J. W. THOMPSON.

Indicator for Steam-Engines.

No. 167,364. Patented Aug. 31, 1875.

Fig. 1.

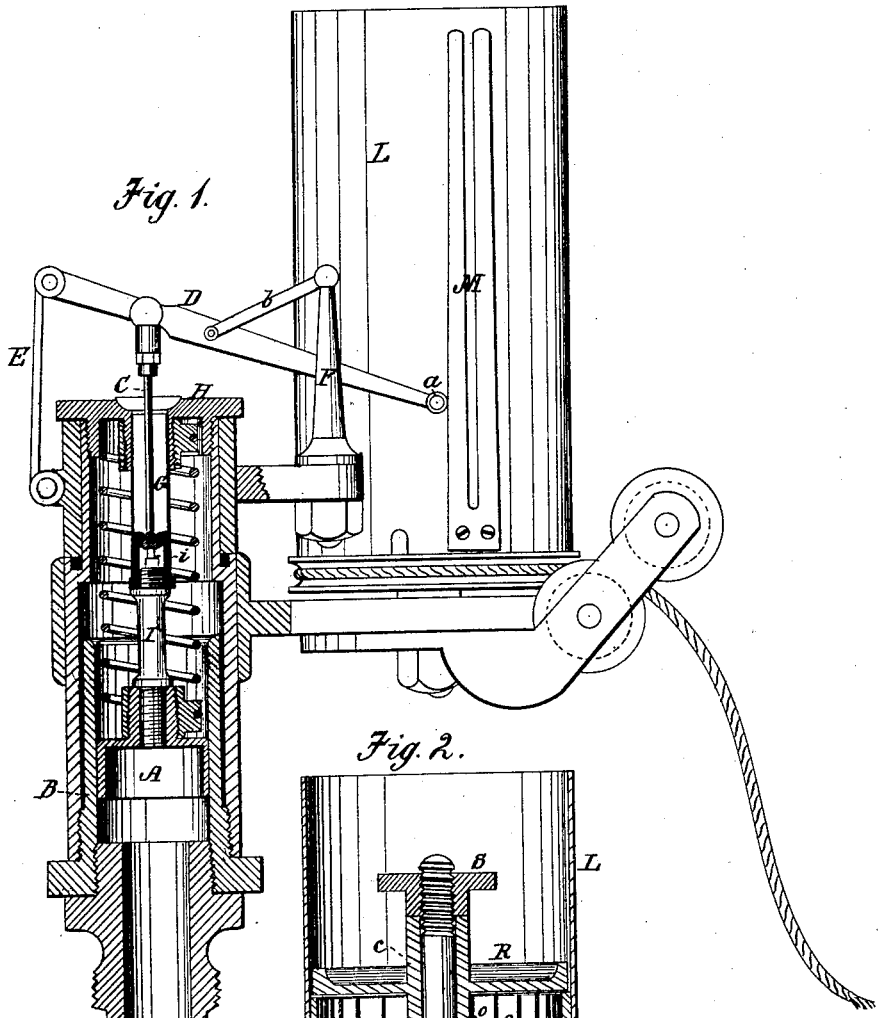
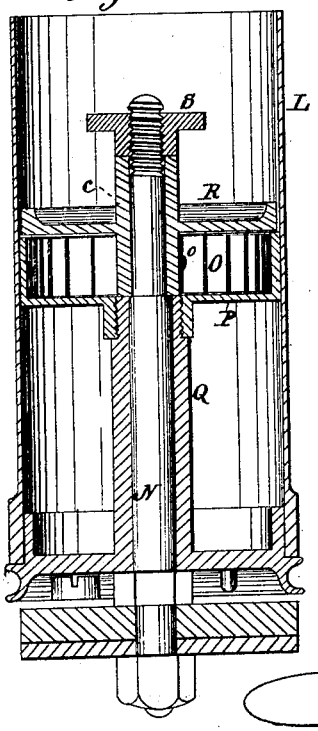


Fig. 2.



WITNESSES:

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UNITED STATES PATENT OFFICE.

JOSEPH W. THOMPSON, OF SALEM, OHIO, ASSIGNOR TO HIMSELF AND BUCKEYE ENGINE COMPANY, OF SAME PLACE.

IMPROVEMENT IN INDICATORS FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. **167,364**, dated August 31, 1875; application filed August 13, 1875.

To all whom it may concern:

Be it known that I, JOSEPH W. THOMPSON, of Salem, in the county of Columbiana and State of Ohio, have invented a new and Improved Indicator for Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing forming a part of this specification, in which—

Figure 1 is a sectional elevation of my improved indicator, and Fig. 2 a similar view of the drum or paper-carrying barrel and its contained spring and tension-adjusting devices therefor.

The indicator is designed to register the relative amounts of steam-pressure exerted on the piston at each portion of its stroke. It is, in part, an improvement upon the automatic recording-indicator for which Letters Patent of the United States were granted to C. B. Richards, March 24, 1863, No. 37,980.

