

(No Model.)

2 Sheets—Sheet 1.

A. L. IDE.

VALVE INDICATOR FOR STEAM ENGINES.

No. 343,032.

Patented June 1, 1886.

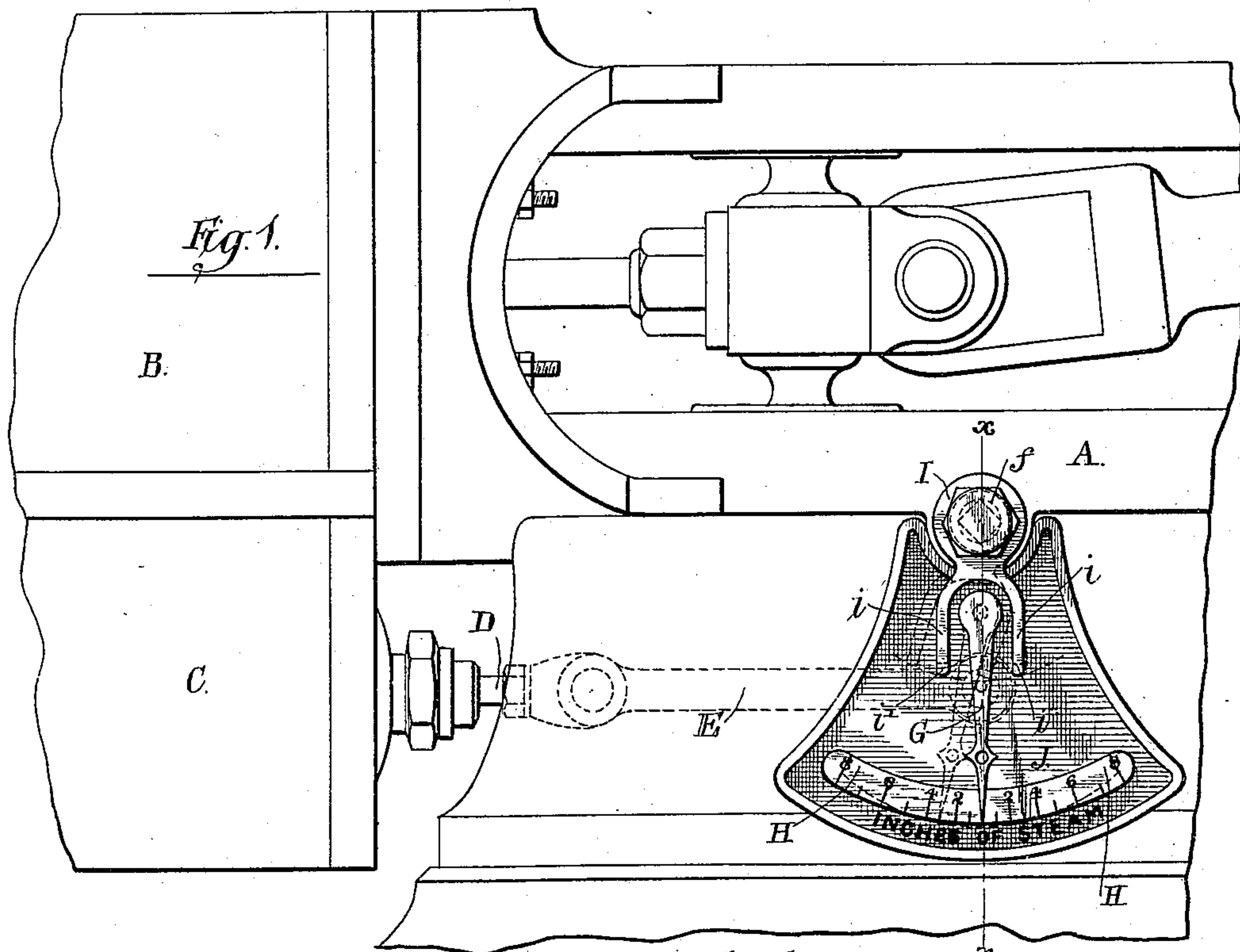


Fig. 4.

Fig. 2.

