No. 618,420. Patented Jan. 31, 1899.

A. P. KINNEY & E. VAUGHAN.

STEAM ENGINE INDICATOR.

(Application filed Mar. 25, 1898.)

(No Model.) 2 Sheets—Sheet 1.

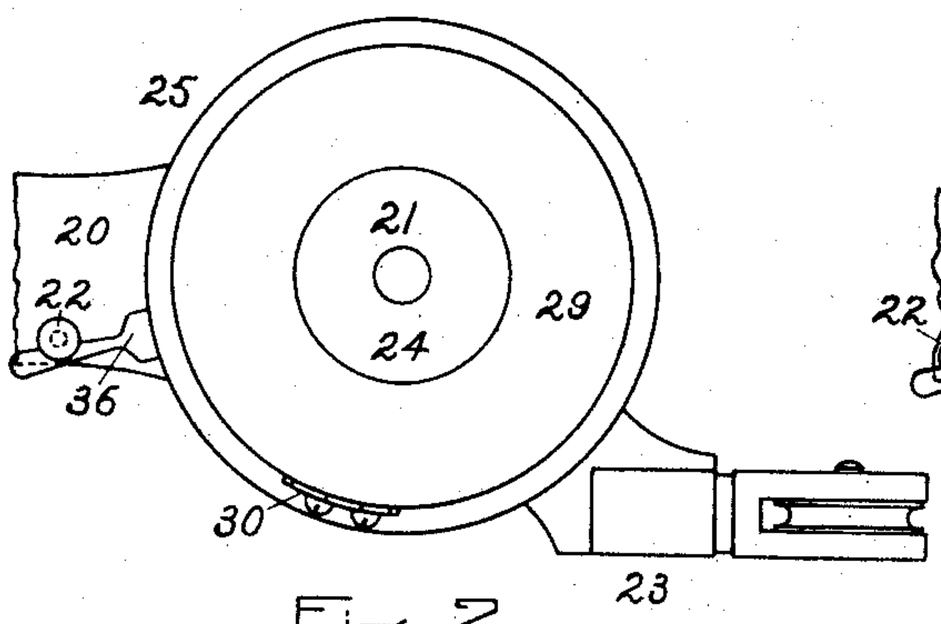

Fig. 2.

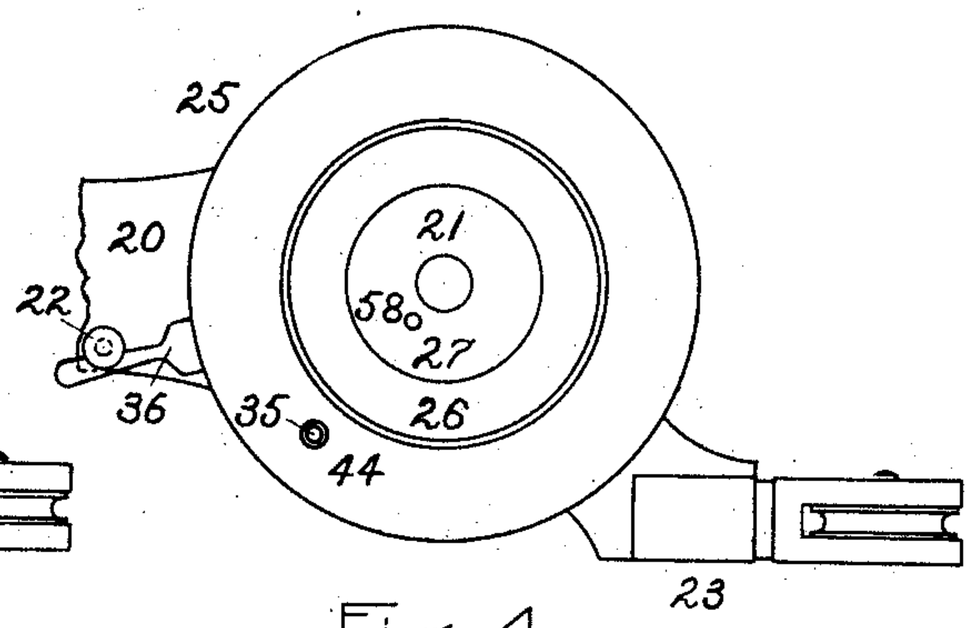

Fig. 4.

