

(No Model.)

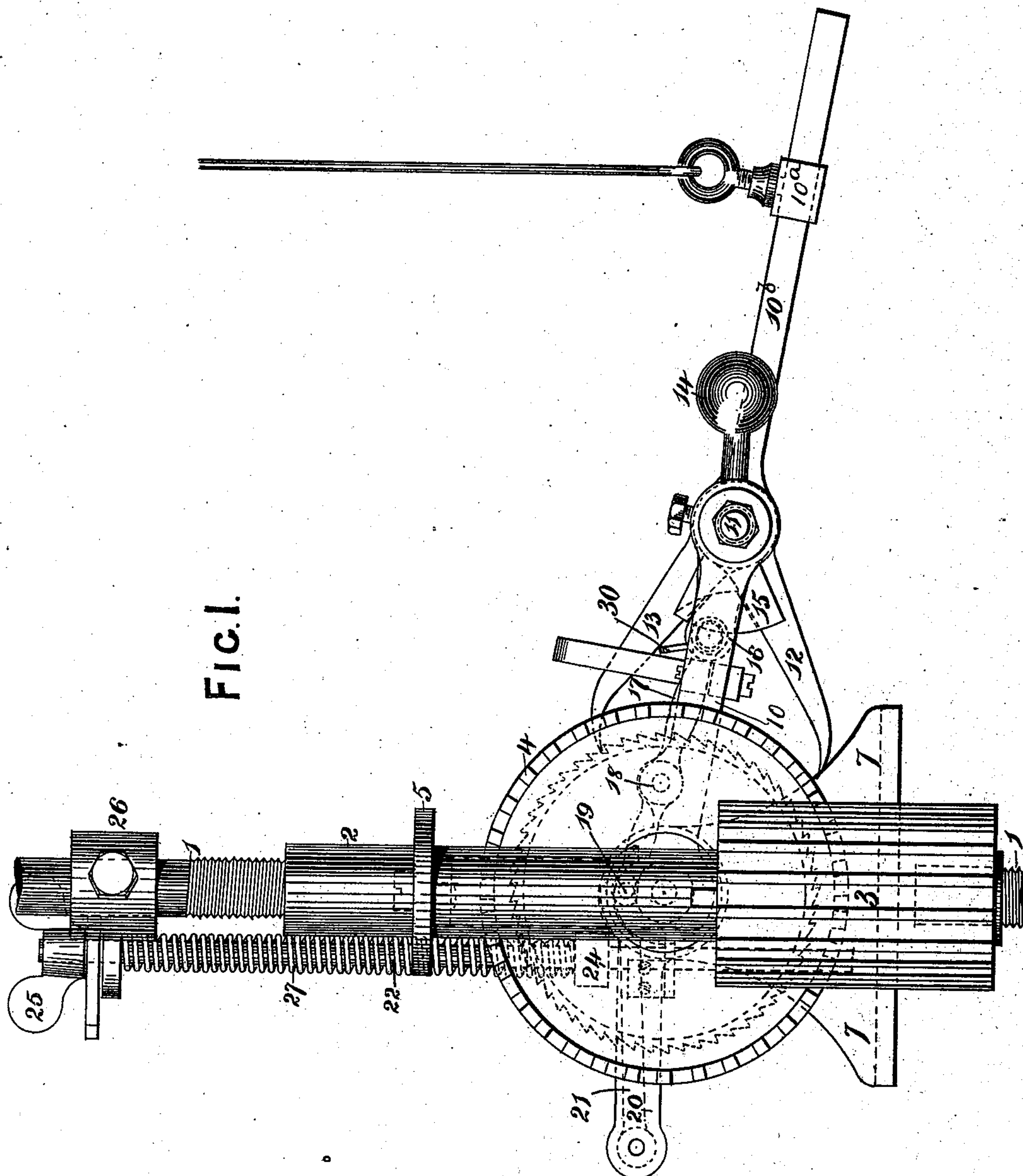
4 Sheets—Sheet 1.

