

(No Model.)

2 Sheets—Sheet 1.

A. DANNER & G. ROTHENBÜCHER.
CARBONIC ACID OR OTHER GAS ENGINE.

No. 502,430.

Patented Aug. 1, 1893.

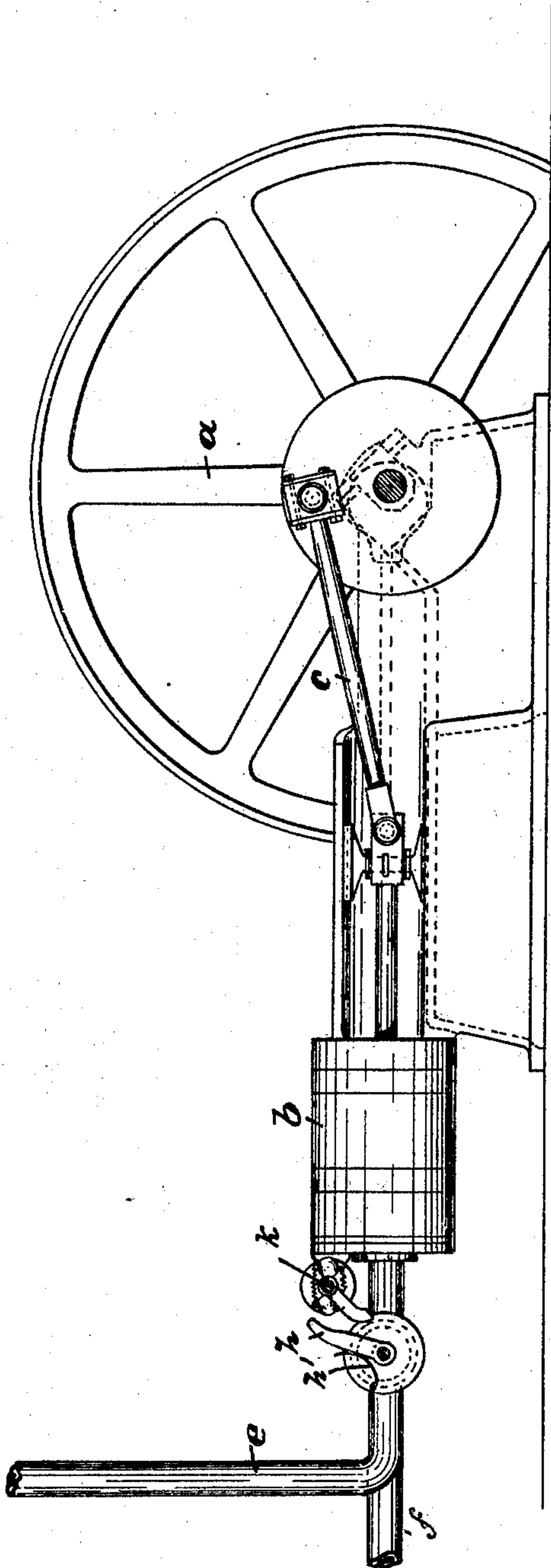


Fig. 1.

