

No. 619,049.

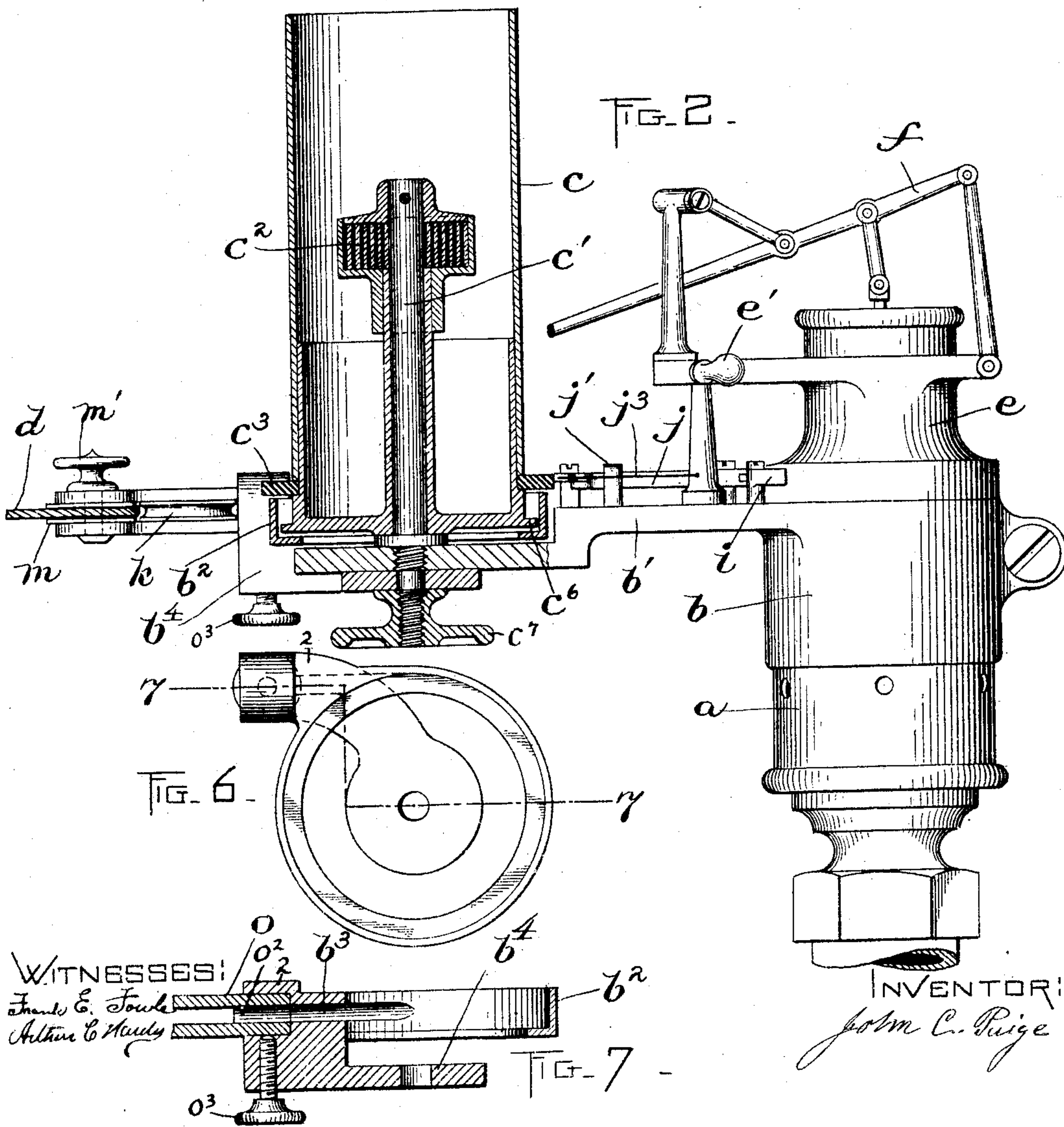
