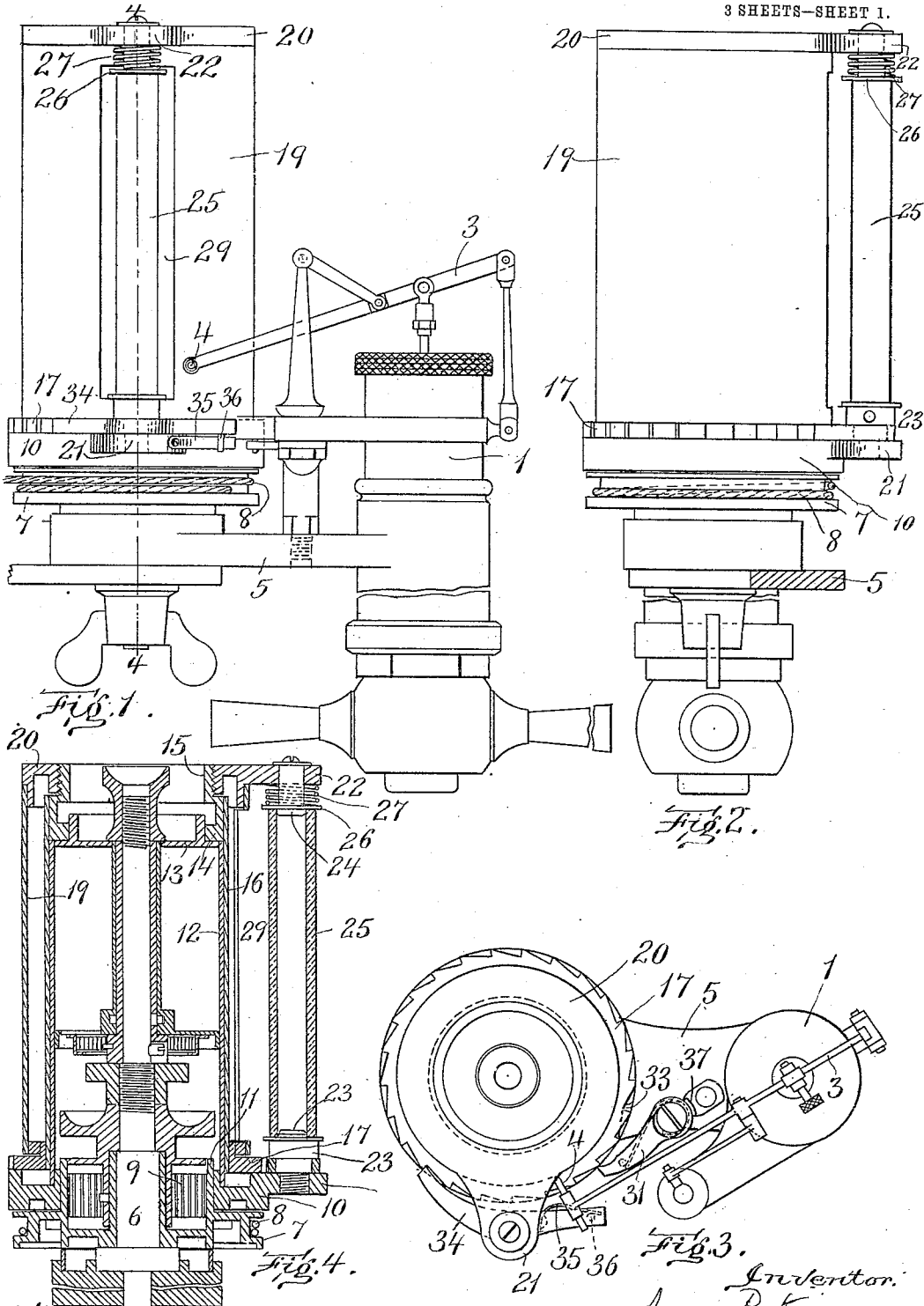


A. P. KINNEY.
 CONTINUOUS CARD INDICATOR.
 APPLICATION FILED MAR. 12, 1909.

951,131.