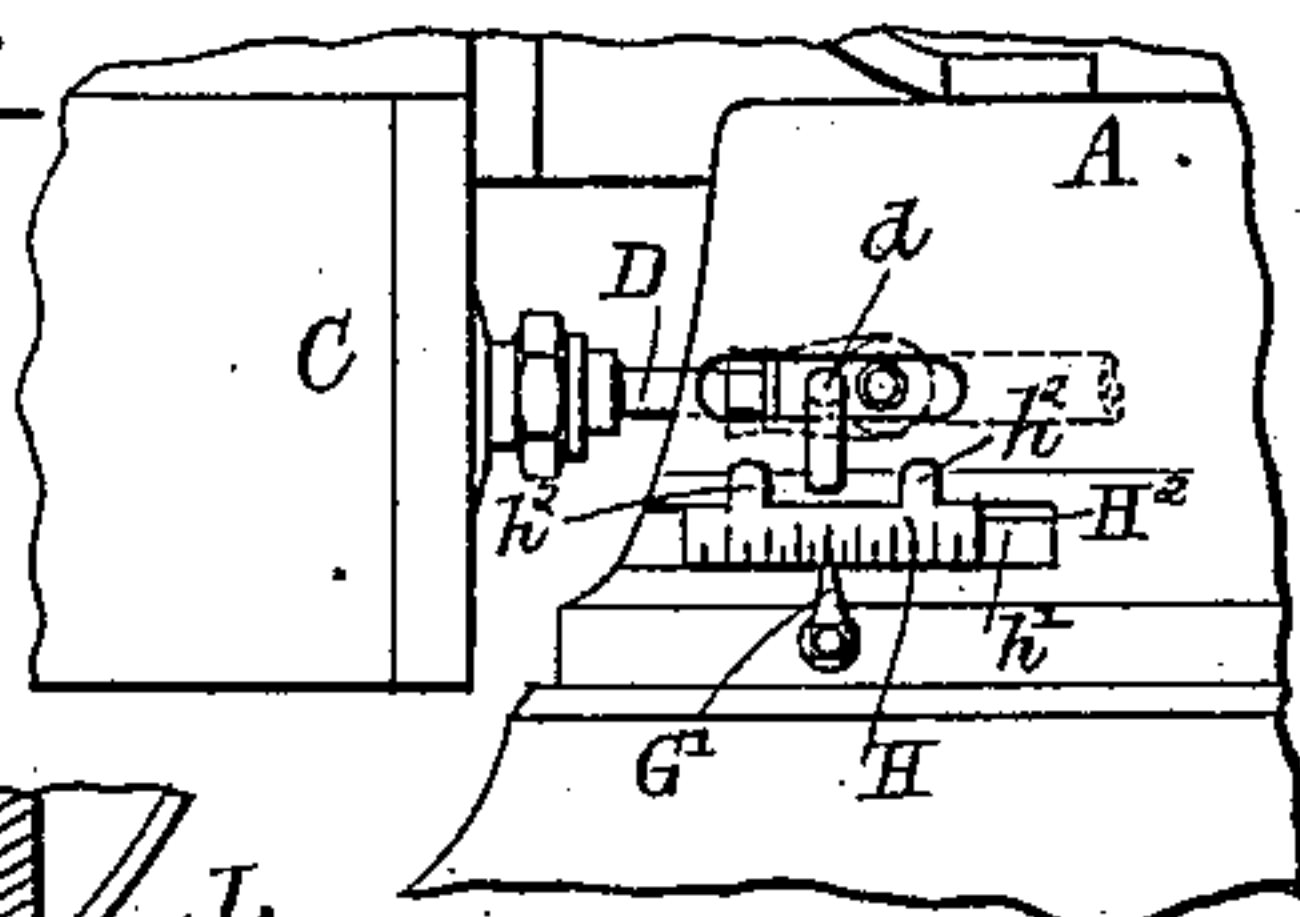


Fig. 3.