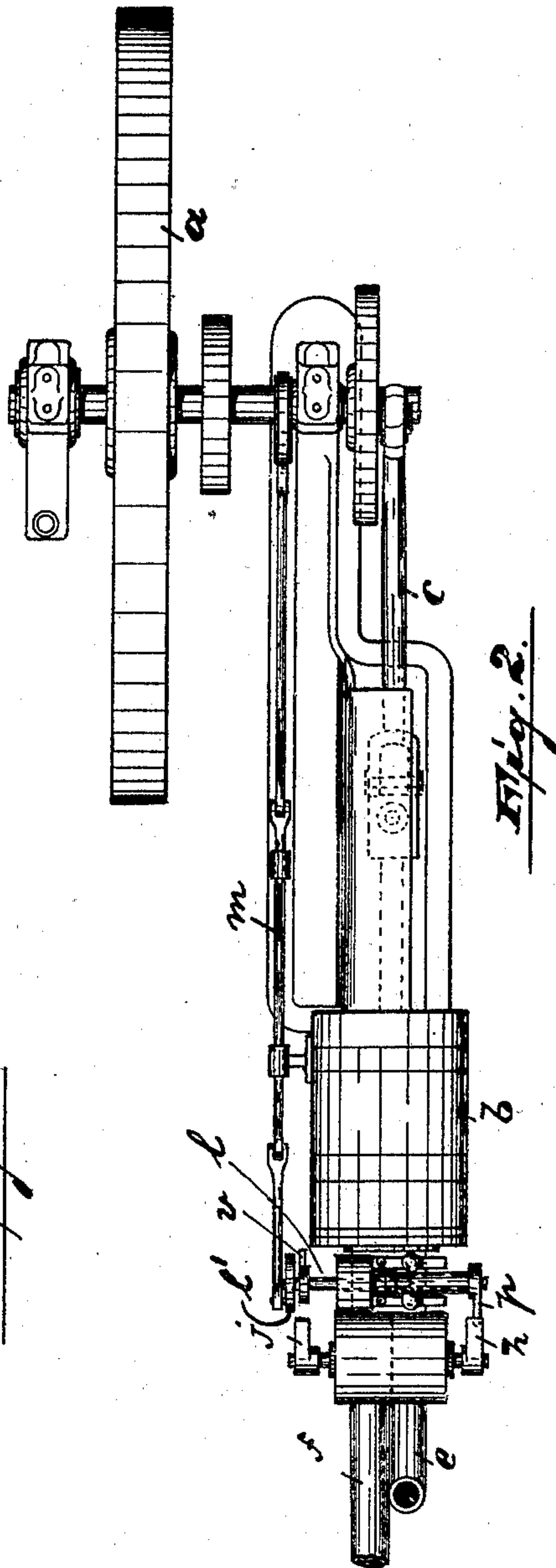


Fig. 2.

WITNESSES:

Wm. D. Bell
D. M. Robertson.

INVENTORS:

Adam Danner
George Rothenbücher
BY *Sartorius & Co*

ATTORNEYS

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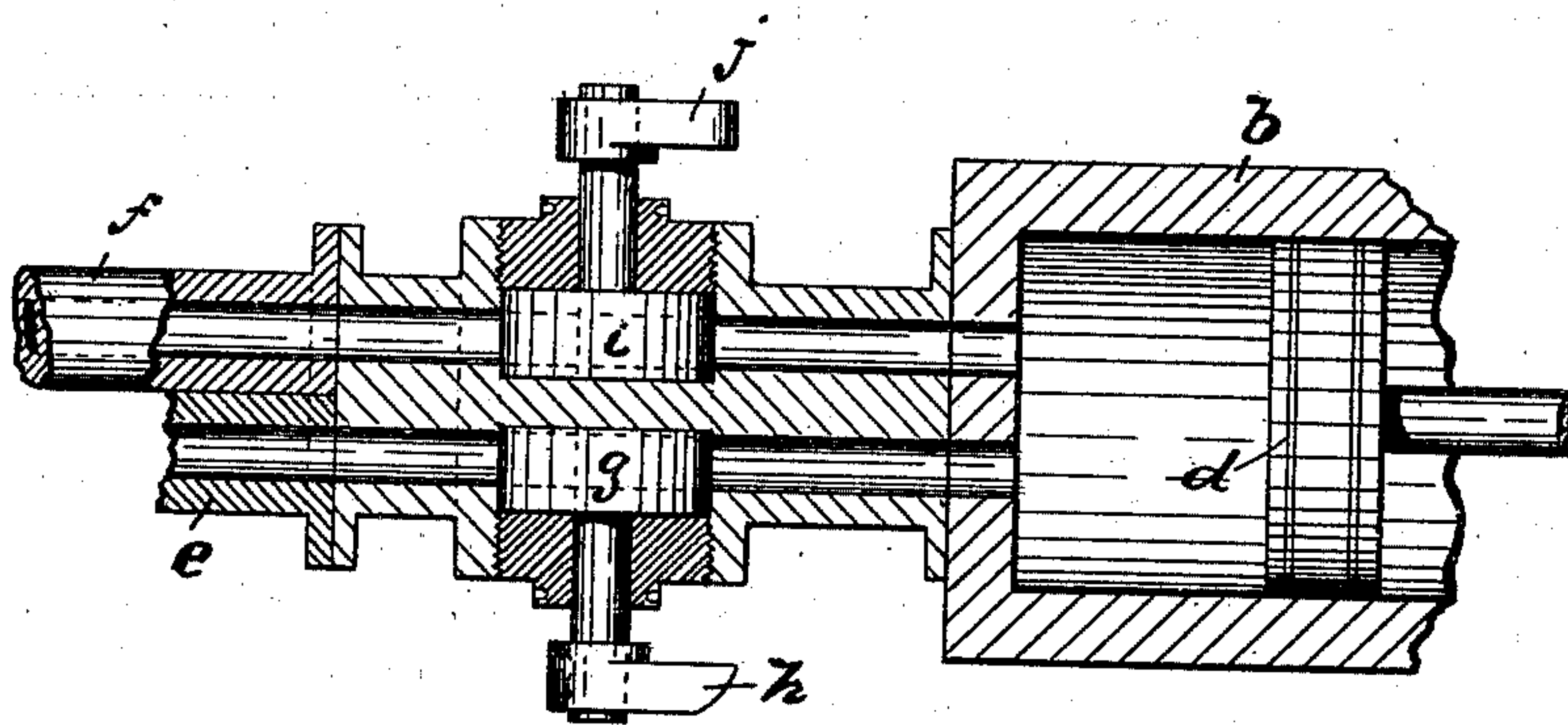