Patented Mar. 8, 1910.

3 SHEETS-SHEET 1.



Witnesses.
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Fig. 5.

Fig. 6.

Fig. 7.

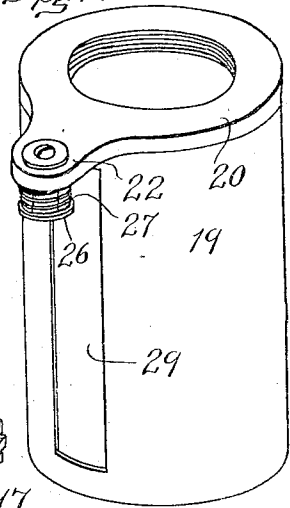
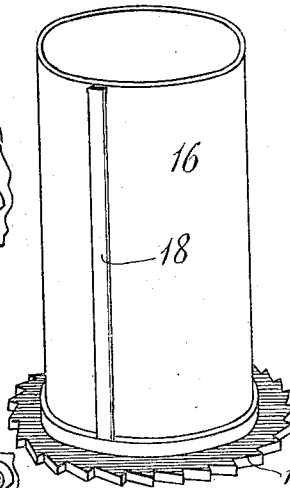
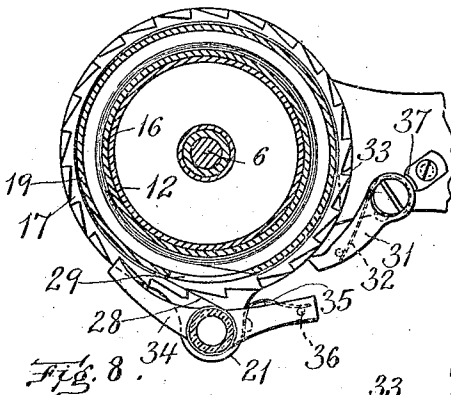


Fig. 8.

Fig. 9.

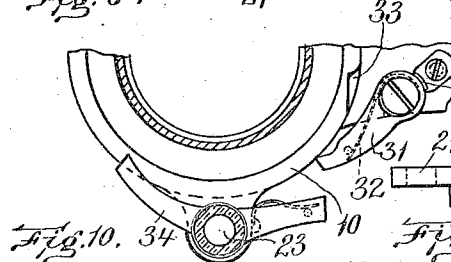


Fig. 10.

Fig. 11.

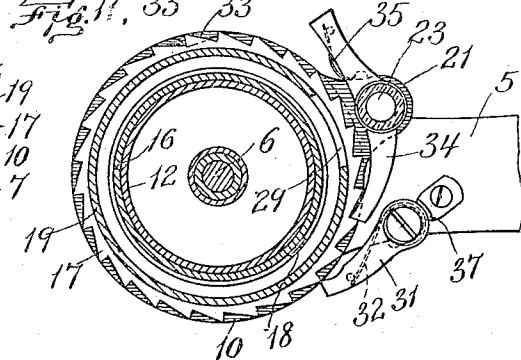
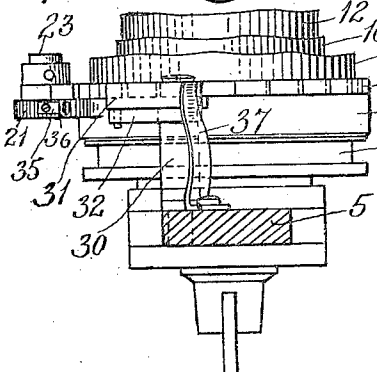
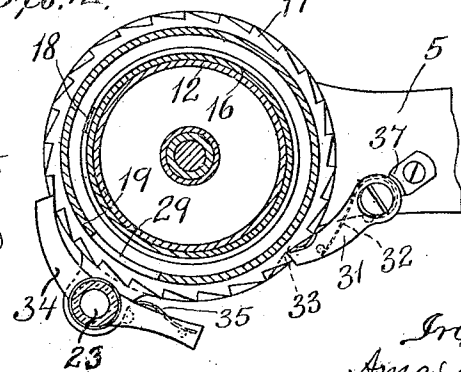
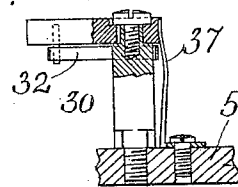


Fig. 13.

