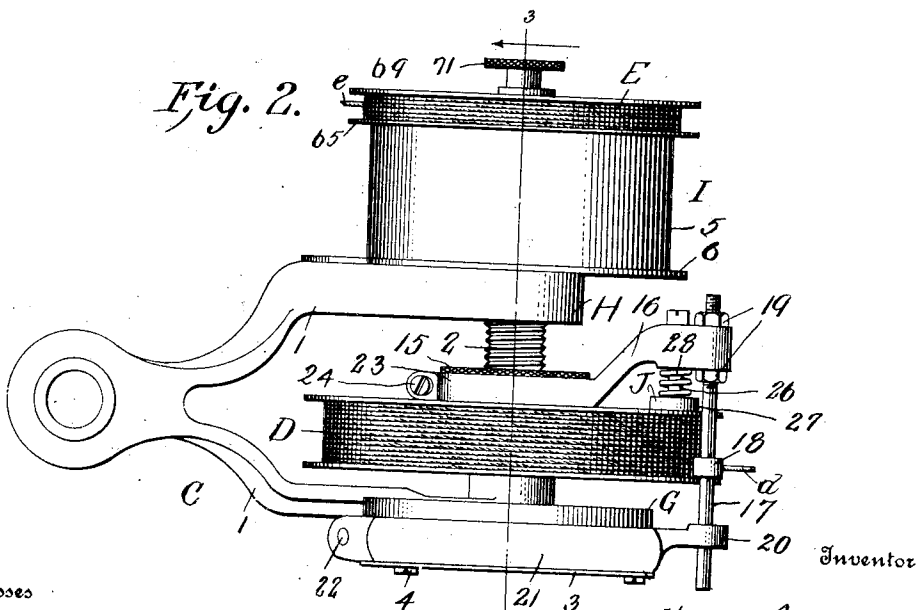
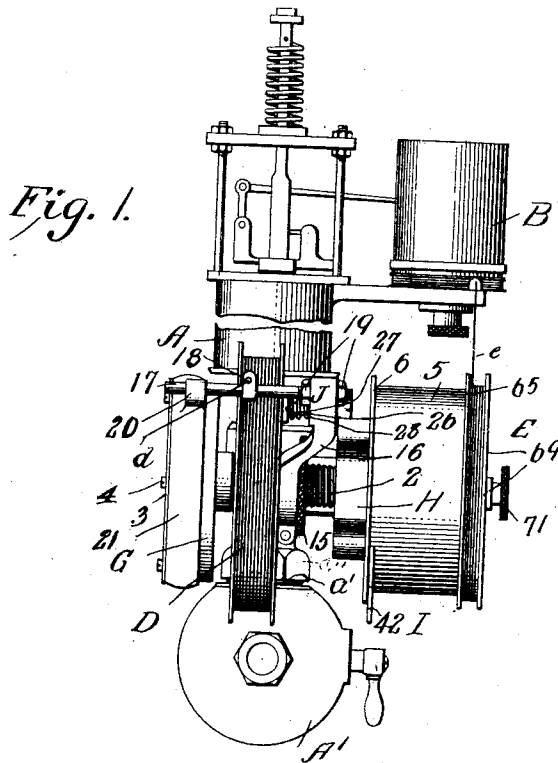


P. W. CRAIG.
REDUCING WHEEL FOR STEAM ENGINE INDICATORS.
APPLICATION FILED FEB. 24, 1908.

945,703.

Patented Jan. 4, 1910.
3 SHEETS—SHEET 1.



Witnesses

Jos. F. Collins.
Julie Anniger

334

Barley Wesley Craig
C. J. Stockman

Inventor

Attorney

945,703.

3 SHEETS--SHEET 2.

Jos. H. Collins.
Amie Annie Cole

Wm. O. Stockman

Attorney

P. W. CRAIG.
REDUCING WHEEL FOR STEAM ENGINE INDICATORS.
APPLICATION FILED FEB. 24, 1908.

945,703.

Patented Jan. 4, 1910.

3 SHEETS—SHEET 3.

Fig. 7.

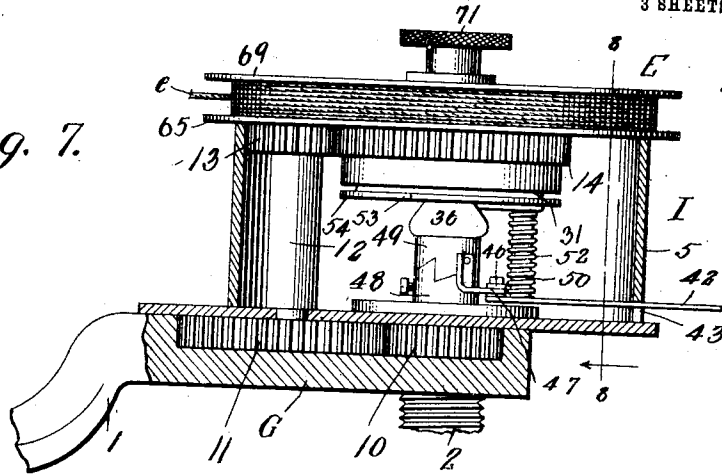


Fig. 9.

