

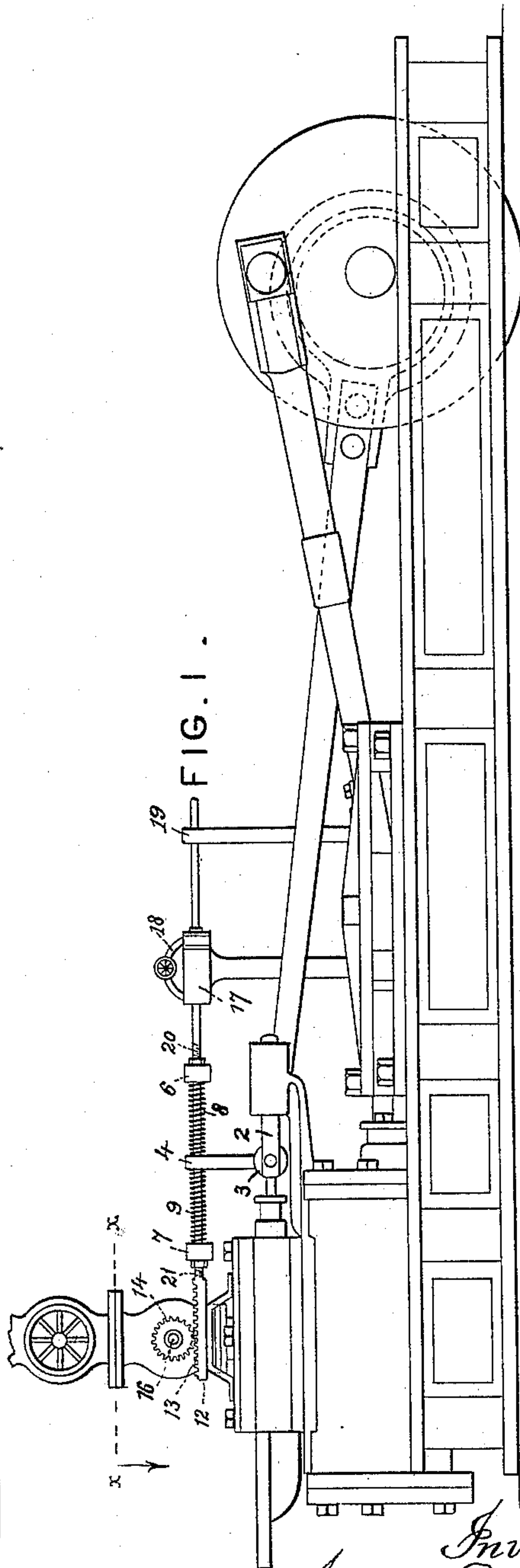
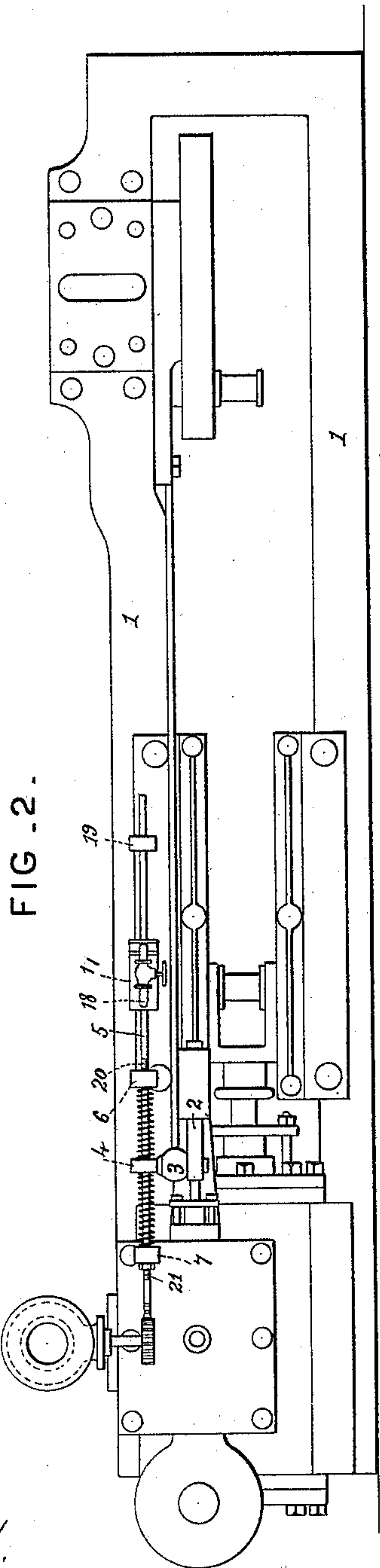
(No Model.)