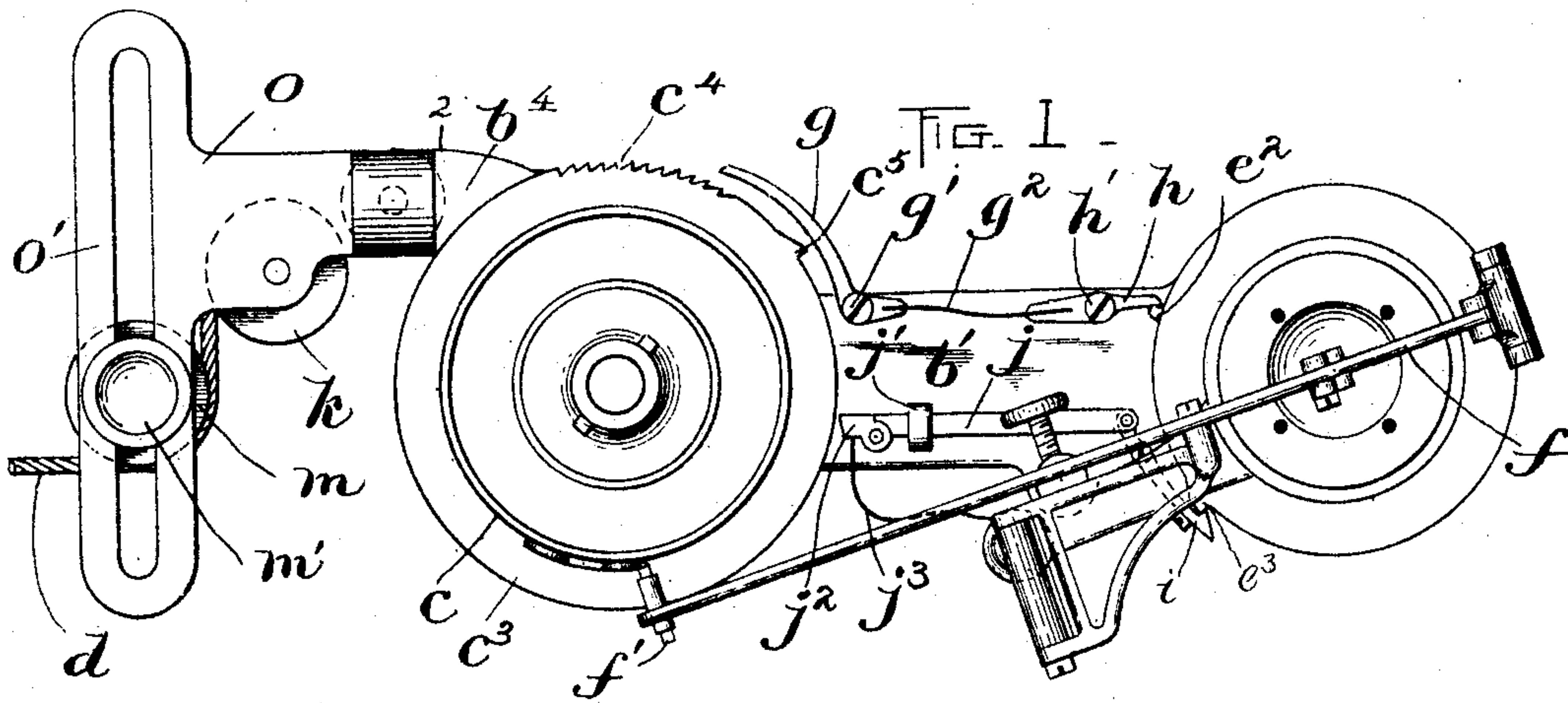
Patented Feb. 7, 1899.

