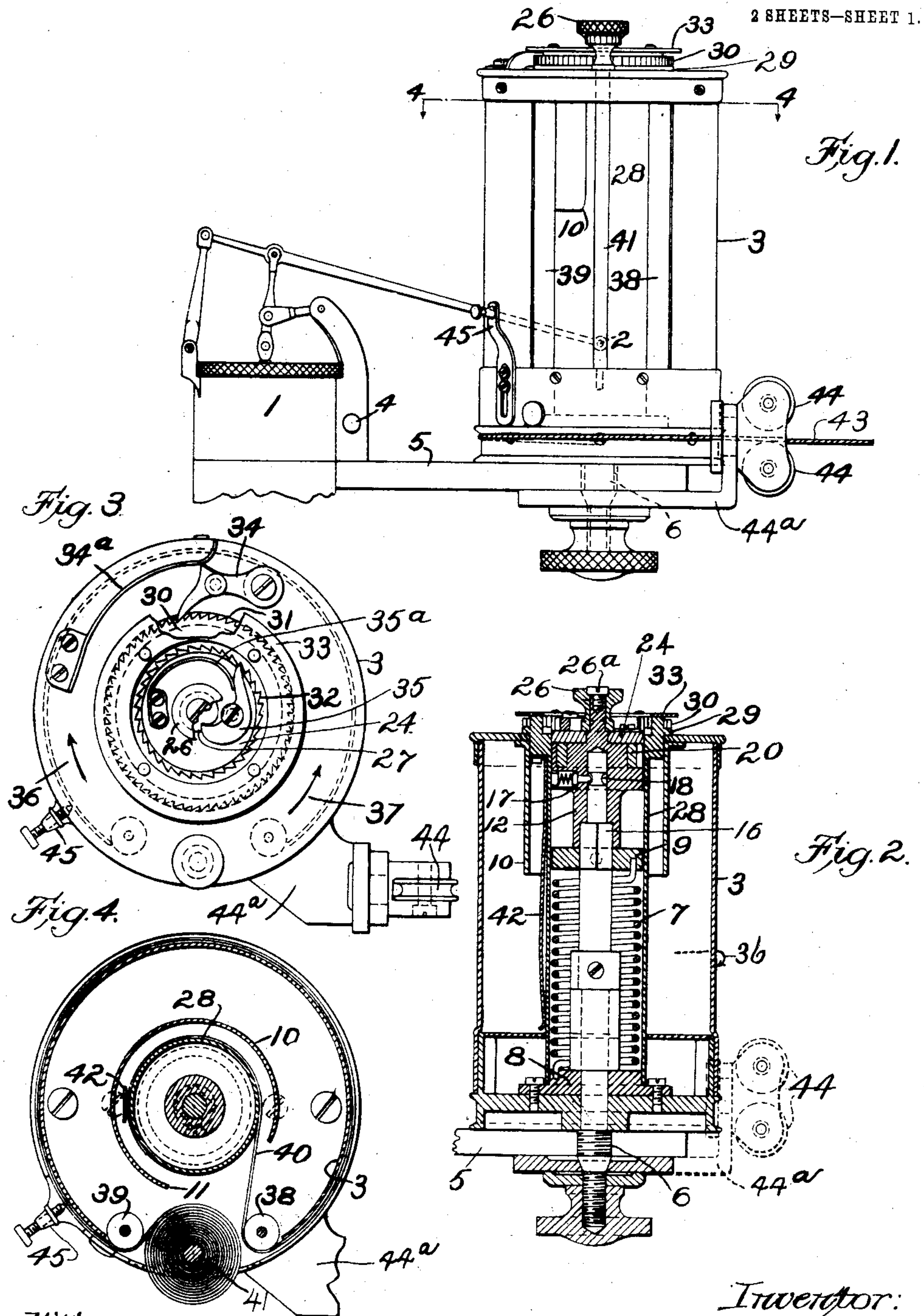


No. 867,953.

PATENTED OCT. 15, 1907.

T. DAVIDSON.
ENGINE INDICATOR.
APPLICATION FILED DEC. 12, 1906.

2 SHEETS—SHEET 1.



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APPLICATION FILED DEC. 12, 1906.