Fig. 3.

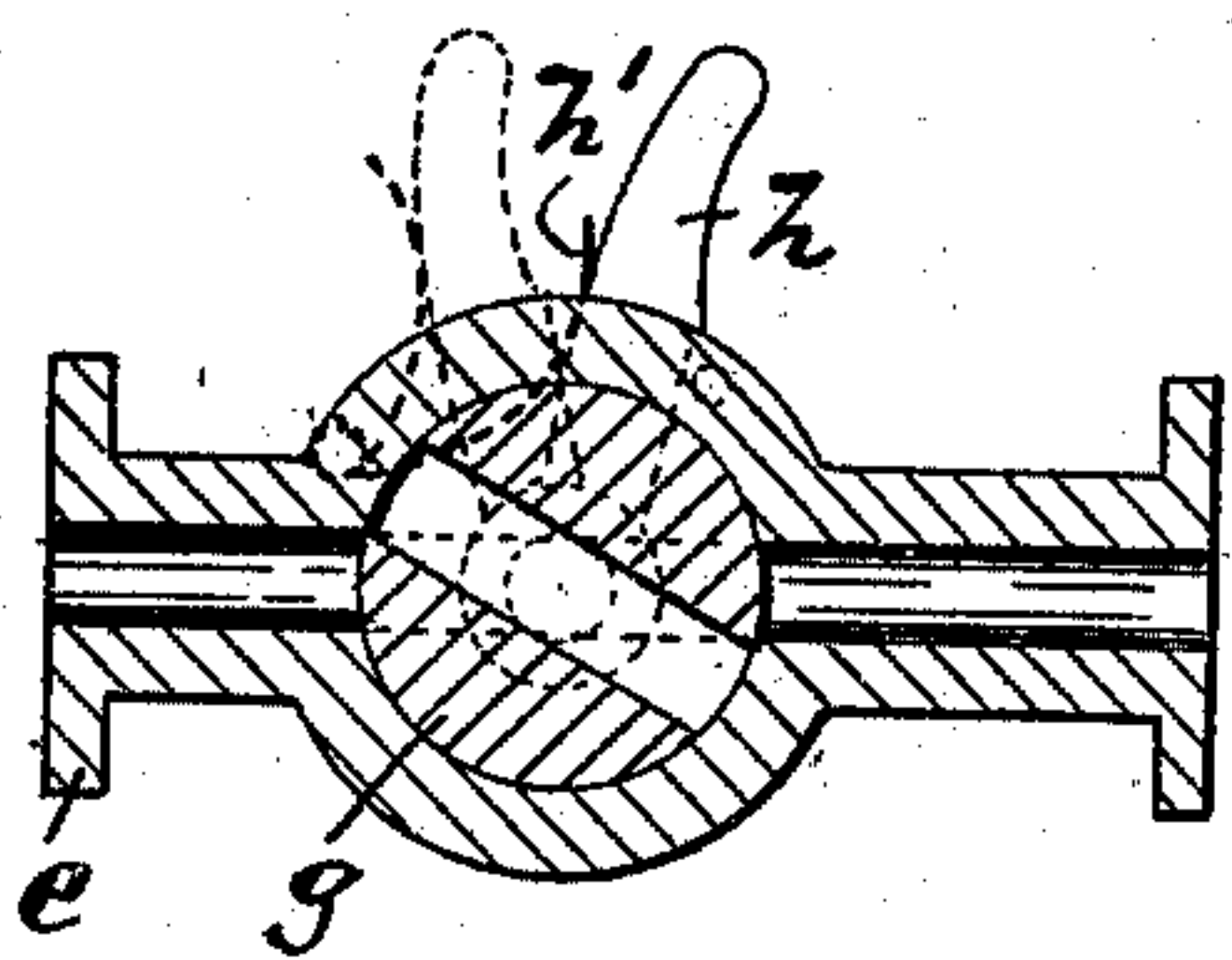


Fig. 4.