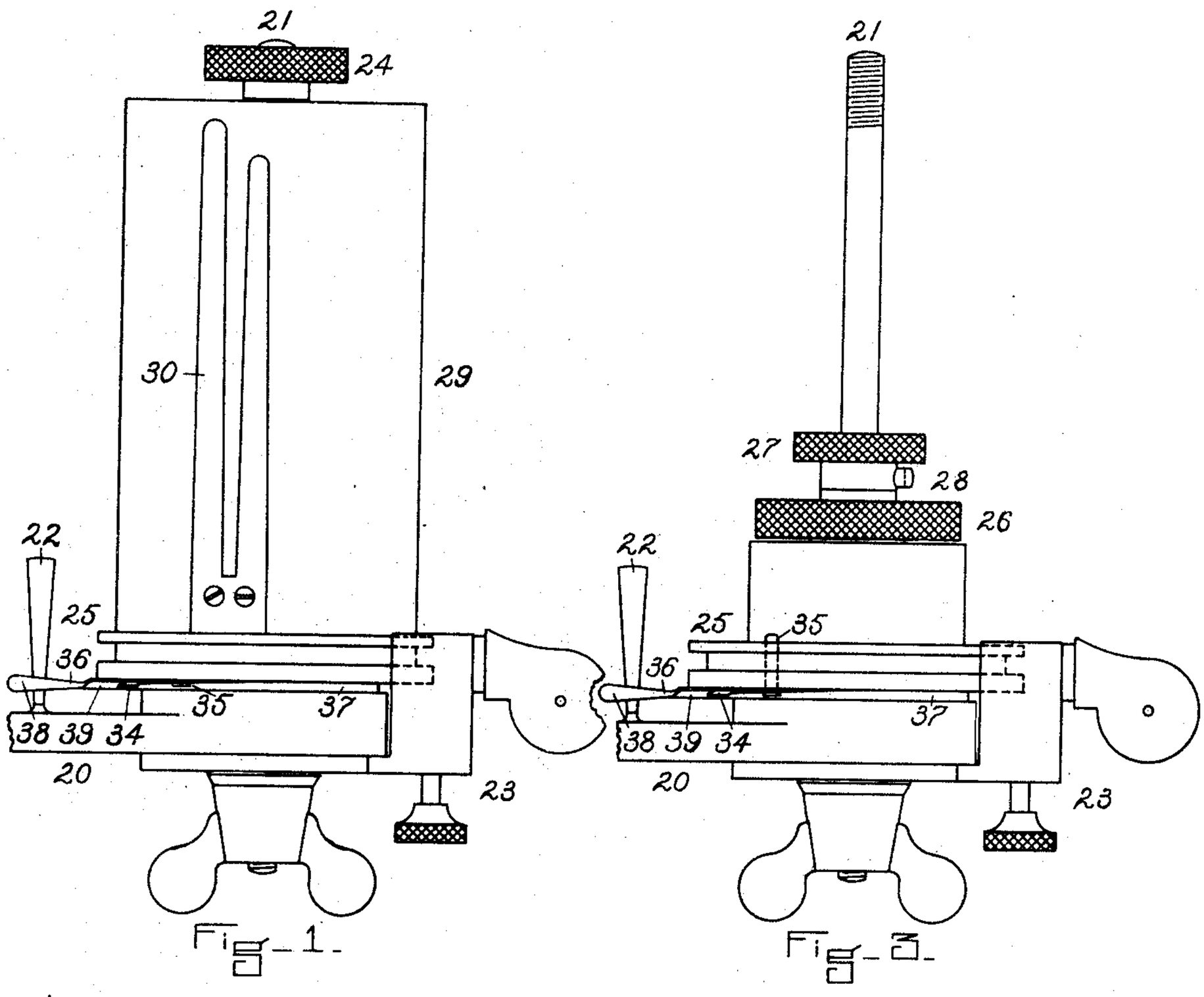

Fig. 1.

Fig. 3.

WITNESSES:

George L. Dolbeare.

Alfred W. Potter.

INVENTORS.

Amos P. Kinney

Earl Vaughan.

BY E. Frank. Woodbury.

ATTORNEY.

No. 618,420. Patented Jan. 31, 1899.

A. P. KINNEY & E. VAUGHAN.

STEAM ENGINE INDICATOR.