R. WILBY.

APPARATUS FOR CONTROLLING THE SPEED OF STEAM ENGINES.

No. 382,577.

Patented May 8, 1888.



WITNESSES:

H. S. Ogden.

INVENTOR:

Richard Wilby.

(No Model.)

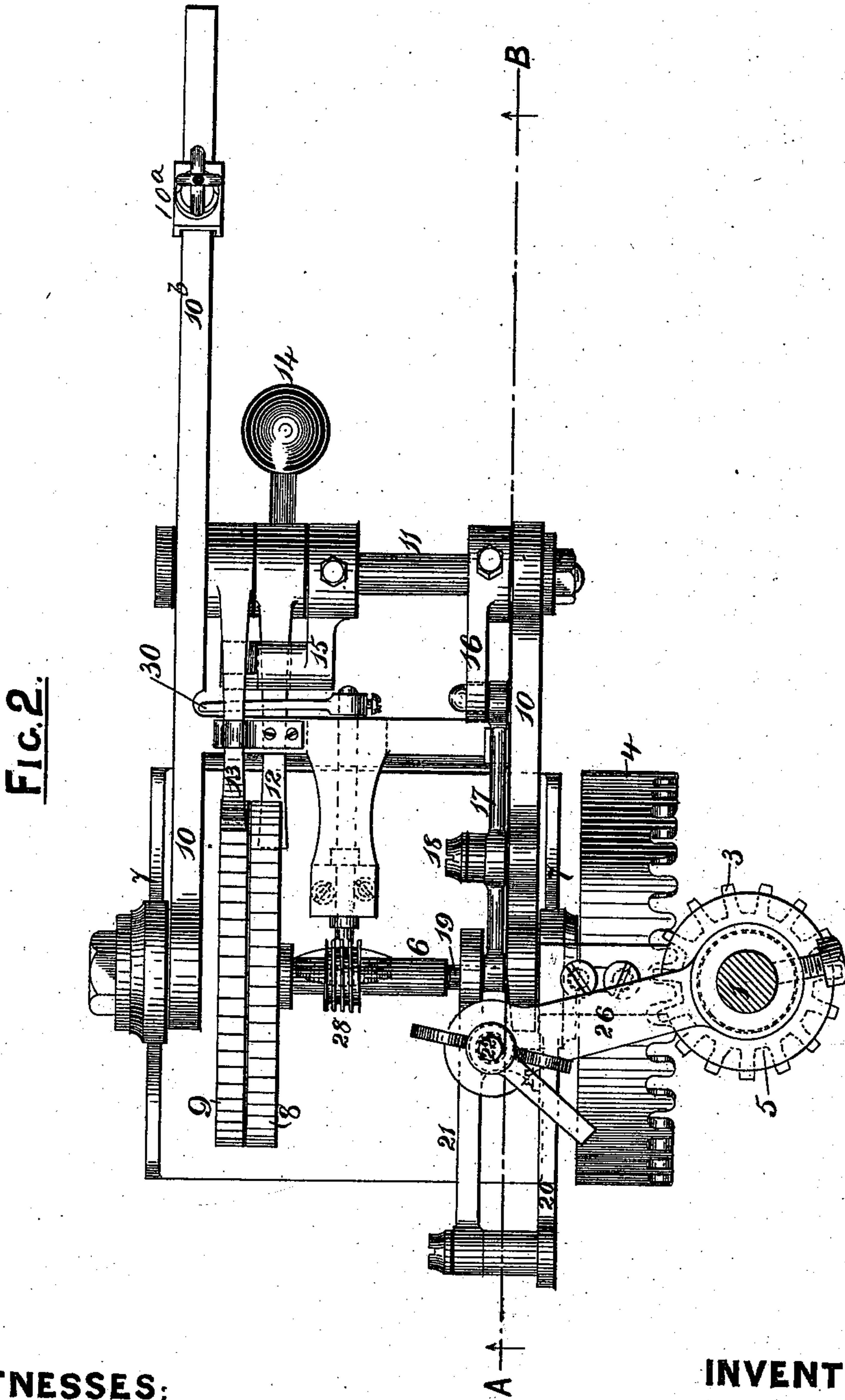
4 Sheets—Sheet 2.