J. C. PAIGE.
STEAM ENGINE INDICATOR.

(Application filed Dec. 15, 1897.)

3 Sheets—Sheet 1.

(No Model.)



WITNESSES:

Frank E. Foul

Arthur C. Hardy

INVENTOR:

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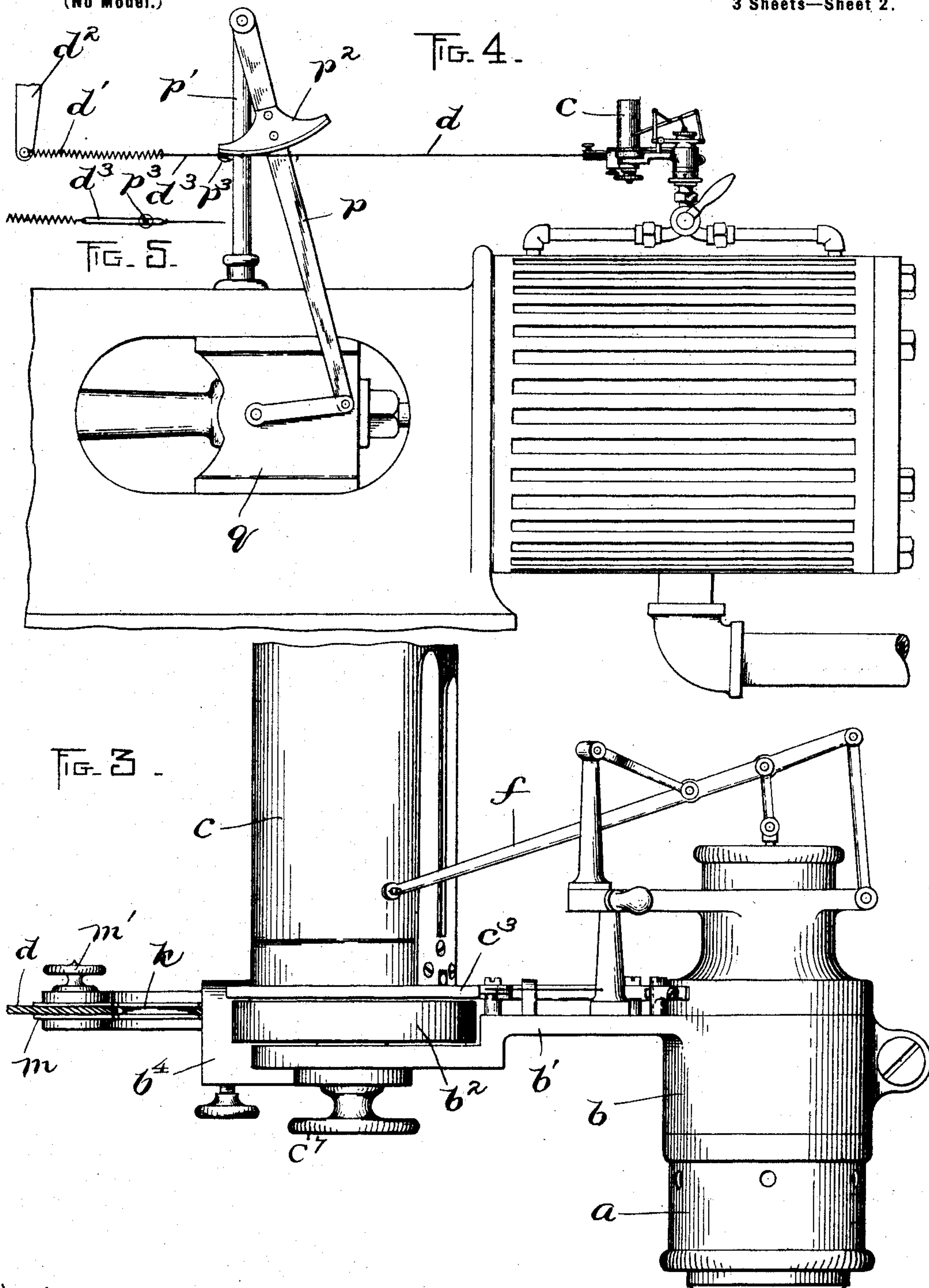
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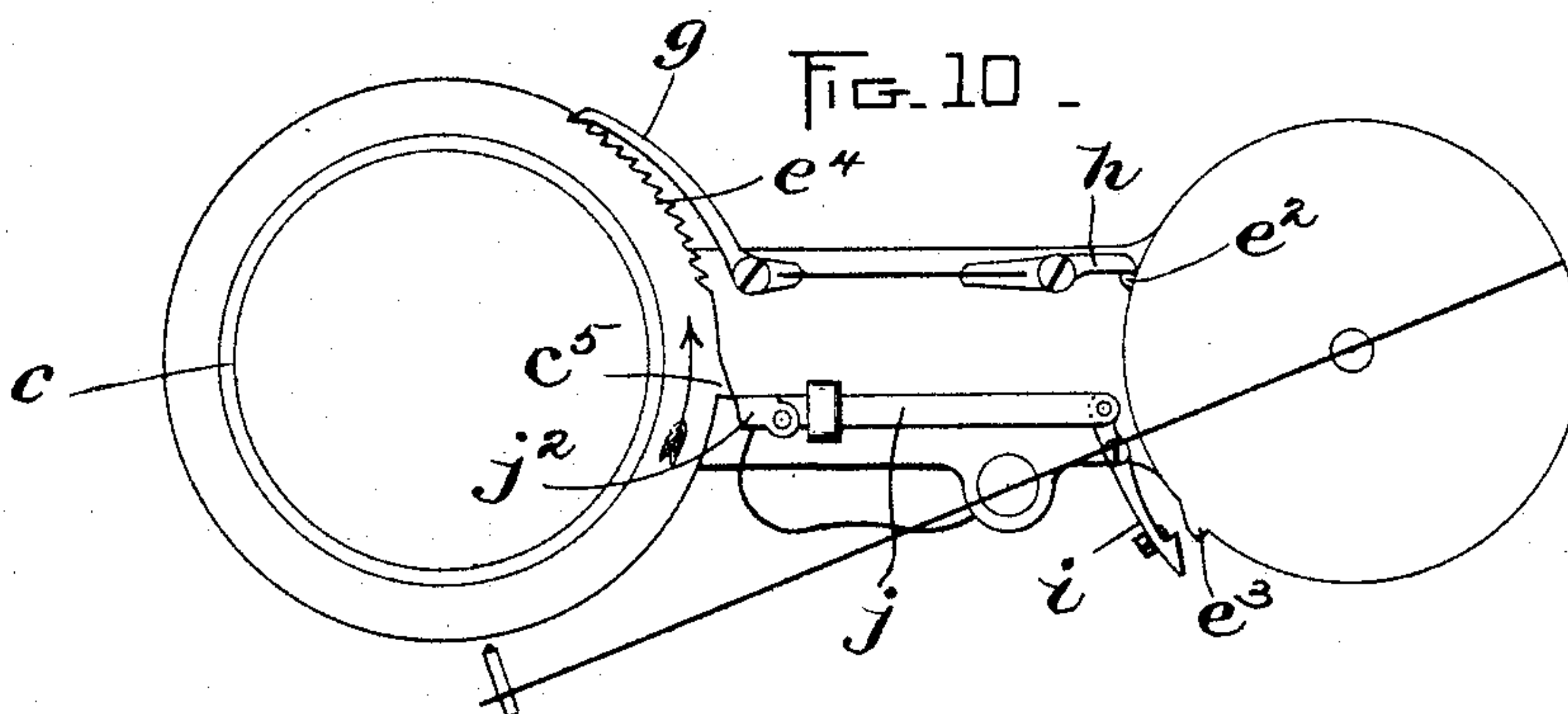
