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No. 646,700.

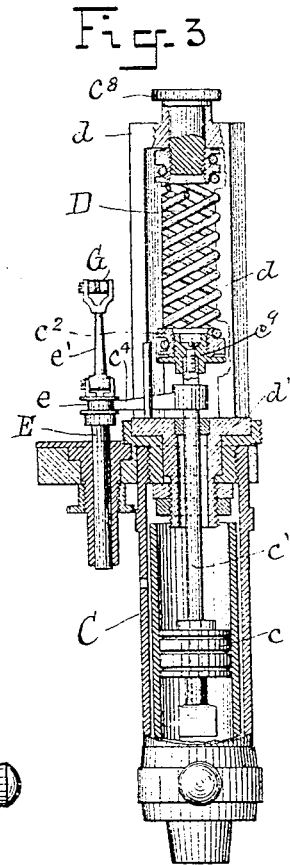
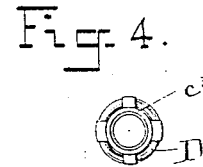
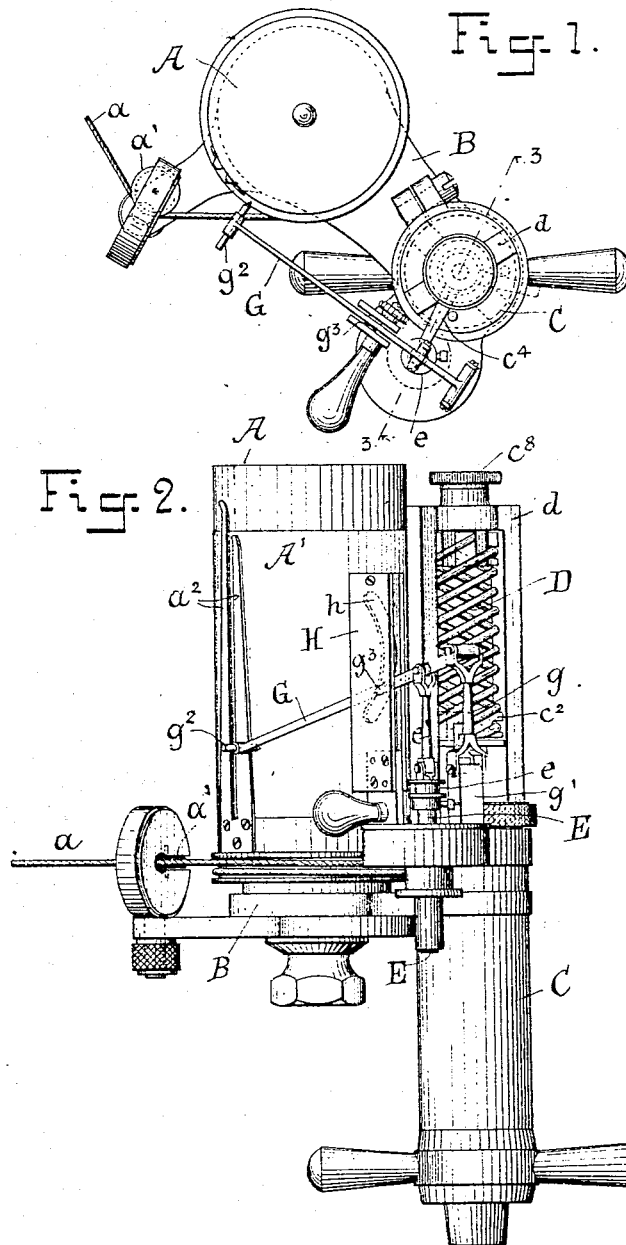
Patented Apr. 3, 1900.

