(No Model.) 2 Sheets—Sheet 1.

E. J. REA.

STEAM ENGINE INDICATOR.

No. 521,815. Patented June 26, 1894.

Fig. 1.

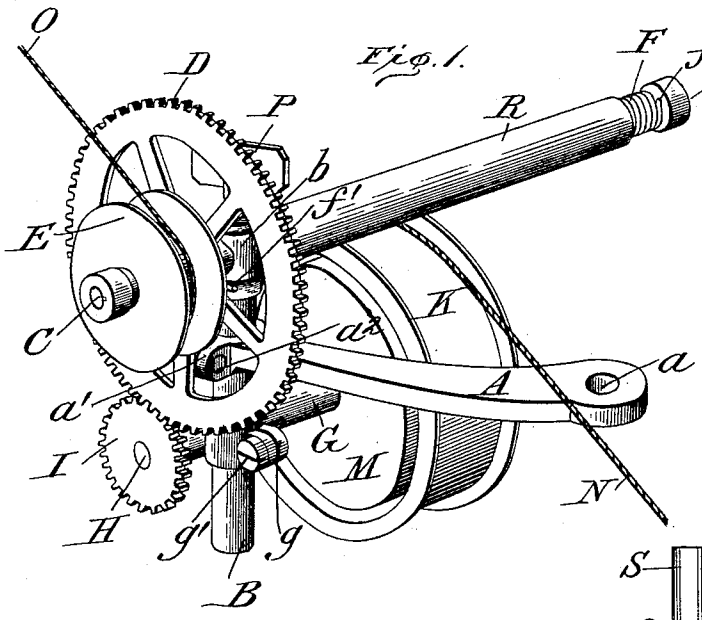
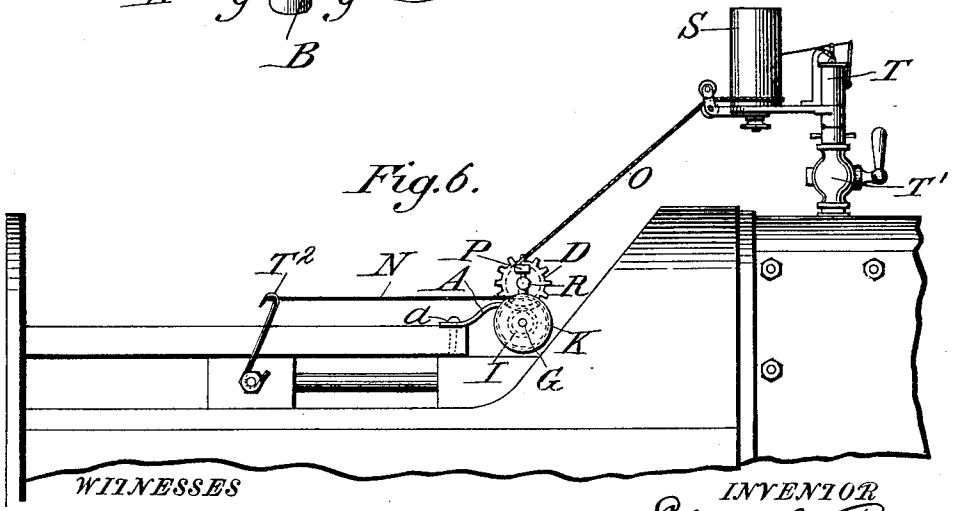


Fig. 6.



WITNESSES

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

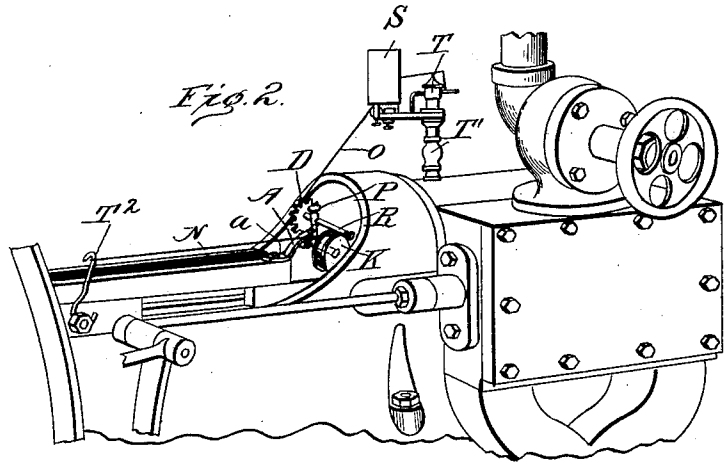


Fig. 3.