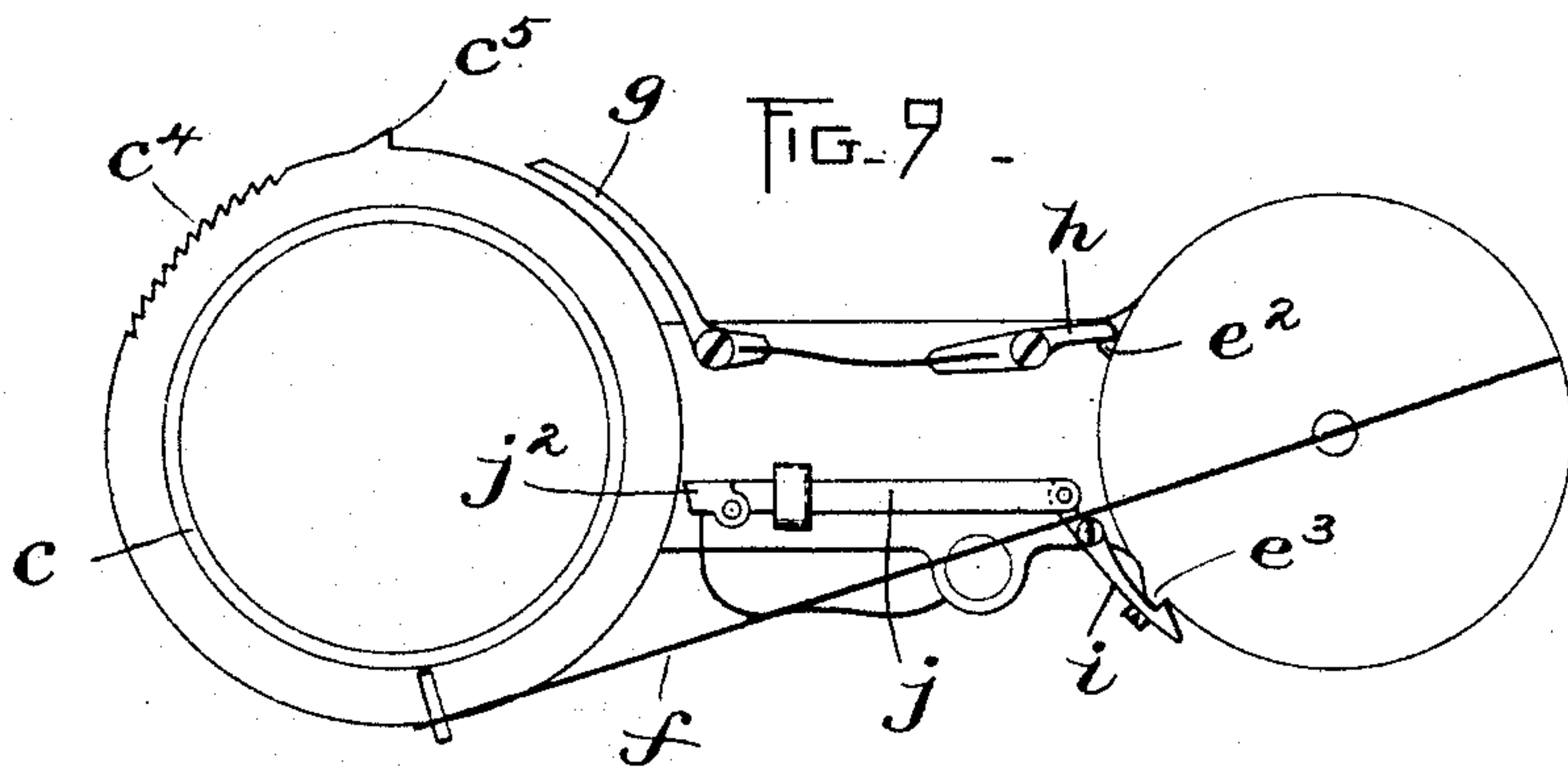
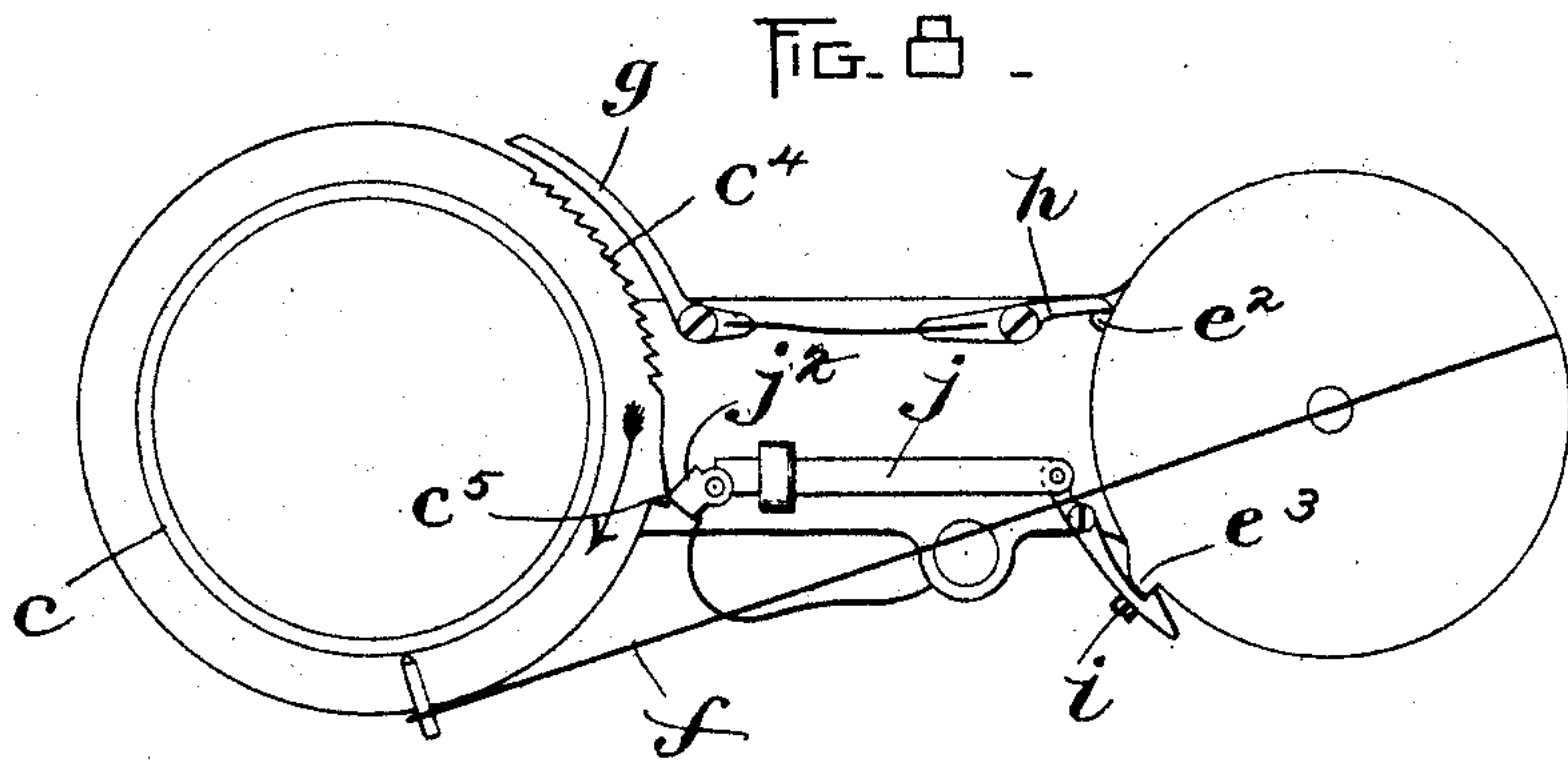
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3 Sheets—Sheet 3.