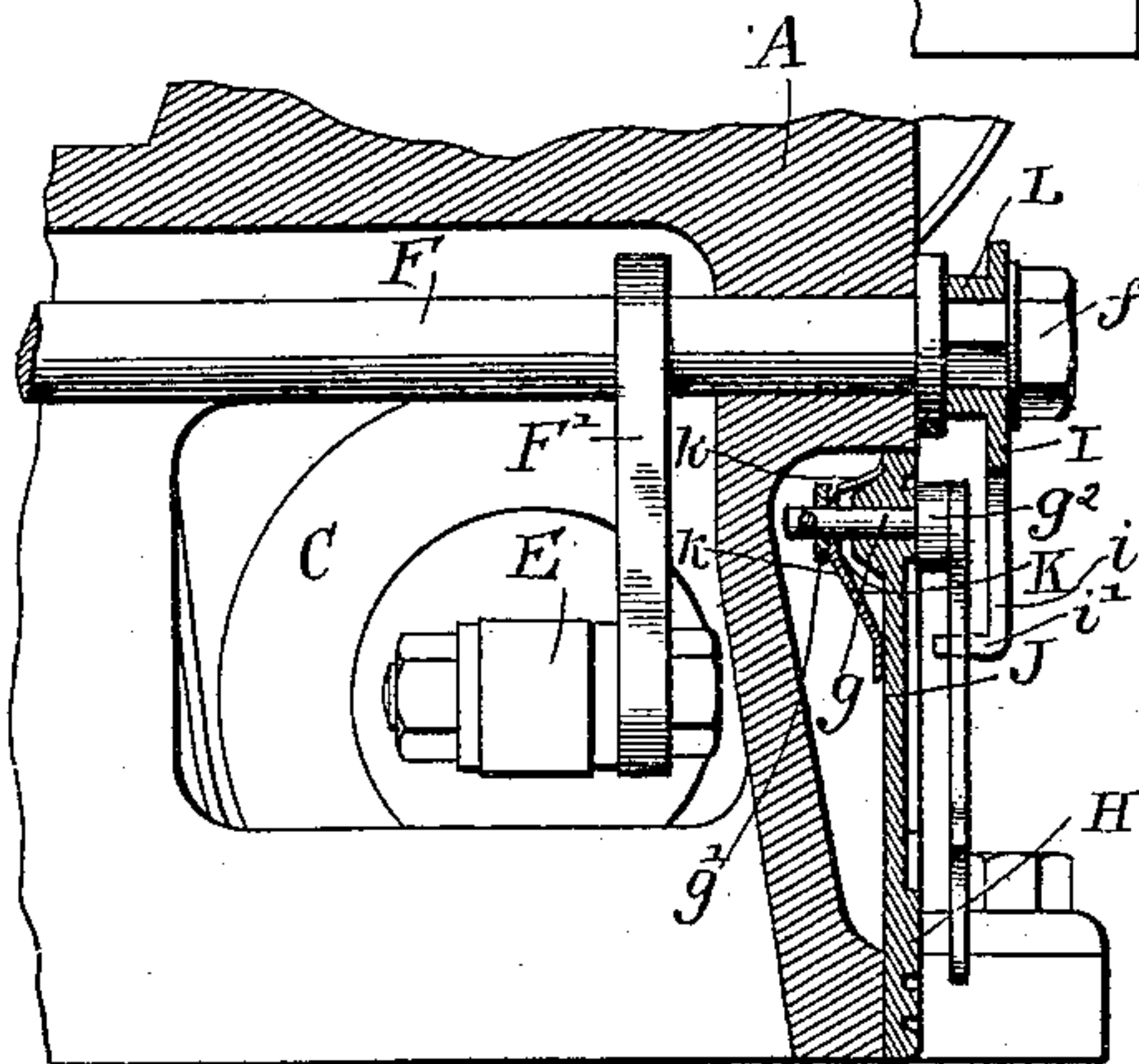
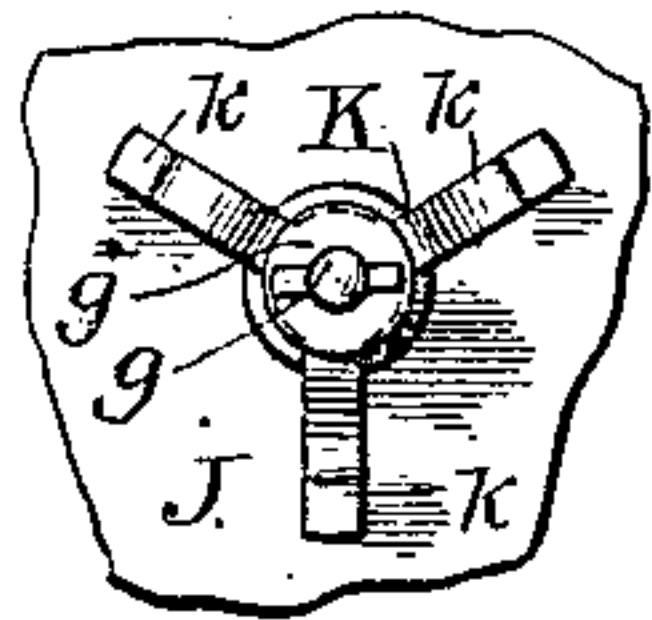
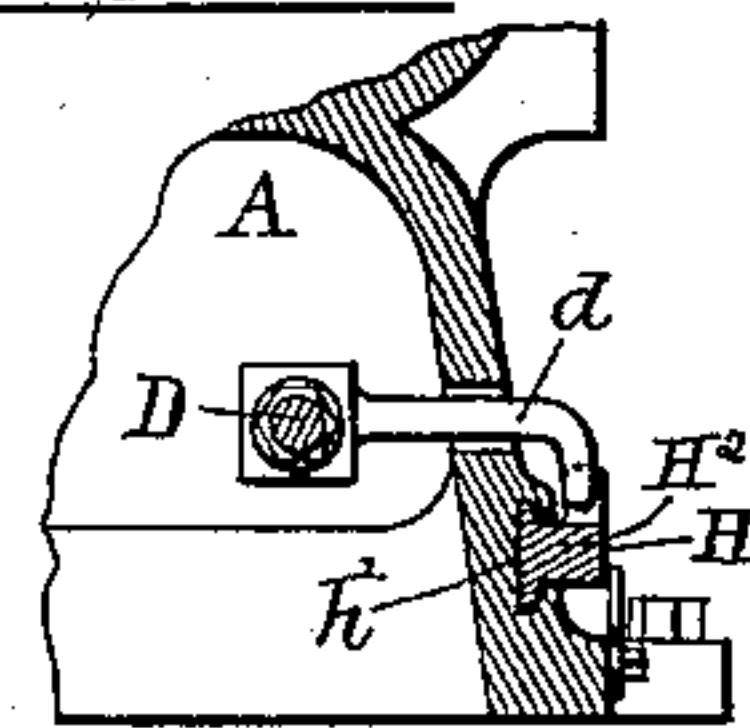


Fig. 5.



Witnesses:

Louis H. Whitehead.

C. C. Poole

Inventor:

Albert L. Ide.

by:

M. E. Dayton

Attorney.

(No Model.)