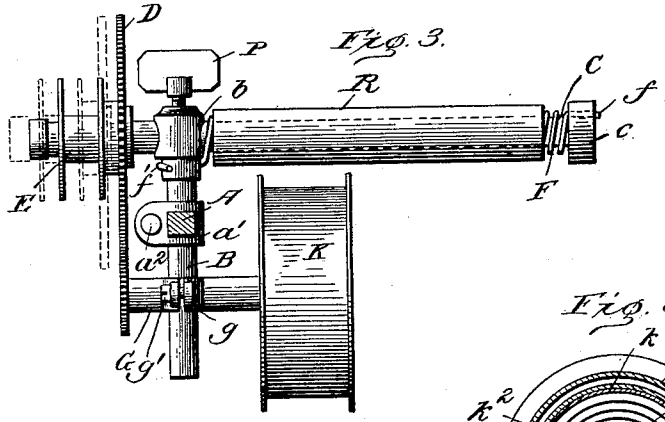


Fig. 4.

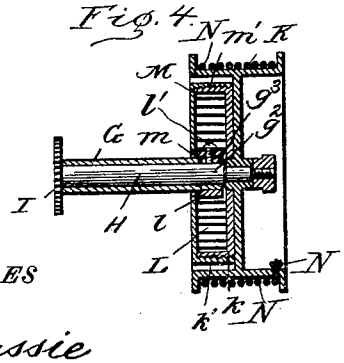
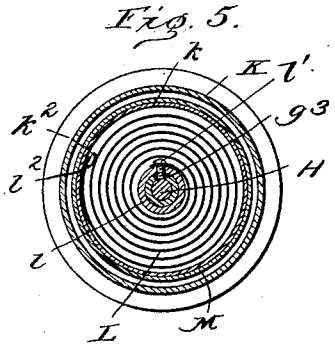


Fig. 5.



WITNESSES

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EDWARD J. REA, OF WASHINGTON, DISTRICT OF COLUMBIA.

STEAM-ENGINE INDICATOR.

SPECIFICATION forming part of Letters Patent No. 521,815, dated June 26, 1894.

Application filed June 17, 1893. Serial No. 477,993. (No model.)

To all whom it may concern:

Be it known that I, EDWARD J. REA, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Steam-Engine Indicators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in steam-engine indicators.

In the ordinary use of the indicator, the drum-cord is often attached directly to the cross-head of the engine, the spring-drum on the indicator being relied on to take up the slack in the cord on the back stroke of the engine. In this arrangement, the indicator-drum is always rotating as long as the drum-cord is attached to the cross-head, and of course, to replace the cord on the indicator-drum, it becomes necessary to unfasten the drum-cord from the cross-head, which is quite a disadvantage. Moreover, in a long stroke engine, an indicator-cord of considerable length is required, and an indicator drum constructed for such engines gives too small a cord when used on short stroke engines. To overcome this last objection, it is customary to use what is known as a reducing gear between the indicator drum and the cross-head, this reducing gear generally being provided with some device which permits its ratio of reduction to be changed, so that when an indicator is used with the reducing gear on a short stroke engine, the drum will make practically a complete rotation and give as long a cord as on a long stroke engine. But in all the reducing gears with which I am acquainted, it is necessary to disconnect the cord, which operates the reducing gear, from the cross-head, when it is desired to stop the indicator drum. This is sometimes done by means of tripping devices, which release the cord, or which attach it to the cross-head while the engine is in motion.

The object of my invention is to provide means whereby it is unnecessary to release the operating cord from the cross-head, and which will permit the indicator drum to be readily stopped or started at any time.

With this object in view, my invention consists, broadly, in a reducing gear which has a disconnecting mechanism for throwing out that part of the mechanism which drives the indicator drum, thereby permitting the portion operated by the cross-head to operate while the indicator drum is stationary.

My invention consists, further, in such features and combinations of parts as will first be described in connection with the accompanying drawings, and then particularly pointed out in the claims.

In the drawings—Figure 1 is a perspective view of the reducing gear embodying my invention. Fig. 2 is a perspective view, on a reduced scale, of a reducing gear in position on an engine. Fig. 3 is a side elevation of the mechanism shown in Fig. 1. Figs. 4 and 5 are sectional views of the spring-drum and spring. Fig. 6 is a side elevation showing the reducing gear on an engine.