2 Sheets—Sheet 1.

J. D. GRAY.
GOVERNOR AND CUT-OFF VALVE GEAR.

No. 417,170.

Patented Dec. 10, 1889.



Attest.
Geo. T. Smallwood.
Chas C. Buckley

Inventor
James D. Gray
by M. J. Foote
his Attorney

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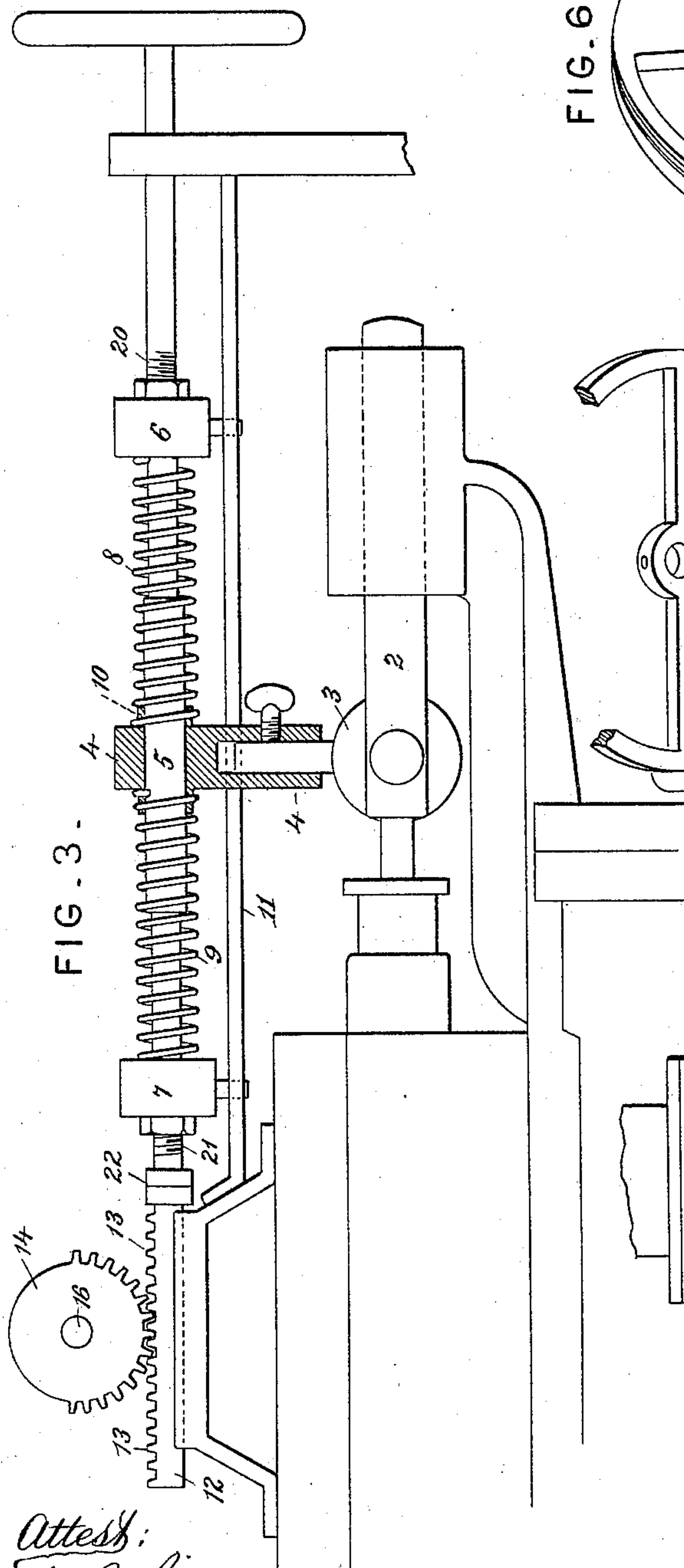


FIG. 3.

