

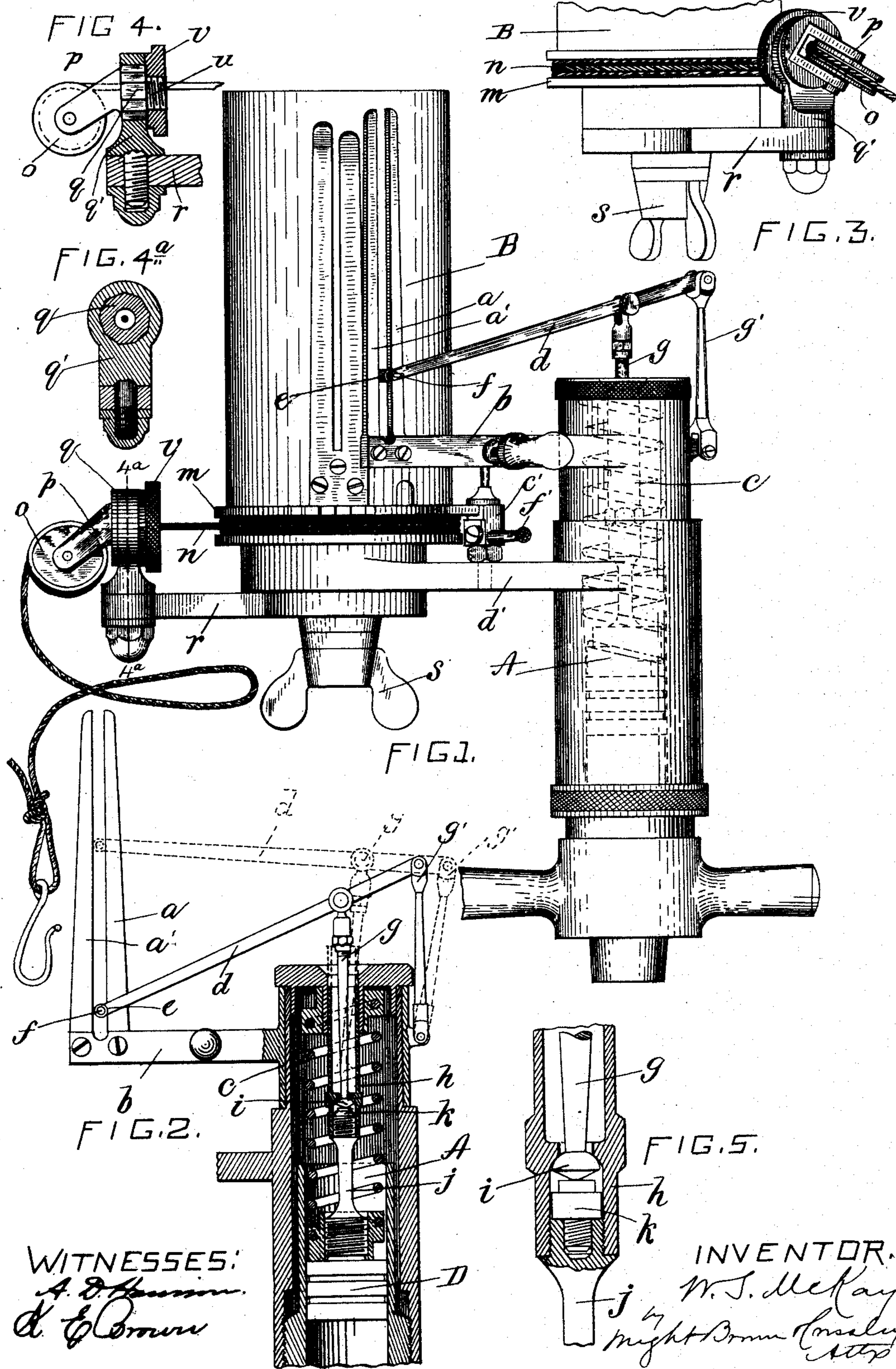
(No Model.)

2 Sheets—Sheet 1.

W. S. McKAY.
STEAM ENGINE INDICATOR.

No. 428,933.

Patented May 27, 1890.



