

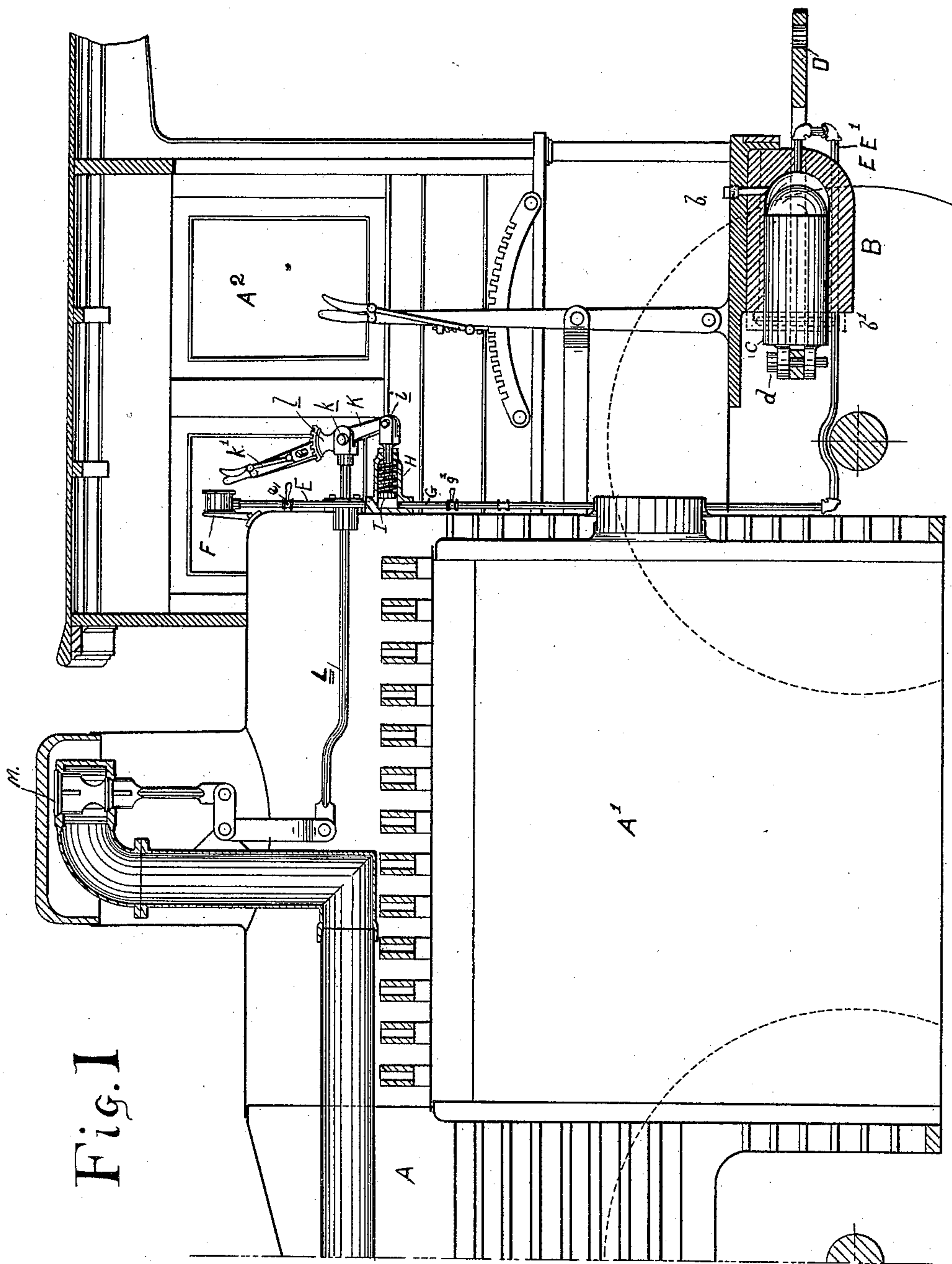
(No Model.)

2 Sheets—Sheet 1.

J. E. PHILLIPS.  
LOCOMOTIVE.

No. 428,179.

Patented May 20, 1890.