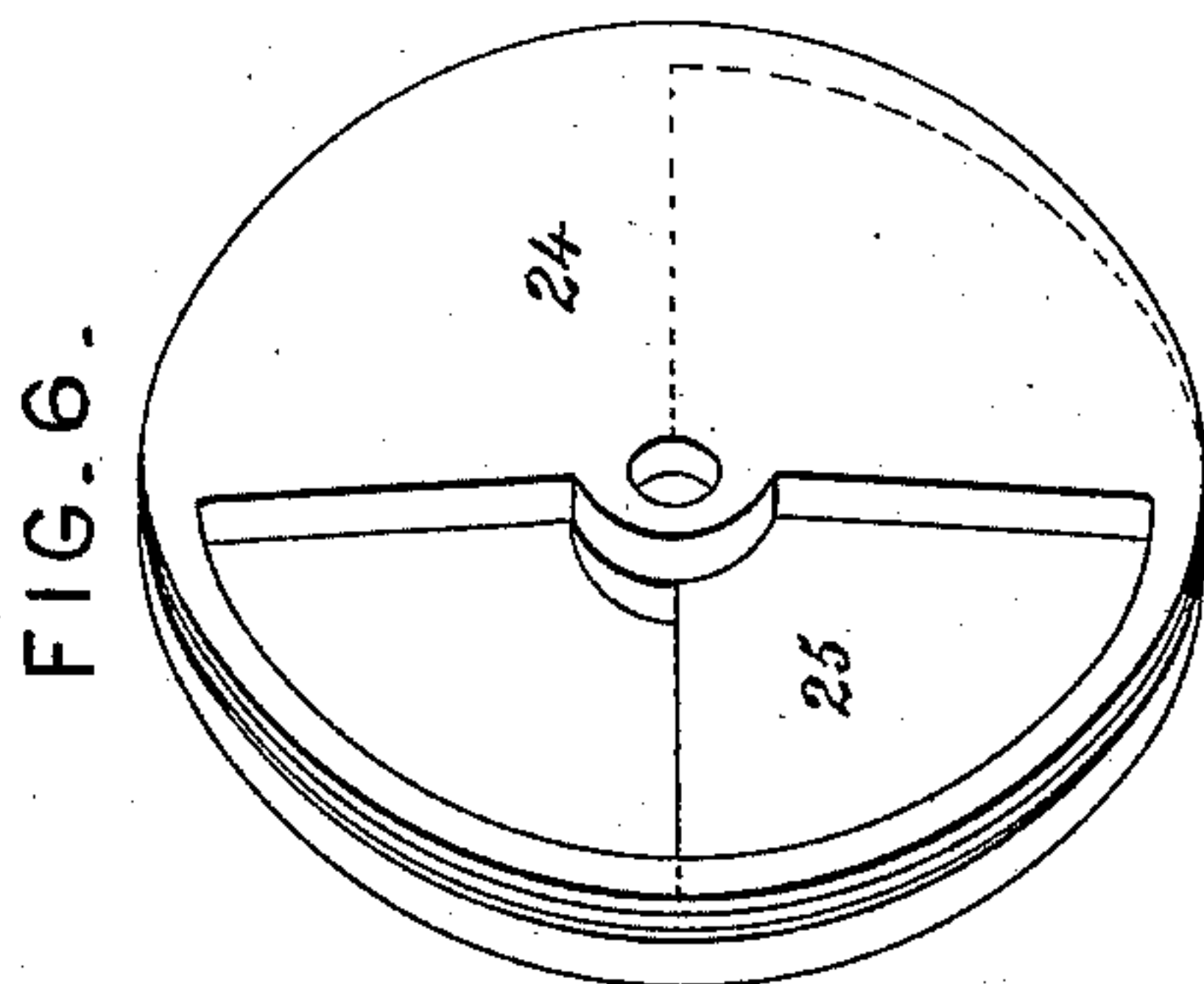


FIG. 6.