R. WILBY.

APPARATUS FOR CONTROLLING THE SPEED OF STEAM ENGINES.

No. 382,577.

Patented May 8, 1888.



WITNESSES:

Abbronsky
H. S. Ogden.

INVENTOR:

Richard Wilby

(No Model.)

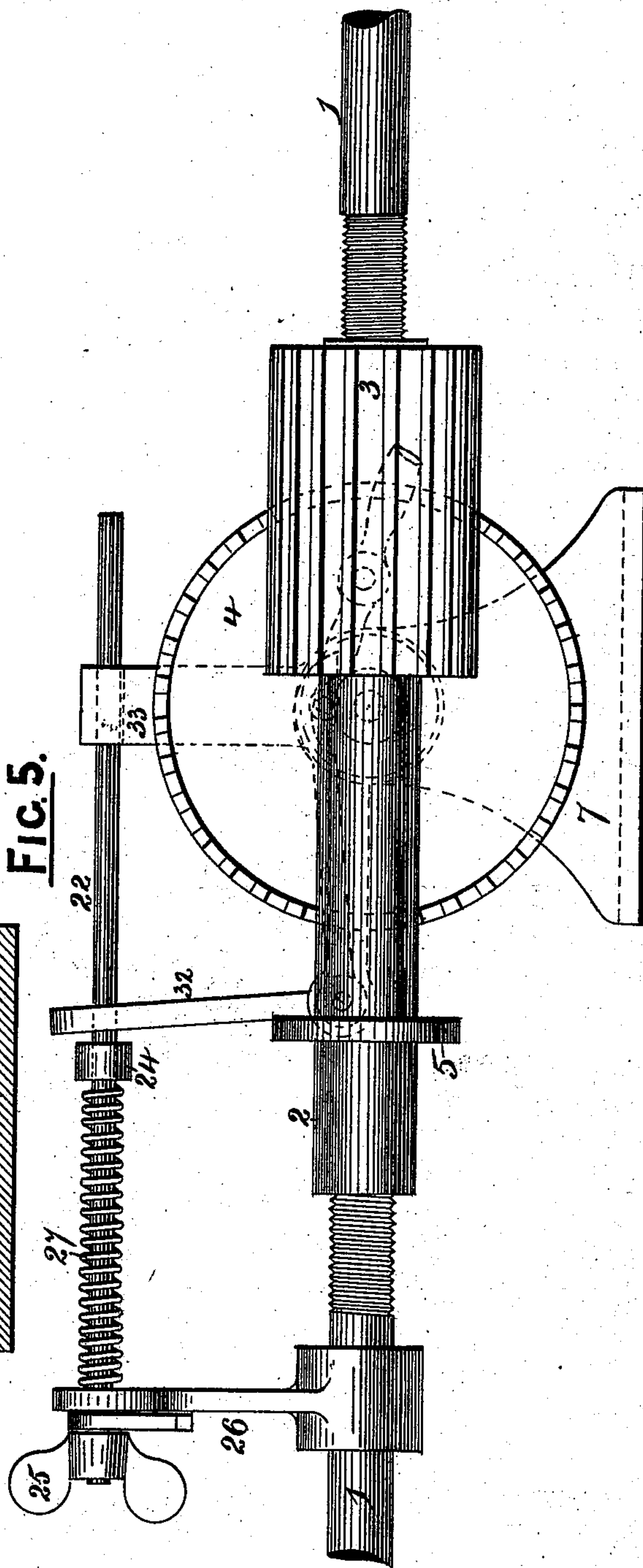
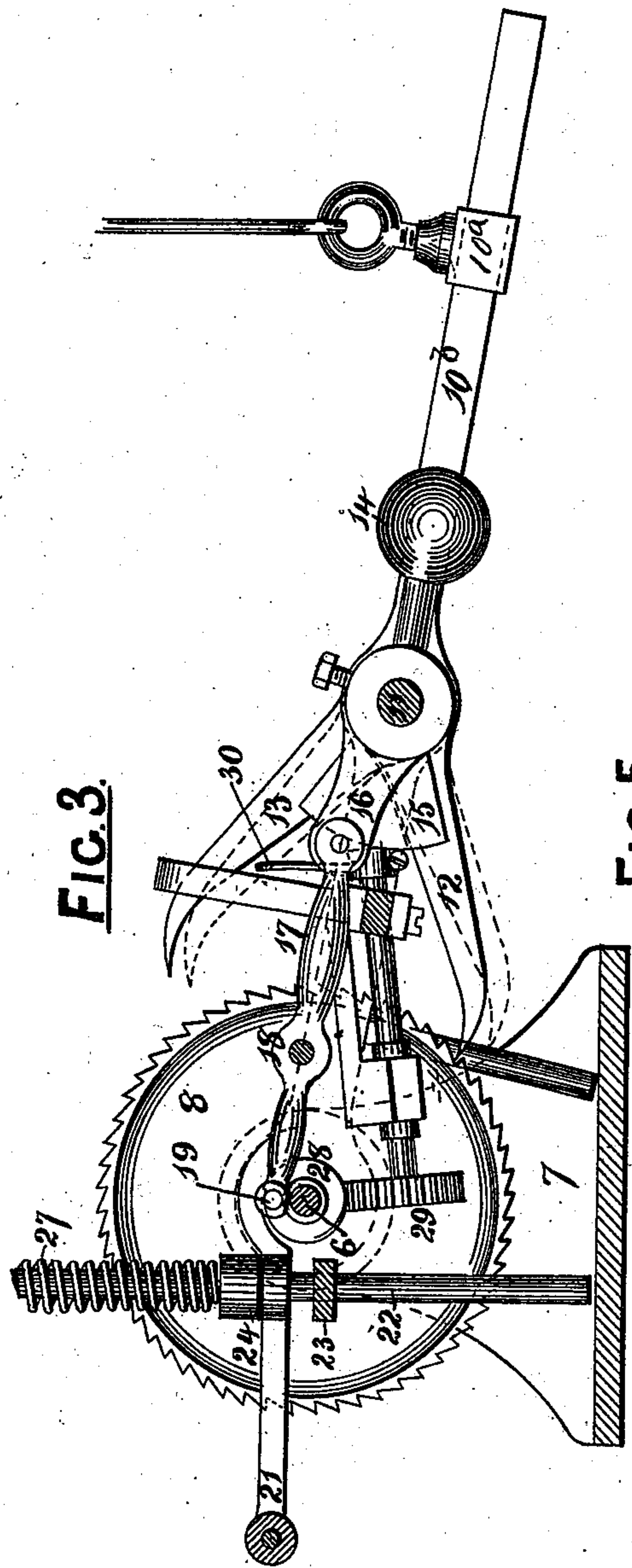
4 Sheets—Sheet 3.

