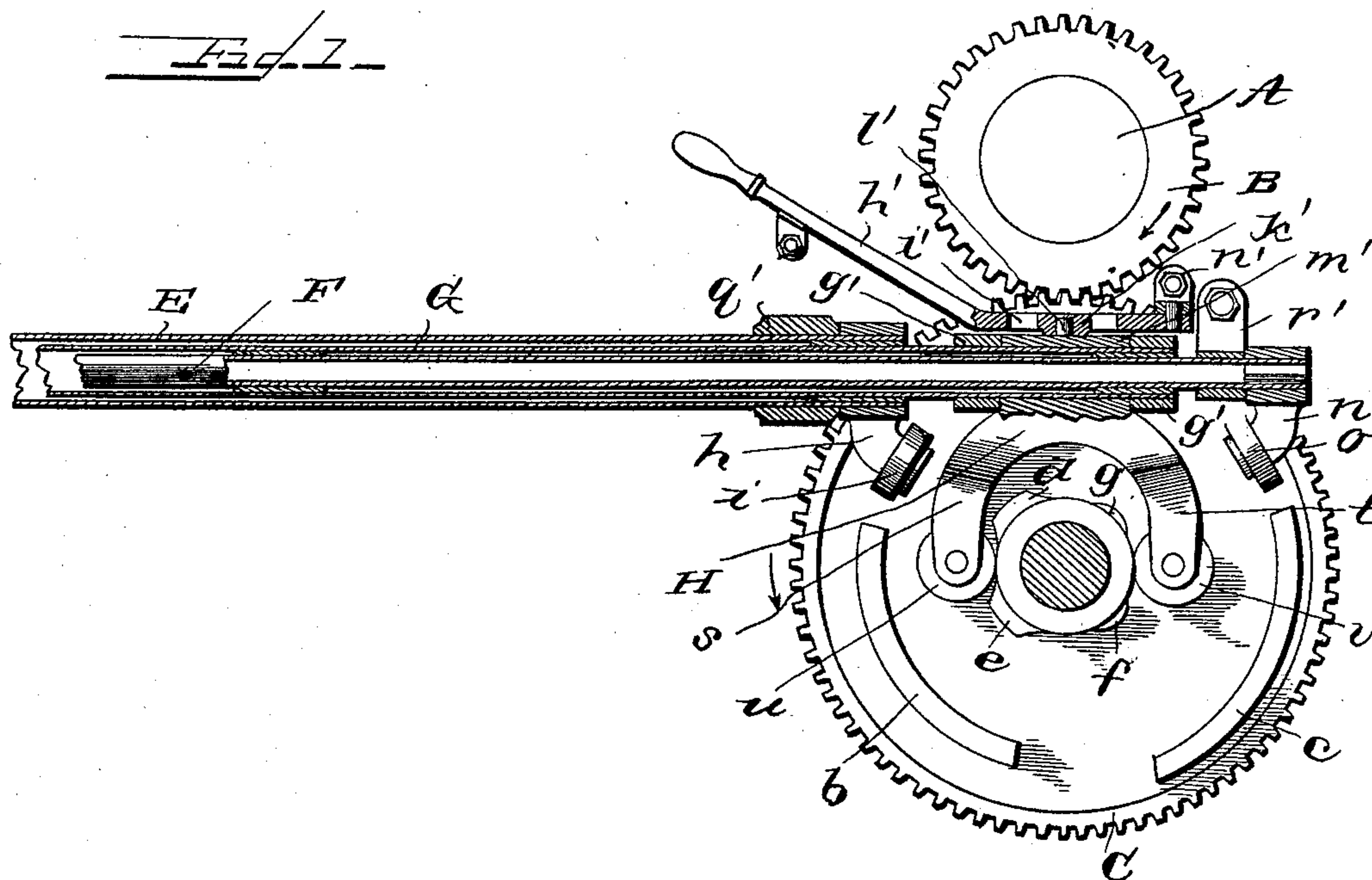


2 Sheets—Sheet 1.

No. 594,381.

Patented Nov. 30, 1897.



Witnesses \_\_\_\_\_

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(No Model.)

2 Sheets—Sheet 2.

E. CELLISON.  
VALVE GEAR FOR GAS ENGINES.

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Patented Nov. 30, 1897.

Fig. 3.