(Application filed Mar. 25, 1898.)

(No Model.) 2 Sheets—Sheet 2.

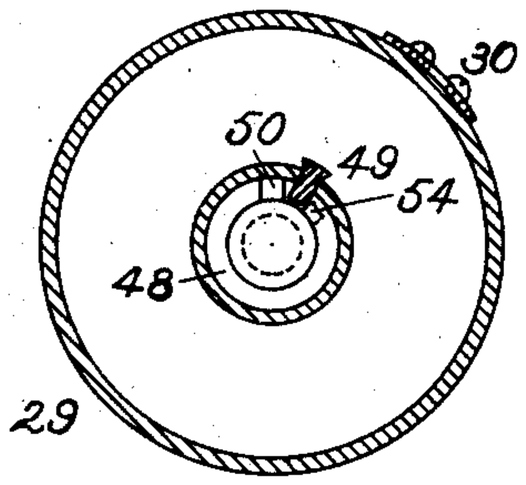

Fig. 13.

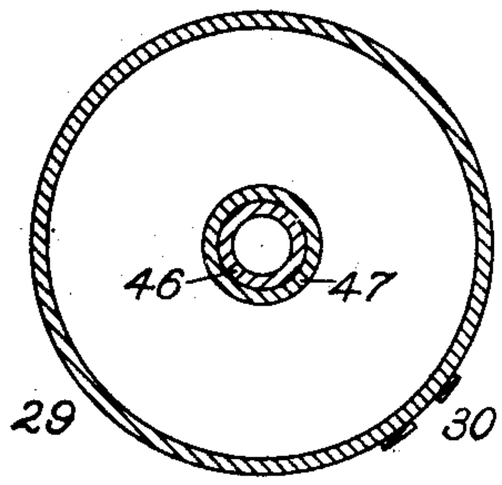

Fig. 11.

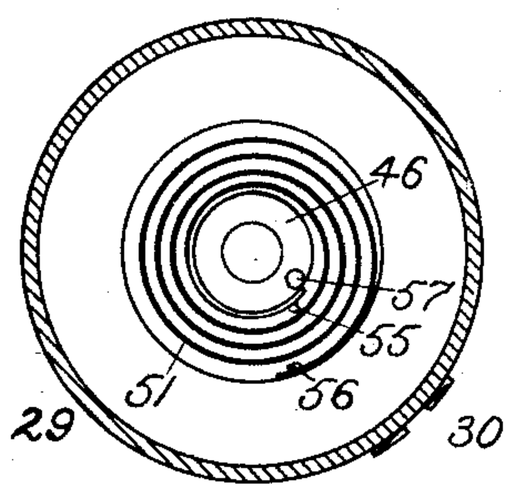

Fig. 10.

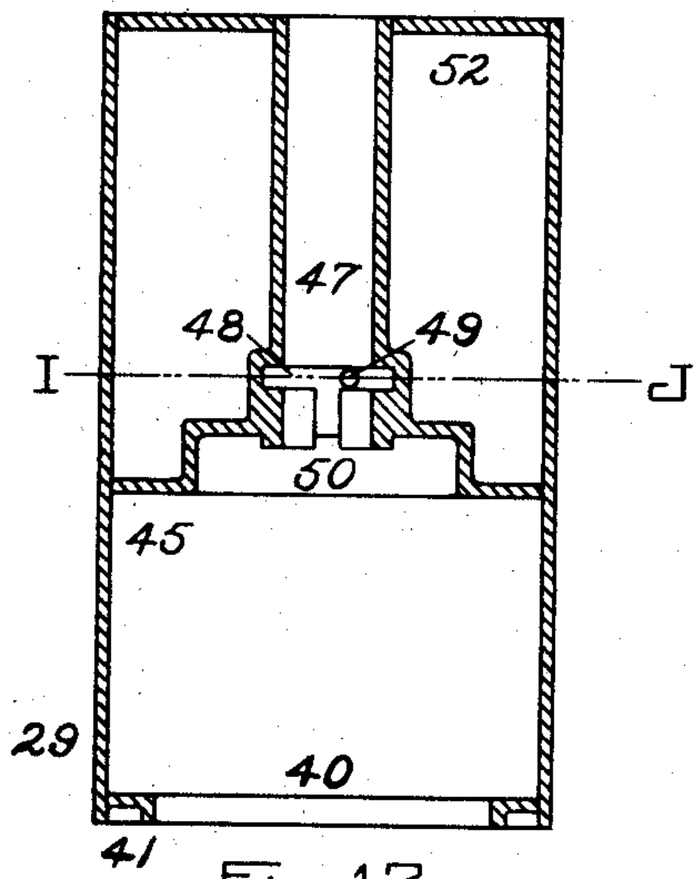

Fig. 12.