WITNESSES:

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UNITED STATES PATENT OFFICE.

JOHN C. PAIGE, OF MALDEN, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO
JULIAN D'ESTE, OF BOSTON, MASSACHUSETTS.

STEAM-ENGINE INDICATOR.

SPECIFICATION forming part of Letters Patent No. 619,049, dated February 7, 1899.

Application filed December 15, 1897. Serial No. 661,982. (No model.)

To all whom it may concern:

Be it known that I, JOHN C. PAIGE, of Malden, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Steam-Engine Indicators, of which the following is a specification.

This invention, which relates to steam-engine indicators, has for its object to prevent a repetition of the lines of the diagram ordinarily caused by the contact of the pencil with the card during several strokes of the indicator-drum and resulting in a thick or indistinct composite line which is difficult of measurement.

The invention also has for its object to automatically arrest and lock the indicator-drum after a complete stroke of the same in order to permit the removal and insertion of cards.

Certain other objects of the invention relating to improvements in the construction and operation of the indicator will appear from the succeeding description and claims when taken in connection with the drawings which accompany and form a part of this specification.

Figure 1 represents a plan view of an indicator constructed in accordance with my invention. Fig. 2 represents a side elevation of the same with the drum in section. Fig. 3 represents a side elevation. Fig. 4 represents a view in side elevation, illustrating the construction and arrangement of the operating-cord. Fig. 5 represents a detail plan view of one end of the cord. Fig. 6 represents a plan view of certain parts below the drum. Fig. 7 represents a section on line 7 7 of Fig. 6. Figs. 8, 9, and 10 represent diagrammatic plan views, showing different successive positions of some of the operating parts.

The same reference characters indicate the same parts in all the figures.

Referring to the drawings, *a* designates the pressure-cylinder of the indicator, and *b* designates a split collar carrying an arm *b'*, upon which the drum *c* is mounted.

c' is the spindle upon which the drum revolves, and *c²* is a spring connected with the spindle and with a sleeve formed on the drum for giving a return motion to said drum after

it has been revolved for a half-stroke by the operating-cord *d*. The drum is composed of a lower part actuated by the spring and cord and an upper removable part for holding the card, this construction being familiar in a well-known type of indicator. Surrounding the upper part of the pressure-cylinder *a* is a loose collar *e*, which carries the link mechanism supporting the pencil-arm *f* and which may be turned by a handle *e'* so as to move the pencil *f'*, carried by the pencil-arm, from an inoperative position out of contact with the card on the drum to a position of contact with said drum, as shown in Figs. 1, 8, and 9. The lower part of the drum *c* is provided with a flange *c³*, which is provided on one portion of its periphery with ratchet-teeth *c⁴* and on a portion adjacent thereto with a single tooth *c⁵*.