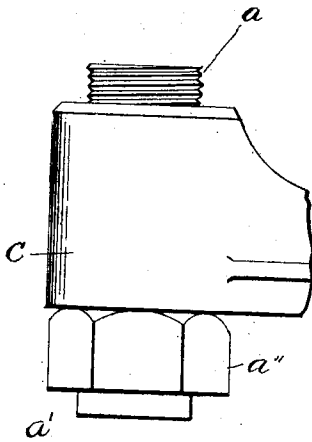
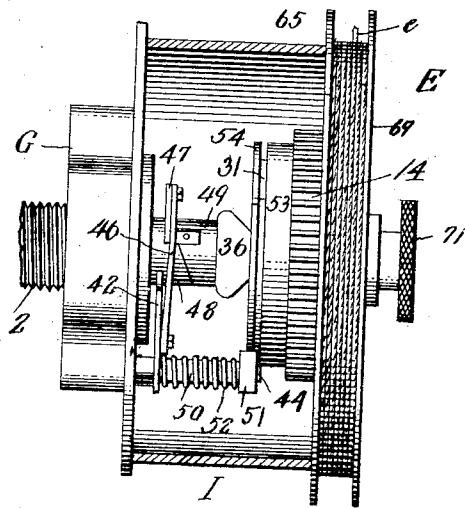


Fig. 8.



Witnesses
Jos. F. Collins,
Jesse Amick

Barley Wesley Craig
By C. F. Stockman

Inventor

Attorney

UNITED STATES PATENT OFFICE.

PARLEY WESLEY CRAIG, OF ENSLEY, ALABAMA, ASSIGNOR OF ONE-HALF TO LOUIS
ERWIN BAUMGARTEN, OF ENSLEY, ALABAMA.

REDUCING-WHEEL FOR STEAM-ENGINE INDICATORS.

945,703.

Specification of Letters Patent.

Patented Jan. 4, 1910.

Application filed February 24, 1908. Serial No. 417,366.

To all whom it may concern:

Be it known that I, PARLEY WESLEY CRAIG, a citizen of the United States, residing at Ensley, in the county of Jefferson and State of Alabama, have invented certain new and useful Improvements in Reducing-Wheels for Steam-Engine Indicators, of which the following is a specification.

This invention relates to improvements in reducing wheels for steam engine indicators, and consists in certain peculiarities in the construction and arrangement of parts and in certain novel combinations of elements substantially as hereinafter described and particularly pointed out in the subjoined claims.

The object of the present invention, stated in general terms, is to provide these reducing wheels with new and useful features whereby objections found to exist with those commonly used are obviated.

Among the new and useful features referred to, the following are worthy of special mention:—

Means are provided which, in the event of an accident, such as the rupture of the cord which connects the cord-pulley with the cross head of the engine, for example, acts automatically against the spring which effects the return movement of the parts and brings the parts to a stop before rupture of said spring can take place. The illustrated embodiment of this mechanism is in the nature of a brake which frictionally acts upon the pulley referred to and between which and said pulley there is a relative to and fro movement in the operation of the mechanism, whereby the holding engagement between them is automatically released in one direction of movement of the pulley and is again automatically effected at the end of the return movement of the pulley. The operating parts are so related to each other that the return movement of the pulley is concluded at the place, predetermined in the action of the spring, at which the spring is subjected to no strain in anywise liable to cause its rupture, and the brake is of such nature that it gradually overcomes the power of the spring and brings the parts gradually to a full stop.

Second. The reducing mechanism includes most effective and easily operated and simple means by which movement of the indi-

cating pulley, which is connected with the indicator cylinder, may be stopped without stopping the engine or disconnecting the cord. Different means may be used for this purpose. I have shown in the accompanying drawings a preferred form of means in which the indicating pulley is loosely mounted and is locked to a constantly rotating gear of the reducing train by means adapted to be manually operated to release it from said gear to stop the transmission of movement from the gear to the pulley.

Third. A supporting frame of special construction is provided, and the parts are so related thereto and to each other as to provide a well balanced and effectively supported structure, whereby durability is enhanced.

In addition to these important features the details of the structure are such as to provide, among other things, for complete protection of, and convenient access to the spring and gears and for maximum adjustment of the guide provided for the operating cord.

These several features of the invention are well exemplified in the structure illustrated in the accompanying drawing, which exemplify what I now believe to be the best embodiment of the invention, but it is to be understood that the invention in respect of any of its features is not to be construed as limited to the form or mechanism illustrated, which may be varied within apparently wide limits, without departing from the spirit of the invention or the scope of the subjoined claims.