Witnesses  
Harry Bitner.  
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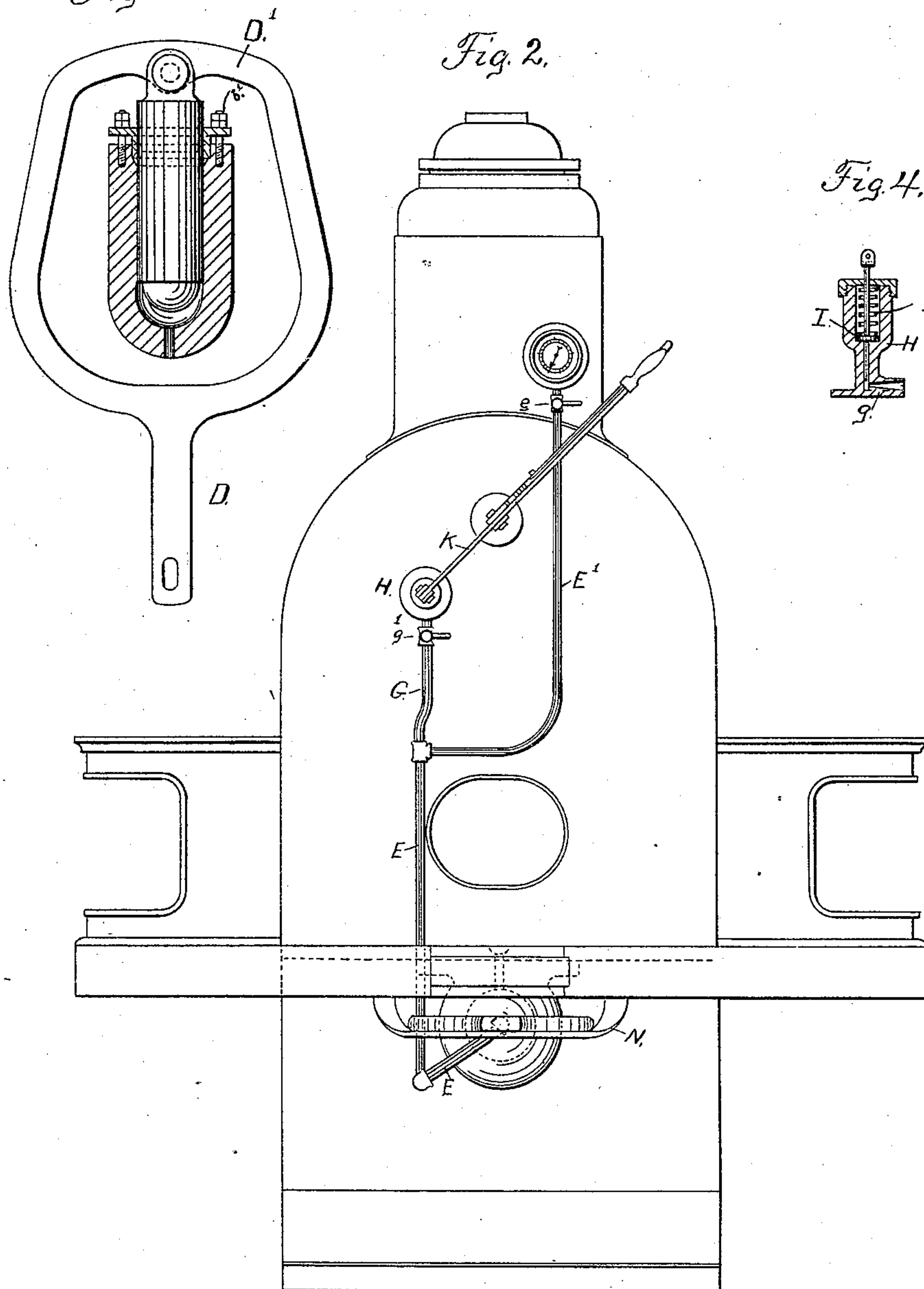
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2 Sheets—Sheet 2.

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*Fig. 3*

Patented May 20, 1890.



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# UNITED STATES PATENT OFFICE.

JOHN E. PHILLIPS, OF FORT MADISON, IOWA.

## LOCOMOTIVE.

SPECIFICATION forming part of Letters Patent No. 428,179, dated May 20, 1890.

Application filed May 16, 1889. Serial No. 311,082. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN E. PHILLIPS, a citizen of the United States of America, residing at Fort Madison, in the county of Lee and State of Iowa, have invented a new and useful Improvement in Locomotives, of which the following is a description, reference being had to the accompanying drawings, in which—

Figure 1 is a cross-section of a rear portion of a locomotive embodying my improvement. Fig. 2 is a transverse section of the same. Fig. 3 is a detail plan view showing the arrangement of the locomotive draw-bar in my improvement, and Fig. 4 is a detail cross-section of the piston and spring regulating the movement of the throttle-valve.