g is a pawl pivotally mounted on a stud *g'* on the arm *b'* and adapted to be moved into and out of engagement with the ratchet-teeth *c⁴*. The heel of said pawl is connected by a flat steel spring *g²* with the heel of a dog *h*, which is pivoted in a stud *h'* on the arm *b'* and which is adapted to contact with a boss *e²*, formed on the collar *e*, and on another portion of the periphery of said collar is formed a tooth *e³*, which is adapted to be engaged by a detent or catch *i*, pivotally mounted on a stud on the arm *b'*. The heel of the detent *i* is connected to a sliding bar *j*, which slides in a stationary collar *j'* and which is provided on the end adjacent to the drum *c* with a pivoted catch *j²*, actuated by a spring *j³*. The catch *j²* is so constructed and arranged that it will be displaced by the tooth *c⁵* on the drum when the latter moves in the direction of the arrow shown in Fig. 8, so that the tooth can pass the catch without displacing the sliding bar *j* longitudinally. When the drum moves in the opposite direction, however, the tooth in passing the catch displaces the sliding bar to the right.

In Fig. 1 the various parts are shown in the positions which they occupy when a card is about to be taken. The drum *c* has been revolved against the tension of the spring *c²* by an outward stroke of the engine-piston. The pawl *g* has been released from the ratchet-

teeth c^4 , which it had previously engaged, and the pencil-arm f has been moved by manipulation of the handle e' so as to bring the pencil f' into contact with the cards surrounding the indicator-drum. In moving the pencil-arm to its operative position the collar e has been turned so as to bring the tooth e^3 into engagement with the detent i , and the pencil f' is thereby held in contact with the drum. At the same time the boss e^2 has moved against the end of the dog h , so as to produce a tension on the spring g^2 , which tension is transmitted to the heel of the pawl g and holds the end of said pawl out of engagement with the ratchet-teeth c^4 . On the return stroke of the engine-piston the tooth c^5 passes the catch j^2 , as shown in Fig. 8, and reaches the position shown in Fig. 9, which represents the drum at the end of the half-stroke. The engine-piston then begins its outward stroke again, and the drum c is moved in the direction of the arrow shown in Fig. 10. Just as the drum and engine-piston complete this half-stroke the tooth c^5 passes the catch j^2 and moves the sliding bar j to the right, thereby disengaging the detent i from the tooth e^3 on the collar e . The said collar being thus unlocked, the dog h , under the influence of the spring g^2 , operates upon the boss e^2 so as to move the collar e and throw the pencil f' a slight distance away from the drum. The tension on the spring g^2 being thus relieved, the pawl g at the same instant moves into engagement with the ratchet-teeth c^4 and locks the drum c against a return movement in obedience to the pull of the spring c^2 . It will thus be seen that the indicator-drum completes a single stroke in two directions and is then locked and that at the end of the stroke the pencil is thrown out of contact with the card on the drum, and therefore only marks once thereon instead of repeating its mark again and again during successive strokes. The indicator-cord d , after leaving the drum, passes around two pulleys k and m , mounted in a holder o , which is swiveled to a member b^4 . The pulley m slides in a slotted portion o' of the holder o and is provided with a screw-threaded stud or shaft having a locking thumb-screw m' . This arrangement of parts allows the pulley m to be moved toward and away from the pulley k , so that any slack which may occur from the stretching of the cord d may readily be taken up. This obviates the necessity for tying knots in the cord or applying clips thereto, as has ordinarily been done heretofore.

p is a swinging arm connected by a link to the cross-head q of a steam-engine and pivoted to a stationary post p' . On the arm p is a segment p^2 , which is provided with a pin p^3 , adapted to engage the end of the cord d to operate the indicator.

d' is a light spring whose strength is just sufficient to take up the slack in the cord d and is somewhat less than that of the spring c^2 , connected with the indicator-drum. The

spring d' is connected with a stationary support d^2 .

d^3 (see Fig. 5) is a loop in the end of the cord d , in which the pin p^3 is adapted to slide. When the indicator-drum c is free to revolve, the tension of its spring c^2 holds the left-hand end of the loop d^3 against the neck of the pin p^3 ; but when the indicator-drum is locked, as shown in Fig. 10, the pin p^3 slides to the right-hand end of the loop d^3 on the back stroke of the cross-head q , the spring d' holding the cord d taut instead of allowing it to sag.

