No. 871,471. PATENTED NOV. 19, 1907.

W. L. BRAMAN.

LEAD CONTROLLING MECHANISM FOR STEAM ENGINES.

APPLICATION FILED APR. 9, 1907.

2 SHEETS—SHEET 1.

Fig. 1.

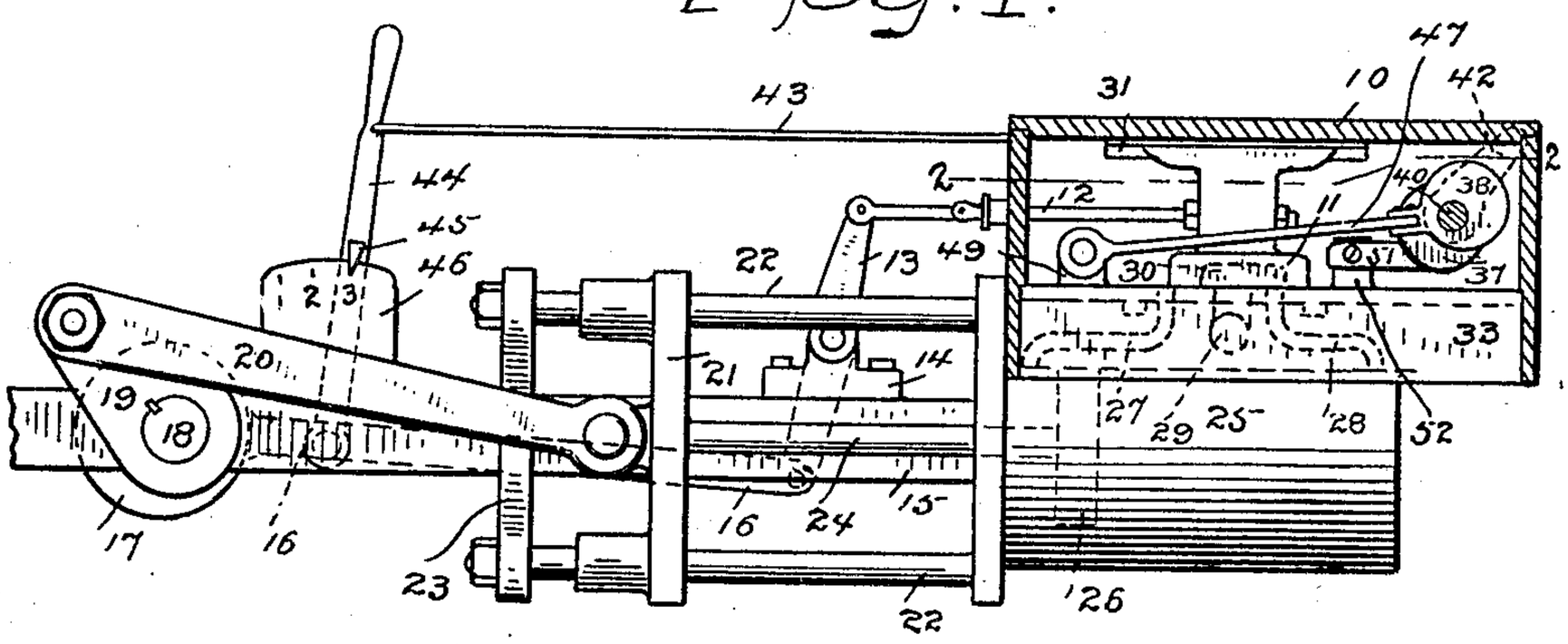
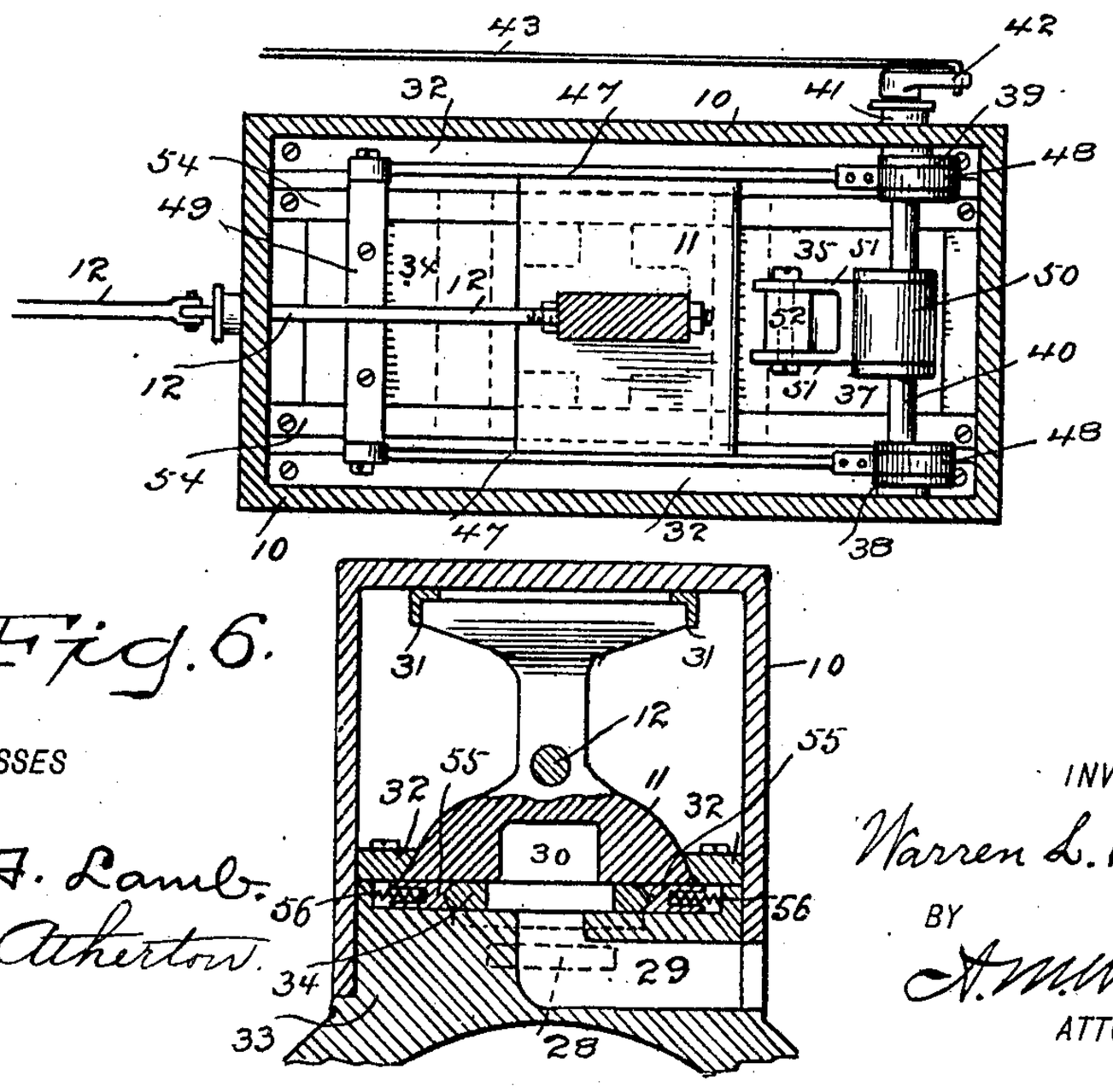