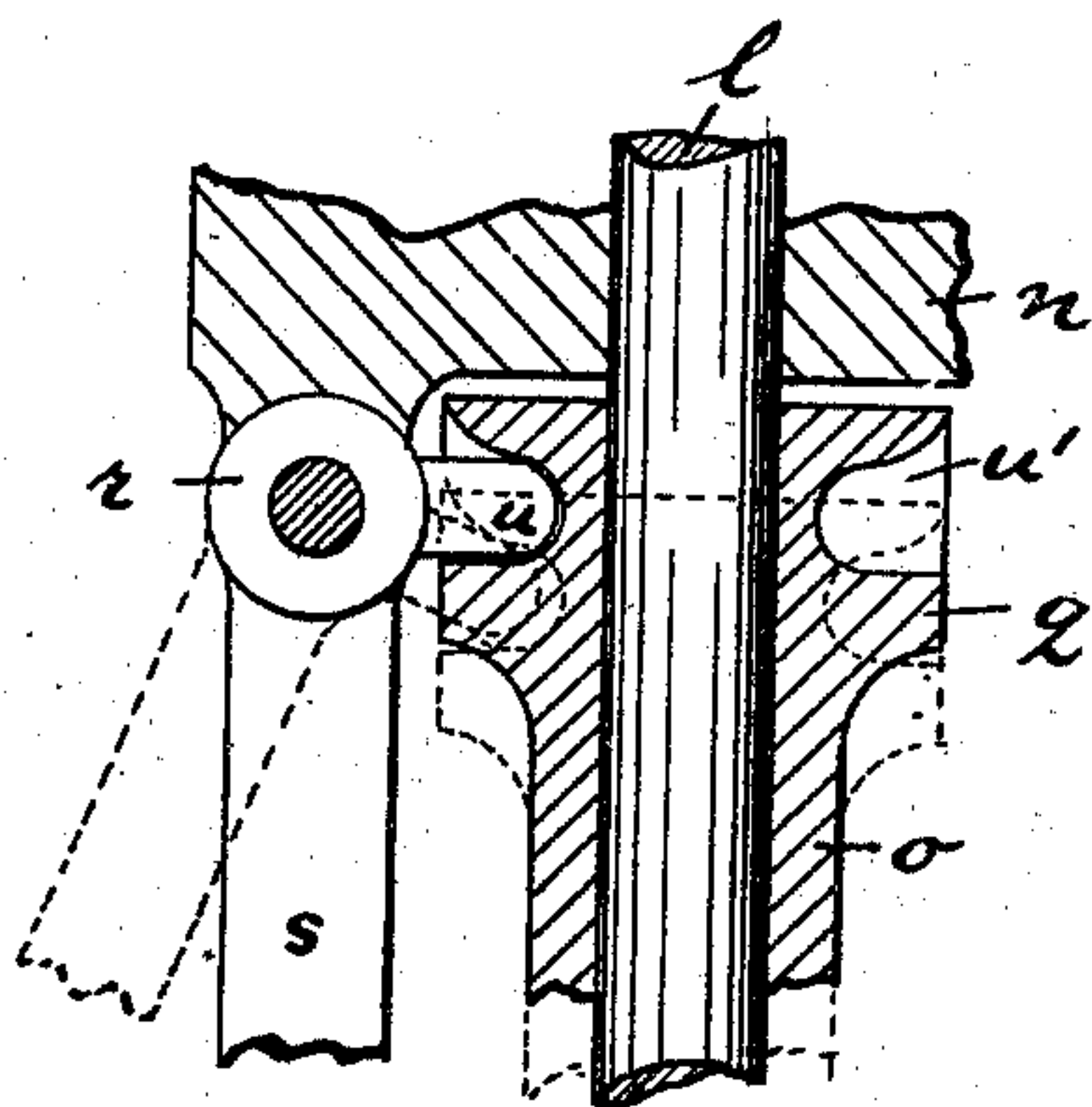


Fig. 6.

