

(No Model.)

2 Sheets—Sheet 1.

J. H. C. BACHELDER.
STEAM ENGINE ATTACHMENT.

No. 360,644.

Patented Apr. 5, 1887.

Fig. 1

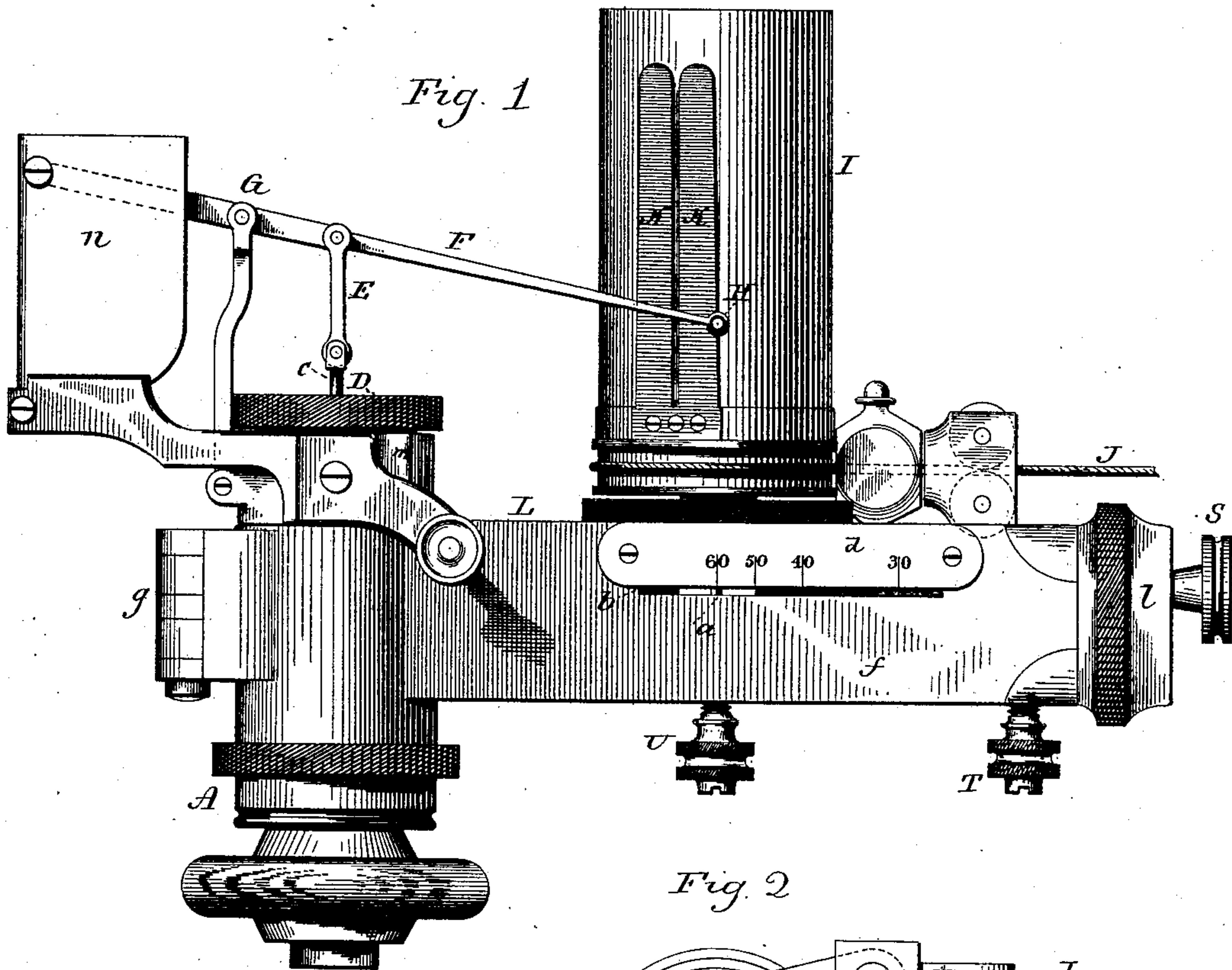
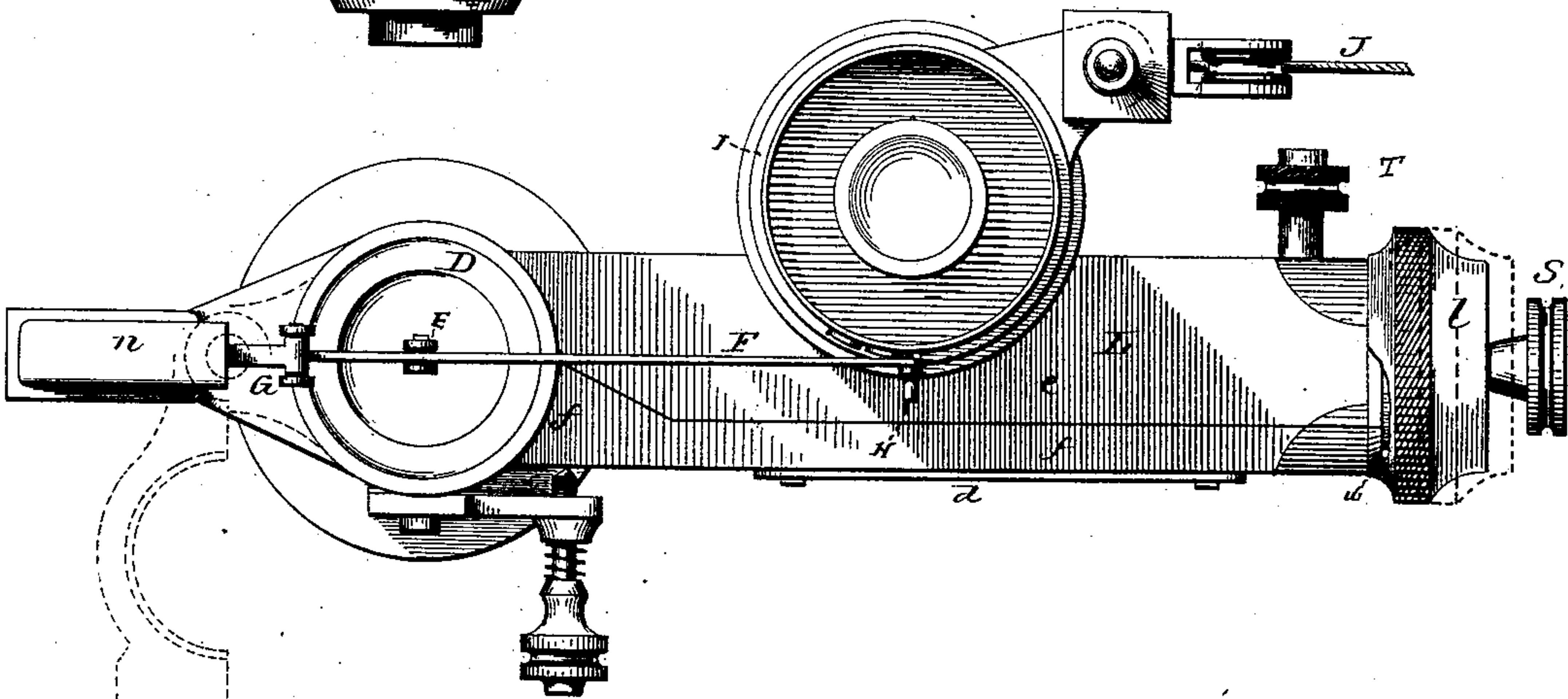


