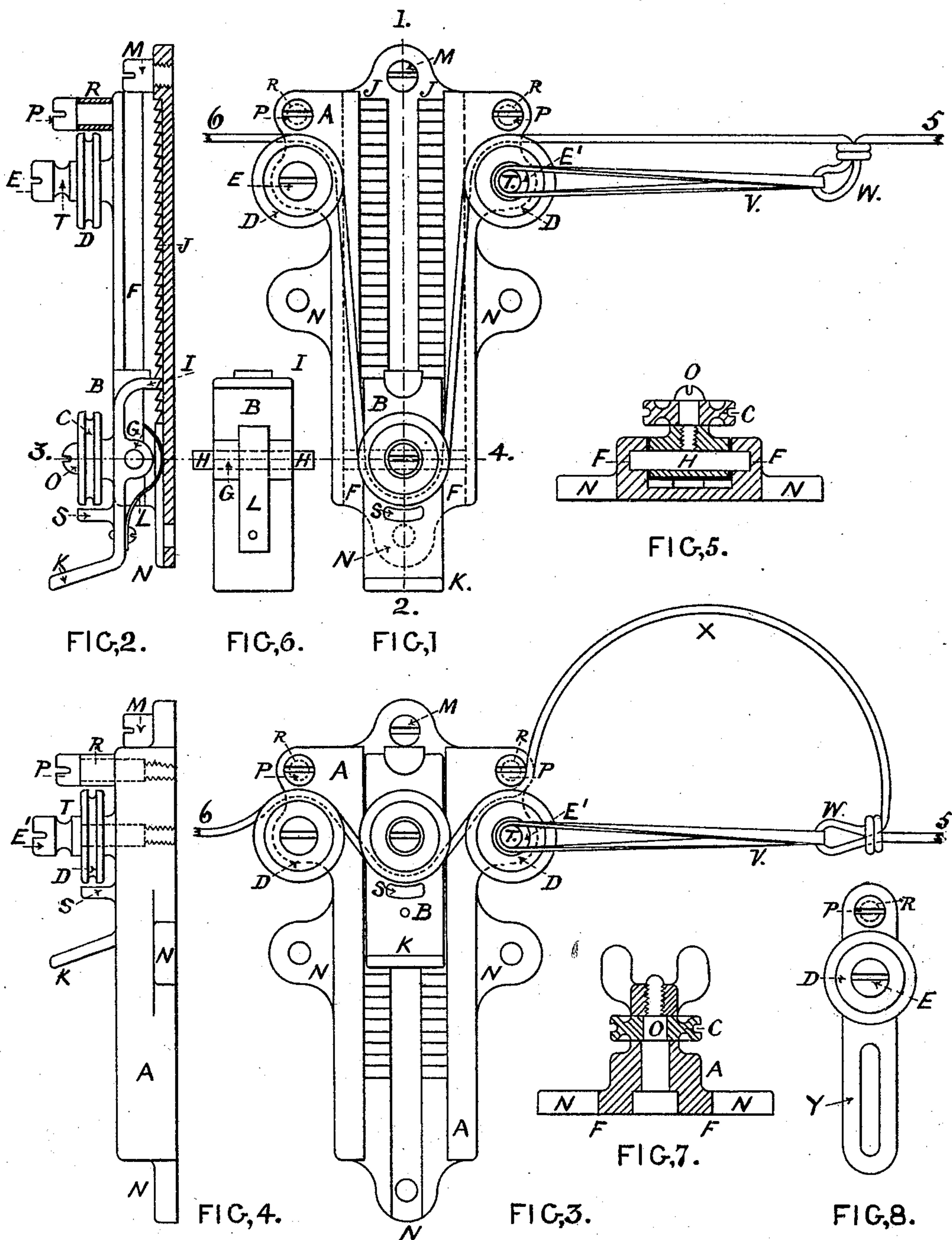


(No Model.)

W. M. HENDERSON.  
DRUM STOP FOR STEAM ENGINE INDICATORS.

No. 544,896.

Patented Aug. 20, 1895.



WITNESSES.

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## DRUM-STOP FOR STEAM-ENGINE INDICATORS.

SPECIFICATION forming part of Letters Patent No. 544,896, dated August 20, 1895.

Application filed December 1, 1894. Serial No. 530,226. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM M. HENDERSON, a citizen of the United States, residing at Philadelphia, State of Pennsylvania, have  
5 invented certain new and useful Improvements in Drum-Stops for Steam-Engine Indicators, of which the following is a specification.