Fig. 12.



Witnesses:
F. R. Roulstone
A. C. Patigan

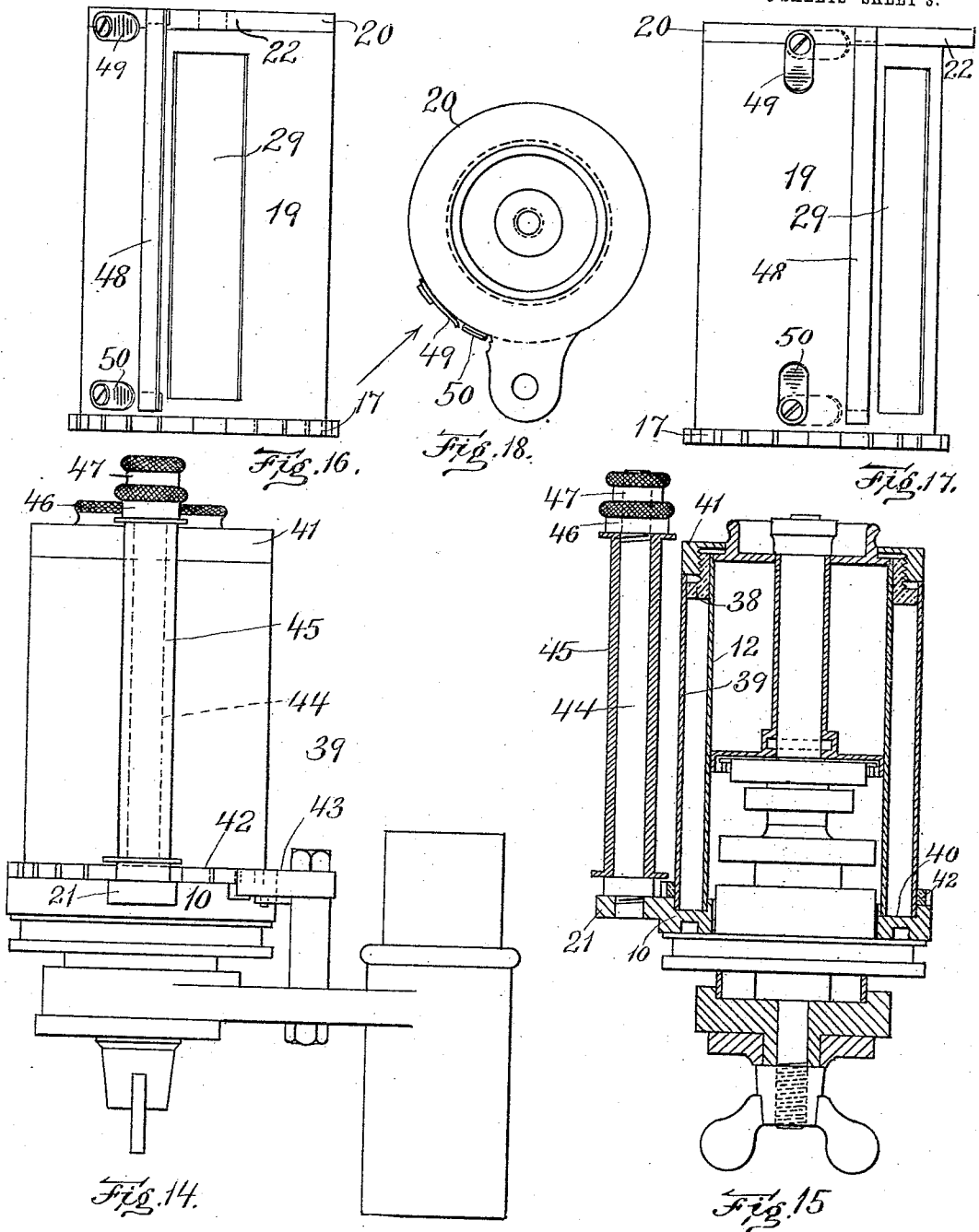
Inventor:
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CONTINUOUS CARD INDICATOR.
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3 SHEETS—SHEET 3.