2 SHEETS—SHEET 2.

Fig. 5.

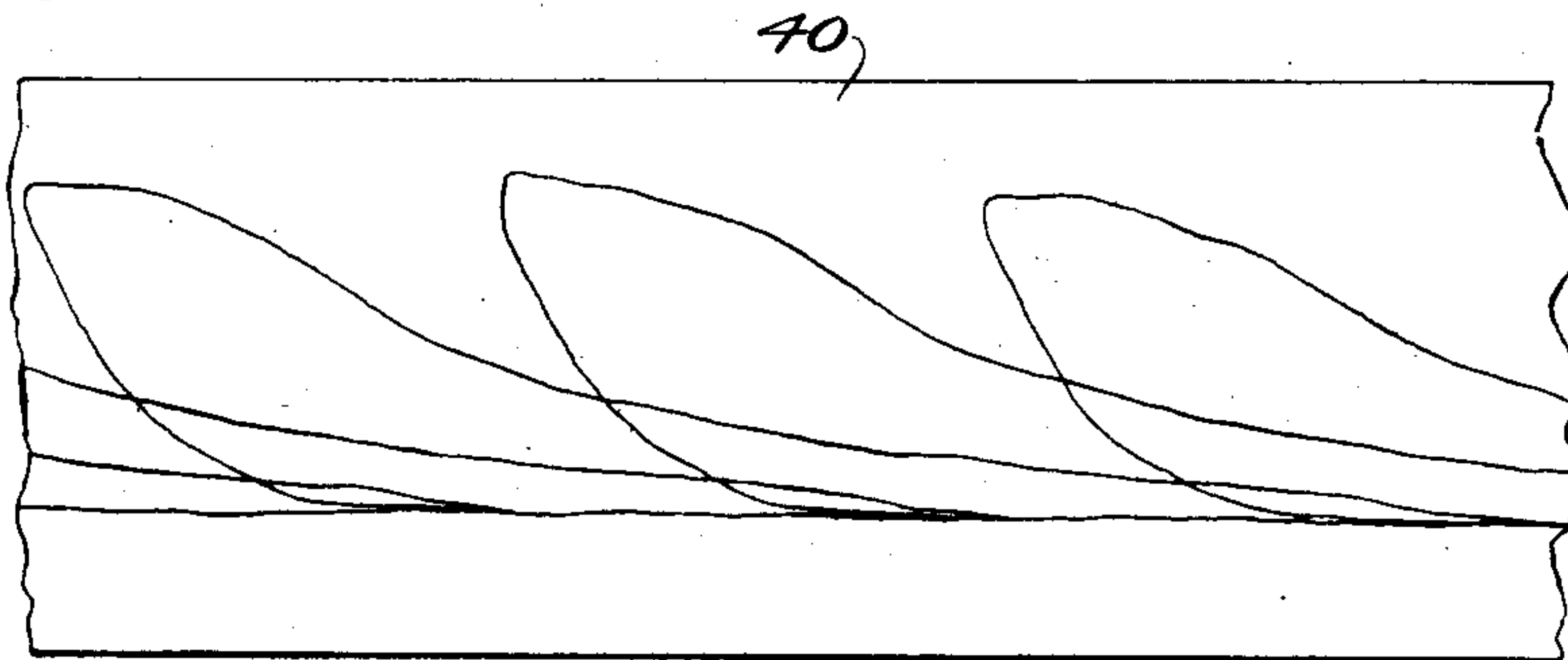


Fig. 7.