WITNESSES:
A. D. Brown
C. E. Brown

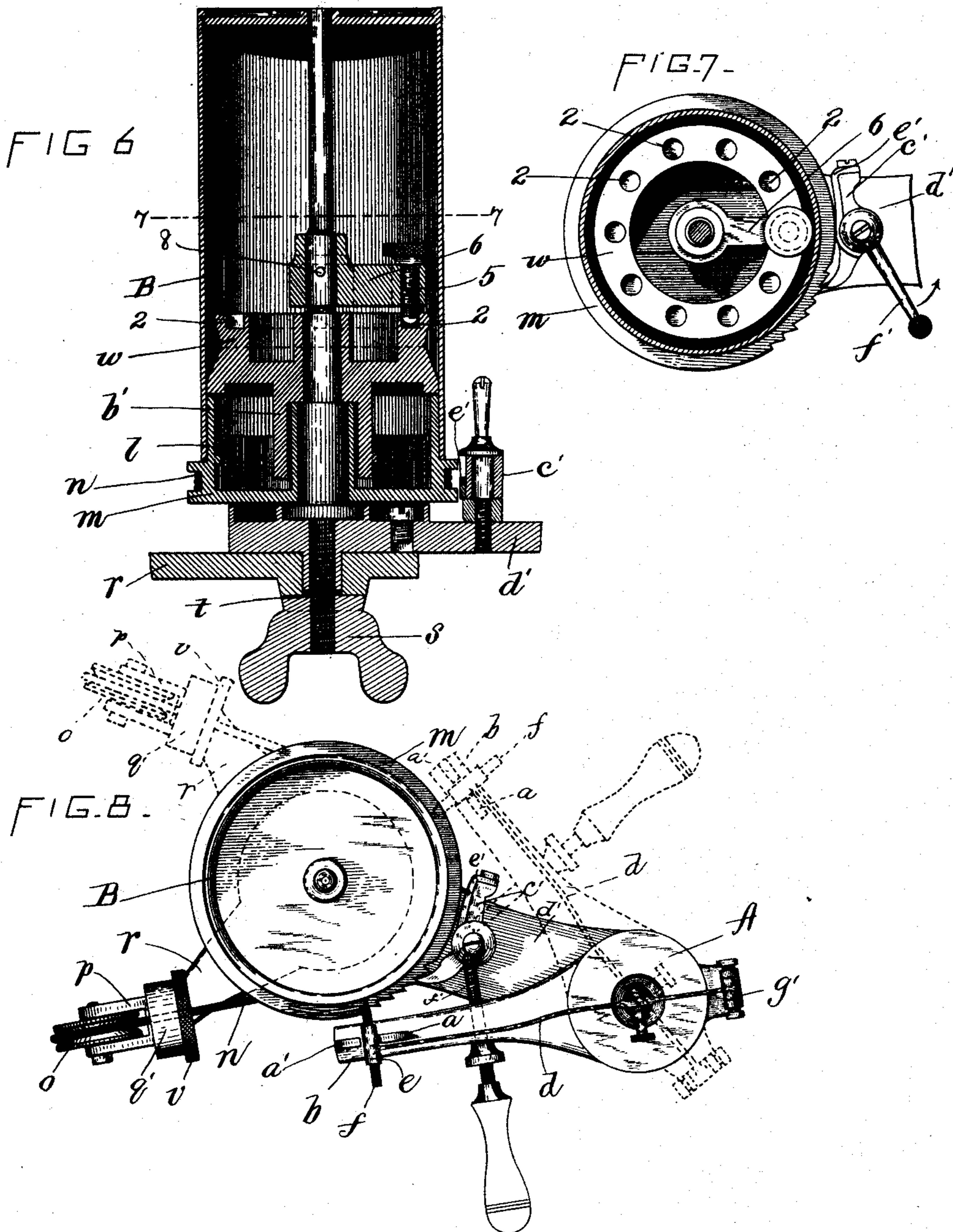
INVENTOR.

W. S. McKay
Wm. Brown & Co. Secy.

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WITNESSES.
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INVENTOR:
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UNITED STATES PATENT OFFICE.

WALTER S. MCKAY, OF EAST BOSTON, MASSACHUSETTS.

STEAM-ENGINE INDICATOR.

SPECIFICATION forming part of Letters Patent No. 428,933, dated May 27, 1890.

Application filed June 10, 1889. Serial No. 313,773. (No model.)

To all whom it may concern:

Be it known that I, WALTER S. MCKAY, of East Boston, in the county of Suffolk and State of Massachusetts, have invented certain
5 new and useful Improvements in Steam-Engine Indicators, of which the following is a specification.

This invention relates to steam-engine indicators, the action of which, when suitably
10 attached to the cylinder of a steam-engine, will determine the pressure of the steam in said cylinder at all points of the stroke of the piston.

The invention has for its object to provide
15 an indicator of the class mentioned, which may be adapted for use on either a right or left hand engine or on either cylinder of a double engine, so that one instrument only will be required, instead of two, as heretofore.

20 The invention also has for its object to provide a simple and effective parallel motion whereby the pencil attached to the instrument may be moved in a straight line, and thereby be made to trace an accurate diagram.

25 The invention also has for its object to provide improved means for readily adjusting the different parts in their operative position when necessary to change the instrument from right to left, or vice versa.