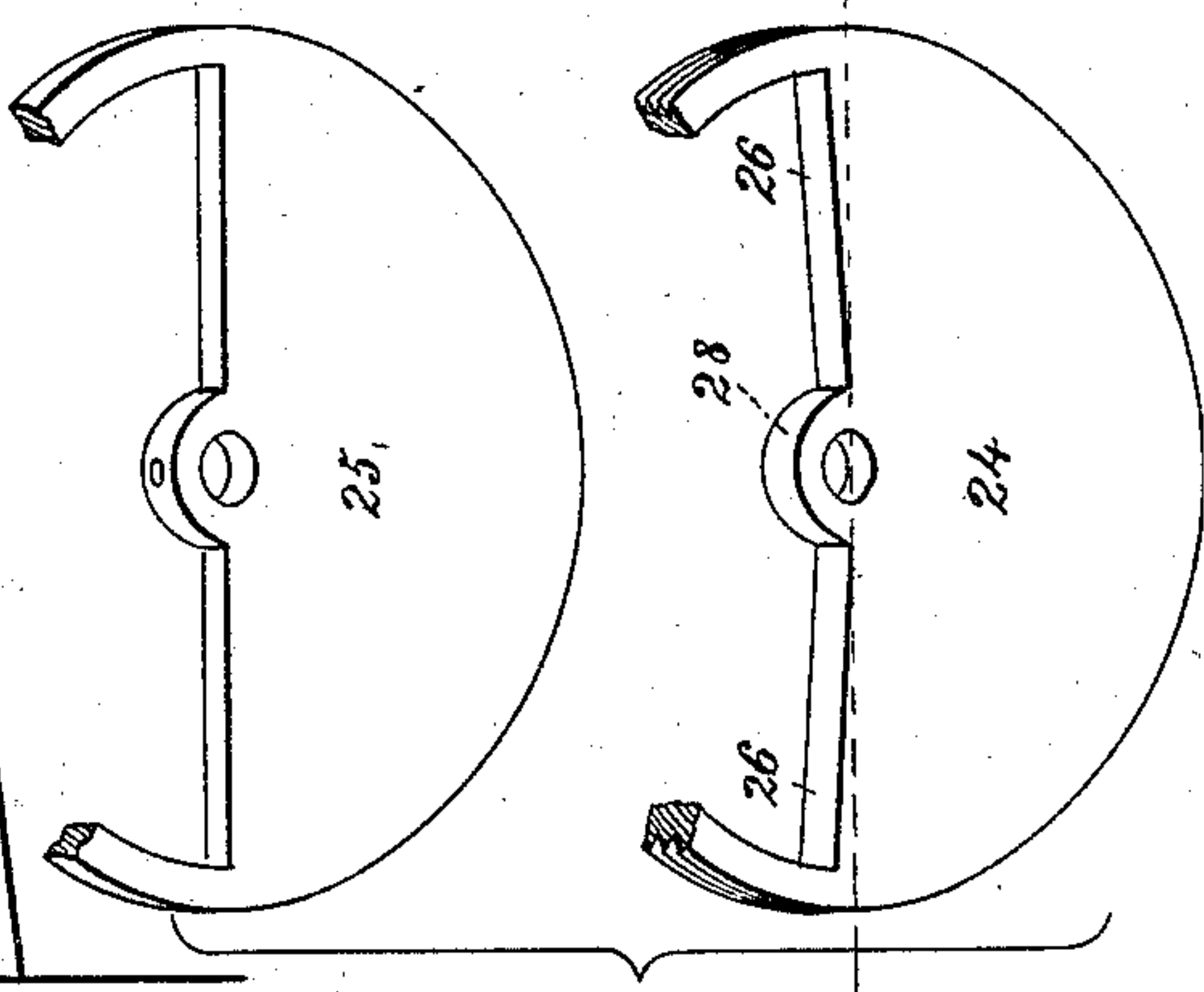


FIG. 5.