In said drawings: Figure 1 is a side elevation of an indicator embodying my improvements. Fig. 2 is a plan view of the reducing wheel. Fig. 3 is a longitudinal section through the same, on the line 3—3 of Fig. 2. Fig. 4 is a detail plan view of the means for controlling connection of the indicator pulley with the reducing gears, with certain parts removed and other elements broken away. Fig. 5 is a detail view of the elements in the pulley which are removed in Fig. 4, showing their position when the pulley is locked for rotation. Fig. 6 is a view of the same in the position they occupy when the pulley is released. Fig. 7 is a section through a portion of the supporting frame and the second gear box, intended

particularly to show the general relation of the parts constituting the connection between the indicating pulley and the operating shaft. Fig. 8 is a section on the line 8—8 of Fig. 7. Fig. 9 is a detail view of a part of the frame, showing the lateral threaded projection and sleeve nut thereof.

The same characters of reference designate the same parts in the several views.

In the drawing there is illustrated in a general way the usual indicator comprising the cylinder A which is provided with means whereby a diagram is produced on a card carried by the drum B. These parts may be of the usual or any suitable construction, the details of which form no part of the present invention, and for this reason and for the further reason that their construction and operations are well known, a detail explanation thereof is entirely unnecessary herein.

The present invention relates to the reducing wheels or mechanism of these indicators. This reducing mechanism comprises a supporting frame, C, a pulley, D, to which is connected the operating cord *d* which runs to the cross head of the engine, a second or indicating pulley E, provided with the indicating cord *e* which runs to the card-drum B, and connections between the two pulleys, including a reducing train of gears, whereby they are operated in unison. While these parts have been embodied in other reducing wheels of this type, yet they are here shown as of novel construction and arrangement whereby advantageous results are secured. Thus, the frame C of the present construction is of yoke form, and is provided with lateral projections *a a'*, one of which as *a* is threadably or otherwise suitably connected to the cylinder A and the other, as *a'*, is connected, preferably by means of a lock-nut *a''*, to the valve-casing A' through which steam is admitted to the interior of said cylinder. The outer ends of the arms, 1, 1 of the frame form separated bearings for the operating shaft *x*. The operating or cord pulley D is mounted upon this shaft at a place between these bearings. The opposite ends of the arms 1, 1 are preferably enlarged and chambered, or formed to provide boxes, G and H respectively, one as H, adapted to contain elements 10 and 11 of the reducing train, and the other G, adapted to contain the spring F. This box G is provided with a plate 3, which constitutes a cover therefor and is removably secured thereto by suitable means, such as the screws 4. A second gear box, I, is provided for other elements, 13 and 14, of the reducing train, and this second box is mounted against the box H, and is formed by a ring 5 which is removably secured, as by screws 5^a to a disk 6 forming the outer wall of the box H. A wall of the box H

thus forms one wall of the box I and the other wall of the latter is formed by one side of the pulley E. In this box I there is also mounted releasing means for the pulley E. This relative arrangement and connection of the parts affords convenient access to the spring F, and also enhances the durability of the structure by affording a most stable support for the shaft X and the parts carried by said shaft, and by causing the parts to be well balanced. Moreover, the spring F and the referred to elements of the reducing train are incased and protected. One end of the spring F is suitably secured to the shaft X while its other end is secured to a fixed support as a projection 7 from the spring-box or casing 4, for example.

The cord pulley D is suitably connected to the shaft X to rotate therewith, and is here shown as fixed thereto by a set screw 8 which constitutes a suitable means for the purpose. It is provided with a sleeve 2 which is secured to it by suitable means, screws Y being here shown for the purpose. This sleeve is externally threaded and acts as an adjusting means for a cord guide and brake, as will be hereinafter more fully set forth, and also forms extended bearing for the cord-pulley upon the shaft. It is apparent that the sleeve might be dispensed with and the brake adjusted by forming threads directly on the shaft, for example, but for the reasons just stated I greatly prefer to use said sleeve.

Mounted upon the end of the shaft X in the gear box H is the member 10 of the reducing train, another member (11) of which train is mounted upon a shaft 12 which extends into the second gear box or casing I and is provided with the third gear (13) which intermeshes with the fourth gear 14. These gears are proportioned properly to reduce the speed suitable between the shaft X and pulley E.

It will now be seen that when the cord *d*, which is attached to the cross head of the engine, is pulled, the shaft X is turned against the tension of the spring F, and that this motion, suitably reduced, is communicated to the pulley E when the latter is fixed to rotate with the gear 14, and that the pulley E, by means of the cord *e*, rotates the drum B: and it will be understood that steam entering the cylinder A through the connection *a'* will act upon the usual piston in the latter and raise and lower the pencil which is connected with said piston and is in contact with the indicator card upon the drum B.