Fig. 2



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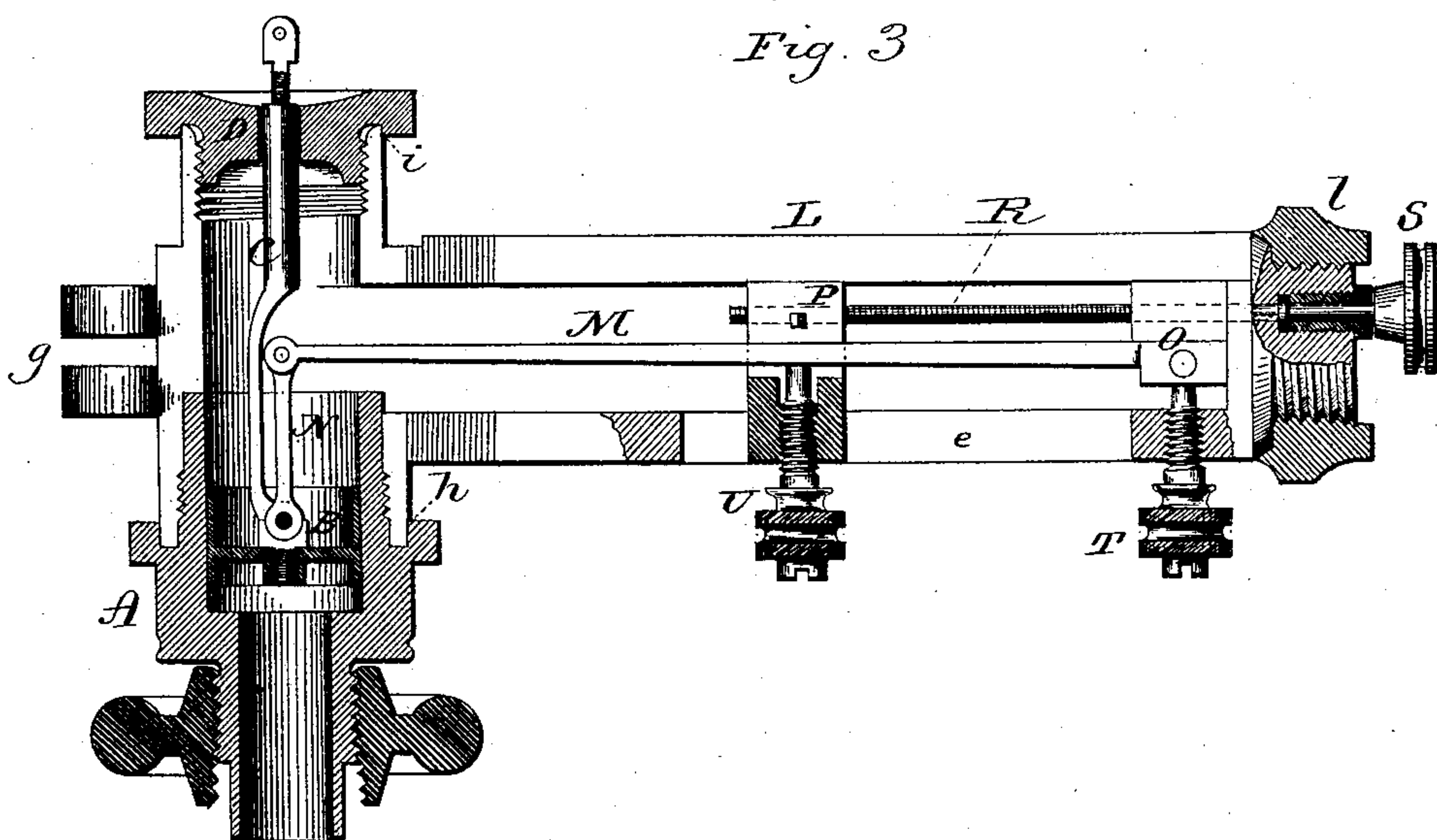
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UNITED STATES PATENT OFFICE.

JOSEPH H. C. BACHELDER, OF MERIDEN, CONNECTICUT.

STEAM-ENGINE ATTACHMENT.

