

J. DAVIDSON & T. R. HAMPSON.
ENGINE GOVERNOR.

(Application filed June 6, 1899.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

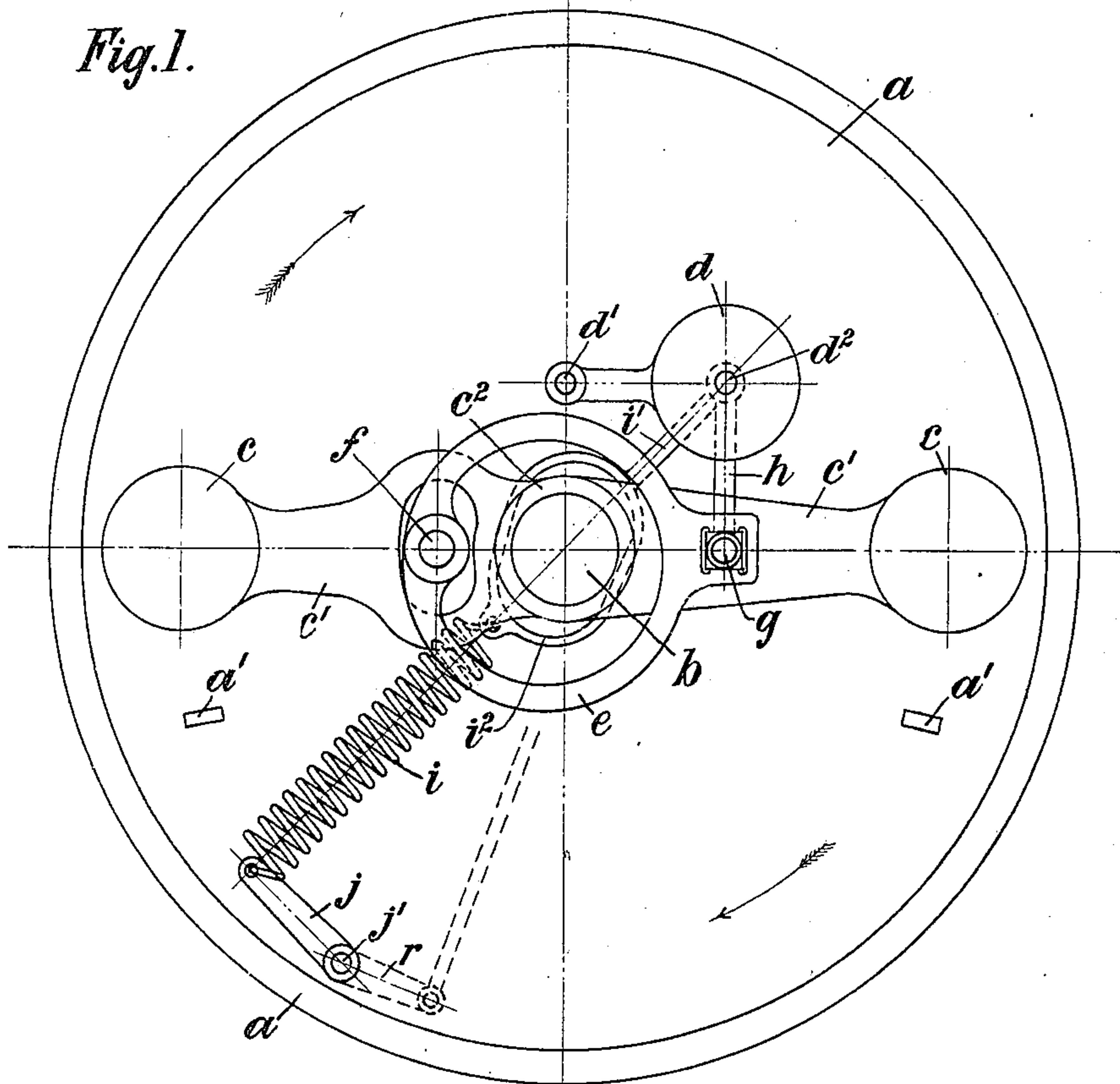
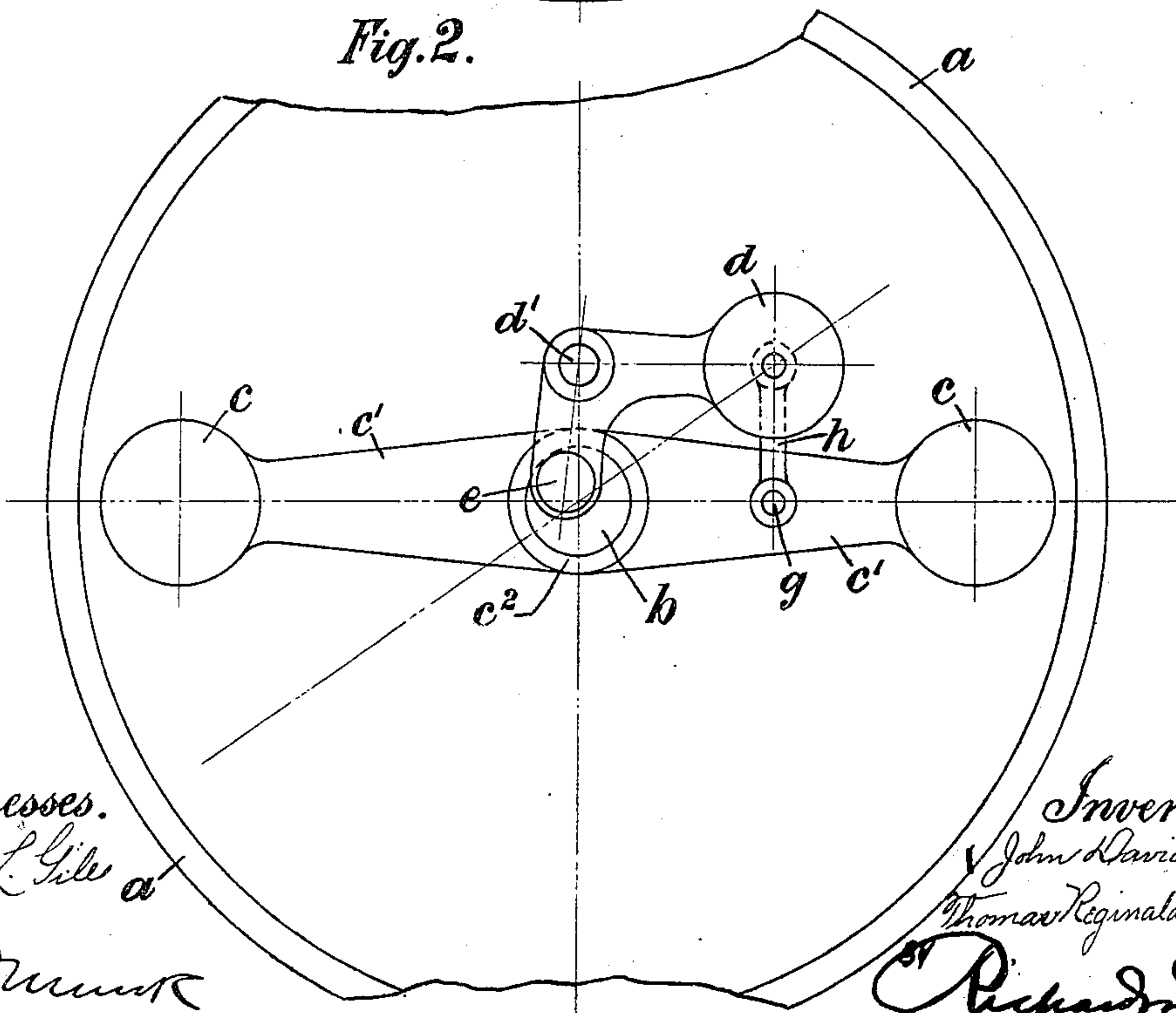