It is well known that a locomotive can haul over the line no heavier a train than it can haul over the steepest grade upon the line. In consequence the train is made up in starting with the intention of giving the locomotive its maximum haul over the steepest grade. This is found to be a work of great difficulty, as often some of the cars in the train are empty and others loaded, while the loaded cars vary in length and capacity and often vary greatly in the weight of their load.

In the system at present in use the weight and draft of the train can only be guessed at approximately from a casual inspection, and in consequence frequently when the locomotive has nearly ascended the steepest grade it is compelled to return with the train and side-track a portion of it to enable the train to surmount the grade, while, on the other hand, the locomotive hauls over the steepest grade a lighter train than it could well have drawn had the load been properly proportioned to the traction of the locomotive, thereby unnecessarily increasing the cost of the haul over the entire line.

The object of my invention is to overcome this difficulty; and it consists in providing the locomotive with a permanent attachment to its draw-bar, whereby the engineer can determine at the start and at any time the normal draft of his train as made up, and whether it equals or exceeds the maximum permissible in surmounting the steepest grade upon the line, thereby enabling him at the start to make up a train of just the right weight and

draft to insure the maximum haul over the entire line.

It consists, also, in the further improvement of a connection between the above-mentioned attachment and the throttle-valve, whereby the amount of steam admitted to the cylinders is automatically regulated by the draft of the train upon the locomotive, all of which will be hereinafter more particularly described, and pointed out definitely in the claims.

In the drawings A is the rear of the locomotive-boiler, A' the fire-box, and A<sup>2</sup> the cab.

A metallic cylinder B, closed at its rear end, is bolted to the frame-work beneath the cab and is provided with a piston or plunger C, closely fitting within the cylinder B. The draw-bar of the locomotive D extends forward around the cylinder B in the form of a yoke D' and is attached in front by the bolt *d* or in any other suitable manner to the outer end of the piston C. The cavity in the cylinder B behind the piston C is filled with oil or other suitable liquid through the duct *b*, which is then closed. A tube or pipe E E' leads outward from this cavity through the cylinder B and thence upward to a pressure-gage F, the finger and dial of which show the amount of pressure exerted upon the oil in the cylinder by the inward movement of the piston C.

The tender is coupled to the draw-bar D in the usual manner. In the preferable construction the cylinder B is provided at its open end with the stuffing-box *b'*, surrounding the piston C, and shown in dotted lines in Fig. 1 and also shown in Fig. 3. The yoke D is further supported by the curved bar N, attached to the bottom of the locomotive and passing beneath the yoke.

In operation the engineer knows the traction-power of his locomotive, he knows the draft of the maximum load his locomotive can haul over the steepest grade upon the line, and he knows, also, the draft of this load upon his locomotive upon a level track. A train having been made up, the locomotive is coupled to it and put into motion. The draft of the train upon the draw-bar D, acting upon the piston C, compresses the oil in the cylinder B, causing the finger of the gage F to indicate the draft of the train. If this exceeds



the maximum load which the locomotive can haul over the steepest grade upon the line, one or more cars are cut out from the train, while, on the other hand, if it be materially less than the maximum, one or more cars are added to the train, and the engineer is thus enabled at the start to apportion his train to the traction-power of his locomotive with reference to the steepest grades upon the line, and thus secure the most economical transportation upon the through-trains. The engineer can also, by glancing at his gage when at the foot of a steep grade, determine in advance whether the addition of cars to his train from time to time has increased the load beyond the maximum the locomotive can haul over the grade, enabling him to adjust his load at the station before he enters upon the ascent of the grade.

In a further improvement of my invention the pipe E, leading from the cylinder B in a continuation or branch G, leads into a cylinder H, admitting oil against the face of a piston or plunger I, which plays therein against the resistance of a spring *h*. The throttle-lever K is pivoted in the outer end of the piston I by the bolt *i*. The rod L, connected in the usual manner with the throttle-valve M, is also pivoted to the throttle-lever K by the bolt *k*, and the throttle-valve is actuated by the movement of the throttle-lever in the usual manner; but the connecting-rod L is provided at its outer end with a toothed segment *l*, rigidly attached, and the lever K is provided with a locking-bar *l'*, which engages in the teeth of the segment *l*.