SPECIFICATION forming part of Letters Patent No. 360,644, dated April 5, 1887.

Application filed November 23, 1886. Serial No. 219,579. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH H. C. BACHELDER, of Meriden, in the county of New Haven and State of Connecticut, have invented new
5 Improvements in Steam-Engine Indicators; and I do hereby declare the following, when taken in connection with accompanying two sheets of drawings and the letters of reference marked thereon, to be a full, clear, and exact
10 description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a front view of the indicator complete; Fig. 2, a top view of the same, parts
15 being broken away to illustrate the construction; Fig. 3, a vertical central section through the cylinder, showing a partial sectional front view of the spring-case with a side view of the spring.

20 My invention relates to an improvement in the device constructed for attachment to a steam-engine cylinder, and in which the pressure of the steam in the cylinder is caused to impart an up-and-down movement to a pencil
25 on the surface of a cylinder made to oscillate under the reciprocation of the piston-rod, and whereby the action of the steam in the cylinder during the stroke of the piston will be indicated on the surface of the said cylinder or
30 a card placed thereon. In the more general construction of this class of indicator the adjustment to different pressures of steam in the boiler is produced through a helical spring arranged to bear upon or resist the movement
35 of the piston, and is not readily adjustable when in operation.

The object of my invention is to provide a resisting-spring which may be adjusted to different pressures while the indicator is at
40 work and without disturbing any of the parts of the apparatus.

A represents the cylinder, which is fitted for connection with the cylinder of the steam-engine in the usual manner, and within the
45 cylinder is the usual piston, B, to the under side of which the steam from the engine-cylinder is admitted, the piston being free to work in the cylinder. From the cylinder a rod, C, extends up through a cap, D, on the upper
50 end of the cylinder. This rod, through a link, E, connects with a lever, F, hung upon a ful-

crum, G, and carrying at its free end the usual pencil, H.

I represents the oscillating cylinder, from which a cord, J, extends to the cross-head or
55 other part moving with the piston, the cylinder being provided with a reactive spring, and so that as the cord J is drawn from the cylinder it will rotate the cylinder in one direction, and then, as the cord is free, the reaction
60 of the spring will cause the cylinder to rotate in the opposite direction. This arrangement of cylinder is common and well known, and does not require to be particularly described.
65 The spring is not shown.

K K are springs to secure the card to the cylinder, also in the usual manner.

In a hollow arm or case, L, which extends laterally from the cylinder, a steel spring, M, is arranged at substantially right angles to the
70 axis of the piston, one end being hung to the piston—say as by a link, N—the other end fixed in the arm L, as at O, Fig. 3. Between the fixed point O of the spring M and the opposite end, by which it is connected to the piston, a fulcrum, P, is arranged, against the under
75 side of which the spring M bears, and so that resistance to the ascent of the piston is according to the power of the spring from the fulcrum to its said opposite end. The nearer
80 the fulcrum stands to the said opposite end the greater will be the power of the spring, and vice versa. The fulcrum P is arranged to slide longitudinally in the arm, and that it
85 may be readily moved a leading-screw, R, is arranged within the arm through the fulcrum P, the screw being free to be rotated, yet held against longitudinal movement, as in leading-screws for various purposes.

Outside the end of the arm the screw is provided with a head, S, by which it may be
90 readily turned, and so that as the screw R is turned in one direction it will force the fulcrum toward the said opposite end of the spring, and turned in the opposite direction
95 will move the fulcrum toward the fixed end of the spring. The spring is held at its fixed end by a set screw, T, in the sliding fulcrum, and upon the under side of the spring is a set-screw, U, so that the spring may be clamped
100 upon the fulcrum at any point to which it may be set, as seen in Fig. 3.