Referring to the drawings, A is an arm provided with a bolt-hole, *a*, at one end, by means of which it may be secured to any suitable portion of the engine, its other end having a split socket, *a'*, provided with a clamp-screw, a^2. Through the socket passes a vertical standard, B, which may be held at any point in the socket by means of the clamp-screw, a^2. This standard is provided with a transverse bearing, *b*, in which is mounted a longitudinally-movable rotatable main-shaft, C, on which is removably secured a spur-gear wheel, D, arranged to rotate with the shaft. Outside of the gear-wheel, D, a pulley, E, is fixed to the shaft, so as to be removable, to permit the gear-wheel to be taken off when desired. The opposite end of the main-shaft, C, is provided with a head, *c*, a helical spring, F, surrounding the shaft between the head, *c*, and the bearing, *b*, one end of the spring being secured to the head, as shown at *f*, Fig. 3, and the other end being attached to the bearing, as shown at *f'*.

On the lower part of the standard, B, is clamped an adjustable bearing, G, by means of a split socket, *g*, which encircles the standard and may be clamped to it by a screw, *g'*. Through the bearing, G, is passed a rotatable pinion-shaft, H, provided at its outer end with a gear-pinion, I, arranged to mesh with and communicate motion to the gear-wheel,

D. The inner end of the pinion-shaft is provided with a barrel, K, having an inner spring-case, k, preferably made integral with the barrel, and provided on the front portion of its periphery with a screw-thread, k', as clearly shown in Fig. 4. Within this casing, k, is a spiral spring, L, whose inner end is attached to a boss or collar, l, by means of a screw, l', the boss being arranged to fit over the end, g^2, of the bearing, G, the screw passing entirely through the boss and having its end projecting into a slot or groove in the bearing, as shown in Fig. 5, by which construction the spring is removably secured to the said end, g^2, of the bearing, G. The outer end of the spring, L, is removably attached to the inner surface of the spring-case in any suitable way, as by slotting the end of the spring at l^2, for engagement with a hook-pin, k^2, on the inside of the casing. A spring-case cover or lid, M, is provided, having a central opening, m, of such size as to permit the lid to fit closely over the bearing, G, this lid having an internal screw-thread, m', which is arranged to engage the exterior thread, k', of the spring-casing, thus securing the lid to the casing, yet permitting it to be removed and slid back on the bearing out of the way, in order that access may be given to the spring.

In using the apparatus thus far described, the arm, A, is preferably secured to one end of the slides by bolting or otherwise. A cord, N, is wound on the barrel, K, having one end attached thereto, the other end of the cord being secured to the cross-head. The indicator-cord, O, is wrapped around and secured to the pulley, E. It is plain that if the engine be now put in motion, the forward stroke of the cross-head will communicate a rotary motion to the barrel, K, unwinding the cord, N, from off it, this forward rotary motion being transmitted through the pinion, I, and gear-wheel, D, to the pulley, E, the number of rotations of the pulley being in the same proportion to the rotations of the barrel as the teeth on the gear wheel D are to the teeth on the pinion I, so that, by using various sizes of gear-wheels, the speed of the pulley, E, may be varied as desired. The forward rotary motion of the pulley, E, will wind up the indicator-cord and rotate the indicator-drum, and it is to be noticed that the amount of cord wound upon the pulley, E, at each forward stroke of the engine may be varied not only by the use of varying sizes of gear-wheels, but also by using different sizes of pulleys, E. By this arrangement, a complete rotation of the indicator-drum may be produced on a short stroke engine, or a partial rotation of the said drum on a long stroke engine. It will be seen that during the backward stroke of the engine, the cord, N, would hang loosely and might become entangled in the moving parts of the engine, were it not for the spring, L, which will produce a backward rotation of the barrel, K, during such backward stroke of the engine, thereby winding up the operating cord on the barrel, K, and unwinding the indicator-cord N from the pulley, E, the indicator-spring itself taking up the slack of its own cord. If, now, it is desired to stop the indicator drum for the purpose of attaching a cord to or removing one from it, it is only necessary to move the shaft, C, longitudinally, thus disengaging the gear-wheel, D, from the pinion, I, which may be done by pressing the head, c, inward, thereby compressing the spring, F. In this position, the shaft, C, may be held by any suitable locking device, preferably by a thumb-screw, P, passing through the top of the bearing, b, and contacting with the shaft. In such position, the reciprocation of the engine cross-head will continue to rotate the barrel, K, and pinion, I, but the shaft, C, and pulley, E, will be stationary, since the gear-wheel, D, is no longer in engagement with the pinion, I, and consequently, the indicator drum will be stationary.