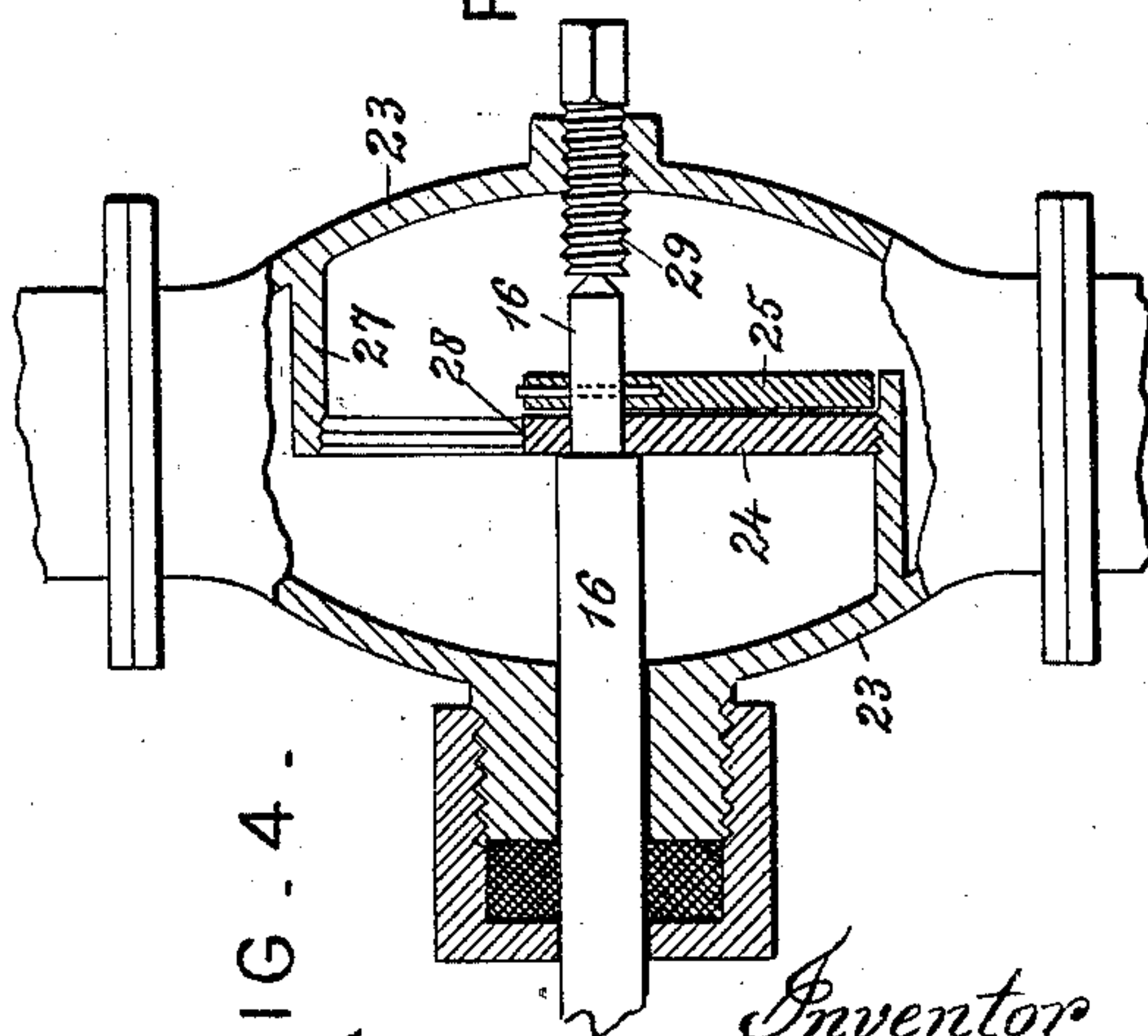


FIG. 4.

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UNITED STATES PATENT OFFICE.

JAMES D. GRAY, OF ARLINGTON, VIRGINIA, ASSIGNOR TO LOUIS M. BERRY,
OF READING, PENNSYLVANIA.

GOVERNOR AND CUT-OFF-VALVE GEAR.

SPECIFICATION forming part of Letters Patent No. 417,170, dated December 10, 1889.

Application filed February 2, 1889. Serial No. 298,455. (No model.)

To all whom it may concern:

Be it known that I, JAMES D. GRAY, a citizen of the United States of America, residing at Arlington, in the county of Alexandria and State of Virginia, have invented certain new and useful Improvements in Automatic Governor and Cut-Off-Valve Gears, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to that class of automatic governors and cut-offs designed to regulate the admission of steam or other imponderable agent in such a manner as to render the rate of the engine constant through all the variations of the resistance to be overcome, and designed also to so admit the steam at such times during the quartering of the stroke as will best develop the efficiency of the engine.