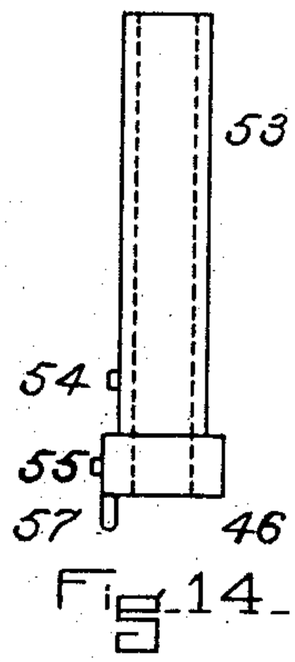

Fig. 14.

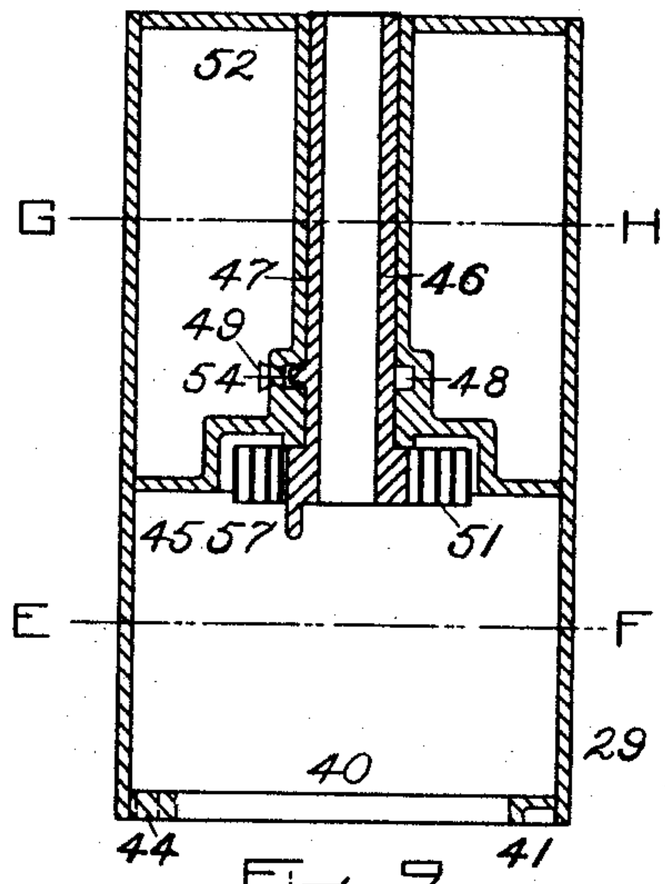

Fig. 9.

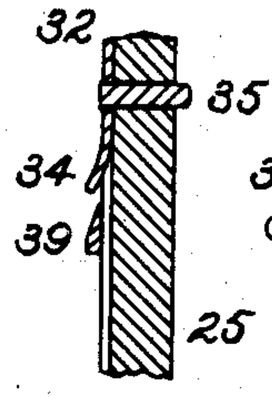

Fig. 6.

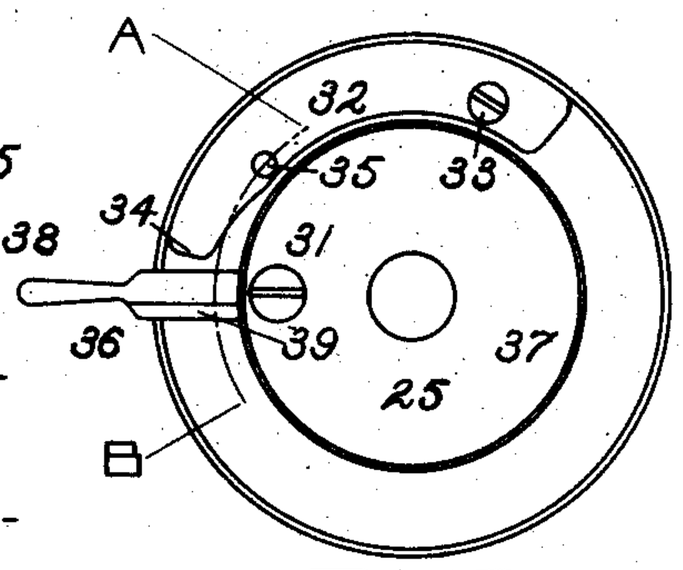

Fig. 5.