One of the troublesome things encountered  
10 by engineers in taking indicator-diagrams is the hooking and unhooking of the actuating-cord to start or stop the drum to put on and take off cards. Up to two hundred revolutions of an engine this may be done by expert manipulation, but when running beyond  
15 this—say at four hundred revolutions—it is impossible. The plan then to be adopted is to stop the engine to attach and remove each card taken; but apart from the general inconvenience of this the dexterity demanded  
20 in the possible hooking and unhooking of the indicator-cord on a high-speed engine is a trying ordeal to the person attempting it. Many of the indicators made are furnished  
25 with a "detent motion" to start and stop the paper-drum to change cards; but a little reflection will show that to instantly start the drum from a state of rest to, say, four hundred to five hundred revolutions per minute is  
30 hard on the delicate mechanism of an indicator, and to as instantly stop the drum under the same conditions is very jarring to the instrument and not to be successfully maintained.

35 The object of this improvement is to provide a simple and inexpensive attachment, which can be readily applied to operate with any steam-engine indicator, of such nature that the starting up and stopping of the paper-drum are effected in the most gradual and  
40 at the same time positive manner without jarring the instrument or whipping or snapping on the cord, no matter what the revolution speed may be.

45 Figure 1 is a front view of the attachment slack of actuating-cord taken up and paper-drum in motion; Fig. 2, a section through line 1 2 of Fig. 1, showing rack and sliding carriage; Fig. 3, a front view of instrument, cord slackened, stopping paper-drum. Fig. 4 is a side  
50 view of instrument corresponding to Fig. 3. Fig. 5 is a cross-section through the lines 3 4

of Figs. 1 and 2. Fig. 6 is an under side view of the carriage, showing trunnions and tilting-spring; Fig. 7, a modified form of slotted  
55 guide-frame with T-headed bolt and thumb-nut; Fig. 8, a modified manner of mounting pulleys and guide-rollers.

A is a guide-frame for a sliding carriage B, which has a grooved tension-pulleys C attached to it, rotating upon a steel pin O.

D D are two similar pulleys rotating upon steel pins E E', secured to frame A. This frame has two guideways slotted throughout its length, as shown at F F, Fig. 5; also shown  
65 on Figs. 1 and 2. The carriage B, with the tension-pulley C on the back of it, has a lug G on the underside, drilled for a trunnion-pin H, which is loosely inserted, its ends projecting and sliding in the slotted guides F F.  
70 The front end of the carriage is curved over in form of a pawl I, engaging in a double rack J J, running nearly the whole length of the body-frame A, so as to give a motion of two and one-fourth inches for taking four-inch  
75 cards and three inches motion for taking cards five and one-half inches in length. The other end of the carriage is bent outward, forming a thumb-piece K for tilting the pawl  
80 from the rack, allowing the carriage to slide to and fro, thus tightening or slackening the actuating-cord for starting and stopping the rotation of the paper-drum. Between the racks J J a level path is milled for the spring  
85 L to slide on. This spring keeps the pawl always in gear when released by reacting against the end K. At the upper end of the frame A a stop M is secured, limiting the motion, as shown by Fig. 3, which shows the  
90 slack run out, stopping the rotation of the paper-drum.

N N N are lugs drilled for screws to attach the instrument in operating position on an engine to be indicated. This may be done by attaching it vertically, as shown on the  
95 drawings, to a piece of iron, brass, or wood of angle form, as L, secured to the steam-chest. It may be inverted or may be secured flatwise on the steam-chest, pointing either way, or fastened in any position on a narrow bar of  
100 wood or metal, as convenience may suggest, depending upon the engine's surroundings.

P P are two screws carrying small steel rollers R R. (See Fig. 2.) These are placed just