R. WILBY.

APPARATUS FOR CONTROLLING THE SPEED OF STEAM ENGINES.

No. 382,577.

Patented May 8, 1888.



WITNESSES:

A. Brossky.
H. S. Ogden.

INVENTOR:

Richard Willy

(No Model.)

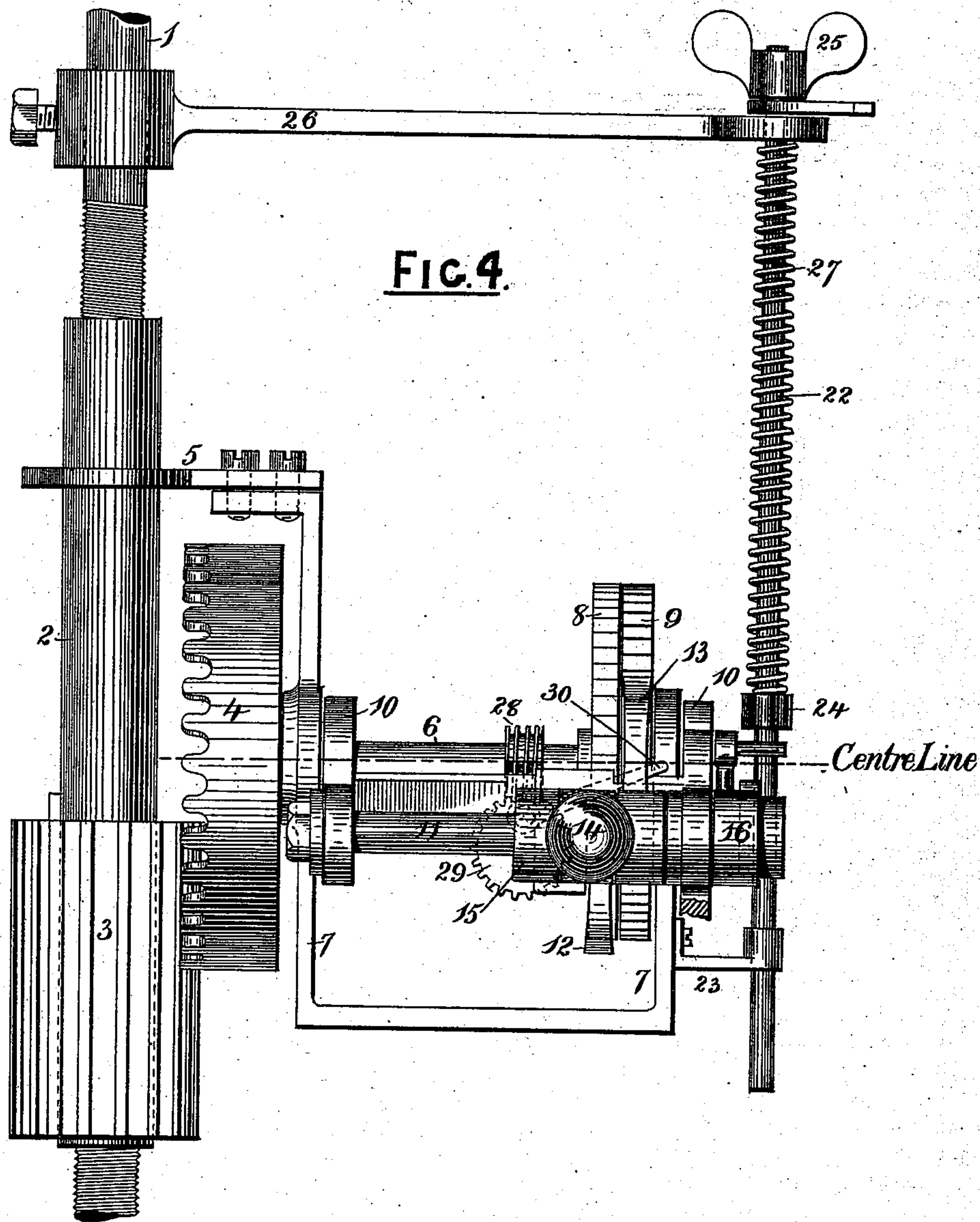
4 Sheets—Sheet 4.

R. WILBY.

APPARATUS FOR CONTROLLING THE SPEED OF STEAM ENGINES.

No. 382,577.

Patented May 8, 1888.



WITNESSES:

A. Brossley.
H. S. Ogden.

INVENTOR:

Richard Wilby.

UNITED STATES PATENT OFFICE.

RICHARD WILBY, OF MIRFIELD, COUNTY OF YORK, ENGLAND.