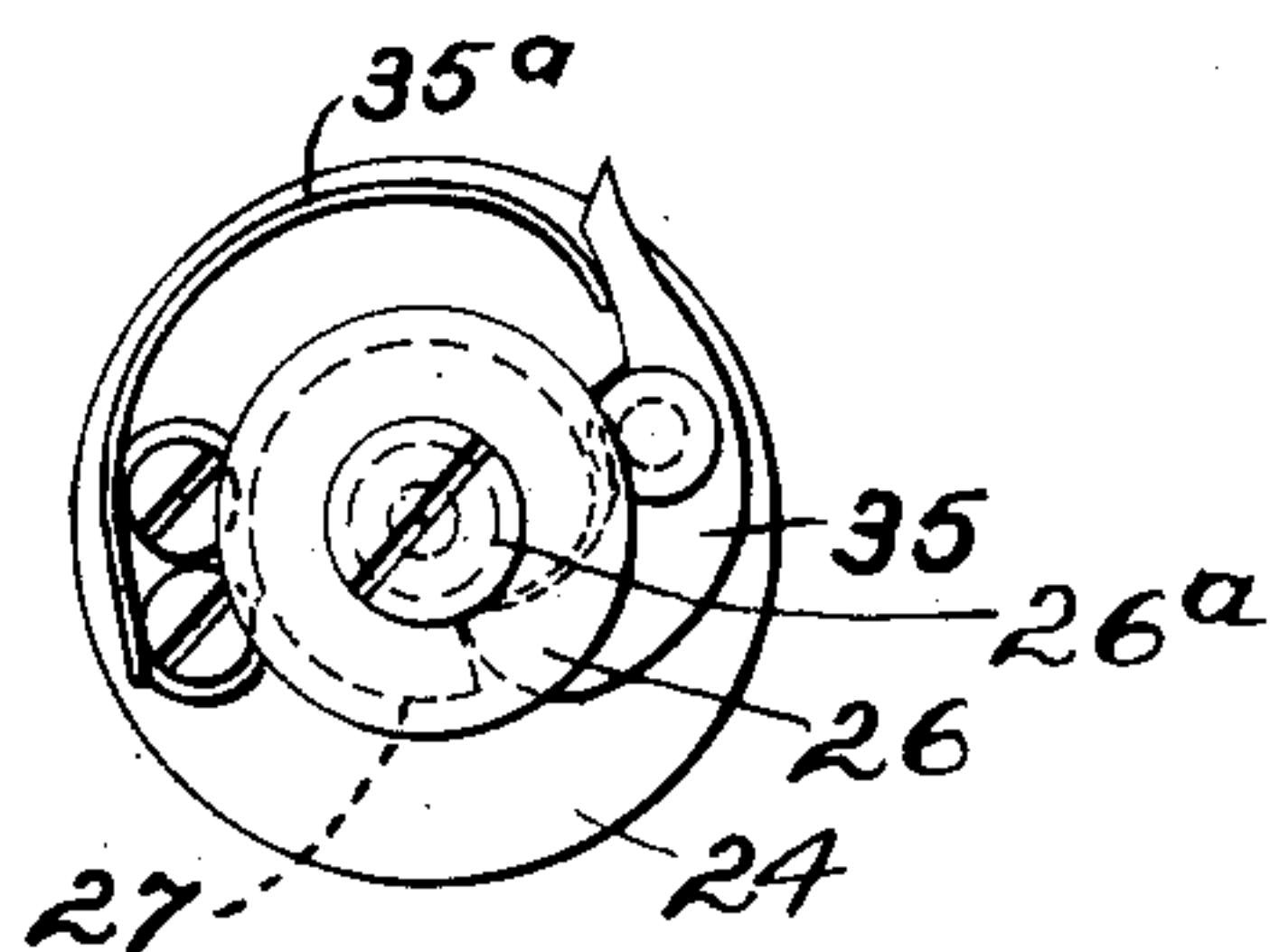


Fig. 9.