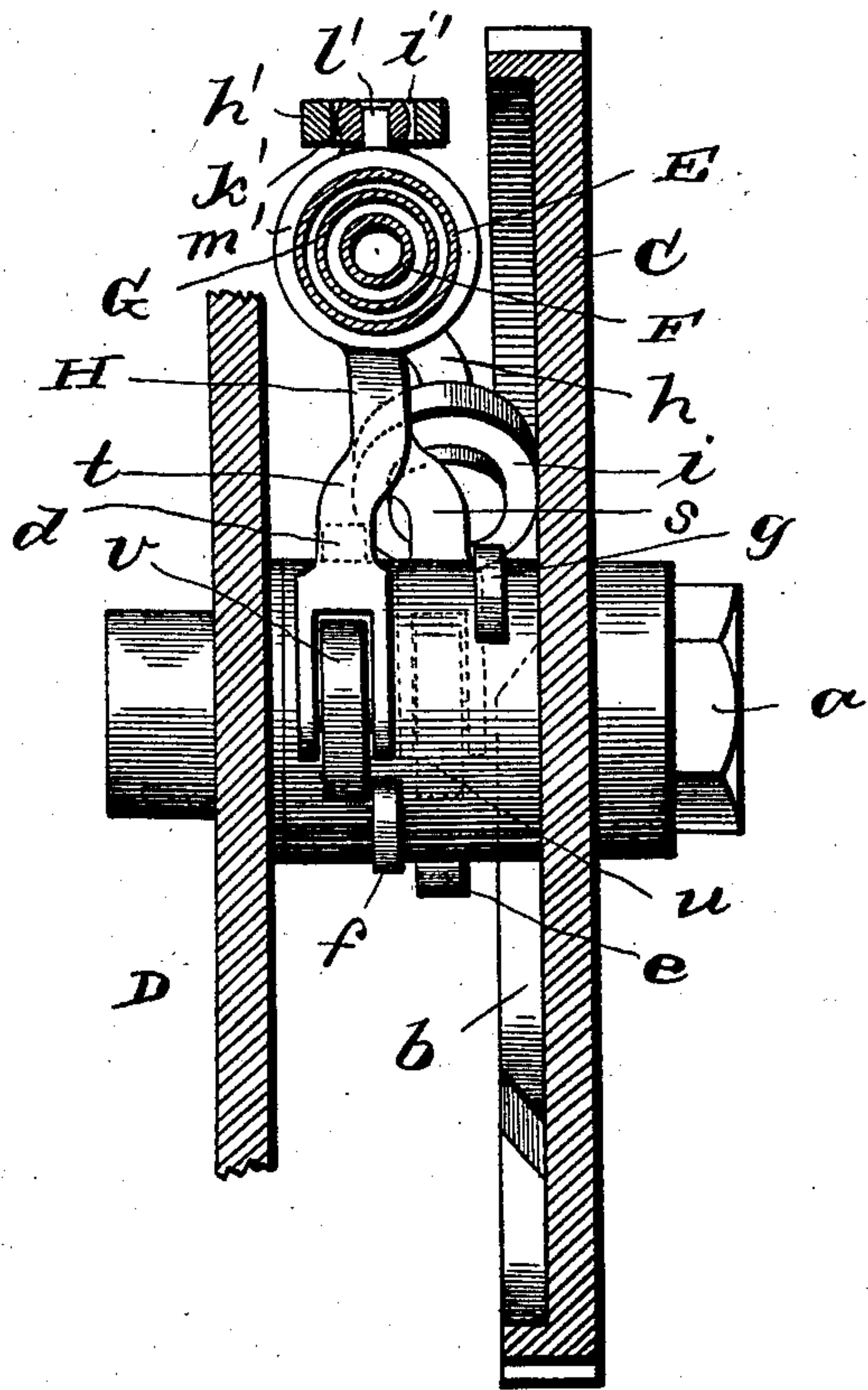


Fig. 4.