Witnesses:
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UNITED STATES PATENT OFFICE.

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CONTINUOUS-CARD INDICATOR.

951,131.

Specification of Letters Patent.

Patented Mar. 8, 1910.

Application filed March 12, 1909. Serial No. 483,078.

To all whom it may concern:

Be it known that I, AMOS P. KINNEY, of Quincy, in the county of Norfolk and State of Massachusetts, have invented certain new and useful Improvements in Continuous-Card Indicators, of which the following is a specification.

The object of this invention is to produce an indicator capable of making a series of diagrams separated from one another sufficiently to be individually distinguished upon one and the same card or sheet.

The invention is designed to enable a distinct diagram to appear on the card or record sheet for each successive stroke of the engine during which the indicator is in operation.

In carrying my invention into effect I provide in connection with the usual paper or card-carrying drum of an indicator, a supply spool or roll carrying a continuous strip of paper, together with mechanism for advancing the sheet relatively to the marking point of the indicator after or near the completion of each individual diagram, so that a fresh portion of the sheet will be presented to the marking point preparatory to the production of each new diagram. I have found that this may be done in two ways, first, by having the sheet moved relatively to the drum around which it is wrapped, so that after each stroke of the engine the sheet is shifted on the drum, and second, by having the drum itself moved so as to wind or roll up the sheet upon its surface at or near the conclusion of each stroke.

Of the accompanying drawings,—Figure 1 represents an elevation of an indicator having applied thereto the improvement in which my invention is embodied, and illustrating the first of the above methods of shifting the paper. Fig. 2 represents an elevation as seen from the left of Fig. 1. Fig. 3 represents a plan view. Fig. 4 represents a longitudinal central section on line 4—4 of Fig. 1. Fig. 5 represents a horizontal sectional view of the same embodiment of the invention. Fig. 6 represents a perspective view of the drum on which the paper is wound. Fig. 7 represents a similar view of the outer drum about which the paper is wrapped and on which it is held when the diagrams are made. Fig. 8 repre-

sents a partial plan view of the disk by which the drums are carried, showing the means for advancing the paper. Fig. 9 represents a partial elevation of such disk. Fig. 10 represents an elevation of the parts shown in Fig. 8. Figs. 11 and 12 represent plan views showing the paper-carrying drums in different positions. Fig. 13 represents a detail sectional elevation of the pawl by which the paper is shifted. Fig. 14 represents an elevation of an indicator embodying means for shifting the paper according to the second method. Fig. 15 represents a central section of the same. Figs. 16 and 17 represent elevations of the outer paper-carrying drum seen in different positions. Fig. 18 is a plan view of the same.

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

The indicator as a whole is of any approved or ordinary type, having the cylinder 1 to which the pressure fluid of the engine to be tested is admitted, and by which the lever 3 carrying the marking point 4 is operated. Secured upon the cylinder is a bracket 5 carrying a stud 6 (Fig. 4) on which a pulley 7 is journaled, this pulley carrying a cord 8 wrapped about it, by which it is turned in one direction, and containing a spring 9 for returning and holding it when in normal position.

The part of the indicator in which my invention particularly resides is the paper-carrying and feeding mechanism, which may be applied to any of the indicators in ordinary use, and is constructed as follows: The disk 10 is journaled upon the barrel 11 (Fig. 4) which forms part of the pulley 7 and contains the spring 9, and is suitably connected to said pulley so as to have the same oscillatory motions as the latter. This disk has secured to it an internal drum 12 which is soldered or otherwise permanently secured to the disk. On the upper end of the drum 12 are secured a head 13 and a ring 14, the upper end 15 of which is threaded. Mounted upon the interior drum is an intermediate drum 16 which has an easy fit thereon so that it may turn without looseness, but with some frictional resistance. This drum has on its lower end a ratchet wheel 17 which rests upon the rim of the disk 10.