Suitably connected with the shaft X preferably through the intermediate threaded sleeve 2, as already indicated, is a sleeve 15, upon which is suitably secured an arm 16 from which a rod 17 projects across the periphery of the pulley D. This rod is pro-

vided with an eye 18 through which the cord d extends, and it is reciprocated in the oscillatory movement of the shaft, X. It is adjustably fixed to the free end of the arm 16 by clamp nuts 19, and its outer end is guided in its movements by an eye, here shown as formed in a projection 20 which extends from a spring band 21 mounted around the spring casing 6 and fixed thereon by a screw 22. As herein shown, the end of the arm 16 remote from the rod 17 is formed or provided with a spring band 23 having a clamping screw 24 by which it is adjustably fixed upon the sleeve 15. Most convenient provision is thus made for adjustment of the cord-guiding rod, through adjustments of its supports (the arm 16 and projection 20) and of the rod relative to its supports. It thus may be arranged in different position with respect to the sleeve, to suit the wishes of different users, and also may be adjusted relatively to the periphery of the pulley D to bring its guide eye 18 into proper position for the cord. It will be understood that this guide eye is, by the means described, caused to reciprocate as the cord d is unwound and wound upon the pulley D, thus guiding said cord to and from said pulley.

It commonly happens that the cord which is attached to the cross head of the engine breaks and when this occurs in the type of reducing mechanism to which the present structure belongs, the parts are brought back with force by the spring F sufficient to frequently and, in fact, usually, break the spring or destroy its operative connection with the shaft. To overcome this, means are provided whereby return movement of the shaft X is more or less gradually restrained. The means here shown for this purpose comprises a brake J carried by the arm 16 and arranged to engage the pulley D when the latter has reached its predetermined limit of movement under the influence of the spring. This brake consists of a rod 26 reciprocatorily mounted in the arm 16 and having a head 27 which is pressed into engagement with the pulley D by a spring 28. The head may be provided with fiber or other suitable soft packing to bear against the pulley, if desired. When the arm 16 moves away from the pulley it carries the brake with it, thus removing the restraint which said brake imposes to the unwinding movement of said pulley: and said brake moves toward the pulley in the winding movement of the latter and contacts therewith at the conclusion of the return movement which has been predetermined, and by its spring-pressure thereon prevents dangerous overrunning of the latter and brings it to a more or less gradual stop. It will be observed that the brake acts against the side or rim of the cord-pulley and that the

sleeve 2 provides an extended bearing. The effectiveness of the brake is thus enhanced and all tendency of the mechanism to throw the cord-pulley out of true when the brake is applied is overcome.

This invention also contemplates certain improvements in the means for stopping the rotation of the pulley E without disconnecting the operating cord d from the engine or stopping the latter. In the means illustrated for this purpose the pulley E is keyed upon a hub 30 of a carrier 31 which preferably is loosely mounted upon a stationary shaft Z in the box I, and means are provided for locking the carrier to and releasing it from the gear 14, which gear preferably is constantly intermeshed with the gear 13, instead of being shifted into and out of engagement with its driving gear. The shaft Z is preferably provided with a flanged end Z' secured to the wall 6 of the box I by screws z , as indicated in Fig. 3. The carrier 31, here shown, is of cup-form and has hubs 30 projecting in opposite directions therefrom to provide effective bearings. In its depression there are mounted a dog 32 and an arm 33, pivoted at the points 34 and 35 respectively. The dog and arm are connected with each other by a spring 36, of such form that it presses the arm toward a cone 37 and the dog outward into operative relation with a collar 38, both hereinafter referred to. The spring also serves, when the arm 33 is moved by said cone, to return the dog from said operative relation. For the latter purpose the edge 39 of the dog is inclined and the end of the spring slides thereon and is sufficiently rigid to turn the dog upon its pivot while it is being moved thereon. The dog extends through an aperture 40 in the wall of the carrier and its free end engages a tooth or depression 41 in the collar 38, which encircles the carrier and is attached to or formed integral with the gear 14, and thereby locks the carrier, and through it the pulley E, to the gear 14 for the transmission of movement between the same. To release this connection so as temporarily to discontinue movement of the pulley E, the dog is, as already implied, moved out of engagement with the aperture or tooth 41. This is effected by moving the cone 37 longitudinally and relatively to the arm 33 which rests thereupon, thus forcing the latter backward and communicating like movement to said dog by the spring already described. For the purpose of moving the cone 37 manually I have provided an operating lever or arm 42 which extends outward from the box I through an aperture 43 in the wall of the ring 5 and is fulcrumed upon a rod 44 and has a crank arm 45 which is connected by a link 46 with a projection 47 extending from said cone, whereby the cone is turned when