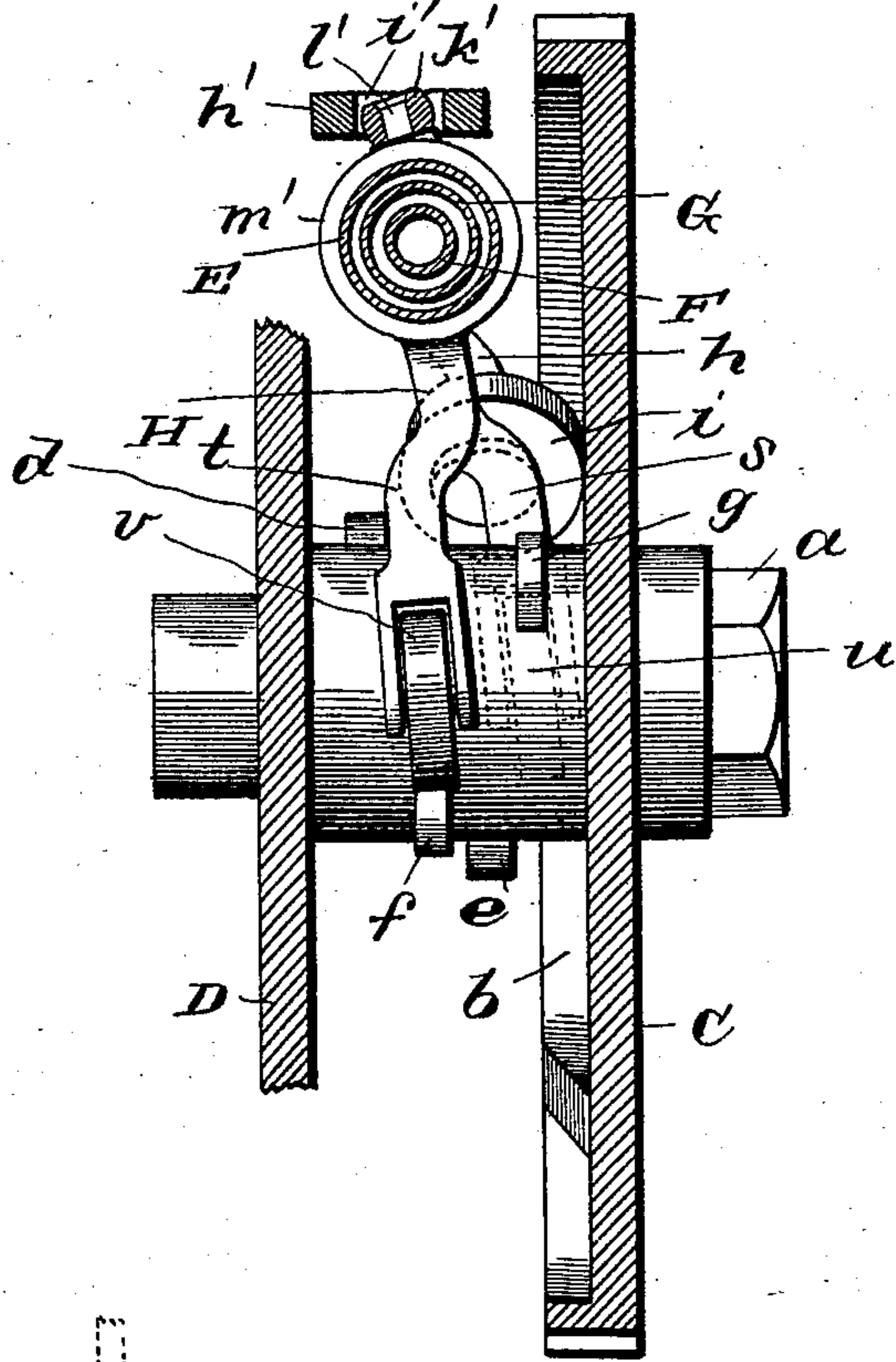
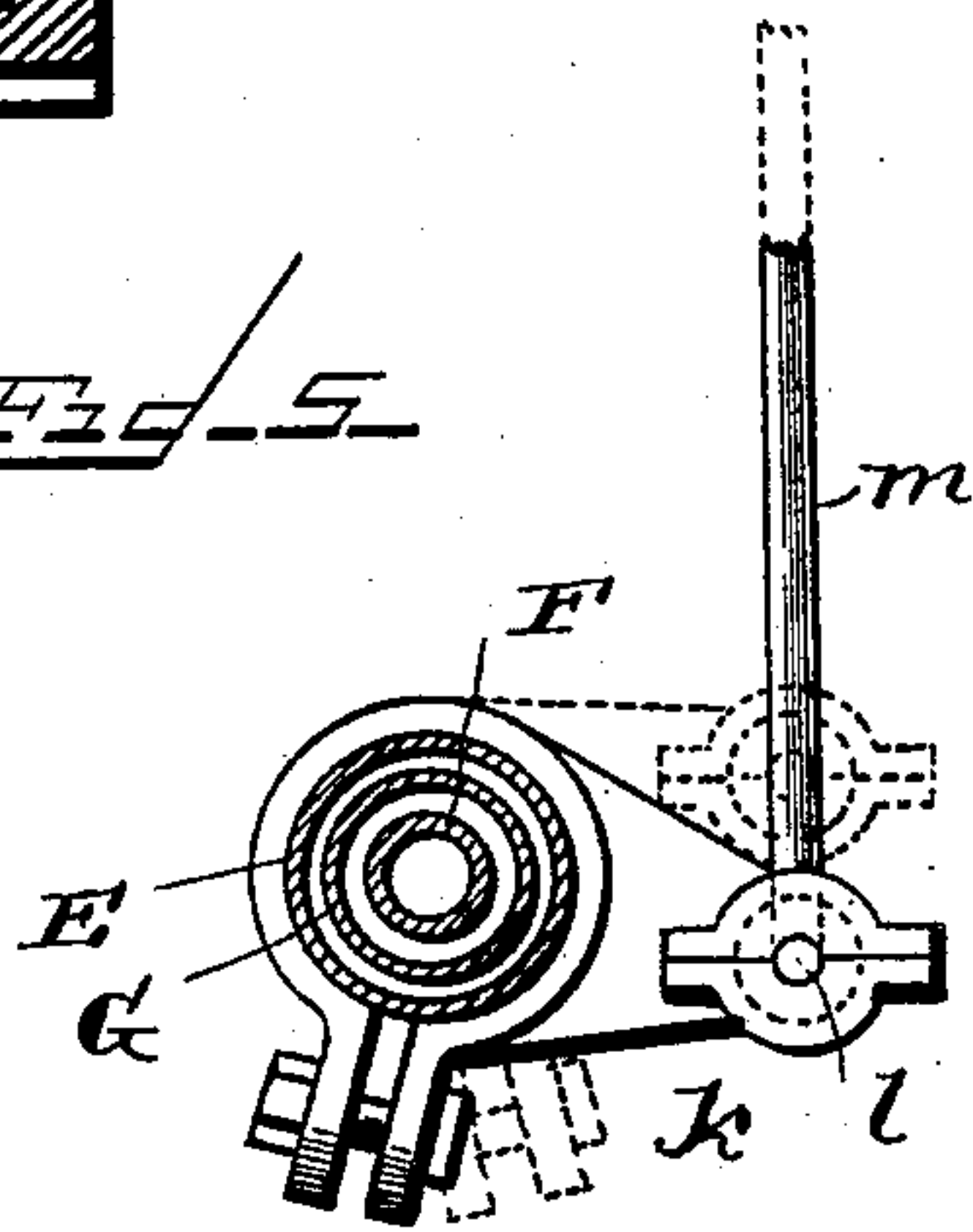