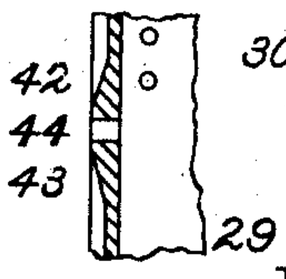

Fig. 8.

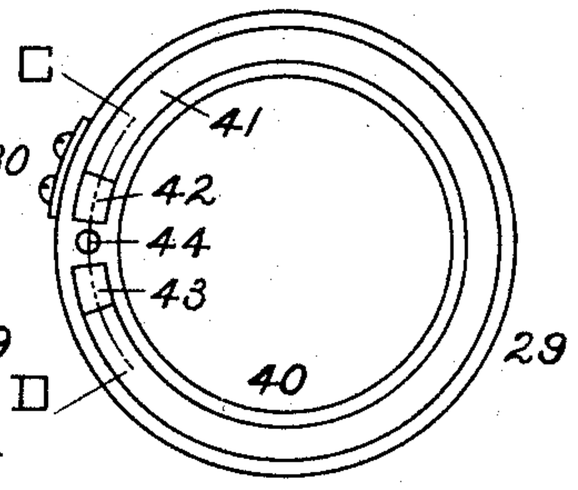

Fig. 7.

WITNESSES:

George L. Dolbeare.

Alfred W. Potter.

INVENTORS.

Amos P. Kinney

Earl Vaughan.

BY E. Frank. Woodbury.

ATTORNEY.

UNITED STATES PATENT OFFICE.

AMOS P. KINNEY AND EARL VAUGHAN, OF BOSTON, MASSACHUSETTS.

STEAM-ENGINE INDICATOR.

SPECIFICATION forming part of Letters Patent No. 618,420, dated January 31, 1899.

Application filed March 25, 1898. Serial No. 675,180. (No model.)

To all whom it may concern:

Be it known that we, AMOS P. KINNEY and EARL VAUGHAN, citizens of the United States of America, residing at Boston, in the county of Suffolk and Commonwealth of Massachusetts, have invented certain new and useful Improvements in Steam-Engine Indicators, of which the following is a specification.

Our invention relates to steam-engine indicators designed to be used in the taking of indicator-diagrams from engines, pumps, and the like.

It has for its object an improved construction and a novel arrangement of the drum-carriage and the drum which permits (when taking diagrams at the pleasure of the operator) the stopping and starting or the detaching or disconnecting of the drum without interfering with or affecting in any manner or degree the operative movement of the drum-carriage.

An indicator fitted with our invention possesses many valuable qualities, especially when applied to high-speed stationary engines, to locomotives, and to marine engines. In taking indicator-diagrams from high-speed engines it is very difficult to take off a card and put on another, using any style of indicator now in use, for the reason that the movement of the drum-carriage must be stopped while changing the cards or while the drum is removed and put on again. This stopping and starting of the drum-carriage of the ordinary indicator whenever it becomes necessary to put on a new card, however accomplished, is usually attended by many vexatious happenings and disagreeable results, which are wholly obviated in using our invention, as the drum-carriage after it is once connected with the reducing motion need not be disconnected until desired. In taking cards from locomotives and marine engines it is usually much more difficult to connect and disconnect the drum-carriage with the reducing motion than it is with stationary engines. In taking cards from marine engines it is often very desirable or necessary on account of close quarters to take the drum off the indicator in order to put on a new card, and this results in the spoiling of the fit of the drum of the ordinary indicator, and thereby causing it to run out of true—a very objectionable feature, which our invention entirely obviates, as the drum fit on the spindle is a long lubricated bearing well adapted for wear.