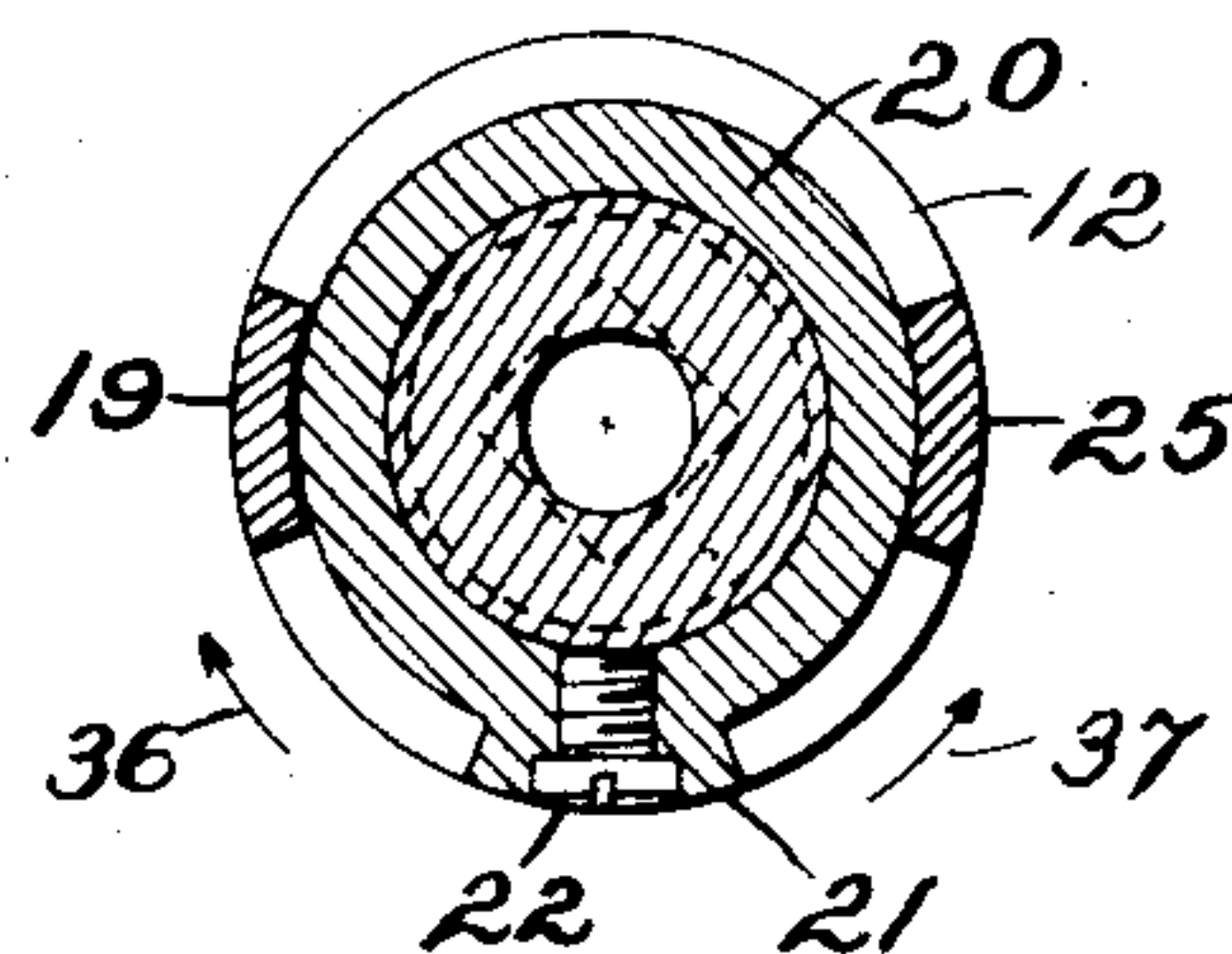


Fig. 6.