Fig. 5.



WITNESSES.

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# UNITED STATES PATENT OFFICE.

EDMUND CELLISON, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE  
PENNSYLVANIA IRON WORKS COMPANY, OF SAME PLACE.

## VALVE-GEAR FOR GAS-ENGINES.

SPECIFICATION forming part of Letters Patent No. 594,381, dated November 30, 1897.

Application filed October 21, 1896. Serial No. 609,631. (No model.)

*To all whom it may concern:*

Be it known that I, EDMUND CELLISON, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Valve-Gear for Gas-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to gas or vapor engines, and has especial reference to the valve-gear used to ignite the charge in the cylinder and operate the exhaust-valve; and it consists in certain constructions which will be fully disclosed in the following specification and claims.

In the accompanying drawings, which form part of this specification, Figure 1 represents a longitudinal section, partly in side elevation, of a portion of my improved valve-gear; Fig. 2, a like view of the remaining portion of the same; Fig. 3, a vertical section, partly in side elevation, taken through the master-wheel of the driving mechanism; Fig. 4, a like view showing the position of the parts at the starting of the engine; and Fig. 5 is a section on the line 5 5, Fig. 2, the full lines showing position of the crank-arm and igniter-rod just after ignition, and the dotted lines show the extreme position of the arm and rod to engage with the igniter at its lowest position.

Reference being had to the drawings and the letters thereon, A indicates the crank-shaft of the engine, on which is secured a pinion B, which engages the master gear-wheel C and which constitutes the driving mechanism of the valve-gear. The gear-wheel C is secured to the engine-frame D by a bolt *a*, on which bolt the gear-wheel revolves, and on the face of the gear-wheel are cams *b c*, and on the hub of the wheel are cams *d, e, f*, and *g*, the function of which cams will hereinafter more fully appear.