APPARATUS FOR CONTROLLING THE SPEED OF STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 382,577, dated May 8, 1888.

Application filed November 28, 1887. Serial No. 256,331. (No model.) Patented in England November 9, 1886, No. 14,431.

To all whom it may concern:

Be it known that I, RICHARD WILBY, a subject of the Queen of Great Britain, and a resident of Mirfield, Yorkshire, England, have invented certain Improvements in Apparatus for Controlling the Speed of Steam-Engines, (for which I have obtained a patent in England November 9, 1886, No. 14,431,) of which the following is a specification.

My invention relates to a gear interposed between an engine-governor and the stem of the valve controlling the admission to the engine of the fluid under tension—as the cut-off valve or throttle-valve of a steam-engine—whereby said governor is enabled the better to control the speed of the engine and preserve a uniform or nearly-uniform speed under varying pressures or loads; and the object is to effect this by a simple, sensitive, and positive mechanism actuated by the engine itself, but controlled in its action by the governor.

My invention will be fully described hereinafter, and its novel features carefully defined in the claims.

In the drawings which serve to illustrate my invention I have shown three arrangements thereof.

Figure 1 is an end elevation of my improved gear. Fig. 2 is a plan of same, and Fig. 3 is a sectional elevation, the plane of the section being indicated by line A B in Fig. 2. Fig. 4 is a side elevation of my gear, illustrating a slightly-different arrangement of some of the parts; and Fig. 5 is an end view of same, illustrating the adaptation of my gear to an engine where the valve stem or rod is arranged horizontally.

I will now describe my invention as illustrated in the accompanying drawings, premising that I effect the control of the admission-valve by varying the length of the connections between the governor and said valve, (cut-off or throttle valve,) said variation being effected by the engine itself, but controlled by the governor.

Referring to the first three figures of the drawings, 1 is the ordinary cut-off or throttle valve stem, which is screw-threaded, and has on it a long sleeve-like nut, 2, with a right and left screw-thread. The nut 2 carries a long pinion, 3, which meshes with a crown-wheel,

4, secured to a shaft, 6, rotatively mounted in suitable bearings in brackets 7. On the nut 2 is a collar-bearing, 5, for steadying the valve-rod, keeping the pinion in mesh with the crown-wheel. On the shaft 6 are secured two ratchet-wheels, 8 and 9, which are alike, except that their teeth are oppositely beveled, as shown. Loosely hung on the shaft 6 is a pawl-frame, 10, in which is mounted a shaft, 11, on which are loosely mounted two pawls, 12 and 13, adapted to engage alternately the ratchet-wheels 8 and 9, respectively. The upper pawl, 13, is a gravity-pawl, and the lower pawl, 12, is pressed upward normally by a weighted arm, 14, projecting from it back of shaft 11. It may, however, be a spring-pawl. On the shaft 11 is secured a device, 15, which I call a "pawl-reliever," and which has a head that stands between the two pawls. Normally this pawl-reliever holds both pawls out of engagement; but when shaft 11 is partially rotated one or the other of the pawls is allowed to engage its ratchet-wheels.

Vibratory motion is imparted to the pawl-frame 10 through the medium of a connector, 10^x, attached to a slide, 10^a, on an arm, 10^b, on said frame 10, said connector being secured at its other end to a reciprocating part of the engine. I have not deemed it necessary to illustrate the engine, as the connection of arm 10^b with a reciprocating part thereof is within the ordinary skill of an engineer or skilled mechanic.

The oscillation of shaft 11, whereby the pawl-reliever 15 is caused to permit one or other of the pawls to engage, is controlled by the governor, and I will now describe the means whereby the shaft is actuated.

On shaft 11 is an arm, 16, which is coupled to one end of a lever, 17, fulcrumed at 18 on the frame 10. On the other end of lever 17 is a laterally-projecting pin, 19, which stands over the shaft 6 when the parts stand as in Fig. 3.