From the fulcrum P a point, *a*, extends through a slot, *b*, in the side of the case, (see Fig. 1,) and adjacent to that slot is a graduated scale, *d*, the marks thereon indicating the different points to which the fulcrum must be set to produce a corresponding predetermined resistance to the piston, and this resistance indicates the pressure of steam in the boiler. In graduating the scale the steam is applied to the piston under known pressure, and the fulcrum is adjusted until that pressure will cause the piston to rise to the required point. When that position is reached, the mark is made accordingly, then another pressure applied and the mark made accordingly, and so on, the adjustment indicated on the scale in Fig. 1 being 30, 40, 50, and 60. It is impracticable to graduate the scale for setting the fulcrum, except by actual tests of the spring, because of the variation which must necessarily exist in the power of different springs.

With the scale thus prepared the device is applied in the usual manner. The screw R is turned until the pointer *a* stands at the requisite pressure indicated on the scale. When that point is reached, the set-screw U should be turned hard up against the spring, so as to clamp it upon its fulcrum. Then the spring acts as though it were fixed at the fulcrum. When different pressure is desirable, the set-screw U is released and the fulcrum adjusted accordingly, then the set-screw reset, as before. Thus by this simple device the power of the spring is readily adjusted and clearly and accurately indicated to the person in charge, and the adjustment may be made while the apparatus is in use and without disturbing any of its parts.

It is often convenient to inspect the piston and cylinder as well as the spring. To this end I make the cylinder detachable from the case and divide the case vertically into two parts, *e f*, and these two parts I hinge together, as at *g*, Fig. 1, and as seen in broken lines, Fig. 2, the part *f* forming a cover for the front of the case L. The cylinder A is screwed into the lower end of the two parts of the case corresponding to the cylinder, and as seen in Fig. 3.

The head of the cylinder is constructed with a concentric groove, *h*, into which the lower end of the divided cylinder-case may set, as seen in Fig. 3, and so that the head of the cylinder will serve to lock the two parts together. The cap D of the cylinder is also constructed with a like groove, *i*, by which the upper end of the divided case is secured; and at the end of the case where the spring is fixed I provide a screw-cap, *l*, which has upon its face a concentric groove, *w*, to pass on over the part *f* of

the case, as seen in section, Fig. 2, so as to lock that end of the case. Therefore, by removing the parts which secure the case in its closed position, the covering portion of the case may be turned away, as indicated in broken lines, Fig. 2, and so as to expose the piston and its connections.

The fulcrum G of the lever F is hung upon a ring, *m*, which surrounds the upper end of the cylindrical portion of the case beneath the cap D, and so that the ring *m* and the lever F, which it carries, together with the parallel mechanism of the lever in the case *n*, (the parallel mechanism not shown,) may be turned to take the pencil from or apply it onto the card, as occasion requires.

The spring M, rigidly set to a predetermined pressure, may be used to great advantage in an indicator where only one fixed pressure is required.

I claim—

1. The combination of the steam-cylinder A, piston B therein, the spring M, in a plane substantially at right angles to the axis of the piston, fixed at one end, the other end hung to the piston as a resistance to the movement of the piston, and an oscillating cylinder, with a system of levers between said cylinder and said piston, the end of the lever next the cylinder carrying a marker, and by which levers the movement of the piston against the action of the said spring will be imparted to said marker, substantially as described.

2. The combination of a steam-cylinder, a piston movable therein, a spring arranged in a plane at substantially right angles to the axis of the piston, fixed at one end, the other end hung to the piston, and an adjustable fulcrum between the fixed and opposite ends of the spring, with connections, substantially such as described, from said piston to the card-carrying device, substantially as and for the purpose described.

3. The combination of the steam-cylinder A, piston B therein, divided case *e f*, surrounding said cylinder, the two parts of the case hinged together upon one side of the cylinder, each of the parts having an extension opposite the hinge, one of said parts forming a spring-case and the other the cover, and a spring in said case, fixed at one end and by the opposite end hung to the piston, with a card-carrying device, and mechanism between said piston and said card-carrying device whereby the movement of the piston may be communicated to said mechanism, substantially as described.

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Witnesses:

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