In Figs. 2, 6, and 7 I have shown an improved construction designed to maintain the operating-cord in place on the indicator-drum and having provisions for leading off the cord in different directions. The lower part of said drum is provided with a flange c^6 , which, together with the wider flange c^3 , forms a groove in which the cord d is wound. Said groove is covered by a vertical flange b^2 , formed on the member b , and a practically-closed annular chamber is thus provided in which the cord is confined. The numeral 2 designates a stem projecting tangentially from one side of the flange b^2 and formed with a tangential aperture b^3 for the exit of the operating-cord. The end of said stem is counterbored to receive the stem of the pulley-holder o , which is provided with an axial aperture o^2 , forming a continuation of the aperture b^3 , said pulley-holder being adapted to be turned to any angular adjustment and fixed in place by a thumb-screw o^3 . The under arm of the member b^4 is apertured to fit over the downwardly-projecting screw-threaded end of the drum-spindle c' and is held in place by the thumb-nut c^7 on the end of said spindle. On loosening said thumb-nut the member may be turned about the spindle to any desired adjustment, so as to lead off the cord in a corresponding direction, said nut being then screwed up to fix the member at said adjustment.

Having thus explained the nature of my invention and described a way of constructing and using the same, although without having attempted to set forth all the forms in which it may be embodied or all the modes of its use, I declare that what I claim is—

1. In an indicator, the combination with the drum and the pencil adapted to be moved toward and away from the same, of means controlled by the drum for automatically throwing the pencil away from the drum at a predetermined point in the movement of the latter.

2. In an indicator, the combination with the drum, of a locking mechanism controlled by said drum and adapted to lock the same at a predetermined point in its movement.

3. In an indicator, the combination with the drum, and the pencil adapted to be moved toward and away from the same, of means controlled by the drum, for automatically throwing the pencil away from the drum at a

predetermined point in the movement of the latter, and a locking mechanism for automatically locking the drum at the same instant.

4. In an indicator, the combination with the drum, and the pencil and pencil-arm adapted to be moved toward and away from said drum, of a loose collar carrying the pencil-arm and normally actuated so as to hold the pencil away from the drum, a catch for holding said collar with the pencil in contact with the drum, and means on the drum for displacing said catch and releasing the collar at a predetermined point in the revolution of the drum.

5. In an indicator, the combination with the drum having ratchet-teeth and a projection on its periphery, and the pencil and pencil-arm adapted to be moved toward and away from said drum, of a loose collar carrying the pencil-arm, a spring-actuated detent adapted to engage the collar and move the same so as to throw the pencil away from the drum, a pawl connected with said detent and adapted to engage the ratchet-teeth on the drum when the detent engages the collar, and to disengage said teeth when the detent is disengaged from the collar, and a catch adapted to engage the collar so as to hold the pencil in contact with the drum and to be displaced by the projection on the drum so as to disengage the collar at the end of a complete stroke of the drum.

6. The combination with an engine, and an indicator having a drum and a mechanism for locking said drum, of a looped cord for operating the indicator-drum, a reciprocating

pin actuated by the engine and engaged with the cord, and a spring connected with the cord and exerting a tension longitudinally thereof, the said spring holding the cord taut, and the pin operating to and fro in the loop of the cord when the indicator-drum is locked.

7. In an indicator, the combination with the drum having a groove adapted to confine the operating-cord, and the arm supporting said drum, of a member secured to said arm and having a vertical flange portion surrounding the lower part of the drum and covering the groove, so as to prevent the cord from slipping out therefrom, a pulley-holder swiveled on said member and having a stem formed with an aperture for the cord, and means for securing said holder in various angular positions.

8. In an indicator, the combination with the drum having a groove to confine the operating-cord, and the arm supporting said drum, of a member having a vertical flange portion surrounding the lower part of the drum and covering the groove so as to prevent the cord from slipping out therefrom and having a tangentially-directed stem with an aperture for the cord, and means for securing said member in various positions.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 6th day of December, A. D. 1897.

JOHN C. PAIGE.

Witnesses:

FRANK E. FOWLE,
ARTHUR C. HARDY.