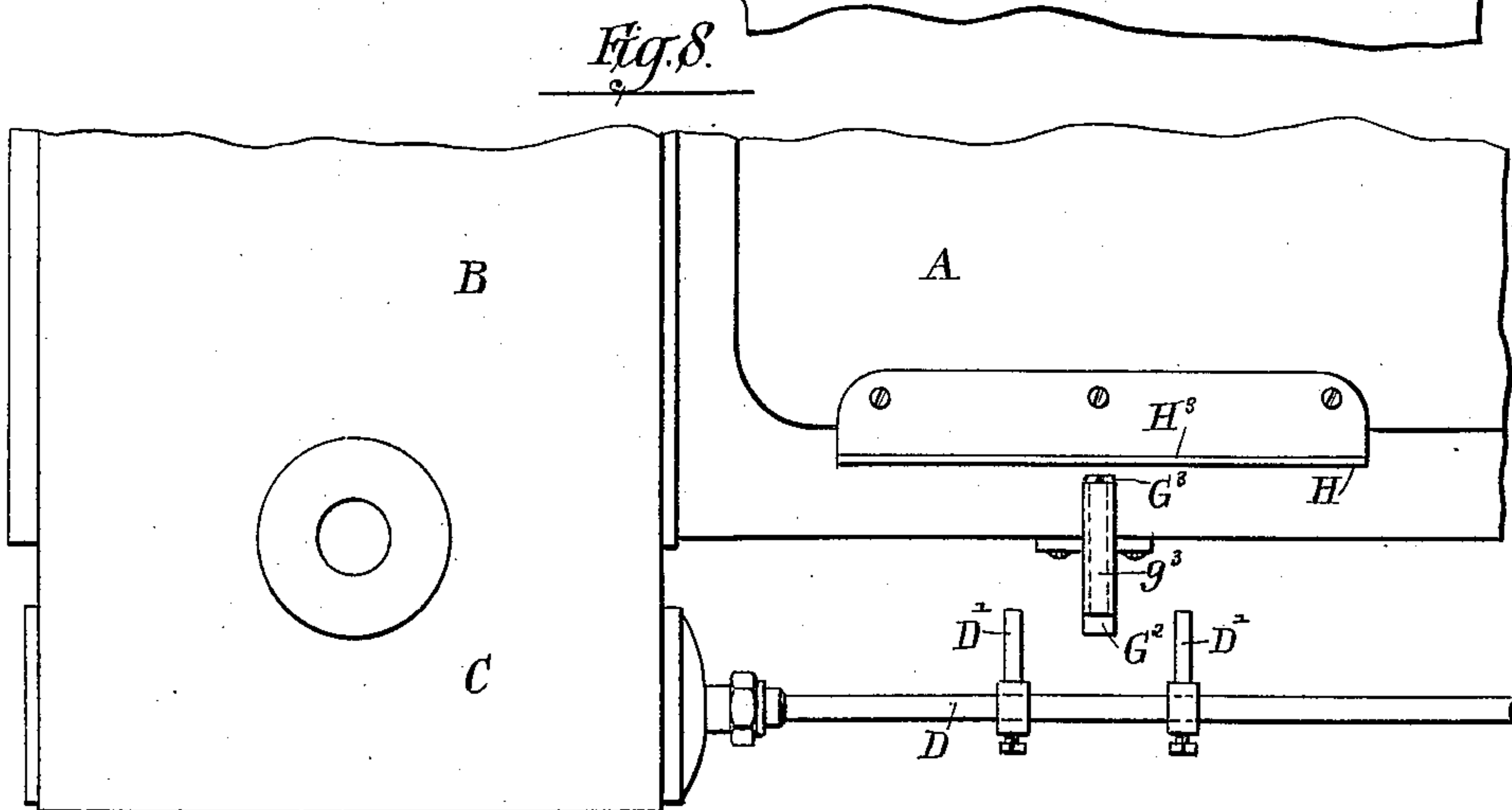
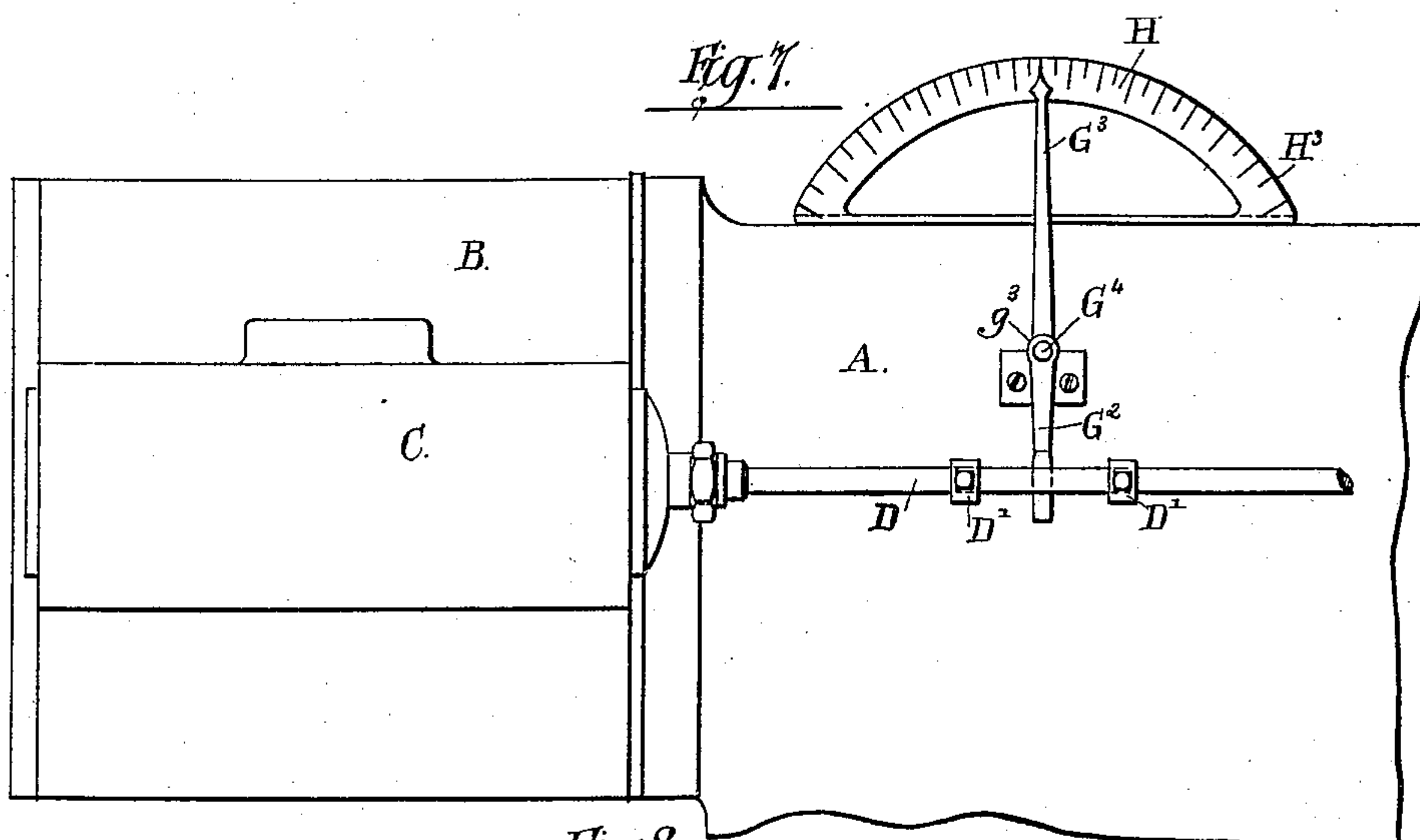