the arm 42 is shifted between starting and stopping positions, which may be delineated on the ring and are defined by the end walls of the aperture 43. To cause the cone to
 5 move longitudinally while being turned, it is mounted upon a member 48 which is relatively fixed to the stationary shaft Z and has a cam edge engaging a like edge of the cone as shown at 49. The angle lever, formed by
 10 the arms 42 and 43, is also provided with a sleeve 50 through which the rod 44 extends, and pivotally mounted on the upper end of this rod is a detent 51 which is under pressure of a spring 52 which holds it in the
 15 path of teeth or apertures 53 on the rim 54 of the carrier 31. This detent 51 is moved out of the path of the rim by movement of the arm 42 from stopping to starting position, being connected with the sleeve 50
 20 upon said arm by the spring 52, so that it does not interfere with rotation of the carrier 31, and similarly it is moved into the path of said rim when the arm 42 is moved from the starting position and, by means of
 25 the spring 52, is snapped into engagement with the contiguous tooth or aperture 53 and locks the carrier 31 and pulley E against rotation.

It will be understood from the foregoing
 30 that when the motion of the carrier is arrested by the detent 51 the dog 32 is disengaged from the depression 41 and that this disengagement is effected by the spring 36 which is put under tension in that movement
 35 of lever 42 which causes the detent 51 to engage the carrier: and, similarly, it will be understood that when the lever 42 is moved to the opposite or starting position the dog 32 engages depression 41 and the detent 51 is
 40 disengaged from the carrier by the spring 50.

Attention is called to the fact that the walls of the teeth or apertures 41 and 53 are such that the gear 14 will be locked to the carrier and the latter locked against rotation
 45 only in one direction of rotation of said gear, hence in the return movement of the parts under the influence of the spring the card-drum B will always remain stationary.

The pulley E is preferably formed of an
 50 inner plate or disk 65 having a hub 66 and a flange 67 and an outer plate formed of two or more flanged and nested rings 68 and 69 arranged one upon another, and mounted upon the flange 67, and a central outer disk or plate 70, all held together upon the hub
 55 30 of the carrier 31 by a nut 71 threaded upon the end of the shaft Z. The nested rings 68 and 69 are for the purpose of securing different lengths of indicator cards
 60 on the indicator drum as may be desired, depending upon the stroke of the engine, one or both of the rings being removable, as necessary.

From the foregoing the construction, op-

eration and advantages of the invention will be fully comprehended and it will be apparent that other than the illustrated means for the several purposes of the invention may be employed without departure from the scope of the invention and claims. I desire it also
 70 to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention and all things, which, as a matter of language, might be said to fall therebetween.
 75

Having thus described the invention what I believe to be new and desire to secure by Letters Patent, is:—

1. In an indicator for steam engines, comprising a rotative means by which is carried the element upon which the indication is made, a shaft, connections between said means and shaft for communicating movement between the same, means for turning
 80 the shaft in one direction and a spring acting in opposition to the latter means and turning it in the other direction: the combination therewith of resilient means for gradually restraining movement of the shaft when
 85 the last mentioned means becomes non-operative.

2. In an indicator for steam engines, comprising a rotative means by which is carried the element upon which the indication is
 90 made, a shaft, connections between said means and shaft for communicating movement between the same, means for turning the shaft in one direction and a spring acting in opposition to the latter means and
 95 turning it in the other direction: the combination therewith of an automatically operating brake mechanism including a cushioned head adapted to contact with a rotative element of the indicator and stop the
 100 movement of the shaft when the last mentioned means becomes non-operative.

3. In an indicator for steam engines, comprising a rotative means by which is carried the element upon which the indication is made, a shaft, connections between said means and shaft for communicating
 105 movement between the same, means for turning the shaft in one direction and a spring acting in opposition to the latter means and turning it in the other direction: the combination therewith of an automatically operating brake mechanism adapted to stop the movement of the shaft when the last mentioned means becomes non-operative, said brake mechanism comprising a
 110 movably-supported spring-pressed head and means carried by the shaft and against which said head operates.

4. In an indicator for steam engines, the combination of an oscillatory shaft, an operating pulley carried thereby, an operating
 125 cord, a spring for turning the shaft in the

direction opposite to that imparted to it by the operating pulley, means for carrying the element upon which the indication is made, connections between the same and the shaft, a brake and means whereby relative to and fro movements between the brake and shaft is effected by the movements of the shaft, said brake having a cushioning element for contact with the pulley.

5. In an operating mechanism for steam engine indicators, the combination of the operating pulley, means for connecting the same with the engine-piston, for turning it in one direction, means for turning it in the other direction, and means operative to elastically check its movement when the first mentioned means becomes non-operative.