above the pulleys D D and are intended to confine the cord within the groove of the pulleys and prevent it getting astray. For the same reason the lip S on the carriage is provided, keeping the cord always on the tension-pulley C. A roller similar to those above the pulleys D D could be used here; but I prefer the lip S, as taking up less room. The steel pins E E' have screw-driver heads. A groove T is turned on them for holding one end of an elastic band V. The other end of this band is secured to the actuating-cord, as shown at W, Figs. 1 and 3. The first shows taut contact, all slack taken up by the extension of sliding carriage B, paper-drum rotating. Fig. 3 shows cord relaxed, paper-drum stopped, the loop X representing the unoperating slack alternately forming and stretching out on the line of cord with the strokes of the engine. It will be observed that a taut line is always maintained between the pin E' and the pulling part on the engine, the elastic band V taking the place of the indicator-drum recoil-spring, when that is at rest, and acting in every way like that spring in keeping up a taut line during the cord's reciprocation, preventing any possible whipping, snapping, or entanglement of the cord. Sliding the carriage B into working position, as shown by Fig. 1, overhauls the slack of the cord and starts the paper-drum from a state of rest into full activity in so gradual a manner that the change is effected almost imperceptibly. A common rubber band is shown by V as being about the handiest and cheapest thing procurable; but any other description of elastic connection—such as a slim coil-spring of fine wire—may be used. Both sides of the center line of the instrument being alike provided with a pulley D and a guard-roller R, as shown on Figs. 1 and 3, the actuating-cord can be led off either to the right or left. As the drawing is made, the end of cord marked 5 connects with the engine and the end marked 6 leads to the indicator.

Fig. 7 shows a cross-section of a modified form of slotted guide-frame furnished with a simple T-headed bolt and thumb-screw nut—a type susceptible of many unimportant changes, such as providing a V-shaped head to the bolt and substituting other forms of clamping-nuts; but I prefer the design shown by Fig. 5 as being of better construction.

Another feature incidental to the improvement is the facility afforded by it for adjusting the indicator-cord to the proper length. This can be done by making the rack a little longer than what is merely demanded for the drum motion, remembering that for each inch length of rack two inches of cord are overhauled, furnishing a direct means, in a two-fold manner, for adjusting the indicator-cord.

Another way of arriving at the same end is shown by the modification, Fig. 8. Here pulley D and guard-roller R are mounted on a short slotted plate Y, and the indicator-cord may be lengthened out or shortened by

sliding the slot on the pin E, secured to the body-frame A. Two of these extension-wings may be employed, one on each side, either or both of which could be used to vary the cord's adjustment.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a drum stop for steam engine indicators, the combination of three grooved pulleys C, D, D, two rotating upon pins secured to a suitable frame, the third mounted on a sliding carriage, for relaxing the cord of an indicator when closed together equal to the circumferential length of rotation of the paper drum, and provided with a compensating elastic connection V, arranged and operating substantially as herein shown and described.

2. In a drum stop for steam engine indicators, the combination of two grooved pulleys D, D, rotating upon pins E, E', with guard rollers R, R, all secured to a suitable frame, and a third grooved tension pulley C, mounted on a sliding carriage, having a cord confining roller or lip, S, arranged and operating substantially as herein set forth.

3. In a drum stop for steam engine indicators, the combination of a suitable frame with pulleys D, D, attached, a sliding carriage with tension pulley C, and means for operating and securing the carriage along the racks J, J, substantially as shown and described.

4. In a drum stop for steam engine indicators, the combination of a suitable guide frame with pulleys D, D attached, a sliding carriage with tension pulley C, and means for controlling the tension of the actuating cord along a slotted path of the guide frame, substantially as herein shown and described.

5. In a drum stop for steam engine indicators, in combination with the three grooved pulleys C, D, D, the rack J, J of the guide frame A, and trunnions H, H spring L and tilting pawl I of the carriage B, substantially as shown and described.

6. In a drum stop for steam engine indicators, in combination with the three grooved pulleys C, D, D, the slotted guides F, F of the frame A, and trunnions H, H of the carriage B, substantially as shown and described.

7. In a drum stop for steam engine indicators, in combination with the three grooved pulleys C, D, D, the rack J, J, and slotted guides F, F of the frame A, and the trunnions H, H, spring L and tilting pawl I of the carriage B, arranged substantially as herein set forth.

8. In a drum stop for steam engine indicators, in combination with the three grooved pulleys C, D, D, guard rollers R, R, and lip, S, the rack J, J, slotted guides F, F, trunnions H, H, spring L, and tilting pawl I, arranged and operating substantially as herein set forth.

9. In a drum stop for steam engine indicators, two grooved pulleys D, D, rotating upon pins E, E', with guard rollers R, R, secured



to a suitable frame, and a tension pulley C  
mounted on a sliding carriage, in combina-  
tion with an elastic connection V, attached  
to the actuating cord, and to the drum stop,  
5 substantially as shown and described.

10. In a drum stop for steam engine indi-  
cators, a tension pulley C, mounted upon a  
carriage sliding on a suitable frame, in com-

bination with slotted extension wings Y, car-  
rying grooved pulley D, and guard roller R, 10  
to adjust the tension on the actuating cord,  
substantially as herein set forth.

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Witnesses:

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DE HAVEN LANCE.