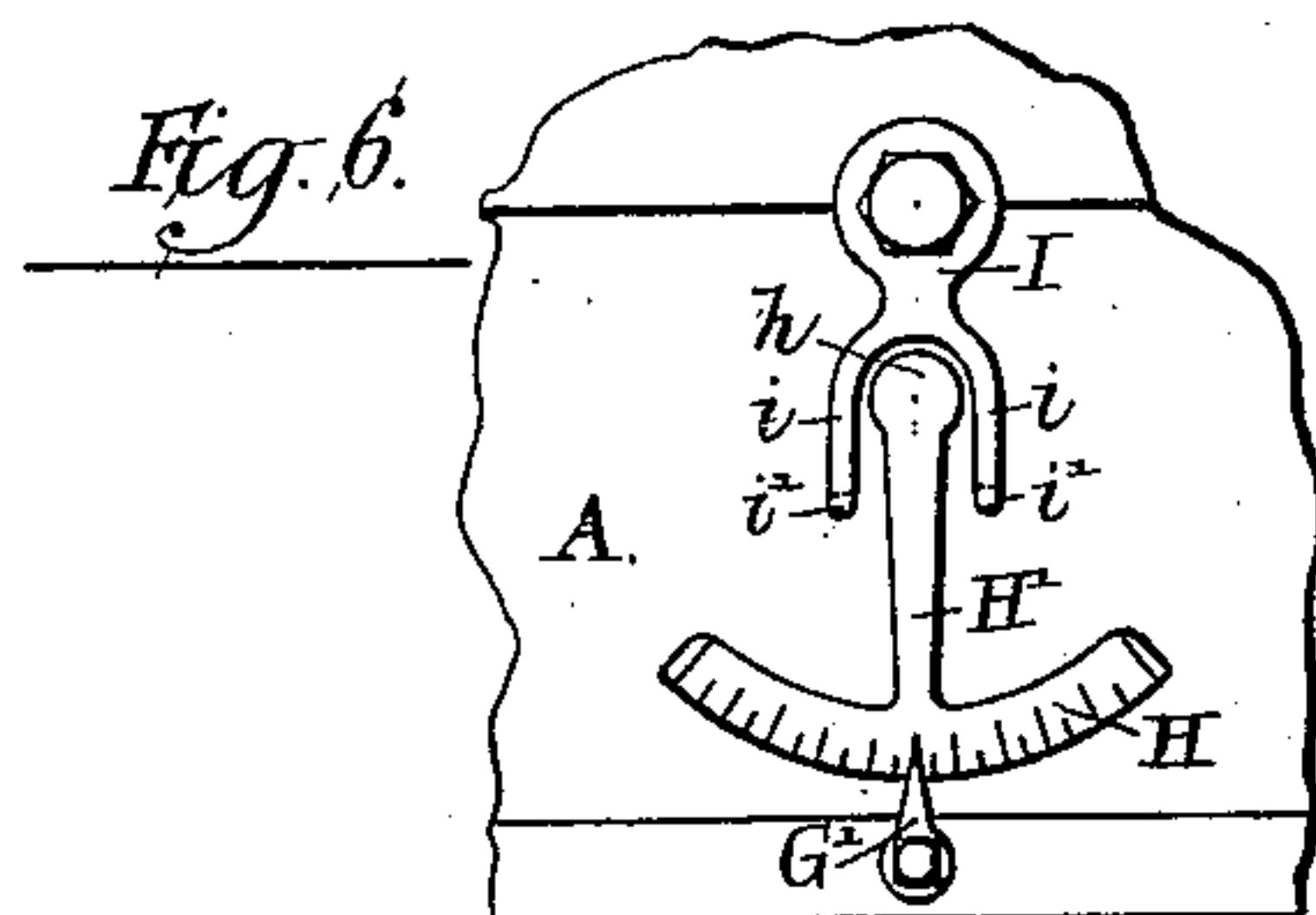
2 Sheets—Sheet 2.