6. In an operating mechanism for steam engine indicators, the combination of the operating pulley, means for connecting the same with the engine piston, for turning it in one direction, means for turning it in the other direction, a yieldable brake for restraining its movement, and means whereby relative to and fro movement occurs between the pulley and brake in the rotative movements of the pulley.

7. In an operating mechanism for steam engine indicators, the combination of the operating pulley, means for connecting the same with the engine piston, for turning it in one direction, means for turning it in the other direction, a brake for restraining its movement and connections between the pulley and brake for automatically moving the brake to and from the pulley.

8. In an operating mechanism for steam engine indicators, the combination of the operating pulley, means for connecting the same with the engine piston, for turning it in one direction, means for turning it in the other direction, a brake for restraining its movement, a shaft to which the pulley is fixed, and connections between the shaft and brake for automatically moving the brake to and from the pulley.

9. In an operating mechanism for steam engine indicators, the combination of the operating pulley, its shaft, means for turning the pulley in one direction, a spring for turning it in the other direction, a brake acting upon the pulley and means whereby the brake has connection with the shaft, said means adapted to reciprocate the brake from the shaft.

10. In an operating mechanism for steam engine indicators, the combination of the operating pulley, an oscillatory shaft carrying the same and turned in one direction thereby, a spring connected to the shaft for turning the same in the direction opposite to that imparted to it by the operating pulley, a brake acting upon the pulley, and

means whereby the brake has connection with the shaft, adapted to reciprocate the brake in the movements of the shaft.

11. In an operating mechanism for steam engine indicators, the combination of the operating mechanism, its shaft, means for turning the pulley in one direction, a spring for turning it in the other direction, a support having a threaded connection with the shaft, and a spring-pressed brake movably mounted in the support and arranged to act on the pulley.

12. In an operating mechanism for steam engine indicators, the operating pulley and its operating cord and spring, a cord guide and brake, a common support for said guide and brake, and means operative to produce relative to and fro movements between said support and pulley in the rotative movements of the latter.

13. In an operating mechanism for steam engine indicators, the operating pulley and its operating cord and spring, a cord guide and brake, a common support for said guide and brake, and means operative to produce movement of the support toward and from the pulley in the rotative movements of the latter.

14. In an operating mechanism for steam engine indicators, the operating pulley and its operating cord and spring, a rotative shaft upon which the pulley is mounted, a support movable with relation to said pulley and having a threaded connection with the shaft, and a cord guide and a brake, both carried by said support.

15. In an operating mechanism for steam engine indicators, the operating pulley, the cord and spring, a casing for said spring, a cord guide, extending over the pulley, and having a support at one end, said guide and pulley having relative to and fro movement, and means for supporting the other end of the guide, the latter means mounted upon the spring casing.

16. In an indicator for steam engines, the combination of an indicating drum, a pulley having connection therewith, a shaft, means for turning the shaft in opposite directions, a reducing train, comprising a gear mounted upon said shaft, a second shaft, having gears one of which is constantly intermeshed with the first mentioned gear, and a fourth gear constantly intermeshed with the other gear on the second shaft, and a locking connection between the fourth gear and the pulley, movable to release the pulley.

17. In an indicator for steam engines, the combination of an indicating drum, a pulley having connection therewith, a shaft, means for turning the shaft in opposite directions, a reducing train, comprising a gear mounted upon said shaft, a second shaft having gears one of which is constantly intermeshed with

the first mentioned gear, and a fourth gear constantly intermeshed with the other gear on the second shaft, and a locking connection carried by the pulley and engaging the
5 fourth gear and movable to release the pulley.

18. In an indicator for steam engines, the combination of an indicating drum, a loosely mounted pulley having connection therewith, and an operating mechanism for said
10 pulley having constantly intermeshed reducing gears, one of which has an aperture, and a movable locking and releasing means, connected with the pulley and adapted to engage the aperture in said gear.

19. In an indicator for steam engines, the combination of an indicating drum, a loosely mounted pulley having connection therewith, and an operating mechanism for said
15 pulley, comprising reducing gears, a carrier which rotates with the pulley and has a dog to engage a reducing gear, and means for moving the dog into and out of engagement with said gear to thereby lock and release
20 the carrier to and from the same.

20. In a reducing mechanism for steam engine indicators, a loosely mounted pulley having means for connecting it with the indicating drum, and an operating mechanism for the pulley, comprising reducing gears,
25 a carrier which rotates with the pulley, a dog and an arm carried by the carrier, said dog adapted to engage a reducing gear, a spring connecting the arm and dog with each other and transmitting movement from
30 one to the other, and means acting upon the arm to adjust the dog.

21. In a reducing mechanism for steam engine indicators, a loosely mounted pulley having means for connecting it with the indicating drum, and an operating mechanism for the pulley comprising reducing gears, a
40 carrier which rotates with the pulley, a dog and an arm carried by the carrier, said dog adapted to engage a reducing gear, a spring connecting the arm and dog with each other and transmitting movement from one to the other, and a longitudinally movable cone
45 which acts upon the arm to adjust the dog.