On one side of the latter drum and parallel with its axis is a bar 18 (Fig. 6) secured at its ends to the drum and slightly separated therefrom between its ends to receive the end of a diagram card or strip of paper. A third drum 19 external of the other two is carried by the interior drum, having a ring 20 which is screwed upon the threaded end 15 of the ring 14. When this ring 20 is screwed home, the inner and outer drums 12 and 19 are rigidly connected together so as to have the same motion, and the intermediate drum is carried frictionally with the other two, but is adapted to be arrested from time to time by a positive stop, as hereinafter explained.

On the disk 10 is a lug 21, and on the annular head 20 of the outer drum is a similar lug 22. When the external drum is properly secured upon the internal drum, these lugs are in alinement. The lower one carries a stud 23 and the upper a lug 24 to carry a spool or tube 25 on which a supply of paper for the indicator is wound. This spool or tube is detachable, and to permit of ready detachment the upper stud is made yielding. As shown in Fig. 4, it passes through the lug 22 and has a flange 26 between which and the lug 22 is a spring 27. As will be readily understood, the spring presses the flange of the stud against the end of the spool, while allowing them to be displaced endwise when the spool is to be removed or a new one inserted. The paper 28 (see Fig. 5) is led from the spool and carried around the outer drum 19, being led through a slot 29 in the latter, and its end passed through and suitably secured to the bar 18 on the intermediate drum. The latter is turned by engagement of a finger or other means, with the ratchet wheel 17 until the paper hugs the outer drum closely. When the drum is set into motion in the usual manner, by connecting the cord 8 with the cross head of an engine, the paper is carried back and forth past the marking point 4.

On the bracket 5 is secured a pin or stud 30 (Fig. 13) which carries a pawl 31 pressed by a spring 32 against the ratchet wheel 17. This pawl is wider than the ratchet wheel and bears also against the rim of the disk 10, which is approximately flush with the points of the ratchet teeth. The disk therefore keeps the pawl out of engagement with the teeth, except when a notch 33 of the disk comes adjacent to the pawl. When the notch is beside the pawl, the latter slips into engagement with the adjacent tooth of the pawl.

During the first movement of the drums, due to the outward pull upon the cord 8, the drums are turned into the position shown in Fig. 11. During the return movement, under the impulse of the spring 9, the notch 32

is carried past the pawl 31, when the drums have been brought almost back to their normal stationary position. The pawl slips into the notch 33 and engages the nearest tooth of the ratchet, holding the same stationary until the notch passes the pawl, and its inclined side displaces the pawl from the tooth. During this period the intermediate drum is held stationary, while the inner and outer drums continue their return movement, the outer drum slipping within the enveloping paper. The cam surface of the notch 33 is equal in length to one of the ratchet teeth, so on each return of the drums, the intermediate drum is given a relative forward movement with respect to the other drums equal to the spacing of one of the ratchet teeth. This has the effect of drawing a short length of paper from the spool and wrapping it upon the intermediate drum. To prevent the intermediate drum from being turned backward by the pull of the paper, or from other causes, I provide a second pawl 34 which is pivotally mounted on the disk 10, being for convenience carried by the spool-supporting stud 23. This pawl is arranged to engage the ratchet teeth of the wheel 17 and is so placed as to slip into the space behind a tooth, immediately before the pawl 31 releases the tooth with which it is engaged. That is, the pawl 31 holds the second drum stationary during a part of the return movement of the inner and outer drums, thus effecting a relative forward feeding movement of the intermediate drum, and the pawl 34 is carried by the return movement of the disk 10 so as to engage the next ratchet tooth to the rear, and it engages this tooth just before the pawl 31 releases the ratchet. A spring 35 fastened to the lug 21 bears against a pin 36 on the tail of the pawl 34 and serves to hold the toe of the pawl against the ratchet.