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C. C. Poole

Inventor:-

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Attorney:-

UNITED STATES PATENT OFFICE.

ALBERT L. IDE, OF SPRINGFIELD, ILLINOIS.

VALVE-INDICATOR FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 343,032, dated June 1, 1886.

Application filed February 4, 1886. Serial No. 190,766. (No model.)

To all whom it may concern:

Be it known that I, ALBERT L. IDE, of Springfield, in the county of Sangamon and State of Illinois, have invented certain new and useful Improvements in Valve-Indicators for Steam-Engines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to valve indicators for that class of steam-engines having automatic cut-off mechanism for using steam expansively; and it consists in the matters hereinafter described, and pointed out in the appended claims.

In a prior patent, No. 322,723, granted to me upon the 21st day of July, 1885, is shown and described a valve-indicator for automatic cut-off engines, which is operated by the movements of the valve, and is constructed to show, by the movements of an index hand or pointer upon a suitably-divided scale, the quantity of steam in the cylinder at the time the steam-supply is cut off in the movements of the valve. As set forth in said patent, the index hand or pointer of the indicator is attached to and moved by one of the moving parts connected with the valve, so that the index-hand is moved or vibrated continuously during the operation of the engine. Such continuous movement of the index-hand has, however, been found objectionable, especially in the use of the device upon high-speed engines, some of which make as many as six hundred strokes per minute, for the reason that in the rapid movement of the index-hand it is difficult to note upon the scale with exactness the limits reached by the index-hand in its movement over said scale.

To avoid this difficulty, an indicator constructed in accordance with the present invention is provided with an index-hand, which, instead of being directly attached to a part of the engine which is connected with and moved by the valve, is movably supported independently of the said moving part of the engine, and the said movable part of the engine is provided with two separate projections or stops adapted to engage and move the said index-

hand. Said projections or stops are located at a considerable distance apart, so that the hand will be moved intermittingly in opposite directions by the stops, which latter will strike it in alternation, the hand being carried to one end or side of the scale by the movement of one stop, and there allowed to remain until engaged and moved by the other stop in the return movement of the valve. By this construction the hand obviously remains stationary at the extreme limits of the movement given to it by the stops during a considerable part of each stroke, thereby giving ample time for the observer to note the extent of its movement upon the scale.

The scale shown in said prior patent is provided with a central blank space which represents the lap of the valve, the division-lines or graduations of the scale being laid off from the end of the blank space to indicate the extent of travel in the valve from its position when the ports begin to open to the extreme limit of its stroke. In this prior construction the central blank space covers the movements of the valve when the latter is not moved far enough to admit any steam to the cylinder, the limits of the said blank space indicating the positions of the valve at the moment the parts begin to open and the graduations at the sides of the blank space the extent to which the valve is moved when open, and consequently the quantity of steam admitted to the cylinder during this time, as fully set forth in said patent. When the index-hand or pointer is disconnected from and is moved by stops upon the moving part of the engine, as herein proposed, the said stops will be preferably set at such distance apart that the said index-hand will not be moved except when the valve is thrown sufficiently to open the parts and admit steam to the cylinder, so that the central blank space representing the lap of the valve may be dispensed with and the scale provided with a central zero-mark, at which the index-hand will stand, except when the valve is moved sufficiently to admit steam to the cylinder, at which time the graduations at either side of the said zero-mark will indicate the extent of movement of the valve while open, and consequently the quantity of live

steam admitted to the cylinders in the same manner as do the divisions at the sides of the blank space upon the scale shown in the patent.

5 In carrying out the general features of the invention a movable instead of a stationary scale may be used, in which case the index-hand will be stationary. The desired intermittent motion of the said index-hand, or of
10 the scale when the latter is the movable part, may be accomplished also by the equivalent construction to that described, in which separate projections or stops are attached to the movable index-hand or scale, and engage a single
15 projection, which partakes of the movement of the valve, as will hereinafter more fully appear.