Fig. 2.



Witnesses.

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2 Sheets—Sheet 2.

(No Model.)

Fig. 5.

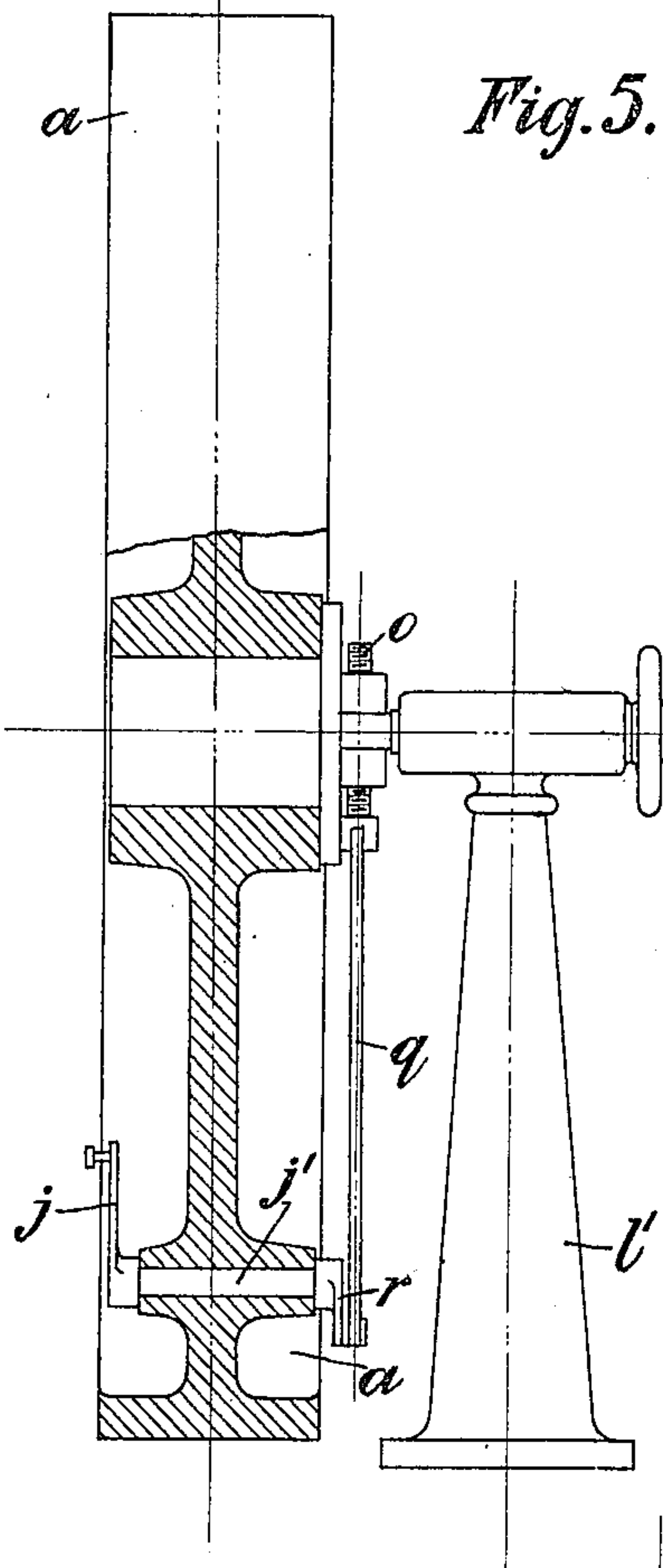


Fig. 4.