W. HOUGHTALING.  
STEAM ENGINE INDICATOR.

(Application filed Aug. 18, 1899.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses  
Charles Harimann  
P. H. Jones

William Houghtaling  
Inventor  
By *Attorney* Jas. H. Jones

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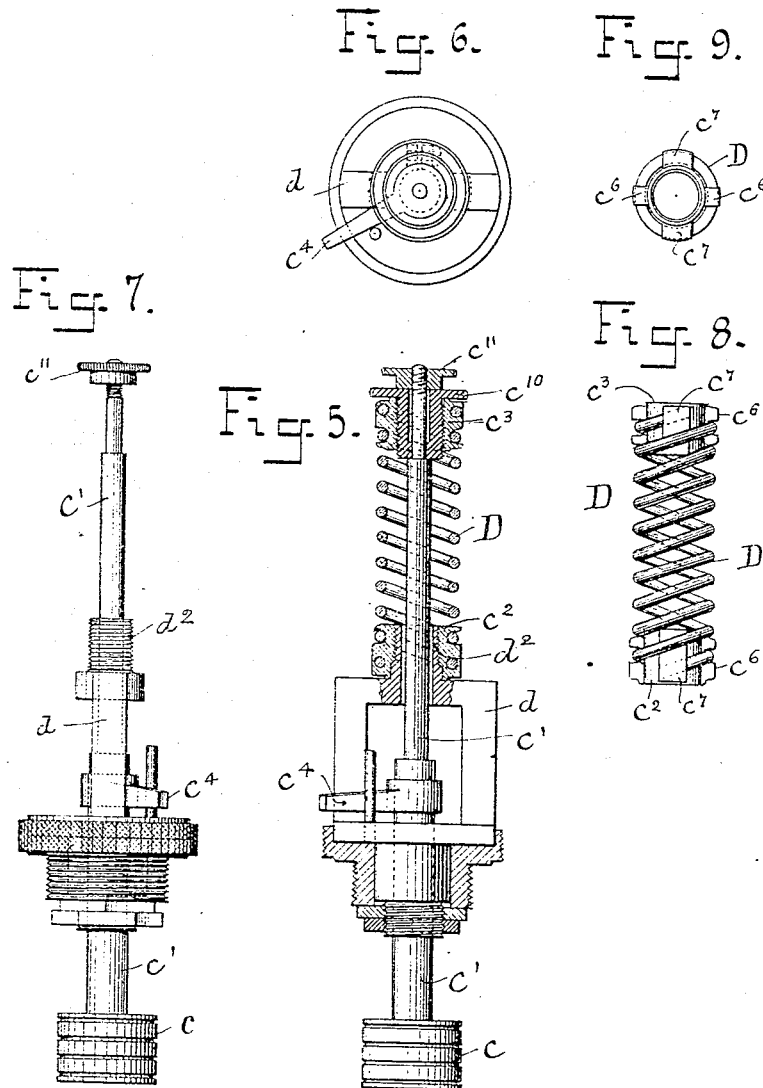
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2 Sheets—Sheet 2.



Witnesses  
Charles Hanemann  
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## UNITED STATES PATENT OFFICE.

WILLIAM HOUGHTALING, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO  
THE ASHCROFT MANUFACTURING COMPANY, OF SAME PLACE.

## STEAM-ENGINE INDICATOR.

SPECIFICATION forming part of Letters Patent No. 646,700, dated April 3, 1900.

Application filed August 18, 1899. Serial No. 727,837. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM HOUGHTALING, a citizen of the United States, residing at Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Steam-Engine Indicators, of which the following is a specification, reference being therein to the accompanying drawings.

The invention relates to improvements in steam-engine indicators in which the pressure-spring is located outside the steam-cylinder. The object of placing the spring outside the steam-cylinder is to avoid the action of the steam in contact, which deteriorates it, causing it to lose its efficiency, besides being difficult to change when desired.

The present invention consists in placing the pencil mechanism and diagram-cylinder at the side and parallel on a plane with the spring, whereby the instrument is rendered more compact and conveniently handled, and connecting the mechanism therewith in such manner as to facilitate a detachment of the same and permit perfect freedom of movement at all points of the spring compression.