In the accompanying drawings, Figure 1 is a front elevation of a valve-indicator constructed in accordance with my invention, together with adjacent parts of an engine. Fig. 2 is a sectional view of the same, taken upon line *x x* of Fig. 1. Fig. 3 is a detail view of a device for frictionally holding the index-
25 hand. Fig. 4 illustrates another form of the indicator, in which the scale is movable and the index-hand stationary. Fig. 5 is a sectional view taken upon line *x x* of Fig. 4. Figs. 6 and 7 illustrate other forms of the indicator, hereinafter described. Fig. 8 is a plan
30 view of the device shown in Fig. 7.

In the said drawings, A indicates a part of the frame of an engine; B, the steam-cylinder; C, the steam-chest; D, the valve-rod; E, the valve-connecting rod, and F a rock-shaft provided with an arm, F', which is connected with the rod E, said rock-shaft being connected with and moved by the engine-eccentric—as, for instance, in the manner set forth in the said
40 prior application No. 322,723.

G is the hand or pointer of the indicator, which is in this case pivotally supported upon the frame adjacent to the shaft F, and is adapted to move over a curved scale, indicated by H, attached to the said frame, and I is a metal plate or yoke, which is rigidly attached to the end of the said rock-shaft, and is provided with two arms, *i i*, having inwardly-turned parts or stops *i' i'*, located in
50 position to engage and move the index-hand G when the said arms are moved in the oscillatory movement of the shaft. The index-hand G is connected with the frame by devices affording frictional resistance to its movement, so that said hand will remain in whatever position to which it is moved or carried by the projections or stops *i' i'*.

In the particular construction of the parts herein illustrated in Figs. 1 and 2, the scale H is formed upon and the hand G pivoted to a plate, J, attached to the front of the engine-frame A beneath the end of the shaft F, the hand G being attached to a bearing-pin, *g*, which extends through the plate J, and is provided with a collar, *g'*, between which collar and the inner surface of the plate is placed a spring plate or washer, K, Figs. 2 and 3,

herein shown as formed with three radial arms, *k*, acting to press the middle part of the washer against the collar *g'*, whereby the hub *g''* of the hand is held forcibly in contact with the plate J, and any movement of the hand, except when force is applied thereto for the purpose, is thereby prevented. The yoke L may be rigidly attached in any desired manner to the shaft F, the end of the shaft being herein shown as squared, and the yoke fitted to the squared part and held in place thereon by a top nut, *f*.

The scale H is provided with a central zero-mark, as shown, and said scale is graduated in both directions from the said zero-mark, said graduations obviously indicating the extent to which the hand is moved by the contact of the stops *i' i'* therewith in the oscillatory movement of the shaft F. The said stops *i' i'* are preferably placed at such distance apart that when the index-hand stands at zero of the scale the said stops will strike the index-hand at the moment the valve is in position for the steam-ports to begin to open, so that the said index-hand will be moved only during the time that the ports are open and to an extent depending upon the travel of the valve while the steam is being admitted to the cylinder. By this construction, inasmuch as the quantity of live steam admitted to the cylinder is dependent upon the throw of the valve, it is entirely obvious that the movements of the hand over the scale will indicate both the extent of valve movement while the parts are open and the quantity of steam in the cylinders at the time the steam is cut off.

The scale will preferably be marked to indicate the inches of steam in the cylinder behind the piston at the moment the steam is cut off; but the scale may be otherwise marked to indicate the quantity of steam in the cylinder or the extent of movement of the piston at the cut-off point, as may be found desirable or convenient in practice.

In constructing the scale H the position of the lines or graduations thereon may be most conveniently determined after the engine has been set up and the several parts thereof put together by first placing the piston at a distance of one inch from the end of its throw, then placing and securing the cut-off or governing devices in position to bring the valve and pointer at the point of cut-off, and then turning the crank-shaft and marking the extreme positions of the pointer under these conditions upon the scale. The piston is then placed at two inches from the end of its throw, the position of the governing device again changed and set so as to bring the valve at the point of cut-off with the piston in the position indicated, the shaft rotated so as to give full throw to the valve, and the extreme limits of the movement of the pointer marked, as before. The same process is repeated with the piston at three, four, five, &c., inches from the end of its throw, so that there is finally marked upon the scale a series of graduations

indicating by the extent of movement of the valve the number of inches of steam in the cylinder at the time the steam is cut off.

By the process described a scale is made in which all errors from calculation are eliminated and which is accurate for each engine.

The general advantage gained by the construction in which the hand is moved intermittently by separate stops allowing said hand to pause or rest at each limit of its movement may be obtained in a construction in which the scale is marked otherwise than as herein shown, and in which the said stops are arranged otherwise than to allow the hand to remain immovable upon the zero-mark, except when the valve is opened sufficiently to admit steam to the cylinder. My invention is not therefore limited to a construction in which the scale is provided with a central zero-mark, as herein described and shown, except in the claim in which this particular feature of construction is specifically set forth.

One advantage of making the scale with a central zero-mark is that the divisions of the scale may be thereby made larger or coarser, so as to be easily read without making the scale of inconvenient length, as may be necessary when a considerable part of the scale is occupied by a central blank space.

The same general principles of construction and operation present in the device when made as above described may obviously be carried out in a construction of the parts in which the scale is movable and the index-hand stationary, and also in a construction in which the two separated parts or stops, whereby lost motion is obtained between the movable part of the indicator and the part connected with the valve, are located upon or attached to the index-hand in case the latter is movable, or to the scale in case the latter is movable and the index-hand stationary.