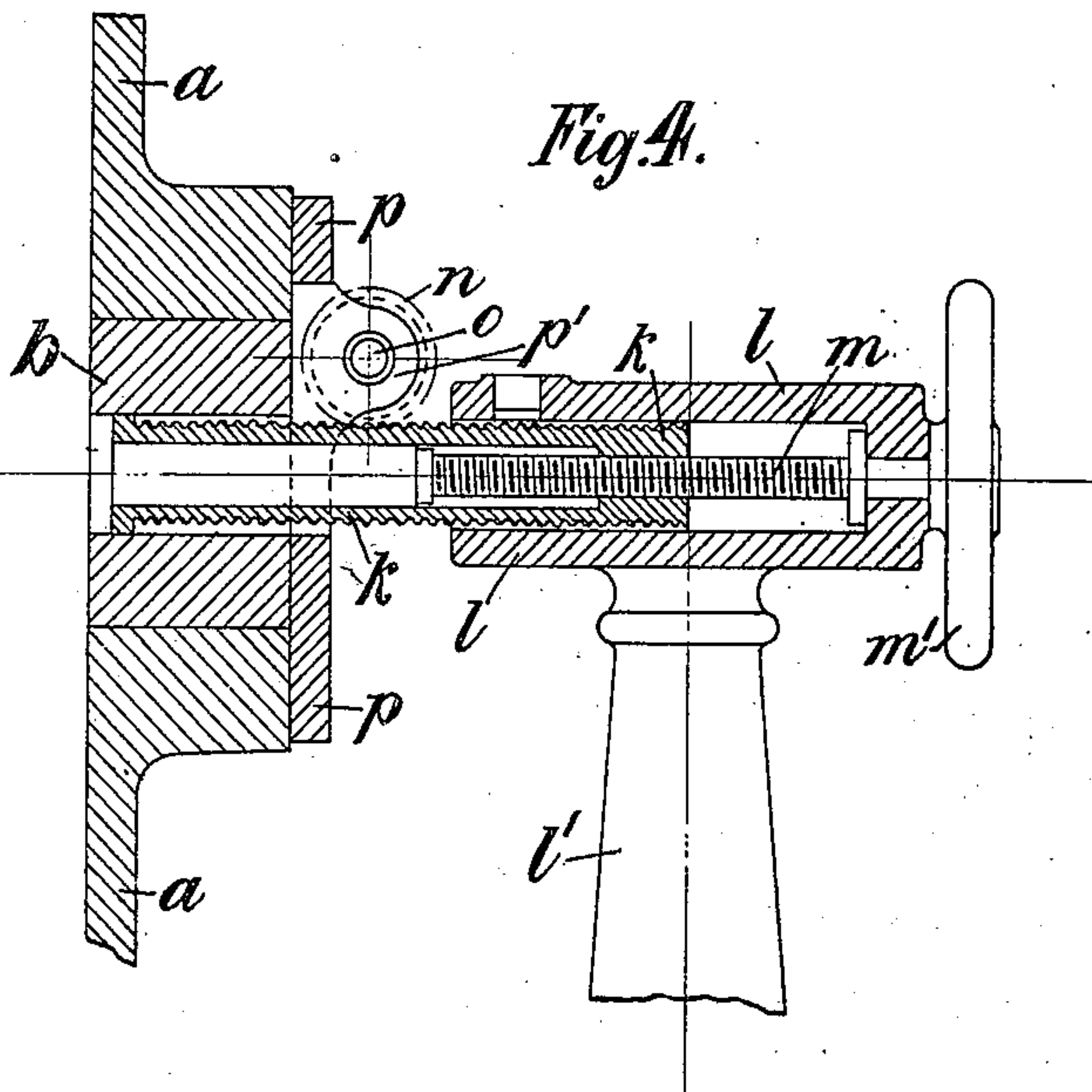
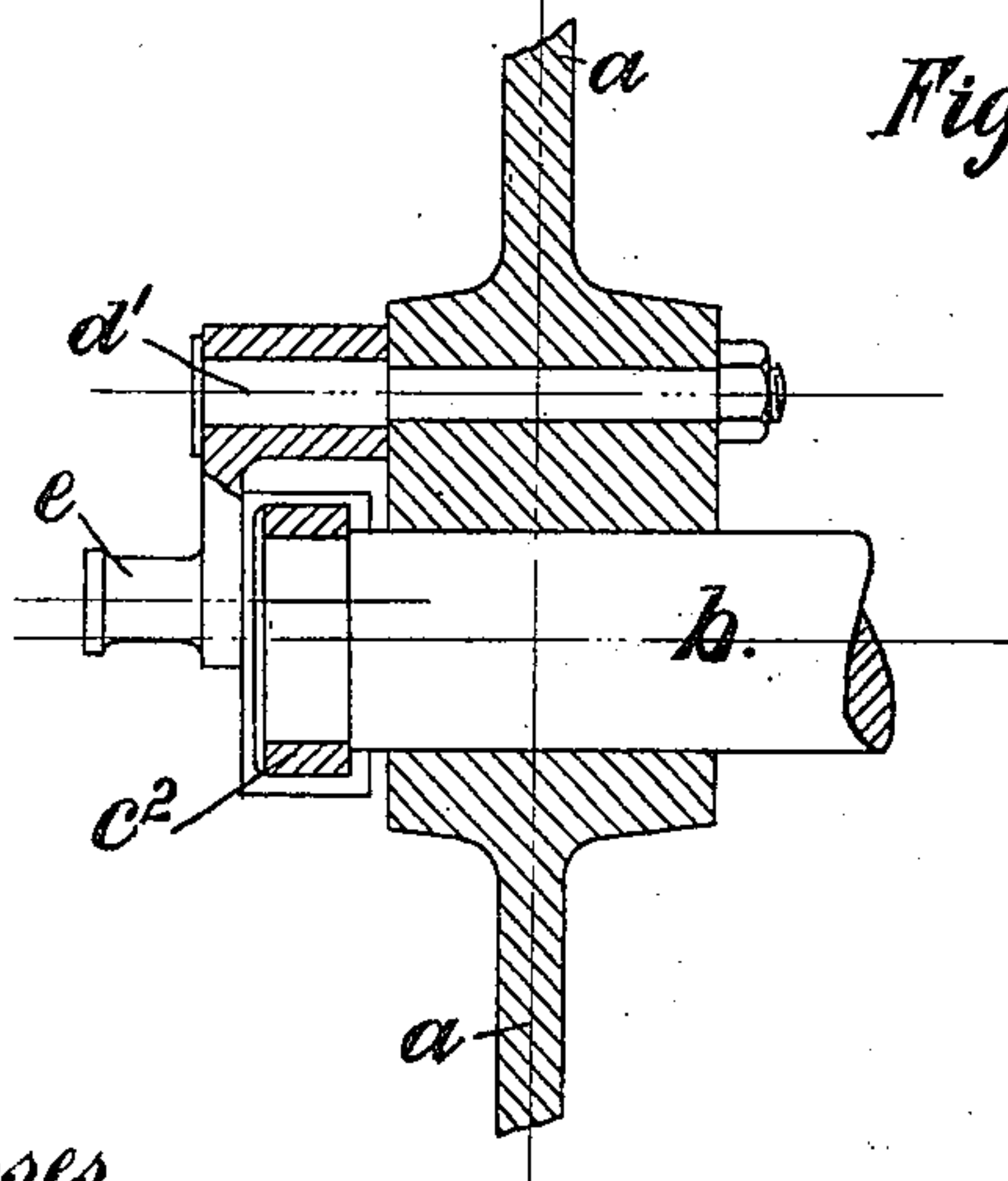