21 is an arm, pivoted at its outer end to a provision, 20, on a bracket, 7. The free end of arm 21 is curved on its under side concentric to shaft 6 and rests on the pin 19. A rod, 22, standing parallel with rod 1, has a sliding bearing at its lower end in a fixed bracket, 23. It passes through the arm 21 and has a collar,

24, fixed on it just above arm 21. On the valve-stem 1 is adjustably secured an arm, 26, the free end of which is provided with a hole, through which the rod 22 plays. A coil-spring, 5 27, on rod 22 bears on the collar 24 and abuts above against the arm 26. The upper end of the rod 22 is screw-threaded to receive lock-nuts 25, which bear on arm 26 and determine the distance between the upper face of said 10 arm and the collar 24.

So far as described the operation is as follows: The arm 26 is first set properly on the rod 22 to press down the arm 21, and through it the end of lever 17 carrying pin 19. This 15 raises the other end of lever 17, which acts through arm 16 to turn shaft 11 to such a position that pawl-reliever 15 shall hold the pawls 12 and 13 both out of engagement with their respective ratchet-wheels 8 and 9. This 20 is the normal position of the parts, and the vibration of frame 10 under these conditions effects no change; but if the speed of the engine slackens from any cause—as by extra load or decrease of pressure—the governor will 25 raise the valve-stem 1, which will carry with it the arm 26 and rod 22. The effect of this will be to relieve the pressure of the collar 24 on arm 21, and allow shaft 11 to turn (to the left, as seen in Fig. 3) far enough for the pawl-reliever 15 to fall and allow the upper pawl, 30 13, to engage ratchet-wheel 9. The vibrations of frame 10 will now impart intermittent rotary motion in one direction to shaft 6, and through it and wheel 4 to pinion 3 and nut 2. 35 The rotation of nut 2 serves to shorten the valve-stem 1, thereby opening the valve for the admission of more steam, or, if a cut-off valve, retarding its closure. This will cause the governor to regain its normal speed, and 40 the several parts of the gear will thus be again brought back to their several normal positions. If the load be thrown off the engine or the fluid-pressure be augmented, the valve-stem 1 will be lowered. This will cause rod 45 22 and collar 24 thereon to descend, and said collar will depress arm 21 and pin 19. The shaft 11 will thus be turned slightly in the opposite direction, (to the right in Fig. 3,) and the pawl-reliever 15 will permit the weighted 50 arm 14 to put pawl 12 into engagement with ratchet-wheel 8. The vibration of frame 10 will now rotate shaft 6, and through it wheel 4, pinion 3, and nut 2 the proper direction to lengthen the valve-stem 1. The effect of this 55 will be to partly throttle the steam or accelerate the cut-off, and thus reduce the speed of the engine again to its normal point.

In order to prevent the nut 2 from being run to the end of the screw-thread on stem 1 60 when the steam-pressure has been allowed to run below and remain below the normal pressure, and thus lock and break the mechanism, I provide the precautionary device I will now describe, premising that this device is de- 65 signed to automatically lift the pawl 13 out of engagement when the shaft 6 shall have been

caused to make a predetermined number of revolutions by the driving ratchet-wheel 9.

On the shaft 6 is fixed a worm, 28, which engages a worm-wheel, 29, on the shaft of 70 which is fixed a finger or arm, 30, which stands under pawl 13. When pawl 13 shall have imparted to shaft 6 (through ratchet-wheel 9) a predetermined number of revolutions, the finger 30 will take under and lift 75 said pawl, and thus prevent any further rotation of said shaft 6 until the backward rotation of said shaft shall have again lowered said finger.

The function of the spiral spring 27 on the 80 rod 22 is to prevent obstruction to the free action of the governor when the acceleration causes said governor to move the valve-stem 1 downward farther than the rod 22 can move. Under these conditions the spring yields by 85 compression and permits the arm 26 to descend after the rod 22 can descend no farther.