22. In a reducing mechanism for steam engine indicators, an indicator pulley, an operating shaft, connections between the shaft and pulley for transmitting movement to the latter, comprising reducing gears, and
50 means for locking the pulley and a gear together for unitary movement, comprising a dog carried by one of the parts and adapted to engage the other and an actuating means for said dog, having an inclined surface,
55 and means for moving the same relatively to the dog.

23. In a steam engine indicator, gearing, a pulley, and means for locking and releasing the pulley and gearing with relation to
60 each other, comprising a dog which moves with one of such parts and is adapted to

engage the other of the same to lock them together for unitary movement, and means for moving the dog into and out of engagement with the latter part, including an element having a sliding engagement with the
70 dog and adapted to move the same in opposite directions.

24. In a steam engine indicator, gearing, a pulley and means for locking the pulley and gearing for unitary movement, comprising
75 a dog which moves with one of such parts and is adapted to engage the other of the same, and means for moving the dog into and out of engagement with the latter part, having a rotatable element having an
80 inclined surface, means for rotating said element and means whereby its rotative movement causes it to move longitudinally.

25. In a steam engine indicator, gearing, a pulley, and means for locking the pulley
85 and gearing for unitary movement, comprising a dog which moves with one of said parts and is adapted to engage the other of the same, and means for moving the dog into and out of engagement with the latter
90 part, comprising a slidable and rotatable actuating device having an inclined surface, an arm engaging said surface, connections between the arm and dog for transmitting movement from one to the other, and means
95 to cause said actuating device to slide upon the rotation thereof.

26. In a steam engine indicator, gearing, a pulley and means for locking the pulley and gearing for unitary movement, comprising
100 a dog which moves with one of such parts and is adapted to engage the other of the same, and means for moving the dog into and out of engagement with the latter part, comprising a slidable actuating device having
105 an inclined surface, an arm, and a spring which presses the arm to said surface and has a sliding engagement with the dog.

27. In a steam engine indicator, gearing, a pulley, and means for locking and releasing
110 the pulley and gearing with relation to each other, comprising a dog which moves with one of such parts, and is adapted to engage the other of the same to lock them together for unitary movement, and means
115 for moving the dog into and out of engagement with the latter part, said means comprising a cone having connection with the dog, an arm engaged with the cone, a spring transmitting movement between the arm and
120 dog adapted also to press said arm against said cone, and means for moving the cone longitudinally.

28. In a steam engine indicator, gearing, a pulley, and means for locking and releasing
125 the pulley and gearing with relation to each other, comprising a dog which moves with one of such parts, and is adapted to engage the other of the same to lock them together for unitary movement, and means
130

for moving the dog into and out of engagement with the latter part, said means comprising a cone having connection with the dog, an arm engaged with the cone, a spring transmitting movement between the arm and dog adapted also to press said arm against said cone, a shifting lever and means actuated by said lever for moving the cone longitudinally.

29. In a steam engine indicator, gearing, a pulley, and means for locking the pulley and gearing together, comprising a carrier which rotates with one of such parts and is provided with a device for locking it to the other of the same, means for releasing the device from the latter part and means for arresting the movement of the carrier when said device is thus released.

30. In a steam engine indicator, gearing, a pulley and means for locking the pulley and gearing together comprising a device which moves with one of the parts and engages the other, means for releasing said device from the latter part and a device having connection with the latter means and operated thereby to arrest the movement of the part which carries said device when the latter is released from the other part.

31. In a steam engine indicator, gearing, a pulley, and means for locking and releasing the pulley and gearing with relation to each other, comprising a carrier which rotates with one of such parts and is provided with a dog for engaging the other of the same, a detent for the carrier, and means for simultaneously moving the detent out of engagement with the carrier and the dog into engagement with the part which it engages.

32. In a steam engine indicator, a loosely mounted pulley, reducing gears and means for rotating the pulley from said gears, comprising a carrier which rotates with the pulley, a dog which is carried by the carrier and locks the same to one of the gears, a detent for the carrier and means having connection with the dog and detent and adapted to operate the same to release the carrier from the detent and lock it to the gear.

33. In a steam engine indicator, a loosely mounted pulley, reducing gears and means for rotating the pulley from said gears, comprising a carrier which rotates with the pulley, a dog which is carried by the carrier and locks the same to one of the gears, a detent for the carrier an actuating lever and means connecting said lever with the dog and detent for actuating both of the same.

34. In a steam engine indicator, a loosely mounted pulley, reducing gears and means for rotating the pulley from said gears, comprising a carrier which rotates with the pulley, a dog which is carried by the carrier and locks the same to the gears, a detent for the carrier, an actuating lever, means connecting the lever with the detent for

actuating the latter, a cone having connection with the dog and adapted to move the same, and means controlled by the lever for moving the cone longitudinally.