Fig. 2.



WITNESSES

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Fig. 3.

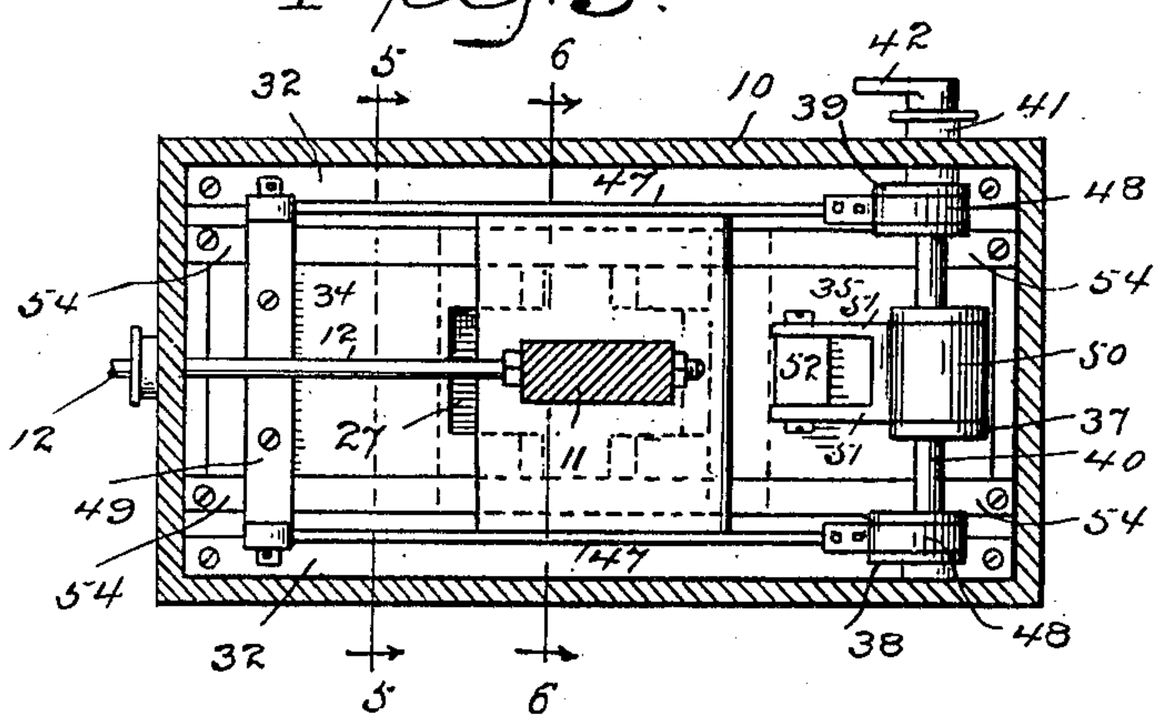

Fig. 4.

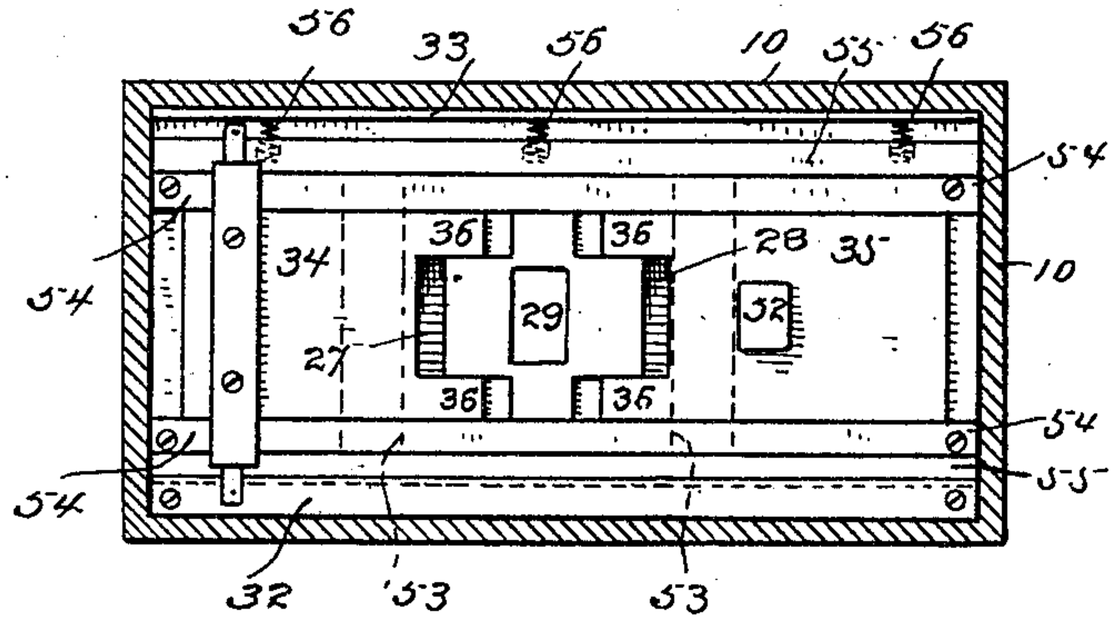

Fig. 5.

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UNITED STATES PATENT OFFICE.

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LEAD-CONTROLLING MECHANISM FOR STEAM-ENGINES.

No. 871,471. Specification of Letters Patent. Patented Nov. 19, 1907.

Application filed April 9, 1907. Serial No. 367,153.

To all whom it may concern:

Be it known that I, WARREN L. BRAMAN, a citizen of the United States, residing at Ellington, county of Tolland, State of Connecticut, have invented a new and useful Lead-Controlling Mechanism for Steam-Engines, of which the following is a specification.

This invention relates to steam engines generally and is especially adapted for use upon locomotives designed to haul heavy trains for long distances, as it gives an engineer perfect control of the lead independently of the throttle. This use of the invention is of especial importance in starting heavy trains and in running them over mountain grades. By placing the lead wholly at the control of the engineer without use of the throttle, he is enabled to start a heavy train easily and quickly without waste of steam, without grinding the wheels and rails, without excessive jar to the machinery and, under ordinary conditions, without the use of sand.