Fig. 3.



Witnesses.
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UNITED STATES PATENT OFFICE.

JOHN DAVIDSON, OF ECCLES, AND THOMAS REGINALD HAMPSON, OF
CHESTER, ENGLAND.

ENGINE-GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 670,131, dated March 19, 1901.

Application filed June 6, 1899. Serial No. 719,590. (No model.)

To all whom it may concern:

Be it known that we, JOHN DAVIDSON, a resident of Eccles, and THOMAS REGINALD HAMPSON, a resident of Chester, England, subjects of the Queen of England, have invented certain new and useful Improvements in Engine-Governors, of which the following is a specification.

This invention has reference to governors for steam and other fluid-pressure engines, and more particularly to the type of centrifugal governors in which centrifugal weights control the position of an eccentric connected with the valve or valve-gear by which the throw of the eccentric is altered.

According to this invention in connection with a disk or wheel on the engine or other shaft which carries the governor there is an eccentric pivoted or mounted on one side of the disk, while on the shaft there is loosely mounted a balanced inertia mass, and to a part of this mass the eccentric is connected, at the opposite side of the shaft to which it is connected to the disk or wheel, by a suitable joint. On a separate part of the disk there is a centrifugal weighted arm, which is hinged upon a pin or similar joint, and this arm is connected to the inertia mass. The position of the governor due to the speed at which it is revolved is controlled by a spring which is preferably attached to the centrifugal weight in such a manner as to act in a line directly through the center of the shaft, whereby the weight pivot or joint is relieved of unnecessary pressure.