The object of the invention is chiefly to reduce the number and weight of the parts composing Richards' recording mechanism proper, and thus correspondingly reduce their momentum when in action, to the end of securing a more perfect record of the several steam-pressures existing in the engine-cylinder during a given stroke or strokes of the piston. This reduction in momentum is particularly important in relation to quick-stroke engines for the indication given or delineation made on the paper barrel by the marking-point will be more or less imperfect as the momentum of the moving parts is greater or less.

In carrying out my invention I dispense with a separate holder for the pencil by which the record is made on a drum or paper barrel, and attach the pencil directly to the main lever, to which a vertical vibratory movement is imparted by the reciprocation of the spring-piston under the varying pressure of steam in the cylinder. To preserve the desired parallel movement, I pivot the working or marking lever to a movable or oscillating fulcrum, connect its free end to a fixed standard by means of a link or bar, and pivot it intermediately of said fulcrum and link directly to the piston-rod, which latter is necessarily vibrated at each movement of the piston. The invention further includes a compensating connection or joint between the piston-rod and piston, and the means for adjusting the tension of the spring of the drum upon which the record is made, all as hereinafter more fully described.

The piston A works in a tube, B, which is in immediate communication with the engine-cylinder. The piston-rod C is pivoted to the working-lever D, which has a socket in its free end to receive a pencil, *a*, and is pivoted at the other end to a link, E, hinged to tube B. The said link, therefore, constitutes a movable fulcrum, oscillating freely in the lengthwise direction of the marking-lever D, whenever the piston A changes its position by reason of variation in steam-pressure. To preserve the desired parallel movement, and cause the pencil to move in a straight line over the paper barrel, I connect the lever D to a fixed vertical standard, F, by a link, *b*, pivoted to the lever at a point near the piston-rod, and between it and the pencil *a*. It is evident that since the lever D has a lengthwise reciprocation (as well as vertical vibration) at every movement of the piston up or down, the upper end of the piston-rod must vibrate correspondingly in the arc of a circle whose radius is determined by the extent of such movement of the piston. It is hence necessary to have a flexible connection between the rod and piston. To this end I arrange the piston-rod to work in a tube or trunk, G, (as in trunk-engines,) which slides through the head H of tube B. Said trunk screws on the end of piston-stem I, and has a concavity or socket thereat suitable to receive the head of the piston-rod. The latter is rounded or spherical on its upper side corresponding to the socket of trunk G, and has a concavity in its under side corresponding to the conical head of a small stud, *i*, which is screwed into the end of the main piston-stem I, as shown. The parts are thus firmly connected by a compensating-joint, which has the freedom of movement required for the piston-rod. The trunk G and stem I of the piston A are encircled by a spiral spring, K, whose tension must be overcome by the

steam-pressure to produce an upward movement of the piston. The vertical pivoted barrel L is provided with the usual form of paper-holding device M, and is caused to make partial rotations back and forth coincident with the movement of the piston of the engine, by means of a cord or other suitable means of connecting it with some reciprocating part of the engine, substantially as in Richards' indicator. The drum is supported by stem or standard N, which rises vertically from a lateral arm of the tube B. The coiled spring O is arranged in the case P, which is fixed on the tubular stem Q of the barrel L. The top of the case N is formed by a disk, R, having a hub, *c*, which turns loosely on the standard N. The tension of the spring can be adjusted at will by turning and clamping the disk R, by means of nut S, on the upper end of standard N, the hub *c* of said disk and the inner side of the case having each a lug, *o*, with which the ends of the spring are in contact. The spring-case accurately fits the drum, and thus forms one of the bearings or supports therefor.

In part recapitulating, it will be seen that when the steam-pressure in the engine-cylinder increases, the piston A will rise, and when it decreases the piston will fall, in either case causing a vibration of the lever D, so that the pencil is caused to move over the paper barrel L in a straight line, and faithfully record the limits of variation of such steam-pressure. Simultaneously with this movement of the pencil the barrel L makes corresponding reciprocating movements, so that the variation during each stroke of the piston is clearly recorded.

The construction and arrangement of the marking device is such that the inertia and corresponding momentum are greatly reduced, and greater accuracy and reliability therefore secured. The spring tension device is easily accessible, and may be quickly adjusted to vary the quickness of the return movement of the paper barrel.

Having thus described my invention, what I claim is—

1. In a steam-pressure recorder, the combination, with the working-lever, carrying the marker, of a movable fulcrum, a fixed standard, F, and link *b*, connecting the lever directly to the standard, substantially as shown and described, for the purpose specified.

2. In a steam-pressure recorder, the combiation with the reciprocating drum of the spring O, spring-case, the disk having hub *c*, and clamping screw-nut S, all as shown and described, to permit the spring tension to be adjusted as desired.

3. The combination of rod C and stud *i*, having corresponding concavity and convexity, and the screw-socket for connecting said parts C *i* to the piston or movable part, to form a a universal compensating-joint, as shown and described.

JOSEPH W. THOMPSON

Witnesses:

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