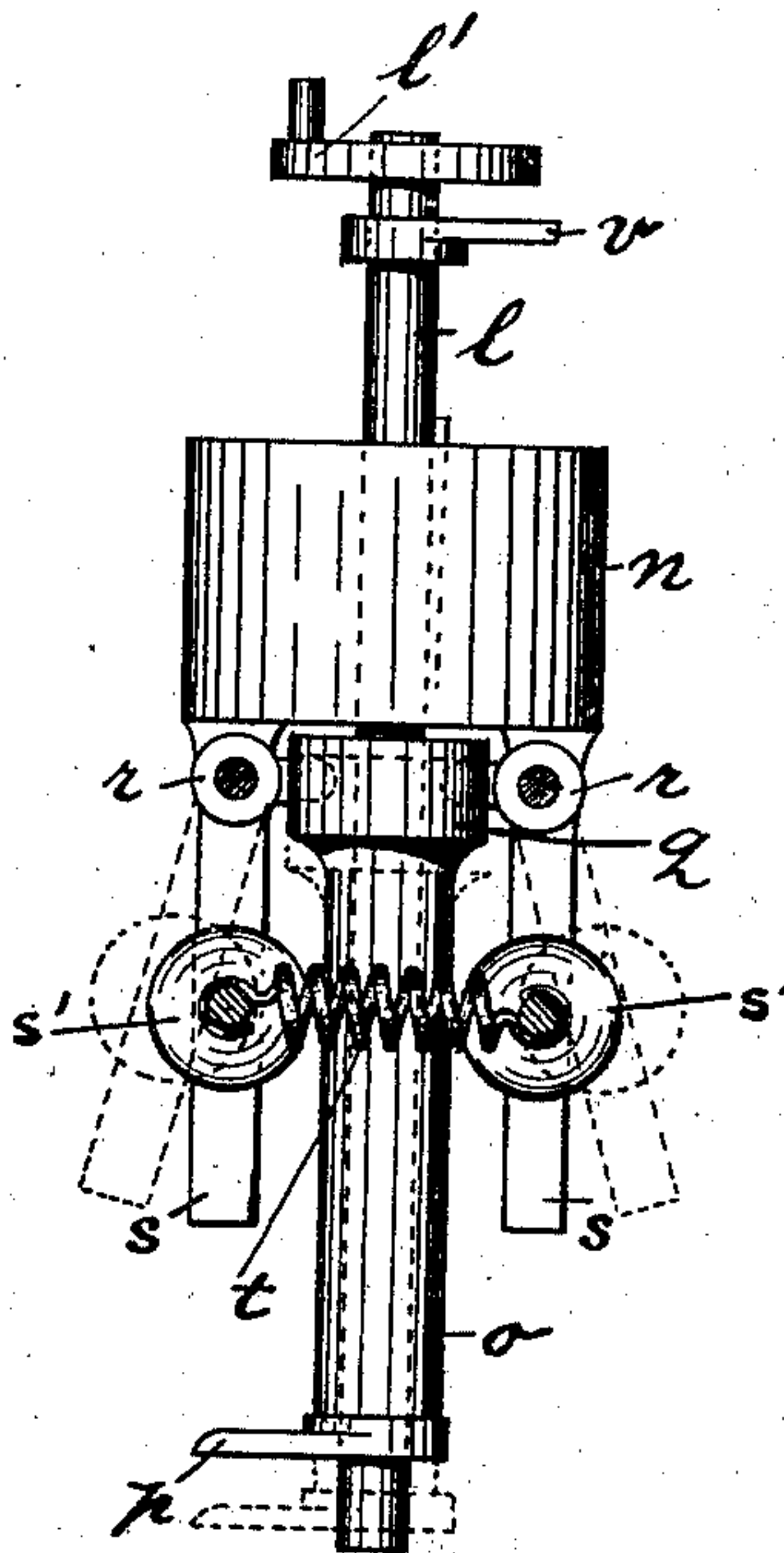


Fig. 5.

WITNESSES:

W. D. Hall
D. M. Robertson.

INVENTORS:

Adam Danner
George Rothenbücher

BY

Gartner & Co

ATTORNEYS

UNITED STATES PATENT OFFICE.

ADAM DANNER AND GEORGE ROTHENBÜCHER, OF NEW YORK, N. Y.

CARBONIC-ACID OR OTHER GAS ENGINE.

SPECIFICATION forming part of Letters Patent No. 502,430, dated August 1, 1893.

Application filed February 14, 1893. Serial No. 462,268. (No model.)

To all whom it may concern:

Be it known that we, ADAM DANNER, a subject of the German Emperor, and GEORGE ROTHENBÜCHER, a citizen of the United States, both residing in the city, county, and State of New York, have invented certain new and useful Improvements in Carbonic-Acid or other Gas Engines; and we 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, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention relates to new and useful improvements in carbonic acid and other gas engines and it consists in the construction and arrangement of inlet and outlet valves to the piston of the engine and in the governor, whereby carbonic acid gas and similar gases may be utilized to actuate the engine.

It consists also in the arrangement and combination of parts hereinafter described and claimed.

In the drawings Figure 1, is a side elevation of the improved engine; Fig. 2 a plan view thereof; Fig. 3 a transverse section enlarged of the inlet and outlet valves and the piston of the engine. Fig. 4 is a vertical section of the valve. Fig. 5 is an enlarged plan view of the governor, and Fig. 6 an enlarged detail transverse section partly broken away, of the same.

In the drawings *a* represents the fly wheel of the engine; *b* the steam cylinder and *c* the connecting rods between the crank of the fly wheel and the piston *d* which works in said cylinder *b*. The connection between the fly-wheel *a* and piston *d* and the construction of the parts do not differ from the arrangement and construction in ordinary engines.