A governor having the characteristics herein described is powerful, and the pressure on the joints and parts due to centrifugal force is obviated, and thereby its action is rendered sensitive, and it possesses a high degree of effectiveness, while at the same time a powerful drive to the gear can be obtained and not at the expense of great friction. The gear for speeding the governor consists of a circular toothed rack which is moved axially in and out of a frame by a screw-gear, a wheel mounted on a threaded spindle or worm carried on the governor-wheel and meshing with the circular rack and serving as a nut to the threaded spindle, and a lever and other con-

nections connecting this spindle with the spring, also carried on the wheel.

Drawings illustrating this invention are annexed to this specification, in which—

Figure 1 is a side elevation showing one arrangement of governor under the invention, while Figs. 2 and 3 show a modification in side elevation and cross-section. Figs. 4 and 5 are a longitudinal section and an outside view, partly in section, showing the speeder mechanism or gear under the invention.

Referring in the first instance to Fig. 1, *a* is the carrier disk or wheel, and *b* is the shaft (which generally will be the crank-shaft) of the engine on and in connection with which the several parts of the governor are mounted and work. The loosely-mounted inertia-weight shown consists of two bob-weights *c*, at equal distances from the center of the shaft, on the end of arms *c'*, carried by a boss *c²*, which fits freely over and is carried by the end of the shaft *b* and about which it is free to move.

d is the centrifugal weight, and *d'* is the supporting or carrying pin for the weight mounted on the disk *a*.

e is the eccentric-sheave from which the cut-off valve of the engine would be driven, one part of which is pivoted on and carried by the pin *f*, mounted on the disk *a*, and another part—viz., at a point on the opposite side of the shaft—is connected with the inertia-weight arm *c'* by a pin *g*. To this inertia-weight also the centrifugal weight *d* is connected, the connection being by the link *h*, one end of which in the case shown is connected to the inertia-weight by the same joint-pin *g*, while the other is connected to the center of the centrifugal weight *d* by a pin *d²*.

i is the spring by which the position of parts above specified is controlled and normally held, the connection of the spring with the weights being by means of the rod *i'*, one end of which is coupled up with the weight *d* by the central pin *d²*, while to the other end, which is in the form of a link *i²* for spanning the shaft *b*, the spring is directly attached. The outer end of the spring *i* is held by an arm *j* on the pin *j'*, carried in the disk *a* and adapted to oscillate axially in it. This arm

j is controlled from the speeder-gear herein-
after described. It will be seen that the
spring is so disposed in relation to the cen-
trifugal weight d as to act in a line directly
5 through the center of the shaft b . By this
disposition in action the pressure on the joint
 d' is relieved and the friction due to the cen-
trifugal force is largely diminished or obvi-
ated and its action rendered sensitive.

10 In action under normal conditions when the
engine is running at the rate of speed re-
quired the governor parts—namely, the in-
ertia mass or weight c and centrifugal weight
 d and eccentric-sheave e —would take the
15 relative positions shown, the direction of rev-
olution of the disk a being that indicated by
the arrow in Fig. 1. When a change of speed
takes place—say an increase—the weight c
owing to the inertia of the mass will not di-
20 rectly receive the increase of speed and will
not therefore move so fast as a —that is, it
will tend to lag behind, while the centrifugal
weight d will move outward about its sup-
porting-pin d' by the increase of centrifugal
25 force. By these combined movements of the
two weights c and d the eccentric-sheave e ,
which drives the valve, is shifted—that is, its
center is shifted in relation to the crank of
the engine—and the speed reduced in the
30 well-known way. If the speed of the engine,
on the other hand, falls below the normal and
that required, the mass c tends to overrun the
disk a by the inertia of momentum, and as
the forces due to the centrifugal action of the
35 weight d become reduced the pull of the
spring i becomes greater than the opposing
force of the weight, and this excess of force
coupled with that due to the inertia mass c
moves the eccentric-sheave e in the opposite
40 direction and so alters the throw of the valve
it works in the opposite direction and the
speed of the engine is increased in the well-
known way. In these actions a limit of move-
ment of the balanced inertia-weight c in either
45 direction is obtained by the stops a' on the
disk a .