With these and other objects in view I have devised the novel valve controlling mechanism of which the following description in connection with the accompanying drawings is a specification, reference characters being used to indicate the several parts:

Figure 1 is a side elevation illustrating the application of the invention to a locomotive, the steam chest being in section; Fig. 2 a horizontal section of the steam chest on an enlarged scale on the line 2—2 in Fig. 1, the steam ports being closed by the regulating valves as when the lead lever is at 3 on the dial; Fig. 3 a similar view, the regulating valves being fully open as when the lead lever is at 1 on the dial; Fig. 4 a view corresponding with Fig. 3, the main valve and eccentrics being removed; Fig. 5 a detail sectional view on the line 5—5 in Fig. 3, looking in the direction of the arrows; and Fig. 6 is a transverse section of the steam chest on a still larger scale on the line 6—6 in Fig. 3, looking in the direction of the arrows.

10 denotes the steam chest, 11 the main admission and exhaust valve, 12 a jointed valve rod connected to the main valve and pivoted to a rocker arm 13 which oscillates in a bearing 14 on a frame 15, 16 the eccentric rod one end of which is pivoted to the rocker arm and the other connected to a strap (not shown) inclosing an eccentric 17 on a shaft 18 journaled in the frame, 19 the crank, 20 the connecting rod which is pivoted to the crank and to a cross head 21 which reciprocates on guide bars 22 rigidly secured to the cylinder head and to a bracket 23, 24 the piston rod which is connected to the cross head, 25 the cylinder, 26 the piston (shown in dotted lines only), 27 and 28 steam ports leading from the steam chest to the opposite ends of the cylinder and 29 the exhaust port. These parts may all be of any ordinary or preferred construction as my invention is not limited in its application to any special type of engine or special type of valve gear but is applicable in connection with any ordinary type of valve gear and to any of the types of engines now in general use.

The main valve 11 is provided in its underside with the usual recess 30 and operates in the usual manner, permitting steam to pass from the steam chest through one of the steam ports, as through steam port 27, to the cylinder and permitting steam to exhaust from the other end of the cylinder through steam port 28, recess 30 and exhaust port 29. The main valve reciprocates in ways 31 at the top of the steam chest and in ways 32 on the base of the steam chest, which is indicated by 33. The steam and exhaust ports 27, 28 and 29 are formed in this base.

My novel port regulating valve controlling mechanism consists of two valves or plates indicated by 34 and 35 and operating mechanism therefor which places them under the control of the engineer to regulate the lead at all times. These valves lie under the main valve and are recessed in the base 33 of the steam chest. The port regulating valves lie on opposite sides of the exhaust opening, valve 34 operating in connection with steam port 27, and valve 35 operating in connection with steam port 28. The inner ends of both regulating valves are provided with extensions 36 lying under the main valve which acts to retain the said regulating valves always in position even when a regulating valve and the main valve are at their opposite extremes of movement when full lead is on, as in Fig. 3. The position of the regulating valves and consequently the amount of lead is controlled by means of eccentrics 37, 38 and 39 on a shaft

40 journaled in the steam chest. One end of shaft 40 extends through a stuffing box 41 in one side of the steam chest and carries a crank 42. A rod 43 connects the crank with a lever 44 shown as pivoted to the frame. A pointer 45 on the lever 44 registers with a dial 46 on the frame. In use, the lever 44 is placed wherever most convenient for the engineer, as in the cab of a locomotive. In the present instance, I have shown the dial as provided with the numerals 1, 2 and 3, but any other graduation may be used if preferred. As shown in the drawings, when the pointer registers with the numeral 1, the regulating valves will be at their farthest open position, giving full lead. When the pointer registers with the numeral 2, the regulating valves will have been moved inward and there will be no lead, and when the pointer registers with the numeral 3, the regulating valves will have been moved to their farthest inward position and the steam ports will be entirely closed thereby, so that no steam can pass to the cylinder. The amount of lead can be regulated by placing the pointer at any intermediate position between the numerals 1 and 2. The farther the lever 44 is moved toward the left the more lead will be given. Movement of the lever toward the right from numeral 1 to numeral 2 will lessen the lead until at 2 there will be no lead. Regulating valve 34 is operated by means of eccentrics 38 and 39 on shaft 40.