The drum-carriage and the drum represented in the drawings by Figures 1 and 2 are views of the well-known Thompson indicator as now made, with the exception only of the drum-detaching lever, the handle of which is shown in its position against the pencil-stop.

As our invention relates only to improvements in the construction and arrangement of the drum-carriage and drum, we have not shown in the drawings the steam-cylinder and pencil mechanism of the indicator.

Fig. 1 is a side elevation or view of the drum-carriage and drum and a portion of the frame of a standard Thompson indicator. Fig. 2 is a plan of Fig. 1. Fig. 3 is a side elevation of Fig. 1 with the drum removed. Fig. 4 is a plan of Fig. 3. Fig. 5 is an inverted plan of the drum-carriage. Fig. 6 is a sectional view of Fig. 5 on line A B. Fig. 7 is an inverted plan of the drum. Fig. 8 is a sectional view of Fig. 7 on line C D. Fig. 9 is a central vertical sectional view of the drum and spindle-sleeve. Fig. 10 is a full cross-sectional view of the drum on line E F of Fig. 9, looking toward the top of the drum. Fig. 11 is a full cross-sectional view of the drum on line G H of Fig. 9. Fig. 12 is a central vertical sectional view of the drum. Fig. 13 is a full cross-sectional view of the drum on line I J of Fig. 12, looking toward the base of the drum; and Fig. 14 represents the spindle-sleeve in elevation.

The following are standard parts, as usually constructed, of the well-known Thompson indicator, (see United States Patent No. 167,364 of August 31, 1875:) frame 20, provided with the spindle 21 and pencil-stop 22, carrier 23, provided with the ordinary adjusting devices, and drum safety-nut 24.

The drum-carriage 25 is of the usual construction and arrangement, except that it is provided with the drum detaching and connecting device, as hereinafter described, and it is provided with the usual drum-carriage spring-tension adjusting-collar 26 for adjusting the regular drum-carriage spring located inside the drum-carriage in the ordinary manner.

The spring-tension adjusting-collar clamping-nut 27 is of the usual or common construction, except that it is provided with the set-screw 28, which is used for the purpose of preventing the unscrewing of the nut when it is set up in its clamping position against the collar 26.

The drum 29, so far as its outer exposed surface is concerned, is the same as the regular standard drum, and it is provided with the ordinary indicator-card-fastening spring-clips 30.

As shown in Figs. 5 and 6, the drum-carriage 25, having the usual drum-carriage stop 31, is provided with the drum-engaging-pin spring 32, one end of which is securely fastened to the under side of the drum-carriage by means of the spring-fastening screw 33, while the other end is slightly bent or raised to form the lip 34. The spring is also provided with the drum-engaging pin 35, which is free to play or move longitudinally within the engaging-pin hole 44 of the drum and which extends through the rim of the drum-carriage. One end of the pin is riveted to the spring near the lip end thereof. This pin plays in a hole 35′ in the rim of the drum-carriage, and its upper end projects slightly above the upper surface of said rim, as shown in Figs. 3 and 6.

The drum-detaching lever 36 is provided with the thin light ring 37, designed to fit into a recess (not shown) in the indicator-frame which is made to receive the drum-carriage, all in the ordinary and common manner, and in this recess the ring is free to turn. The radial lever 36, which is a part of or is fastened to the ring, consists of the handle 38 and the wedge-shaped portion 39, which, when pushed by the handle under the lip 34 of the drum-engaging-pin spring (or by so holding the handle 36 that the drum-carriage in its movement will cause the depressing of the drum-engaging-pin spring) will, by depressing the spring or forcing it away from the under side of the drum-carriage, withdraw the drum-engaging pin from the hole 44 in the drum, thereby insuring the ready disengagement of the drum from the drum-carriage.

The drum 29 at its lower end or bottom is provided with the grooved ring 40, having the circular groove 41. This circular groove is provided with the two inclines 42 and 43 and the hole 44, adapted to cause the engagement of the drum with the drum-carriage when and only when the drum-engaging-pin hole 44 is brought opposite the drum-engaging pin 35 of the drum-carriage.

The drum 29 at its central and upper portion is provided with the combined spindle-sleeve and spiral-spring receiving case 45. That part of the case designed to receive the spindle-sleeve 46 is constructed as follows: The cylindrical bore or bearing 47 is made to receive the spindle-sleeve 46. This bearing is provided with the circular groove 48, in which is placed the drum-stop 49 and from which to its lower end extends the slot 50. The lower enlarged portion of the case is designed to receive the spiral spring 51.