Entering the head of cylinder *b* are two pipes: the inlet pipe *e* and outlet or exhaust pipe *f*. The inlet pipe *e* is provided with a rotary or oscillating spindle valve *g* operated by the handle *h* and the outlet pipe is also provided with a similar valve *i* operated by the handle *j*. These valves are preferably arranged alongside each other so that they may readily be operated by the governor *k* in the manner hereinafter described.

The governor *k* consists of the shaft *l* connected by suitable mechanism *m* to the crank of the fly wheel *a*. In the drawings this mechanism consists of a series of shafts and cranks so geared that the rotary motion of the fly-wheel is communicated to the crank *l'* of the shaft *l* of the governor, but it is manifest that any other suitable means of communication between the fly-wheel and the shaft *l* may be used without departing from the spirit of our invention.

Between the ends of shaft *l* is keyed the drum *n*. Loosely sliding on said shaft *l* is also placed the sleeve *o* carrying the arm *p* designed in its revolution to normally strike upon and operate the handle *h* of the inlet valve *g*. This sleeve *o* is provided at its opposite end with the collar *q*. Extending from the drum *n* and pivoted thereto are two elbow levers *r r* the free arms *s s* of which are provided with adjustable weights *s' s'* connected by a spiral spring *t*, all as shown in Figs. 5 and 6.

The short arms *u* of the elbow levers *r r* engage in suitable recesses *u'* in the collar *q* of sleeve *o* keyed to the shaft *l*. Near one end thereof is the projecting cam arm *v*, designed, when said shaft is rotating to periodically strike against and operate the handle *j* of outlet valve *i*.