My invention has for its object the adoption of means simple and compact in form and moderate as to its cost of construction which will equalize the variations in magnitude undergone by the driving-couple in its stroke, which is accomplished by gradually cutting off the steam as the driving-couple advances toward one of the points of its least efficiency—viz., at the end of the stroke of the piston—and upon arrival at said point entirely closing the initial entrance, and as the driving-couple recedes from said point gradually opening said initial entrance until upon the arrival of the driving-couple at the quarter-stroke of the piston, or the point of its greatest magnitude or efficiency, the initial entrance is entirely opened, admitting the full pressure or head of steam.

My invention consists in a reciprocating rod which reciprocates loosely through a connecting rod or arm, which latter has its other extremity secured by means hereinafter described to the valve-stem or eccentric-rod of an engine. Said rod has one of its ends formed into a rack, which engages with a pinion secured to the shaft, which actuates the valve admitting the steam to the steam-chest. Interposed are two spiral springs coiled about the reciprocating rod between a weight or weights and the connecting rod or arm secured to the valve-stem or eccentric-rod, said

weight or weights traveling or riding in guides. The two coiled springs may be increased in resiliency by means of right-and-left-hand screws. I also, when found necessary, employ a hydraulic cylinder provided with a delivery-pipe connecting or opening communication between the two ends of the cylinder, the piston-head of said cylinder being connected to the reciprocating rod.

The admission-valve consists of a valve-seat, preferably flat in form, provided with screw-threads on its periphery, which mesh with screw-threads cut in a projection cast with the casing, said seat describing or forming the half of a circle, the other half of which is open for the entrance of the steam. The valve-face is also formed flat and constitutes slightly more than the half of a circle, providing a lap, which forms a tight joint. The valve-shaft, to which the face is rigidly secured, passes loosely through the seat and impinges against the point of an adjusting thumb-screw.

The accompanying drawings represent a convenient arrangement of parts attached to a stationary engine, carrying out the object of my invention.

Figure 1 represents a side view of my improved governor and cut-off attached to a stationary engine. Fig. 2 is a plan view of the same. Fig. 3 is an enlarged view, shown detached from the engine, of my improved governor and cut-off. Fig. 4 is a vertical section through the admission-valve casing. Fig. 5 is a detail plan view of the valve-seat and valve-face. Fig. 6 is a detail view showing the relative positions of the valve face and seat in full and dotted lines.

1 is an ordinary steam stationary engine, to the valve-stem 2 of which is attached by means of a friction-clamp 3 or other suitable means the connecting-arm 4, which latter has its upper extremity bossed, through which passes loosely the reciprocating rod 5, provided with weights 6 and 7 and spiral springs 8 and 9, coiled about said reciprocating rod, one of each of the extremities of said spiral springs 8 and 9 being secured to or impinging against the weights 6 and 7 and their remaining extremities respectively impinging against or secured to each side of the boss 10, formed at

the loose connection between the reciprocating rod 5 and the connecting-arm 4. I also provide guides or travelers 11 for the said weights 8 and 9. A portion of said reciprocating rod 5 is formed into a rack 12, the teeth 13 of which engage in a pinion 14, secured to the shaft 16 of the admission-valve. I also, when necessary, provide a hydraulic cylinder 17, through which the reciprocating rod 5 passes, and a branch or delivery pipe 18, communicating with each end of the cylinder, permitting the liquid to alternately act as a stop or resistance against the piston-head of the cylinder at each end thereof. An arm or standard 19, suitably braced to modify friction, serves as a support and guide for the outer portion of the reciprocating rod 5. The interior periphery of the weights 6 and 7 where the reciprocating rod 5 passes through them and the length of the same portion of said rod 5 are screw-threaded at 20 21 with right and left threads, respectively, and the end of the rod may be provided with means by which the said rod is rotated to increase the tension of the springs 8 and 9. The reciprocating rod 5 may be formed in two parts and a union effected by means of a coupling 22, so that the tension of the springs may be increased by means heretofore described without disturbing the relative position of the rack 12 to the pinion 14.

The admission-valve consists of the casing 23, which is provided with a valve-seat 24, forming the half of a circle, through which the valve-shaft 16 passes loosely. The valve-face 25, secured to shaft 16, forms or describes slightly more than the half of a circle, so that a lap 26 is formed, making a tight joint between the face 25 and seat 24 when the valve is closed. The valve-seat 24 has its periphery screw-threaded, which meshes with a screw-thread on the projection 27, cast with the valve-casing. The valve-shaft 16 passes loosely through the hub 28 of the valve-seat 24 and impinges against the thumb-screw 29.