The shaft of the valve-gear consists of three separate concentric shafts, which are so operated that they oscillate or reciprocate only when brought into use to effect ignition of the charge in the engine-cylinders, opening the exhaust-valves to discharge the waste prod-

ucts from the cylinders and for the relief of compression to aid in starting the piston on its first power stroke. The outer shaft E is provided at one end with an arm *h*, supporting a friction-roller *i*, which engages the cam *b* on the face of the gear-wheel C, and the shaft is oscillated thereby, and at the opposite end of the shaft E is a crank-arm *k*, to whose wrist-pin *l* is connected a pitman-rod *m*, which operates the igniter of an engine. (Not shown.) The inner shaft F is provided with a like arm *n* and friction-roller *o* at one end, which engages the cam *c* on the gear-wheel C, and said shaft is oscillated thereby, and at the opposite end of the shaft F is a crank-arm *p*, to whose wrist-pin *q* a pitman-rod *r* is connected, which operates the igniter (not shown) of another engine-cylinder, and the middle shaft G is provided at one end with a bifurcated lever H, whose arms *s t* bear friction-rollers *u v*, which are engaged by the cams *d* and *e* alternately to open the exhaust-valves of the engines to discharge the waste products and by the cams *f* and *g* to open the exhaust-valves slightly to relieve compression to aid in starting the engine. The exhaust-valve stems *w y* are operated by arms *a' b'*, attached to the opposite or outer end of the shaft F, as the shaft is reciprocated by the cams *d, e, f*, and *g* to open the valves, and the valves are closed automatically by the springs *c' d'* bearing against the inner sides of the arms *a' b'* and against the exhaust-valve cases *e' f'*.

The bifurcated lever H is attached to the shaft F to oscillate thereon and secured in position by collars *g' g'*, as shown in Fig. 1, and is oscillated to put the arms *s t* in engagement with the cams *d, e, f*, and *g* by means of a lever *h'*, having an elongated slot *i'*, which engages a roller *k'* on the stud or pin *l'*, secured to the cylindrical bearing *m'* of the lever H and fulcrumed at its outer end to a lug *n'* on the frame of the engine.

The shafts E, F, and G are supported in suitable bearings *o', p', q'*, and *r'*, so that they may oscillate and reciprocate therein, as required.

In starting the engine the lever H is turned axially on the shaft F, so as to bring the arms *s t* into contact with the small relief-cams *f*



- and *g* on the hub of the gear-wheel C to relieve the compression of the charge in the cylinder of the engine to aid in starting. The engine having been put in motion, the lever 5 *H* is returned into its normal position, when the arms *s t* will alternately engage the cams *d e* and open the exhaust-valves to their full extent to relieve the cylinders of the waste products.
- 10 Having thus fully described my invention, what I claim is—
1. A valve-gear for gas-engines provided with a shaft composed of concentric members connected to the igniter and the exhaust-valve 15 of the engine and means for imparting oscillating motion to one of said members and longitudinal reciprocating motion to the other.
2. A valve-gear for gas-engines having a shaft composed of concentric members con- 20 nected to the igniter and the exhaust-valve of the engine and means for imparting oscillating motion to one of said members and longitudinal reciprocating motion intermittently to the other.
- 25 3. A valve-gear for gas-engines having a gear-wheel provided with a cam on its face, a hub on said wheel provided with a cam on its periphery, an oscillating shaft operated by the cam on the face of the wheel and con- 30 nected to the igniter and a reciprocating shaft operated by the cam on the hub of said wheel and connected to the exhaust-valve.
4. A valve-gear for gas-engines having con-

centric shafts, a gear-wheel provided with a cam on the face of the wheel for operating an 35 igniter and cams on its hub for operating an exhaust-valve, an arm connected to one of the shafts and engaging the cam on the face of the wheel and an arm on the other shaft engaging the cams on the hub of said wheel. 40

5. A valve-gear for gas-engines having concentric shafts, a gear-wheel provided with an igniter-cam on the face of the wheel, and ex- 45 haust-valve-operating cams in different planes on its hub, an arm connected to one of the shafts and engaging the cam on the face of the wheel and the bifurcated arm on the other shaft engaging either of the cams on the hub of said wheel.

6. A valve-gear for gas-engines having three 50 concentric shafts, a gear-wheel provided with concentric cams on its face, two of said shafts being rocking shafts and engaging said cams and connected to the igniters of the engine and the third being a reciprocating shaft hav- 55 ing a loose bifurcated arm, two sets of cams on the hub of said gear-wheel with either of which said bifurcation may engage, and means for moving said arm about its shaft.

In testimony whereof I affix my signature 60 in presence of two witnesses.

EDMUND CELLISON.

Witnesses:

JAMES E. GRIST,  
CHAS. DICKERMAN.