30 The invention consists in the improvements which I will now proceed to describe and claim.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents
35 a side elevation of an indicator provided with my improvements. Fig. 2 represents a sectional view of the cylinder of the same and a side elevation of the pencil-operating devices, hereinafter explained. Figs. 3, 4, 4^a,
40 and 5 represent detail views, hereinafter referred to. Fig. 6 represents a longitudinal section through the paper-cylinder shown in Fig. 1. Fig. 7 represents a section on line 7
7, Fig. 6, looking downwardly. Fig. 8 represents a top plan view of the invention as shown
45 in Fig. 1.

The same letters of reference indicate the same parts in all of the figures.

50 In the drawings, referring to Figs. 1 and 2, A represents the steam-cylinder, B the paper-cylinder, and D the piston, of a "Thompson indicator"—an instrument well known to

those skilled in the use of such devices and forming no part of my invention, but to which my improvements in the present instance are
55 preferably attached.

In the application and use of the indicator, connection being made with each end of the engine-cylinder by suitable appliances, steam
60 from said cylinder is admitted to the indicator-cylinder, which forces the piston upwardly in the cylinder of the indicator against the tension of a spiral spring suitably secured to the piston and resting against the
65 head of the cylinder. To the piston-rod is attached a sleeve provided with a socket at its lower end adapted to receive the lower
end of a bar. The latter being connected at
70 its upper end to the pencil-carrying arm, said arm is connected at its outer end to a "radius-bar" and is adapted to move between vertical parallel guides secured to an arm,
the arrangement being such that the pencil
75 is moved in a vertical line by the piston and intermediate connections above described. The paper-cylinder is revolved to correspond
to the movement of the piston by suitable devices which it is not necessary here to describe.

The foregoing is simply a description of
80 the operation of indicators in general use, and in carrying out my invention I have made certain new and useful improvements which I will now proceed to describe and claim.

Referring to Figs. 1 and 2, *a a'* represent
85 parallel vertical guides suitably secured to an arm *b*, formed integrally with or suitably attached to a sleeve *c*, surrounding the upper portion of the cylinder A and fitted thereto, so that it may be revolved thereon. *d* represents an arm, which is commonly called the
90 "pencil-carrier," on the outer end of which is formed a sleeve *e*, adapted to fit the space between the guides *a a'*, so that it may move freely therebetween. In said sleeve is inserted a pencil *f*, (see Fig. 8,) adapted to
95 trace a diagram in a common and well-known manner. *g* represents what I term the "socket-bar," said bar being connected to the pencil-arm at its upper end, and extending
100 downwardly into a sleeve *h*, having a socket formed in its lower end and adapted to engage a spherical enlargement *i* on the bottom of the socket-bar. The sleeve is secured to

the piston-rod *j* by a screw-threaded connection with the same. A step or stud *k* is inserted in the enlarged portion of the piston-rod, and the socket-bar is adapted to lightly
 5 bear against the same, so as to take up all vertical play and allow the arm to be rocked easily, the arrangement being such that a ball-and-socket joint is formed, whereby the bar may accommodate itself to the radius im-
 10 parted thereto through the pencil-arm when the latter is moved between the guides, as shown in dotted lines in Fig. 2 and on an enlarged scale in Fig. 5.

It will be understood by the foregoing that
 15 I am enabled to provide a simple, durable, and accurate "parallel motion," which is an important feature of my invention.

The paper-cylinder *B* is provided with a coiled drum-spring *l*, the tension of which
 20 may be regulated for different speeds of engines. Said spring is adapted to operate the carrier disk or drum *m*, to which the cylinder is detachably secured. (See Fig. 6.) Said carrier-disk is provided with a groove, Figs.
 25 1 and 6, for the reception of a cord *n*, adapted to be attached to the cross-head of the engine through suitable devices.

Heretofore considerable difficulty has been experienced in guiding the cord to the grooved
 30 carrier-disk *m*, as the connection with the engine is frequently made at sharp angles and the range of adjustment has been limited. To this end I have provided a "leading-pulley" *o*, which consists of a grooved
 35 pulley affixed to a bracket *p*, having a polygonal shank adapted to fit a socketed standard *q'*, secured to an adjustable base-plate *r*, held in position by a thumb-nut *s* to the spindle *t*, on which the carrier-disk rotates.
 40 Said bracket-shank *q* is provided with a screw-threaded portion *u*, Fig. 4, to which a milled disk-nut *v* is attached, by which the pulley may be held in position. The cord passes over the pulley, which is always in
 45 line with the carrier-disk, as shown in Figs. 1, 8, and 3, and passes through the portion *q*, as shown in Fig. 4^a, (which is a sectional view on line 4^a 4^a of Fig. 1,) and around the carrier-disk *m*.

It will be seen by reference to Figs. 4 and 4^a that the wheel *o* may be set at any angle permitted by the number of sides of the polygonal portion and insures a superior means for guiding the cord than has been used heretofore. Fig. 3 shows the leading-wheel set at
 55 one of the angles, which will serve to make clear the point just described.