35. In a steam engine indicator, a loosely mounted pulley, reducing gears and means for rotating the pulley from said gears, comprising a carrier which rotates with the pulley, a dog which is carried by the carrier and locks the same to the gears, a detent for the carrier, an actuating lever, means connecting the lever with the detent for actuating the latter, an arm, a spring connecting the arm with the dog, a cone engaging the arm, and means controlled by the lever for moving the cone longitudinally.

36. In a steam engine indicator, a frame having lateral connections for the engine and indicator-cylinder, respectively, and provided with a bifurcated portion forming spaced bearing arms, a shaft journaled in said arms, and operating mechanism for the shaft including an operating pulley mounted on the shaft between said arms.

37. In a steam engine indicator, a frame having a bifurcated end forming spaced bearing arms, one of which is chambered, a shaft journaled in said arms, an operating pulley mounted on the shaft between said arms, a second pulley, adapted for connection with the indicator drum, and reducing gears between the shaft and second pulley, comprising elements mounted in said chambered portion of an arm.

38. In a steam engine indicator, a frame having a bifurcated end forming spaced bearing arms, a shaft journaled in said arms and having an end projecting beyond one of the same, an operating pulley mounted outside one of said arms, and an incased spring mounted on said projecting end of the shaft.

39. In a steam engine indicator, a frame provided with a gear box, a second gear box adjacent to the first, a train of reducing gears arranged in said boxes, a pulley arranged adjacent to the second gear box, means for connecting it to said train, an operating shaft connected to said train, and an operating pulley connected to said shaft.

40. In a steam engine indicator, a frame having spaced arms one of which is provided with a gear box, a second gear box removably secured to the first box, shafts extending through said arms and boxes, one shaft movable and the other stationary, an indicating pulley mounted on the stationary shaft beyond the second gear box, an operating pulley mounted on the movable shaft between the arms, an incased spring mounted on the end of the movable shaft remote from the indicating pulley, and a reducing train of gears having connection with the movable shaft and indicating pulley and arranged in said gear boxes.

41. In a steam engine indicator, gearing, a pulley, and means for locking and releasing the pulley and gearing with relation to each other, comprising a carrier which
 5 moves with one of such parts, means for fixing it to the other of such parts in one direction only of the movement of the latter, and means for locking the carrier operable thereon only in one direction of movement.
- 10 42. In a steam engine indicator, gearing, a pulley, and means for locking and releasing the pulley and gearing with relation to each other, comprising a carrier which moves with one of such parts, means for
 15 fixing it to the other of such parts in one direction only of the movement thereof, means for locking the carrier operable thereon only in one direction of movement and operating mechanism for said means, acting
 20 thereon to release the carrier from its locking means and fix it to one of said parts.
43. In a steam engine indicator, an indicator drum, an operating shaft, means whereby the shaft is oscillated, a loosely-
 25 mounted indicator pulley connected with the drum, gearing connecting the pulley with the shaft, and means for transmitting movement from the gearing to the pulley, comprising a carrier movable with the pulley, a
 30 dog carried by the carrier and adapted to engage the gearing, a detent to engage the carrier, and means for simultaneously moving the dog into operative relation with the gear and the detent out of operative relation
 35 with the carrier and vice versa.
44. In a steam engine indicator, an operating shaft, an operating pulley and its cord, a spring having connection with the pulley, a casing for the spring, a rod extending over

the pulley and provided with an eye for the
 cord, a support to which one end of the rod
 is secured, means whereby the support is re-
 ciprocated by the shaft and a bearing for the
 other end of the rod, carried by the spring
 casing.

45. In a steam engine indicator, a shaft, means for turning the shaft in opposite directions, one of such means comprising an operating pulley, a sleeve on the shaft, a support threadably mounted on the sleeve
 50 and reciprocated thereby and a brake carried by said support and adapted to engage said pulley.

46. In a steam engine indicator, a shaft, means for turning the shaft in opposite directions, comprising a pulley fixed to the shaft, a sleeve mounted on said shaft and fixed to said pulley and projecting therefrom, a support threadably mounted on the sleeve and reciprocated thereby, and a brake
 55 carried by said support and adapted to engage said pulley.

47. In a steam engine indicator, a longitudinally stationary shaft, means for turning the shaft in opposite directions, comprising an operating pulley and its cord, a sleeve mounted on the shaft and moved therewith a support threadably engaged with the sleeve to move longitudinally of said shaft, and a brake and a cord guide both carried
 60 by said support.

In testimony whereof I affix my signature in presence of two witnesses.

PARLEY WESLEY CRAIG.

Witnesses:

ROBT. B. TORNEY,
 WILL G. MITCHELL.