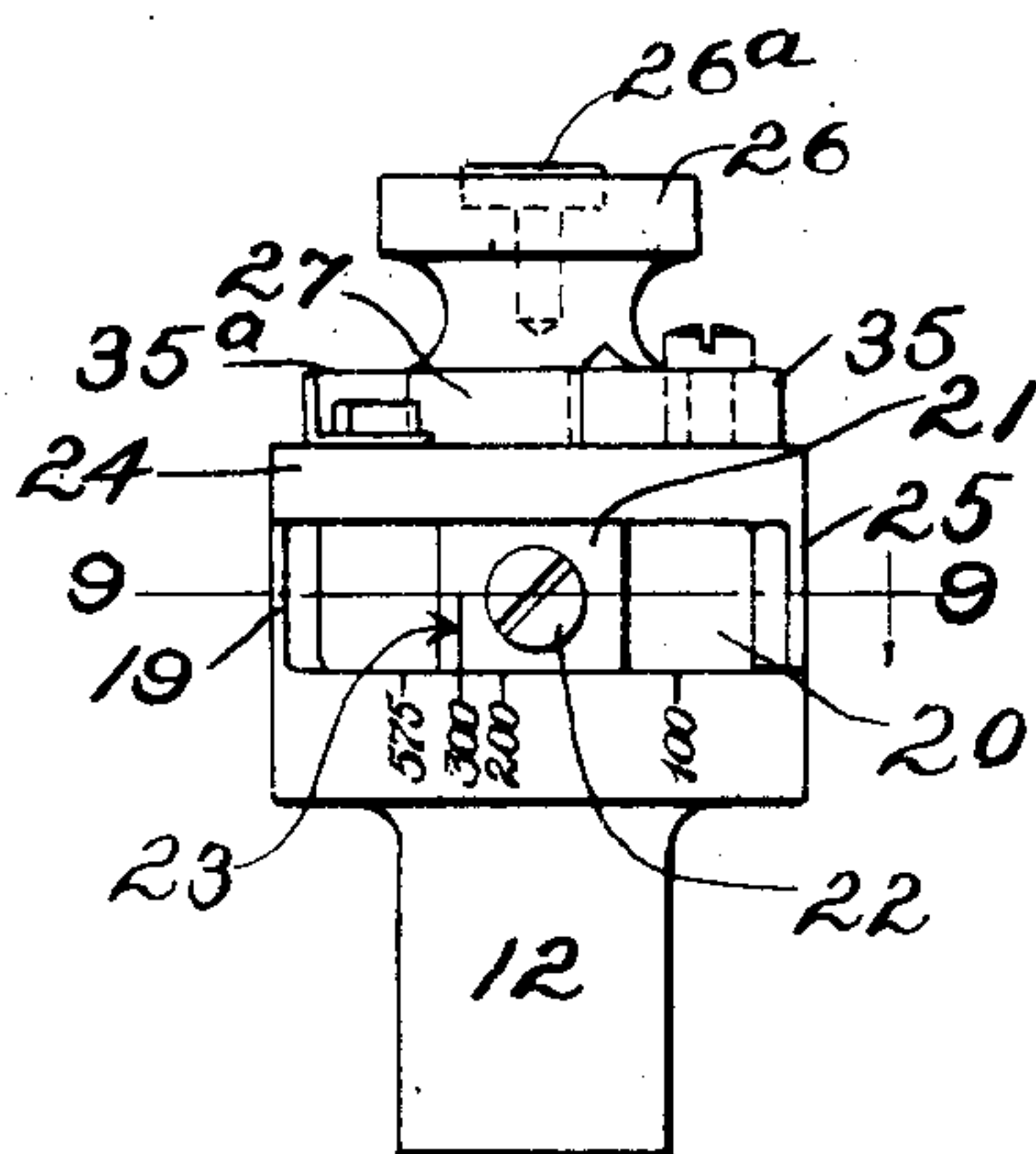
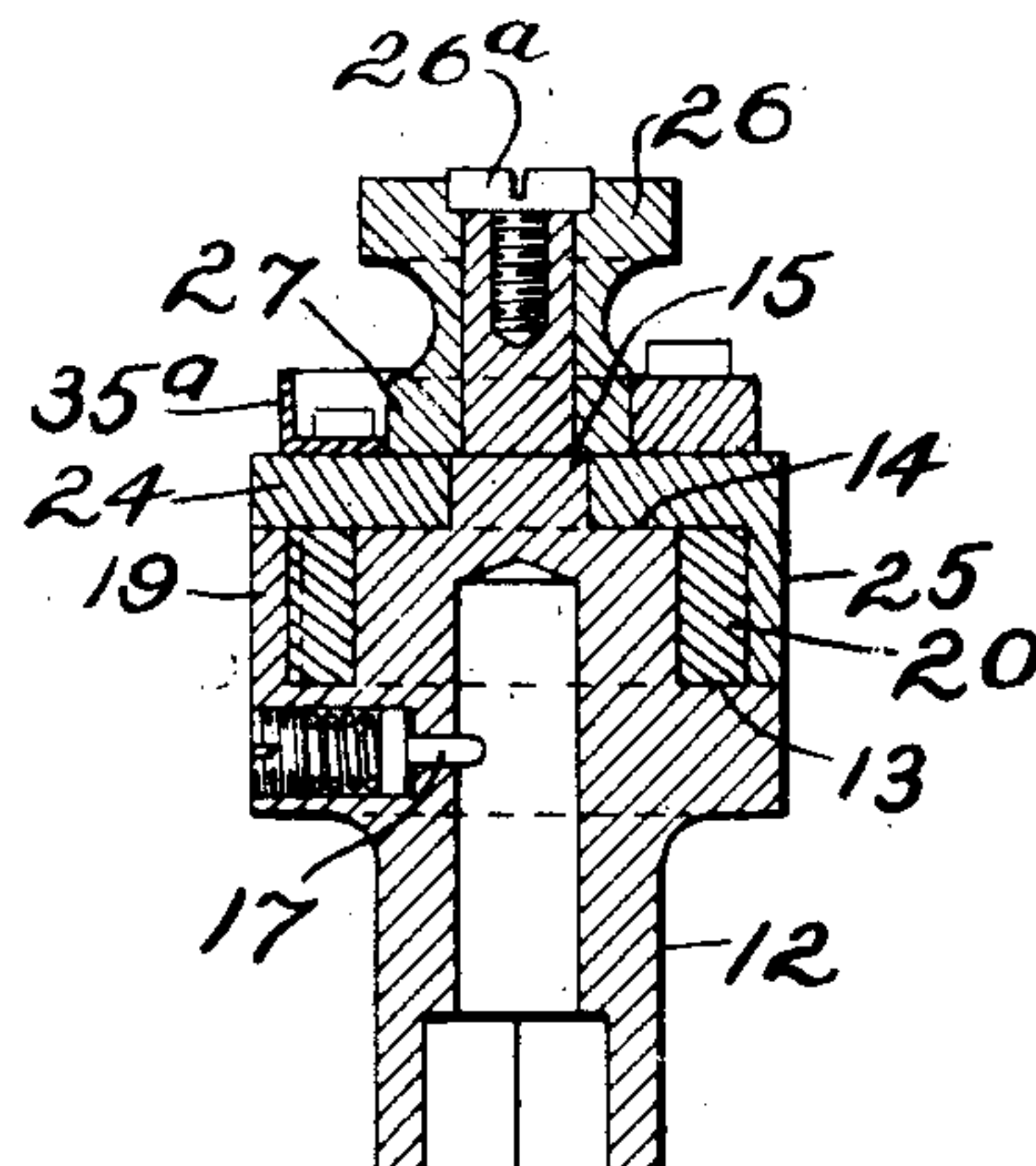