The drum 29 at its top is provided with the cover 52.

The grooved ring 40, the case 45, and the the cover 52 are preferably soldered to drum.

The spindle-sleeve 46 is provided with the following: bearing-surface 53, upon which the drum is free to turn, stop 54, which limits the extent of the rotative movement of the drum upon the spindle-sleeve, spring-catch 55 for holding one end of the spiral spring, while the other end is held by the spring-catch 56 of the case 45, and pin or stud 57, which fits into the stud-hole 58 in the top of the nut 27. This stud-hole 58 in the fixed nut 27 on the stationary spindle 21, as shown in Fig. 4, is preferably made in the same radial line as the pin-hole 35′, through which the spring-locking pin 35 projects.

The length of the spindle-sleeve is such that it is firmly held or clamped in its fixed non-rotative position upon the spindle 21 between nut 27 and the nut 24, which also serves as a safety-nut in preventing the lifting of the drum.

The parts comprising the drum mechanism are assembled as follows: The spindle-sleeve 46 is placed in its position within the case 45. In entering the sleeve care must be taken to have the stop 54 enter the groove 48 through the vertical slot 50. When the sleeve is in its longitudinal position, it is designed that the stop 54 will be within the groove 48 and that the collar 46′ on the spindle-sleeve will abut against the lower end of the bearing 47 of the case 45. The spiral spring is then put in place within the case 45, and its tension is in such a direction as will tend to keep the drum-stop 54 of the spindle-sleeve 46 always in contact when the drum is disconnected from the drum-carriage with spindle-sleeve drum-stop 49. When these drum-stops 54 and 49 are in contact, as shown in Figs. 9 and 13, it is designed that the stud 57, which projects from the spindle-sleeve 53 and enters the pin-hole 58 on the fixed nut of the stationary spindle and the pin-hole 44 of the drum, shall not be in the same radial line, as shown in Fig. 9; but hole 44 shall be a little to the right of a radial line drawn through stud 57 when looking down upon the top of the drum. In this construction and arrangement it follows that when the drum is placed upon the drum-carriage the holes 35′ and 58 are in the same radial line, and the hole 44 in the drum will be a little to the right of drum-engaging pin 35, which projects through said hole 35′. Therefore it will be impossible to make the engagement between the drum and drum-carriage until the pin-hole 44 of the drum is brought into the same radial line as the stud 57, and this radial alinement,

which insures the drum and drum-carriage engagement, can be readily accomplished by turning the drum (by hand) a little to the left. This engagement can at all times be readily accomplished regardless of the movement of the drum-carriage, and the force necessary to turn the drum is very slight, as the operator will have to overcome only the slight tension of the spiral spring 51.

The detaching or disconnecting of the drum from the drum-carriage is at all times readily accomplished by moving the detaching-lever to the right until the drum-carriage in its movement causes the lip 34 of the drum-engaging-pin spring 32 to come in contact with the wedge-shaped portion 39 of the lever, which contact results in the depressing of the spring and its attached drum-engaging pin 35, thereby disconnecting the drum from the drum-carriage, and the drum at once is forced into its non-engagement position by the action of the spring 51, the pins 54 and 49 being in contact.

In the ordinary use of an indicator in taking diagrams it is well known that the reducing motion is always of such a length that the regular drum-carriage stops do not come in contact. Therefore the length of any diagram is considerably less than it is possible to have it. It therefore follows that in practice it is only essential that the drum detaching and connecting devices should be so relatively arranged that when diagrams are being taken the drum when disconnected from the drum-carriage shall be instantly forced into its non-engagement position by the action of the spiral spring in the receiving-case of the drum.

When detaching or disconnecting the drum from the drum-carriage, the handle of the detaching-lever is held very lightly, and the instant disengagement is accomplished the handle is left free, and the movement of the drum-carriage will push the detaching-lever back until the handle comes in contact with the pencil-stop, as shown in Figs. 1, 2, 3, and 4, where it will remain until the operator again wishes to detach the drum from the drum-carriage.