In order to avoid shock when the tooth of a ratchet comes into contact with the pawl 31 on the rapid return movement of the drums, this pawl is mounted yieldingly, as shown most clearly in Fig. 13. The eye of the pawl which surrounds the trunnion of the stud 30 is elongated in the direction in which the thrust is applied, and is moved outward by a spring 37 which bears against the pawl and exerts its force toward the toe of the latter. Thus when the pawl is out of engagement with the ratchet, it is pressed forward to the fullest extent by the spring 37, and when it is struck by one of the teeth of the ratchet on the return movement of the drums, the shock is first taken by the spring 37 and the intermediate drum gradually brought to rest before the pawl strikes against the rigid stud.

Fig. 8 shows the position of the parts when at rest, Fig. 11 shows them when the drums have been carried to the limit of their

oscillation by a pull on the cord 8, and Fig. 12 shows them as the feeding pawl is brought into engagement with one of the teeth of the ratchet. By comparing Figs. 8 and 12, it will be noted that the notch 33 is so placed that the feeding pawl acts before the drums finish their return movement and before the indicator diagram is completed. During the last portion of the return, the paper moves with the outer drum through the distance shown in Fig. 8, from the end of notch 33 to the toe of pawl 31. Thus the paper feed takes place while the marker is drawing the low-pressure line, which is ordinarily straight, and the motion of the paper is resumed before the compression occurs in the engine cylinder, so that the diagram is not made incorrect on account of the feed of the paper.

In Figs. 14 and 15, I have illustrated a construction of indicator in which there are only two drums, the outer drum serving both to support the paper or card, while the diagrams are being drawn upon it, and also to feed and wind up the card. In this embodiment of the invention there is an internal drum 12 which is rigidly secured by soldering or in any other suitable way, to the disk 10, and has secured to its upper end an externally threaded collar 38. An outer drum 39, which performs the functions of both the intermediate and outer drums of the form of invention first described, is slipped over the ring 38 and into an annular groove 40 of the disk 10, having a bearing on the exterior of said ring and the outer wall of this groove. A collar or ring nut 41 is screwed upon the ring 38 and forms an upper bearing for the drum 39, preventing the latter from being displaced. The outer drum carries a ratchet 42 which is engaged by a feeding pawl 43 of the same character as the pawl 31, previously described. As the outer drum is relatively movable to the disk 10 for feeding the paper, a different means for holding the paper supply spool is employed. In this form a pin 44 is mounted upon the lug 21 of the disk 10, which pin is longer than the supply spool 45, and projects above the end of the latter, having a bearing nut 46 to hold the spool thereon and a lock-nut 47. In all other respects the indicator is the same as hereinbefore described.

In Figs. 16, 17 and 18 the outer drum of the first form of the invention is shown as being provided with means whereby an indicator card of the ordinary form, which is not fed forward between strokes of the engine, may be taken. The drum as here modified has a strip or bar 48 fastened at its ends to the drum and having an intermediate space through which one end of the card may be passed. The card is wrapped about

the drum and its end placed between the pivoted clips 49 50, which are then turned down, as shown in Fig. 17, over the upper and lower edges of this end of the card, to hold it in place.

I claim:—

1. An indicator comprising a card-carrying drum, a pressure-actuated marker arranged to reciprocate beside said drum and parallel to the axis thereof, means for oscillating said drum in synchronism with the strokes of the engine being tested, and a stationary feed pawl arranged to engage and arrest said drum during a portion of the return oscillation of the drum, to produce a forward feed thereof and of the card relatively to the marker.

2. An indicator comprising a pressure cylinder, a marker actuated by pressure in said cylinder so as to reciprocate, an oscillative drum about which the paper or card on which diagrams are drawn is wrapped, a supply spool holding a reserve supply of the paper mounted beside said drum and oscillated therewith, and a stationary feed element arranged to arrest said drum during the return oscillation thereof, and effect a forward feeding movement thereof relatively to said spool and said marker to draw off a supply of paper from the spool and present a fresh surface of the paper to the marker.

3. An indicator comprising a pressure cylinder, a marker actuated by pressure in said cylinder so as to reciprocate, an oscillative drum about which the paper or card on which diagrams are drawn is wrapped, a supply spool holding a reserve supply of the paper, mounted beside said drum and oscillated therewith, a stationary feed element arranged to arrest said drum during the return oscillation thereof and effect a forward feeding movement thereof relatively to said spool and said marker to draw off a supply of paper from the spool and present a fresh surface of the paper to the marker, and a detent for engaging said drum to prevent retraction thereof.