A construction of the device embracing a movable scale is illustrated in Figs. 4 and 5. As shown in said figures, the scale H is formed upon a bar, H², constructed to slide longitudinally in a suitable guide in the frame, said guide being herein shown as formed by a dovetailed groove, h', in the frame with which the said bar H² is engaged. The said bar is actuated by means of a lateral arm, d, upon the end of the valve-rod D, constructed to engage two separate projections, h², upon the bar H², and a stationary index-hand, G', is attached to the frame in position to pass over the scale upon the bar as the latter is moved. In this case the projections h² upon the bar H² are desirably placed the same distance apart as the length of the valve-lap, so that the bar will rest immovable with the index-hand at the zero-mark of the scale thereon when the valve is not moved to a sufficient extent to open the ports. The arm d is shown as extended through a slot in the engine-frame, so as to properly engage the bar; but this and other details of construction may be varied, as found desirable or convenient in practice.

It will be observed that in the form of the indicator last described, and shown in Figs. 4 and 5, the laterally-separated parts or projections, whereby the desired lost motion between the valve and the movable part of the indicator is obtained, are located upon a part attached to and moving with the scale, instead of being attached to a part moving with the valve, as is the case in the form of the device shown in Figs. 1 and 2, the same general result obviously being obtained in both cases.

A construction in which the scale is movable and the index-hand is stationary is shown in Fig. 6, in which a scale, H, is formed upon a segmental plate attached to an arm, H', which is pivoted at h to the frame, said scale being actuated by means of an oscillating yoke, I, provided with arms i i, constructed to engage and move the arm H' in the same manner as before described, in connection with the index-hand shown in Figs. 1 and 2.

Still another embodiment of the main principles of the indicator above set forth which has advantages in point of simplicity, and is especially adapted for use upon a common form of engine in which the steam-chest is located at the side of the cylinder, is shown in Figs. 7 and 8. In this case the valve-stem D is provided with two stops, D' D', adapted to engage a depending arm, G², attached to a pivoted index-hand, G³, moving over a curved scale, H, marked upon a curved plate, H³, attached to the upper part of the engine-frame, the stops D' D' being located at a distance apart to move the hand over the scale in the manner hereinbefore described. In the particular form of device shown in said Figs. 7 and 8 the index-hand G³ and arm G² are affixed to a horizontal rock-shaft, G⁴, mounted in a suitable bearing, g³, attached to the engine-frame; but in the use of this general form of the indicator these and other details of construction may obviously be varied in practice, as found convenient or desirable, without departure from the spirit of my invention.

It is of course understood that in carrying out my invention the stop or stops by which the indicator is actuated may be attached to and moved with any operative part of the engine which partakes of the motion of the valve.

I claim as my invention—

1. The combination, with the steam-valve of an engine, of an indicator comprising a scale and an index-hand, one of which is movable relatively to the other and a part partaking of the motion of the valve engaged with and actuating the movable member of the indicator during a portion only of the stroke of the valve, substantially as described.

2. The combination, with the steam-valve of an engine, of an indicator comprising a scale and an index-hand, one of which is movable relatively to the other, and means transmitting motion from the valve to the movable member of the indicator, comprising a movable part provided with two stops or projections whereby lost motion is afforded between the

valve and the said movable member of the indicator, substantially as described.

3. The combination, with the steam - valve of an engine, of an indicator comprising a scale and an index-hand, one of which is movable relatively to the other and a part moved by or with the valve, provided with two projections or stops adapted to engage and move the movable member of the indicator, substantially as described.

4. The combination, with the steam - valve of an engine, of a scale and an index-hand, one of which is movable relatively to the other, means causing frictional engagement between the movable part or member of the indicator and the part or bearing supporting it, and a part moved by or with the valve provided with two separate projections or stops constructed to engage and move the said movable part or member of the indicator, substantially as described.

5. The combination, with the steam - valve of an engine and a rock-shaft or other oscillating part connected with the valve and partaking of the motion of the latter, of a scale and an index - hand or pointer, one of which is movable relatively to the other, and a plate or yoke attached to said shaft or oscillating part and provided with separated parts or stops constructed to engage and actuate the movable member of the indicator, substantially as described.

6. The combination, with a steam-valve of an engine, of a scale and an index-hand, one of which is movable relatively to the other, and is pivotally supported upon the engine-frame, a spring-washer holding the said pivotally-supported part from movement about its pivot, except by the intentional application of force thereto, and a plate or yoke moved by or with the valve and provided with two separate parts or stops constructed to engage the said pivotally-supported part for actuating the latter, substantially as described.

7. The combination, with the steam - valve of an engine, of an indicator comprising an index-hand and a scale, one of which is movable relatively to the other, and a part partaking of the motion of the valve engaged with and actuating the movable member of the indicator during the portion only of the stroke of the valve in which the ports are open, the said scale being provided with a central zero-mark and graduated at both sides of the said zero-mark to indicate the extent of the movement of the valve, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

ALBERT L. IDE.

Witnesses:

WILLIAM L. GROSS,
EDWARD BOGART.