In operation the engineer controls the admission of steam through the throttle-valve M by the movement of the throttle-lever K in the usual manner, locking the lever to the segment *l* when the required amount of steam is admitted to the cylinders to enable the locomotive to haul the train at the requisite speed upon a level track. By this locking of the lever to the segment *l* the connecting-rod L, the throttle-lever K, and the piston I are firmly united and move as one piece in longitudinal movement. When, now, the train commences to ascend a grade, the increased draft of the train upon the locomotive, acting through the draw-bar D upon the piston C, increases the pressure upon the oil within the cylinder B. The pressure of this oil, transmitted through the pipe E, acts upon the face of the small piston I in the cylinder H, causing the piston I to move outward against the pressure of the spring *h*. This outward movement of the piston I is transmitted by the connecting-rod L to the throttle-valve M, opening it, so as to automatically admit a greater quantity of steam to the cylinders, increasing the power of the locomotive in proportion to the increase in the draft of the train upon it. In like manner, when the train enters again upon a level track or upon a downgrade, the diminished draft upon the draw-bar D and piston C diminishes the pressure upon the oil in the cylinder B, and

consequently upon the face of the small piston I, enabling the spring to cause an inward movement of the piston I and connecting-rod L, which, acting upon the throttle-valve, diminishes the quantity of steam admitted to the cylinders in an amount proportionate to the diminished draft of the train upon the locomotive.

A further improvement upon this part of my invention consists in providing the pipe G with an interior contraction, preferably located at place of its entry into the small cylinder H, as shown at *g* in Fig. 4. This contraction in the pipe G retards the movement of oil in and out from the cylinder H, so that a quick or jerking movement of the draw-bar D to and fro exerts but a slight effect upon the piston I and the throttle-valve, while it steadies the movement of the attached throttle-lever K under variations in the draft of the train upon the locomotive.

To enable the pressure-gage to be shut out of action at any time, I insert in the pipe E' a valve or cock *e*, and I also insert in the pipe G a valve or cock *g'*, to enable the piston I to be withdrawn from action whenever desired.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with a locomotive and its draw-bar, of an abutment interposed between them, which affords a yielding resistance to the outward movement of the draw-bar, and a pressure-gage which indicates the pressure exerted in the draft of the draw-bar, substantially as and for the purpose set forth.

2. The combination, with a locomotive and its draw-bar, of a piston and cylinder interposed between them and a liquid contained in the cylinder, and a pressure-gage which indicates the pressure upon the liquid, substantially as and for the purpose set forth.

3. The combination, with a locomotive, of a draw-bar provided with a yoke at its inner end, a piston and liquid-containing cylinder interposed within the yoke and attached, respectively, one to the yoke and the other to the locomotive, and a pressure-gage which indicates the pressure upon the liquid, substantially as and for the purpose set forth.

4. The combination, with a locomotive, of a draw-bar provided with a yoke at its inner end, a piston and liquid-containing cylinder interposed within the yoke and attached, respectively, one to the yoke and the other to the locomotive, with a bar or hanger supporting the yoke and a pressure-gage which indicates the pressure upon the liquid, substantially as and for the purpose set forth.

5. The combination, with a locomotive and its draw-bar, of a piston and liquid-containing cylinder interposed between them, a pressure-gage indicating the pressure upon the liquid, with a connecting-pipe provided with a valve or cock, substantially as and for the purpose set forth.

6. The combination, with a locomotive and



its draw-bar, of a piston and liquid-containing cylinder interposed between them, a connecting-pipe leading from the cylinder to a second cylinder, and a piston in this second cylinder actuated by the liquid-pressure against the resistance of a spring and connected with the throttle-valve of the locomotive, substantially as and for the purpose set forth.

7. The combination, with a locomotive and its draw-bar, of a piston and liquid-containing cylinder interposed between them, a connecting-pipe leading from the cylinder to a second cylinder and provided with an interior contraction, and a piston in this second cylinder actuated by the liquid-pressure against the resistance of a spring and connected with the throttle-valve of the locomotive, substantially as and for the purpose set forth.

8. The combination, with a locomotive and its draw-bar, of a piston and liquid-containing cylinder interposed between them, a connecting-pipe leading from the cylinder to a second cylinder, a piston in this second cylinder

actuated by the liquid-pressure against the resistance of a spring, and a throttle-lever pivoted thereto and attached to a rod connecting with the throttle-valve and securable rigidly to said rod by a locking-bar fitting into a toothed segment mounted upon said rod, substantially as and for the purpose set forth.

9. The combination, with a locomotive and its draw-bar, of a piston and liquid-containing cylinder interposed between them, a connecting-pipe leading from the cylinder to a second cylinder and provided with a closing valve or cock, and a piston in this second cylinder actuated by the liquid-pressure against the resistance of a spring and connected with the throttle-valve of the locomotive, substantially as and for the purpose set forth.

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