4. In an indicator, an oscillative drum, ratchet teeth carried by said drum, a stationary pawl, and a guard for said ratchet normally holding said pawl out of engagement therewith and constructed to permit engagement with the ratchet during a limited portion of the movement thereof.

5. In an indicator, an oscillating paper-carrying drum, ratchet teeth formed upon said drum, a pawl located beside said teeth adapted to engage the same to effect a relative feeding movement of the drum, and a shield arranged adjacent to said teeth having an oscillative movement with the drum and normally holding the ratchet out of engagement with the teeth, said shield having a notch arranged to permit engagement of

said pawl with a tooth of the ratchet during a limited portion of the oscillations of the drum.

6. An indicator comprising a pressure cylinder, a marker reciprocated by pressure within said cylinder, a drum arranged to support a card or diagram sheet, means for oscillating said drum to carry said sheet back and forth past the marker, an interior drum with which an end of the paper is engaged, said interior drum having oscillating movements in synchronism with said first drum, and stationary means for temporarily arresting said interior drum to feed the same relatively to the first drum and shift the paper on the latter.

7. In an indicator, an oscillating cylinder or drum, a second drum mounted externally on said cylinder or drum and adapted to be turned thereon, said second drum being oscillated with the first drum, and a stationary positive stop rendered periodically operative for arresting said second drum during a part of the oscillations of the first drum to effect a feed of the paper.

8. In an indicator, a cylinder, a drum surrounding said cylinder and adapted to rotate thereon, means for oscillating said cylinder and thereby the drum, a paper holder carrying a roll of paper, one end of which is attached to said drum, said paper holder being rigidly connected with said cylinder, and having oscillatory movements synchronously therewith, a series of shoulders carried by said drum, and a stationary pawl arranged to engage one of said shoulders to arrest the drum and effect a feed of the paper during an oscillation of said cylinder.

9. In an indicator, a cylinder, a drum surrounding said cylinder and adapted to rotate thereon, means for oscillating said cylinder and thereby the drum, a paper holder carrying a roll of paper, one end of which is attached to said drum, said paper holder being rigidly connected with said cylinder, and having oscillatory movements synchronously therewith, a series of shoulders carried by said drum, a pawl arranged to engage one of said shoulders to arrest the drum and effect a feed of the paper during an oscillation of said cylinder, a shield nor-

mally holding said pawl away from said shoulders and having a depression adapted to admit the pawl, said shield being oscillated with the cylinder, and its depression serving to permit a periodical temporary engagement of the pawl with a shoulder.

10. In an indicator, a rotatably mounted drum, means for oscillating said drum, a paper-holding and feeding drum to which an end of a diagram card or sheet is attached and by which said card or sheet is fed and wound, a series of teeth on said paper-holding drum, said latter drum being carried oscillatively by the first drum, and a pawl arranged to engage said teeth during one of the oscillations of the drums and hold said paper-carrying drum stationary while the first drum continues its movement, said pawl being yieldingly mounted to diminish the shock occasioned by striking of the teeth against the same.

11. In an indicator, an internal drum, means for oscillating the same, a paper-winding drum rotatably mounted on said inner drum and having provisions for attachment of a diagram sheet, an outer drum rigidly connected to said inner drum for supporting the sheet, and having an opening in its side through which the sheet is passed to engage with said intermediate drum, a series of teeth carried by said intermediate drum, and a detent adapted to engage said teeth periodically and shift said intermediate drum relatively to the inner and outer drums.

12. In an indicator, a pressure-actuated marker, an oscillative drum mounted adjacent to said marker for carrying a record card or sheet, spool-holding devices attached to the upper and lower parts of said drum approximately in alinement parallel with the axis of the drum, and a spool for carrying a rolled-up record sheet detachably engaged at its ends with said spool-holding devices.

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

AMOS P. KINNEY.

Witnesses:

ARTHUR H. BROWN,
P. W. PEZZETTI.