Fig. 8.



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UNITED STATES PATENT OFFICE.

THEODORE DAVIDSON, OF SALEM, MASSACHUSETTS, ASSIGNOR TO CROSBY STEAM GAGE AND VALVE COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

ENGINE-INDICATOR.

No. 867,953.

Specification of Letters Patent.

Patented Oct. 15, 1907.

Application filed December 12, 1906. Serial No. 347,470.

To all whom it may concern:

Be it known that I, THEODORE DAVIDSON, a citizen of the United States, and a resident of Salem, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Engine-Indicators, of which the following is a specification.

My invention relates to engine indicators and its object is to provide a drum furnished with a paper strip on which a series of diagrams may be taken without removing such strip from the drum and at such intervals thereon as may be desired.

It is illustrated by the accompanying drawings in which—

Figure 1 is an elevation of the drum with a portion of the indicator. Fig. 2 is a central vertical section of the drum. Fig. 3 is a top view of the drum. Fig. 4 is a section on the line 4—4 Fig. 1. Fig. 5 is a portion of the paper strip with diagrams shown thereon. Fig. 6 is a detailed view in elevation of the cap. Fig. 7 is a detailed view showing the top of the cap. Fig. 8 is a central vertical section of the cap. Fig. 9 is a section on the line 9—9 Fig. 6.