The operation of my device is as follows: The reciprocating motion of the valve-stem 2 of the engine is communicated to the reciprocating rod 5 by means of connecting-arm 4, the reciprocation of the said rod 5 being converted into a motion of rotation of the valve-shaft 16 by means of the rack 12 and pinion 14, which motion of rotation is communicated to the valve-face 25, causing the latter to assume varying positions relative to the seat 24, and consequently alternately opening and closing the admission-port in extent proportionate to the throw of the reciprocating rod, which throw is dependent upon the tension of the springs 8 and 9. It will be seen that by the peculiar construction of the admission-valve the steam tends to keep the seat and face from each other, permitting the ready opening of the valve against pressure, it having been heretofore found necessary to admit steam from the opposite direction in order to avoid the necessity of opening the valve

against said pressure. It will also be seen that the valve face and seat being formed flat avoids the excessive cutting incident to the ordinary conical valve. By means of the thumb-screw the valve-face may be regulated relatively to the seat. I preferably adjust the pinion 14 relatively to the rack 12, so that at the beginning of each quarter-stroke the port of the admission-valve will be open, and as the driving-couple of the engine recedes from the said point gradually closes the port of the admission-valve, so that when said driving-couple arrives at the point of least magnitude or efficiency—viz., the end of the stroke of the piston—the valve will be closed. As the velocity of revolution of the engine increases the resistance of the weights 6 and 7 becomes greater, which in turn increases the resiliency of the springs 8 and 9, thus shortening the throw of the reciprocating rod 5 and the relative width of opening of the admission-valve, and necessarily as the velocity diminishes the throw of the rod is increased with its consequent effect upon the admission-valve.

In high-speed engines it may be found necessary to use only one of the weights, or the resiliency of the springs secured to stops alone may even be sufficient; but in engines of a desired moderate speed heavy weights and springs of great resiliency will be needed, while in slow-speed engines it may be found necessary to use the hydraulic cylinder, each case depending upon its individual necessities.

The resistance of a suitable body is employed in my improved device, instead of the usual centrifugal force, and it is obvious that as it is not necessary to develop the force of resistance, as in the case of a centrifugal governor, therefore my governor and cut-off is much more sensitive at the working-point, and therefore more efficient, at the same time being more compact in form and costing less in construction. It will also be seen that I provide an admission-valve flat in form capable of being readily opened against pressure and having only one port of entrance.

Instead of connecting the connecting-arm to the eccentric-rod or valve-stem of the engine, it may be found most desirable to provide an eccentric and connect its rod directly to the reciprocating rod of the governor.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is the following:

1. The combination, with an admission-valve of an engine, of an automatic governor and cut-off consisting of a weighted reciprocating rod, interposed adjustable springs, and means for converting said reciprocatory motion of the rod to rotary motion of the said admission-valve, as set forth.

2. The combination of an admission-valve, a reciprocating rod, interposed adjustable springs, a stationary hydraulic cylinder serv-

ing as a resistance, and means by which said reciprocatory motion of the rod is converted into rotary motion of the said admission-valve, as set forth.

5 3. The combination, in an automatic governor and cut-off, of an admission-valve a pinion, a weighted rack or rod, and interposed spiral springs, said weighted rod being loosely connected with the connecting-arm of the
10 valve-stem, as set forth.

4. The combination, in an automatic governor and cut-off, of an admission-valve, and a weighted rack and rod connected loosely to the connecting-arm by means of adjustable
15 spiral springs, said connecting-arm being connected to the valve-stem of an engine, as set forth.

5. The combination of a weighted rack or rod having a reciprocating motion, and means

for converting said reciprocating motion into 20 rotary motion of an admission-valve, which latter consists of a valve-face and valve-seat flat in form, having a single port of initial entrance and capable of being readily opened against pressure, as set forth. 25

6. The combination of a weighted reciprocating rod having a portion of its length formed into a rack, a pinion secured to the valve-stem of the admission-valve and meshing with said rack, interposed spiral springs, 30 and a stationary hydraulic cylinder for increasing resistance, as set forth.

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

JAMES D. GRAY.

Witnesses:

S. A. TERRY,

JOHN A. ROLLINGS.