In operation when the drum is disconnected from the drum-carriage its movement ceases. It is intended that when taking diagrams from an engine with our improved indicator the drum-carriage shall be connected by means of the usual indicator-cord 60 with the reducing motion and that the indicator-cord may not be disconnected or unhitched from the reducing motion while the engine-indicator tests are being conducted. Therefore the movement of the drum-carriage during an indicator test will not in any manner be interfered with or affected. It will be observed that the wear of the drum-bearing 47 upon the bearing-surface 53 of the spindle-sleeve will be very slight, as there is no drum movement except during the time consumed in the taking of each separate diagram. The bearing 53 of the spindle-sleeve is a very long one of ample diameter, thereby insuring the perfect truth of the motion of the drum.

Our invention can be readily and cheaply applied to any and all of the Thompson indicators now in use, and it can also be easily adapted and applied to any of the standard indicators, such as the Crosby and the Tabor, by making such slight changes in the device as may be necessary.

The indicator shown in the drawings is provided with a large drum; but it is so constructed that it will take a small drum, the lower end of which will be preferably the same diameter as the large drum, while the upper part or that portion of the drum on which the card is placed is reduced to the diameter required for the small drum.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. In a steam-engine indicator, the combination of a drum-carriage, means for imparting a rotary reciprocatory motion to said carriage in unison with the piston movement of the engine, a detachable card-carrying drum mounted on said carriage, and means for locking and releasing said drum during the movement of the carriage without interfering with the operation thereof.

2. In a steam-engine indicator, the combination of a drum-carriage, a spring thereon provided with a pin, a drum mounted on said carriage and provided with a socket adapted to receive said pin, and a lever adapted to engage said spring to withdraw said pin for releasing the drum.

3. In a steam-engine the combination of a drum-carriage, a card-carrying drum supported thereon, one of said elements being provided with a spring-locking pin, and the other with a socket for said pin, and with a groove for the traverse thereof, whereby one of said elements may be adjusted on the other during the movement thereof without interfering with said movements.

4. In a steam-engine indicator the combination of a drum-carriage, a card-carrying drum supported thereon, one of said elements being provided with a spring-locking pin, and the other with a socket for said pin, and with a groove for the traverse thereof, said groove having inclines adjacent to said socket, whereby one of said elements may be adjusted on the other during the movement thereof without interfering with said movements.

5. In a steam-engine indicator, the combination of a drum-carriage, a spring-locking pin disposed thereon, means for reciprocating said carriage, a detachable card-carrying drum mounted on said carriage and provided with a groove in which said pin is adapted to travel during the removal and adjustment of the drum, and a socket for said locking-pin disposed in the circuit of said groove.

6. In a steam-engine indicator, the combination of a drum-carriage, a detachable drum

mounted thereon, comprising two members, one adapted to turn independently of the other, and two catch devices operated successively for locking the separate members of the drum to the carriage.

7. In a steam-engine indicator, the combination of a frame, a spindle supported thereon, a drum-carriage adapted to turn on said spindle, a spindle-sleeve also adapted to turn on said spindle, a drum proper having a tubular case adapted to turn on said spindle-sleeve, a spring for turning said drum proper on said spindle-sleeve, a stop device for said drum proper, and means for locking said spindle-sleeve to said spindle, and means for locking said drum proper to said drum-carriage.

8. In a steam-engine indicator, the combination of a frame, a spindle supported thereon, a drum-carriage adapted to turn on said spindle, means for reciprocating said drum-carriage, an adjusting-nut on said spindle over said carriage, a lock-nut on said spindle over said adjusting-nut, means for locking said lock-nut to said spindle, said lock-nut being provided with a pin-hole, a spindle-sleeve mounted on said spindle over said lock-nut and provided with a projection adapted to enter said hole, a drum proper having a tubular case adapted to fit said spindle-sleeve, a spring for turning said drum proper on said spindle-sleeve, a stop device for said drum proper, and means for locking said drum proper to said drum-carriage.

9. In a detachable drum for a steam-engine indicator, the combination of a spindle-sleeve, a drum proper provided with a tubular casing having a circumferential groove, said casing being enlarged at its lower end, a spring disposed in said casing and connected at one end therewith and at the other end with said spindle-sleeve, and a stop device for arresting the rotation of the drum proper on the spindle-sleeve.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

AMOS P. KINNEY.
EARL VAUGHAN.

Witnesses:
E. FRANK WOODBURY,
GEORGE L. DOLBEARE.