47 denotes shifting arms each carrying at one end an eccentric strap 48 inclosing one of the cams 38 or 39, the other end of each shifting arm being pivoted to a yoke 49 on valve 34. Valve 35 is connected to eccentric 37 by means of a strap 50 which incloses the eccentric and is provided with arms 51 which are pivoted to a lug 52 on the valve.

It will be noted in Figs 2 and 3 that eccentrics 38 and 39 are set opposite to eccentric 37 so that oscillation of shaft 40 by means of the lever 44 will move the regulating valves toward or from each other and will give more or less lead by partly opening or closing the steam ports simultaneously. In running at a slow speed as when hauling heavy trains over mountain grades and in starting trains at stations, very little lead is required. As the speed increases the lead may be increased as found desirable, the lead being at all times wholly at the control of the engineer independently of the throttle. The extensions 36 of the regulating valves permit a wide range of adjustment of said valves, while said valves are still retained in position by the main valve. In other words, the throw of the eccentrics which are employed to vary the adjustment of the regulating valves may be considerable, and still the regulating valves will be held to their seats by the main valve.

In practice, the regulating valves are ground in steam tight. As a rest for each regulating valve, I preferably provide a packing plate 53 which is recessed into base 33 and may be made of hard rubber or of any suitable metal, as copper, and on each side of each regulating valve I place a packing strip or plate 54. These side strips or plates may likewise be made of rubber or any suitable metal, as copper. The outer edges of the side strips are made convex and they are retained closely in engagement with the edges of the regulating valves by means of retaining bars 55, the inner edges of which are made concave to receive the convex outer edges of the side strips, as shown in Fig. 5. Retaining bars 55 are held in yielding engagement with the side strips by means of springs 56 socketed in the retaining bars and bearing against the wall of the recess in casting 33. The bottom ways 32 in which the exhaust valve reciprocates are removable strips, one of which if removed in Fig. 4. The regulating valves, plates 53 and strips 54 may be readily removed and replaced whenever required.

Having thus described my invention I claim:

1. In an engine having admission and exhaust ports, a main valve for both of said ports, regulating valves having extensions under the main valve, and mechanism for manually adjusting said regulating valve to control the lead.

2. In an engine having admission and exhaust ports, a main valve for both of said ports, regulating valves having extensions and mounted to slide under the main valve, and mechanism for manually reciprocating said regulating valves and controlling the lead.

3. In an engine having admission and exhaust ports, a main valve for both of said ports, regulating valves having extensions under the main valve, a shaft having means whereby it may be manually oscillated, and connections between the regulating valves and said shaft whereby said regulating valves may be adjusted.

4. In an engine having admission and exhaust ports, the combination with a main valve, of regulating valves having extensions under the main valve, a shaft, connections intermediate said shaft and the regulating valve whereby the latter may be moved toward or from each other by oscillation of said shaft, a lever, and connections intermediate said lever and shaft.

5. In an engine, the combination with a steam chest having admission and exhaust ports, a main valve for both of said ports, regulating valves having extensions under the main valve and operating in connection with the ports of the steam chest for the purpose set forth, a shaft journaled in the steam

chest, eccentrics on said shaft, and straps and connections between said eccentrics and the regulating valves, whereby they are moved in opposite directions by oscillations of the shaft.

6. In an engine having admission and exhaust ports, the combination with a main valve for both of said ports, of regulating valves recessed below the main valve and having extensions at all times engaged by said main valve, for the purpose set forth, and means for manually reciprocating the regulating valves independently of the main valve.

7. In an engine having admission and exhaust ports, the combination with a main valve for both of said ports, of regulating valves recessed below the main valve and having extensions at all times engaged by the said main valve, for the purpose set forth, a shaft having a crank and lever, a dial operating in connection with said lever, and connections whereby the regulating valves are shifted by the actuation of said shaft.

8. In an engine having admission and exhaust ports, the combination with a main valve for both of said ports, of regulating valves recessed below the main valve and having extensions at all times engaged by said main valve, for the purpose set forth, and rest plates below the regulating valves.

9. In an engine having admission and exhaust ports, the combination with a main valve for both of said ports, of regulating valves recessed below the main valve and having extensions at all times engaged by said main valve, for the purpose set forth, side strips on opposite sides of the regulating valves, retaining bars engaging the side strips, and springs to hold the retaining bars yieldingly in engagement with the side strips and the latter yieldingly in engagement with the regulating valves.

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

WARREN L. BRAMAN.

Witnesses:
A. N. WOOSTER,
S. W. ATHERTON.