To start the indicator, it is only necessary to loosen the thumb-screw, P, whereupon the helical spring, F, will force the shaft, C, longitudinally, so as to draw the gear-wheel, D, into contact with pinion, I, thus transmitting the motion from the engine to the indicator-drum.

The helical spring F is surrounded by a guard-tubing, R, not only for the purpose of protecting the spring, but also to form a stop-device which limits the longitudinal movement of shaft, C, in one direction. The helical spring, F, also assists the spring, L, in taking up the slack in the operating cord, N, when the two gear-wheels, D and I, are in mesh.

I am aware that a reducing gear having the helical spring, F, the gear-wheels, D and I, the pulley, E, and the drum, K, is old, and I do not wish to claim such construction broadly, but so far as I am aware, the disconnecting device, the guard-tubing, the spring-case and the spring, L, for taking up the slack, are new features of my invention. Furthermore, by making the spiral spring L removable from the bearing and from the spring-case, it becomes possible to readily arrange the operating cord, N, in a direction parallel to the direction of travel of the piston-rod. For instance, if, when the cord is wound on the barrel so as to lead off from the top of the barrel, it is too high at the barrel-end, and thereby works at an angle to the piston, the cord may be wound the other way around on the spiral spring-barrel, the spring being removed from the case and placed the other way about, so as to operate the barrel in the opposite direction. In this condition, the barrel-end of the cord is lowered equal to the diameter of the barrel, and to make further slight adjustments in height, the standard, B, may be raised or lowered in the socket, a', and clamped at any desired position by the screw, a^2.

It is apparent that I may modify my device in many ways, without departing from the spirit of my invention, and I do not, therefore, wish to limit myself to the particular construction shown, but

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

1. In a reducing gear an operating cord, a barrel actuated by the operating cord, an indicator cord a pulley for operating the indicator-cord, mechanism for transmitting motion from the barrel to the pulley, and means for throwing said mechanism out of operation, whereby the barrel may be moved by the operating cord while the pulley is stationary.

2. In a reducing gear an operating cord, a barrel rotatable in one direction by the operating cord, means for rotating the barrel in the opposite direction, an indicator cord a pulley for actuating the indicator-cord, and mechanism for transmitting motion from the barrel to the pulley.

3. In a reducing gear an operating cord, a barrel rotatable in one direction by the operating cord, means for rotating the barrel in the opposite direction, an indicator cord a pulley for actuating the indicator-cord, mechanism for transmitting motion from the barrel to the pulley, and means for throwing said mechanism out of operation, whereby the barrel will be moved by the operating cord while the pulley is stationary, and the operating cord will be kept taut.

4. In a reducing gear, the combination, with a main-shaft, and a gear-wheel attached to the shaft, of a pinion-shaft, a gear-pinion mounted on the pinion-shaft and meshing with the gear-wheel, a barrel attached to the pinion-shaft, an operating cord and mechanism attached to the barrel for taking up the slack in the operating cord when wound on the barrel.

5. In a reducing gear, the combination, with a main-shaft, and a gear-wheel attached to the shaft, of a pinion-shaft, a pinion mounted on the pinion-shaft, and means for throwing the gear-wheel and pinion into and out of mesh with each other.

6. In a reducing gear, the combination, with a longitudinally-movable main-shaft, and a gear-wheel attached to the shaft, of a pinion-shaft, and a pinion mounted on the shaft and meshing with the gear-wheel.

7. In a reducing gear, the combination, with a longitudinally-movable main-shaft, and a gear-wheel attached to the shaft, of a pinion-shaft, a pinion mounted on the pinion-shaft, and a spring arranged to hold the gear-wheel into mesh with the pinion.

8. In a reducing gear, the combination, with a longitudinally-movable main-shaft, and a gear-wheel attached to the gear-shaft, of a pinion-shaft, a pinion mounted on the pinion-shaft and meshing with the gear-wheel, and a thumb-screw clamping the main-shaft at any desired position.

9. In a reducing gear, the combination, with a vertically-adjustable pinion-shaft, of a barrel on the shaft, and a spring loosely attached to the barrel and capable of being reversed, substantially as set forth.

10. In a reducing gear, the combination, with a longitudinally-movable main-shaft, a gear-wheel on the main-shaft, a pinion-shaft, and a pinion on the pinion-shaft and meshing with the gear-wheel, of a helical spring around the main-shaft, and a guard-tubing around the spring, substantially as set forth.

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

E. J. REA.

Witnesses:
EDWARD A. PAUL,
MAX GEORGII.