Similar characters refer to similar parts throughout the several drawings.

1 is the indicator on which is mounted the pencil 2 movable towards and away from the drum 3 and manipulated by the knob 4. On the arm 5 fixed to the indicator is mounted the fixed spindle 6 and on this spindle is mounted the rotary spring actuated drum 3 with a central opening at the top and a vertical opening as shown. The drum actuating spring 7 is fixed at its lower end to the springhead 8 fixed to said drum and at its upper end to the springhead 9 fixed to said spindle. The cylindrical guard 10, having a cut-out portion 11, is fixed to the upper part of the drum adjacent to the central opening thereof and concentric therewith and is adapted to protect the paper strip or roll hereinafter mentioned.

On the upper end of the spindle 6 is mounted the cylindrical cap 12 having a series of annular shoulders 13, 14 and 15. The cap is interiorly squared at its lower end to engage the squared portion 16 of the spindle. Mounted in the cap is the spring-controlled catch 17 adapted to engage the annular groove 18 on the spindle and sufficiently yielding to permit the cap to be easily raised from or lowered upon the spindle. The exterior of the cap is graduated and numbered as shown (Fig. 6), and furnished at its outer edge with the vertical lug 19. The annulus 20 is rotatably mounted upon the cap resting upon the shoulder 13 and has a peripheral lug 21 adapted to engage the lug 19. This annulus is furnished with a binding screw 22 adapted to engage the cap and prevent rotation of the annulus.

On the lug 21 is a mark 23 (Fig. 6) adapted to register with the numbered marks on the cap above mentioned. A second rotary annulus 24 engages the cap, resting upon the shoulder 14 and the annulus 20, and having on its outer edge a vertical lug 25 adapted to engage the lugs 19 and 21.

On the outer end of the cap is rotatably mounted the knurled head 26 resting upon the annulus 24 and shoulder 15 and held in place vertically by the screw 26^a. The lower part of this head constitutes a rotary cam 27. The cylindrical sleeve 28 impeding in the drum constitutes a reel with its flanged top 29 resting upon the upper end of the drum. On top of the reel is fixed the ratchet 30 having outer teeth 31 and inner teeth 32. The reel has a knurled portion 33 for convenience in moving it.

Mounted on the upper end of the drum is the spring-controlled driving pawl 34 adapted to engage the outer teeth of the ratchet and to be held in or out of engagement by the controlling spring 34^a (Fig. 3). On the annulus 24 is mounted the spring-controlled retaining pawl 35 adapted to engage the inner teeth of the ratchet and to be thrown into and held in such engagement by the controlling spring 35^a (Fig. 3). This retaining pawl 35 engages also the rotary cam 27 employed to throw said pawl into and out of engagement with the inner teeth of the ratchet and to hold it out of such engagement. These pawls, when engaging the ratchet, rest upon the top of the reel and prevent its vertical movement. They prevent independent rotation of the reel in the direction indicated by the arrow 36, but permit such rotation in the opposite direction indicated by the arrow 37.

The guide rolls 38 and 39 are arranged in the drum at its vertical opening and serve to guide the paper strip 40, which in the form of a roll is mounted upon the fixed spindle 41 arranged in said opening, passes around said drum and guide rolls and winds upon said reel as shown in Fig. 4.

The inner edge of the paper strip is held against the reel by the spring 42. The cord 43, fastened to the drum and encircling it, leads therefrom between the guide pulleys 44 to a reducing mechanism or to the crosshead of an engine in the usual manner. These guide pulleys are carried on the arm 44^a horizontally adjustably mounted upon the spindle 6. The vertically adjustable arm 45 (Fig. 1) carries a pencil adapted to mark upon the moving paper strip what is known as the "atmospheric line."

From Figs. 6, 8 and 9 it appears that, when the parts are arranged as therein shown, the lug 25 of the rotary annulus 24 can travel only between the lug 19 of the cap 12 and the lug 21 of the annulus 20 fixed in place by the binding screw 22.