As before stated, the carrier-disk is provided with a drum-spring *l*, adapted to move
 60 said carrier, and with it the paper-cylinder, in the direction opposite to that in which it is rotated by the cord. In using the instrument with engines of varying piston-speed the tension of the spring must necessarily be regulated—that is, in case of a high-speed engine the spring must have increased tension,
 65 and vice versa. In order to secure a conven-

ient means of adjustment, I have provided a collar *w*, placed upon the spindle *t* and adapted to be turned thereon. Said collar is provided
 70 on its upper side near its outer edge with a series of holes 2 2 2, with which a set-screw 5 is adapted to engage, the latter being attached to a fixed arm 6 on the spindle. The collar is provided on its under side with a hub *b'*,
 75 having means for attaching one end of the spring *l* thereto, the other end of the spring being attached to the carrier-drum. The spindle *t* being held in a fixed position by the wing-nut *s*, it will be seen that the arm 6, being fixed to the spindle, forms an effective means of adjustment, as by simply loosening the screw 5, so as to allow the collar *w* to be turned on the spindle, more or less tension may be given to the spring as occasion may
 85 require, as most clearly shown in Figs. 6 and 7.

I have shown in Fig. 7 a device for stopping the paper-cylinder when necessary without unhooking or disconnecting the connecting-cord, which device consists of a lever *c'*,
 90 pivoted on the supporting-arm *d'*, and having a strip of leather or other suitable material *e'* secured to one side thereof, adapted to engage the periphery of the lower portion of the carrier-disk *m*. An arm *f'*, formed on the
 95 lever and extending out a sufficient distance therefrom to exert sufficient leverage for the application of the brake, secures a convenient means for stopping the cylinder, as will be readily understood by reference to the above-
 100 mentioned figure.

In changing the instrument from a left-hand (as shown) to a right-hand I proceed as follows: By reference to Fig. 8 it will be seen
 105 that the pencil-carrying bar *d* is provided with an offset, and that the guides *a a'* are in line with the center of socket-bar *g* and radius-bar *g'*, so that when the pins or studs which connect said socket-bar and radius-bar to the pencil-carrying lever and the latter re-
 110 versed and the arm *b* swung around on its sleeve to the position shown in dotted lines in said figure, the leading-wheel and its support being adjusted to the dotted-line position shown in said figure, and at the same
 115 time the arm is slipped up on the shaft by removing tapering pin 8, allowing collar *w* to be raised sufficiently to reverse spring *l* and the change is made which obviates the necessity of two instruments instead of one.
 120

Having thus explained the nature of my improvements and described one of the forms of their construction, as also a mode of their use, I declare that what I claim is—

1. In a steam-engine indicator, the combination of the indicator-cylinder and its piston, the sleeve revoluble on said cylinder, the pencil-carrier having a socket at its outer end, the radius bar or link pivoted at one end to said pencil-carrier and at its other end to said
 125 sleeve, the bar or rod *g*, pivotally connected at its upper end to said pencil-carrier and at its other end to the piston, the paper-cylinder, the arm *b*, rigid with said sleeve, and the ver-

tical parallel guides *a a'*, connected to said arm, substantially as set forth, the pencil being guided by said latter arms, as stated.

5 2. In a steam-engine indicator, the combination of the carrier-disk, a vertical standard having a lateral polygonal socket, a laterally-extending bracket having a polygonal shank corresponding with said socket in which the shank is adapted to be held and adjusted, 10 and the leading-pulley journaled upon said bracket, all as set forth.

15 3. In a steam-engine indicator, the combination, with the carrier-disk, of the leading-pulley, a bracket to which said pulley is journaled, said bracket being provided with a polygonally-formed shank and a screw-threaded portion, a supporting-standard provided with a polygonal socket conforming to the polygonal portion of the bracket-shank, and a 20 milled nut adapted to be screwed upon the screw-threaded portion of said shank, as set forth.

25 4. In a steam-engine indicator, the combination, with the spindle, the carrier-drum and drum-spring, one end of which is attached to

the carrier-drum, of a collar adapted to rotate on said spindle and provided on its upper face with a series of holes and having a hub to which the other end of the spring is attached, an arm fixed to the spindle, and a 30 set-screw in said arm adapted to engage the holes in the face of said collar, as set forth.

5. In a steam-engine indicator, the combination, with the paper-cylinder and carrier-drum, of the brake for stopping the revolution of the drum without disconnecting the 35 cord, consisting of the pivoted lever *c'*, having the arm *f'*, said lever being provided on its face adjacent to the carrier-drum with suitable friction material to bind against the periphery of the drum, all as set forth. 40

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 6th day of June, A. D. 1889.

WALTER S. MCKAY.

Witnesses:

A. D. HARRISON,
C. F. BROWN.