The operation is as follows: A drop of liquefied carbonic acid gas or a suitable volume of other gas passes through the inlet pipe *e* when the valve *g* is opened into the cylinder *b* actuating the piston *d* which in turn through the connecting rods *c* rotates the fly-wheel. The fly-wheel in rotating actuates the shaft *l* of the governor *k* through the connecting mechanism *m*. The shaft *l* in rotating carries the arms *p* and *v* which arms are so placed on said shaft that they will alternately come in contact with and push over the handles *h* and *j* of the inlet and outlet valves *g* and *i* respectively. When the shaft *l* of the governor is rotated by the outward movement or expansion of the piston *d* through the fly wheel and connecting mechanism, the arm *v* will, when the piston has traveled the entire length of the cylinder or the entire length of its stroke, strike against and throw over the handle *j* of the outlet valve *i* and thus open the outlet. Again at the inward stroke of the

piston, the arm *p* of the shaft *l* of the governor will strike against and throw over the handle *h* of valve *g* and thus open the inlet to the cylinder. It is to be understood
 5 that normally the handles *h* and *j* of the valves are thrown by springs *h'* into such a position that the valves are closed and the opening of these valves is controlled by the governor *k* through the arms *p* and *v*. As already explained the arm *p* operating the inlet valve
 10 is not carried by the shaft *l* of the governor but by the sliding sleeve *o* thereon. Should the engine exceed a certain prescribed speed the governor *k* through the rapid revolution of its shaft *l* will either refuse to open
 15 the inlet valve *g* or will only open the same to a slight extent (by the contact of the curved ends of the handle *h*, and arm *p*) thus reducing instantly the excess of speed. This is accomplished by the drum *o* and elbow levers *r r* which latter, when rotated rapidly by said drum tend to throw off at a tangent the spring controlled weight arms *s' s'*,
 20 when the arms *u* operating in the recesses *u'* of the sleeve *o* will slide the sleeve outward and thus throw the arm *p* out of alignment or contact with the handle *h* of the inlet valve to a greater or less extent. When the speed slackens the springs *t* tend to return the arms
 25 *r r* and thereby the sleeve *o* and its arm *p* to the normal position when the outlet valve will be opened to its normal extent. It is obvious that any valve may be adapted to be controlled by the governor *k* although the form shown in the drawings will suffice to illustrate the spirit of our invention.
 30

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

40 1. The combination of the cylinder, the piston, connecting rod and fly-wheel of an en-

gine, with the inlet and outlet pipes arranged parallel to each other and entering the end of the cylinder, the inlet and outlet valves arranged alongside each other and provided
 45 with extending handles, and with the governor consisting of a shaft operated directly by the fly-wheel and sleeve splined to said shaft and weighted elbow levers pivoted to said shaft and adapted to slide said sleeve on
 50 said shaft, said shaft and sleeve being adapted to operate respectively the outlet and inlet valves, substantially as described.

2. The combination of the cylinder *b*, piston *d*, connecting rods *c* and fly-wheel *a*, with
 55 the shaft *l*, mechanism whereby the fly-wheel rotates said shaft, the drum *n*, keyed to said shaft, elbow levers *r r* controlled by spring *t* and pivoted to said drum, a sliding sleeve *o* splined to said shaft *l* and adapted to be op-
 60 erated by said levers *r r*, and arms *v* and *p* carried respectively by the shaft *l* and sleeve *o*, and with the inlet pipe *e*, outlet pipe *f*, arranged parallel with each other and entering the ends of the cylinder, inlet valve *g*, outlet
 65 valve *i*, said inlet and outlet valves being provided with projecting spring controlled handles *h* and *j* respectively, all arranged so that when said sleeve *o* and shaft *l* are rotated they will alternately operate said valves *g* and
 70 *i* by the arms *v* and *p* alternately engaging and throwing over the handles *j* and *h* respectively, substantially as described.

In testimony that we claim the foregoing we have hereunto set our hands this 13th day
 75 of December, 1892.

ADAM DANNER.

GEORGE ROTHENBÜCHER.

Witnesses:

ALFRED GARTNER,

WM. D. BELL.