The principal feature of my invention is the means for regulating the number of diagrams to be taken on a strip of given length or, in other words, for regulating the distance between the diagrams. This means consists of the combination of the cap 12 with the annuli 20 and 24, the annulus 20 being fixed and the annulus 24 (carrying the retaining pawl 35) having a limited rotation between the lugs 19 and 21, all as above described.

The operation of the indicator is as follows: The paper strip 40 in the form of a roll is mounted upon the spindle 41, drum 3 and reel 28 (Fig. 4); the pawls 34 and 35 engage the ratchet (Fig. 3); the lugs 19, 21 and 25 are in the position shown in Fig. 9. During the forward stroke of the engine the cord 43 is drawn outwardly, rotating the drum in the direction of the arrow 37 and the reel rotates with it driven by the pawl 34. During this movement the retaining pawl 35 is carried around by its frictional engagement with the ratchet reel until the lug 25 engages the lug 19, after which the ratchet slips past the retaining pawl during the remainder of the forward stroke. Upon the return stroke of the engine the drum is rotated by the spring 7 in the direction of the arrow 36 and carries with it the reel and retaining pawl, all being held together by friction, until the lug 25 engages the lug 21, when the retaining pawl holds the ratchet reel stationary while the drum continues to rotate, the driving pawl slipping past the ratchet during the remainder of the return stroke. When the reel is moving with the drum the paper strip moves with them, all practically as one; and when the drum is moving, while the reel is stationary, the paper strip is wound off the spindle carried by the drum and off the drum onto the reel. It is thus obvious that by determining the period of rest of the reel we determine the amount of the paper strip which advances around the drum at each revolution of the engine and consequently the number of diagrams that can be taken upon a strip of paper of a given length. All this depends upon the amount of travel allowed the retaining pawl and this is determined by the location of the adjustable lug 21.

By calculations it is found how many diagrams can be taken on a strip of given length with the lug 21 adjusted at different distances from the lug 19 and the results are marked upon the cap 12 (Fig. 6), so that in practice the lug is adjusted with reference to these

marks depending upon the number of diagrams desired. For instance, if the mark 23 upon the lug 21 registers with the number "300" on the cap, 300 diagrams can be taken, etc.

As shown in Fig. 9 the lug 21 is adjusted with reference to lug 19, so that approximately 100 diagrams could be taken on a paper strip measuring six feet, while in Fig. 6 the arrangement of the adjustable lug is such that 300 diagrams could be taken on a strip of that length. As described and shown, spring 7 rotates the drum around the stationary reel during the latter part of the return stroke of the engine. To avoid putting this extra work upon spring 7, the cord 43 may be so attached to the reducing mechanism or to the cross-head of the engine that the engine shall, upon either stroke but preferably upon its return stroke, move the drum around the stationary reel, leaving the spring to move both together, which is less work; an operation just the reverse of that described. This is, however, merely a matter of detail or arrangement.

Having described my invention what I claim and desire to secure by Letters Patent is:

1. In an engine indicator the combination, with the rotary drum suitably mounted, of a reel upon which to wind a ribbon depending in said drum, with adjustable means for intermittently and automatically rotating said reel a predetermined distance, said means comprising a ratchet fixed to said reel, a driving pawl mounted on said drum and a retaining pawl suitably arranged and having a limited rotation; substantially as described.

2. In an engine indicator the combination, with the rotary drum suitably mounted, of a reel upon which to wind a ribbon depending centrally in said drum, with adjustable means for intermittently and automatically rotating said reel a predetermined distance, said means comprising a ratchet fixed to said reel, a driving pawl mounted on said drum and a retaining pawl suitably arranged and having a limited rotation; substantially as described.

3. In an engine indicator the combination, with the rotary drum suitably mounted, of a reel upon which to wind a ribbon, said reel being mounted in said drum concentrically therewith, with adjustable means for intermittently and automatically rotating said reel a predetermined distance; substantially as described.

In testimony whereof I have affixed my signature, in presence of two witnesses.

THEODORE DAVIDSON.

Witnesses:

HELEN M. DEARBORN,
RALPH W. FOSTER.