The modification of the governor shown in
Figs. 2 and 3 consists in using an eccentric-
pin e —i. e., eccentric to the center of the
50 shaft b —outside the end of the shaft b for
working the valve of the engine in lieu of an
eccentric-sheave and making this eccentric-
pin in one with the centrifugal weight. This
weight is coupled up with the inertia-weight
55 c and adapted to be held in by a spring, as
in the case above described. In other re-
spects it is the same as the above governor.

The gear for adjusting the governor so as
to cause the engine to run at the speed re-
60 quired is shown in Figs. 4 and 5. In this
gear k is the circular toothed rack. It is mount-
ed in the hollow sleeve l on the fixed stand l'
and moves in and out of such sleeve by a
screw-spindle m , operated by the hand-wheel
65 m' . n is the toothed nut-wheel, which meshes
with the circular teeth of the rack k and has

a threaded hole or bore through it, and o is
the threaded shaft or worm which passes
through this hole and gears with the thread
thereof. The shaft o is carried in a fitting p 70
on the boss of the disk a , having brackets p' .
The shaft o is connected by a connecting-rod
 q with an arm r , mounted on the spindle j' ,
carrying the holding-arm j of the spring i .
In operation by turning the screw-wheel m' 75
in either direction the rack k is moved in or
out, (being suitably prevented from rotating,) and
this rotates the nut-wheel n , which, hav-
ing a thread internally where it fits over the
shaft o and being prevented from turning by 80
its connection with q , moves it longitudinally
in one or other direction, and so through the
connecting-rod q and arms r and j it diminishes
or increases the tension of the spring i . As
regards the movement of these parts due to 85
the rotation of the engine-shaft, as the axis of
the circular rack k is coincident with that of
the engine-shaft the wheel n revolves bodily
about this rack while in constant gear with
it and without acting upon it. 90

What is claimed in respect of the herein-
described invention is—

1. In combination in an engine-governor,
the combination with the engine-shaft, a car-
rier fixed thereon and a balance inertia mass, 95
of a weight having an arm pivoted to said
carrier, a second arm extending from the
right at right angles to the first pivoted to
said mass, an arm extending from the weight
intermediately of the first and a second hav- 100
ing a loop encircling the engine-shaft, a spring
connected thereto arranged in alinement with
the third arm and an eccentric for control-
ling the valve-gears pivoted to the carrier,
and to said second arm an inertia mass at the 105
point of connection of second arm and mass.

2. An engine-governor of the kind herein
referred to, comprising a balanced loosely-
mounted inertia-weight carried on the en-
110 gine-shaft, a carrier; a centrifugal weight piv-
oted to the carrier and having a connection
to said inertia-weight; an eccentric connected
with and controlled by said weights; a spring
for controlling said weights; a stationary
rack with circular teeth coincident with the 115
axis of the engine-shaft, and adapted to be
moved longitudinally; and a wheel carried by
the shaft, having teeth meshing with the cir-
cular teeth of the rack, and motion-convey-
ing connections between said wheel and said 120
spring for regulating same; substantially as
set forth.

3. An engine-governor of the kind herein
referred to comprising a balanced loosely-
125 mounted inertia-weight carried on the en-
gine-shaft, a carrier; a centrifugal weight piv-
oted to the carrier and having a connection to said
inertia-weight; an eccentric connected with
and controlled by said weights; a spring for
controlling said weights; a stationary rack k 130
with circular teeth, coincident with the axis
of the engine-shaft, and adapted to be moved

longitudinally; and a wheel *n* carried by the shaft, having teeth meshing with the circular teeth of the rack *k* and acting as a nut; and a threaded shaft *o* on which said nut-wheel acts, ⁵ and revolving therewith, and connected with the spring of the governor; substantially as set forth.

In witness whereof we have hereunto set our hands in presence of two witnesses.

JOHN DAVIDSON.

THOS. REGINALD HAMPSON.

Witnesses:

WILLIAM CASH,
JNO. E. WALKER.