Instead of arm 16 and lever 17 being arranged as in the first three figures, they may be arranged outside of the ratchet-wheels 90 and the bearing of shaft 6, as seen in Fig. 4. In other respects the construction seen in Fig. 4 is similar to that before described. By this arrangement, however, I am enabled to arrange the pin 19 in line with the axis of 95 shaft 6, and thereby render the curved form of the under side of arm 21 unnecessary; but this advantage is counterbalanced by the disadvantage arising from the extra width of the device. 100

Where my improved gear is applied to an engine in which the valve-stem 1 is horizontally arranged, as shown in Fig. 5, an upright, 33, may be mounted on bracket 7, and said upright be provided with a sliding bearing 105 for the rod 22. The arm 21 will have an upright arm or branch, 32, for the rod 22 to play through. The positions of the remaining parts and the mode of operation will be the same in substance as has been before described. 110

The object in making the under side of arm 21 curved concentric with shaft 6, where said arm rests on pin 19 in lever 17, is this: When the speed is normal and both pawls are dis- 115 engaged, the vibrations of frame 10 cause the pin 19 to move in a curved path about the shaft 6 and concentric with said shaft. Now this pin must be free to traverse its path freely normally, and consequently the arm 21, which must stand in contact with this pin, will have 120 its under side curved to conform to the curved path of said pin.

By the employment of my improved gear any variation of pressure or load may be compensated for automatically, and as the motion 125 or extent of movement of the stem 1 is greatly increased or magnified through the medium 17 the gear is made very sensitive to the least variation in the speed of the engine.

I claim as my invention— 130

1. In a valve-gear, the combination, with the shaft 6 and its gear-wheel 4, of the ratchet-

wheels 8 and 9, mounted on said shaft, the vibrating frame 10, the shaft 11 in said frame, the pawls 12 and 13, loosely mounted on said shaft 11, the pawl-reliever, and arm 16, secured on said shaft 11, the lever 17, mounted in frame 10 and coupled to said arm 16, the arm 21, its free end resting on a pin in lever 17, and the operating-rod 22, for depressing arm 21, said rod being actuated by the governor of the engine, whereby the governor by its action controls the engagement of the pawls with the ratchet-wheels, substantially as set forth.

2. In a valve-gear, the combination, with the screw-threaded valve-stem 1, the long nut 2 on said stem, the pinion 3 on said nut, the operating-rod 22, coupled to and moving with said valve-stem, the shaft 6, the wheel 4 thereon meshing with pinion 3, the ratchet-wheels 8 and 9 on said shaft 6, the vibrating frame 10, the pawls carried by said frame and adapted to engage at proper times the said ratchets, the shaft 11 in said frame 10, the pawl-reliever 15, actuated by the partial rotation of shaft 11, and the intermediate gearing between rod 22 and shaft 11, whereby the movements of said rod are imparted to said shaft.

3. In a valve-gear, the combination, with the shaft 6, the ratchet-wheel 9 thereon, the

vibrating pawl-frame, the pawl 13, carried by same and adapted to engage said ratchet-wheel 9, the worm 28 on shaft 6, the worm-wheel 29 in mesh with said worm, and the releasing arm or finger 30 on the shaft of said worm-wheel and arranged under said pawl, whereby the pawl is lifted out of engagement with the ratchet-wheel when shaft 6 shall have made a predetermined number of revolutions.

4. In a valve-gear, the combination, with the valve-stem 1 and its arm 26, of the operating-rod 22, which passes through said arm and is provided with a collar, 24, and lock-nuts 25, the spring 27 on said rod, between said arm and collar, and the intermediate arm, 21, which is actuated by said rod 22, whereby said valve-stem is enabled to move independently of the operating-rod by compression of said spring.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

RICHARD WILBY.

Witnesses:

A. B. CROSSLEY,
Swires Road, Halifax.

H. T. OGDEN,
21 Clare Road, Halifax.