To enable others skilled in the art to make and use my invention, I will first proceed to describe an indicator embodying my invention, and subsequently will point out in the claims what I desire to secure by Letters Patent.

In the drawings, Figure 1 is a plan view, Fig. 2 a side elevation, and Fig. 3 a sectional elevation, on a line 3 3 of Fig. 1, of an indicator embodying my invention. Fig. 4 is a plan view of the cap to which the springs are secured. Fig. 5 is a detail view showing a tension-spring employed instead of the compression-spring shown in Fig. 3. Fig. 6 is a plan view of Fig. 5. Figs. 7 and 8 are detail views, and Fig. 9 a plan view of Fig. 3.

The cylinder A is revolvably mounted upon a supporting-base B, the operating cord or belt passing over the guide-pulley a' and imparting motion to the cylinder A. A strip of paper A' is held on the periphery of the cylinder A by the spring-clamps a<sup>2</sup>.

Oppositely located from the cylinder A is the steam-cylinder C, secured at the base B. Within the cylinder C is the piston c, secured

on the rod c', which extends through an opening in the head of the cylinder C.

The springs D, Fig. 8, are secured at their upper ends in the block c<sup>3</sup>, having grooves c<sup>3</sup>, 55 through which the ends pass and are rigidly secured in the lugs c' and at their lower ends in the block c<sup>2</sup>, similar in every way to the block c<sup>3</sup>. To remove the springs D, it is only necessary to remove the retaining-stud c<sup>3</sup>, 60 Fig. 3, and then unscrew the spring D from the plug c<sup>3</sup>, which may be secured in any suitable manner to the piston-rod c'.

Secured to and extending laterally from the rod c' is an arm c', its free end engaging 65 the flanges of a collar e, secured on the free-acting pin E, as shown in Fig. 3, the pin E being bifurcated at its upper end to receive a bifurcated arm e', which is pivoted to the pencil-arm G. 70

A bifurcated arm g is pivotally supported on the block g', (see Fig. 2,) and at its upper end is pivoted with the pencil-arm G, carrying a pencil g<sup>2</sup>, which contacts with the paper A' on the cylinder A. The arm G is guided 75 in its movement by a pin g<sup>3</sup>, which engages with slots or grooves in the upright pieces H, as shown in Fig. 2.

Fig. 5 illustrates a slight structural change, permitting the use of an extension-spring D' 80 instead of the compression-spring D. (Illustrated in Figs. 2 and 3.) In the construction shown in Fig. 5 the rod c' extends upwardly through the spring D' and is attached to the upper spring end c' by the plug c<sup>10</sup> and lock- 85 nut c<sup>11</sup>. The spring may be conveniently replaced by another by unscrewing the same from the extending screw-neck d<sup>2</sup> of standard d and without disturbing any other parts of the indicator. 90

The operation is similar to the ordinary indicator, steam being admitted into the cylinder C under the piston c, causing the latter to rise vertically, carrying the rod c' and its laterally-extending arm c', the latter engaging 95 the free-acting pin E, which raises the arm G, carrying the pencil g<sup>2</sup>, in a straight line and parallel with the axis of the cylinder.

I claim—

1. In a steam-engine indicator, a steam-cylinder provided with a piston and a piston-rod; the latter extending outside the cylin-

der and connected with an external spring, in combination with a diagram-cylinder located on a plane with said spring and a pencil-operating mechanism fixed to the piston-rod and detachably engaged with the operating-rod of the pencil mechanism, substantially as set forth.

2. In a steam-engine indicator the combination of the piston-rod *c'* the arm *c'* and pencil-mechanism-operating rod *E* the arm *c'* be-

ing fixed to the piston-rod *c'* and its free end engaging with the operating-rod *E* of the pencil mechanism, substantially as set forth.

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

WILLIAM HOUGHTALING.

Witnesses:

W. R. CLARKE,  
S. S. DE VORKIN.