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R. E. STEPHENSON.

ENGINE VALVE SETTING DEVICE.

APPLICATION FILED SEPT. 29, 1905.

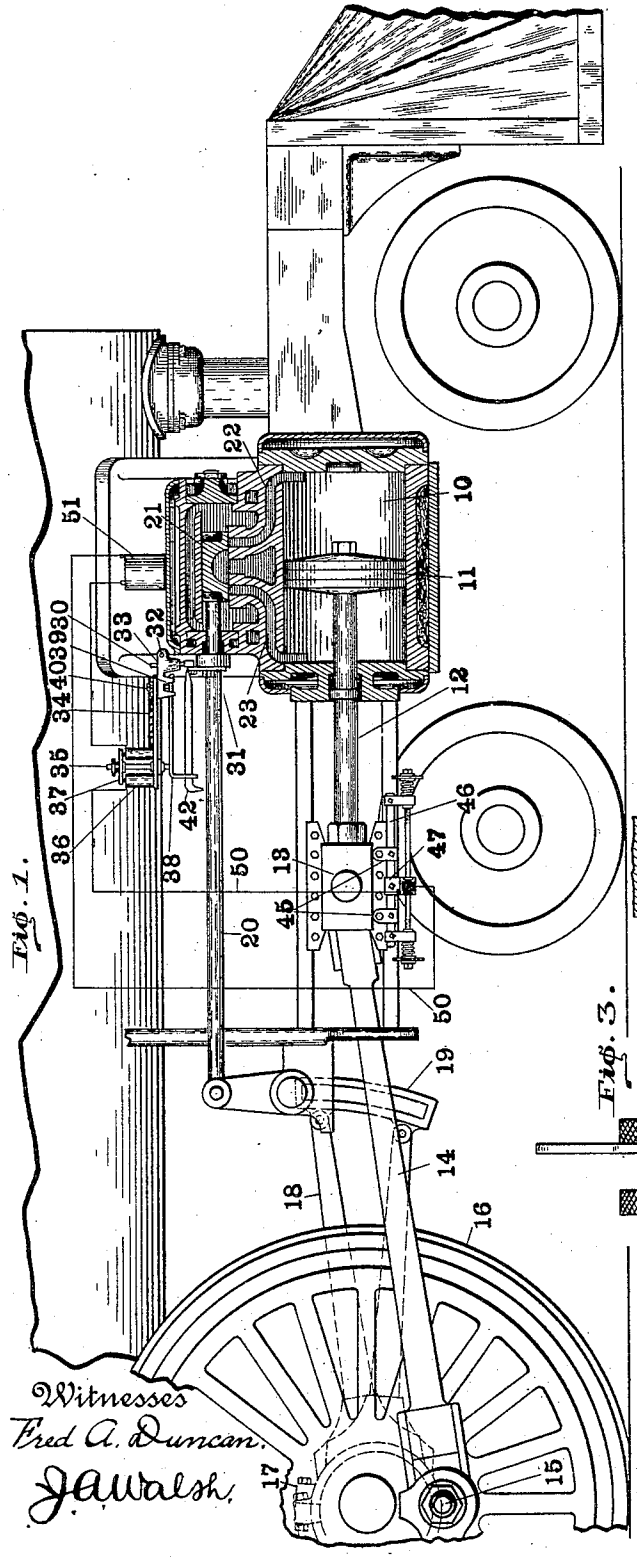


Fig. 1.

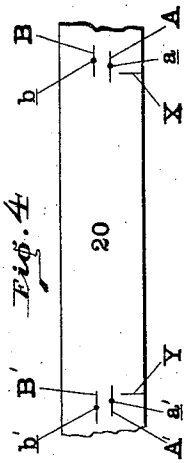


Fig. 4.

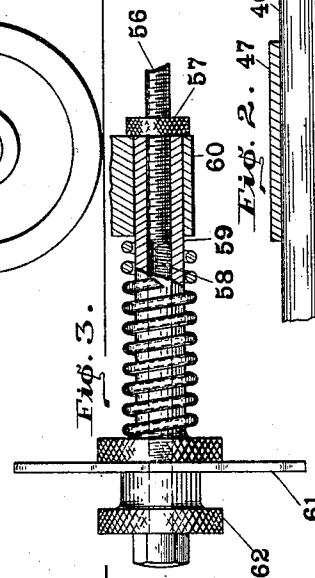


Fig. 3.

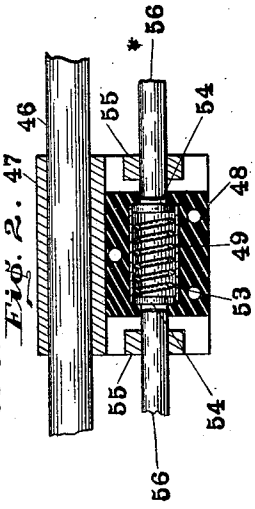


Fig. 2.

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UNITED STATES PATENT OFFICE.

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ENGINE-VALVE-SETTING DEVICE.

No. 870,205. Specification of Letters Patent. Patented Nov. 5, 1907.

Application filed September 29, 1905. Serial No. 280,588.

To all whom it may concern:

Be it known that I, ROBERT E. STEPHENSON, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Engine-Valve-Setting Devices, of which the following is a specification.

At the present time the usual method for setting the valves of an engine is to shift the engine back and forth manually, and, when the piston is at the exact end of its stroke, or as near thereto as can be approximated, the valve stem is marked by a tram and the marks thus made compared with standard marks which are placed upon the valve stem before the steam chest cover is put on. The performance of such an operation is difficult, and requires a large amount of time, and this is especially true in setting the valves of locomotives where it is necessary to push the entire locomotive back and forth manually in order to move the various parts to their different relative positions.

The accompanying drawings illustrate my invention as applied to a locomotive, although it is to be understood that my invention is not to be limited to such use.

Figure 1 illustrates my invention attached to an ordinary locomotive, the cylinder and steam chest being shown in sections; Fig. 2 is a detail of the electrical circuit maker; Fig. 3 a detail of the outer adjustable end thereof; and Fig. 4 a diagram illustrating the character of markings produced.

In the drawings, 10 indicates a cylinder, 11 a piston traveling therein, 12 a piston rod, 13 the cross head, 14 the main or connecting rod, 15 the wrist pin of the drive wheel 16, 17 one of the eccentrics (in dotted lines), 18 the eccentric rods or blades, 19 the link, 20 the valve stem, 21 the valve, and 22 and 23 the admission ports, all of them of any desired construction and arrangement.

When the port openings of an engine are first taken, one of the blades, or eccentric rods, is disconnected from the link and the valve 21 is then arranged with its right-hand side close to the right-hand side of the port 22, a thin strip of metal, such as a tin plate, being inserted between the end of the valve and the right-hand edge of the port. A tram of any desired length is then placed with one end on the cylinder, or, for instance, a fixed point on the steam chest, and a line X struck upon the valve stems. The valve 21 is then shifted to the right and the same metal strip inserted between the left hand side of the valve and the left-hand side of the port 23, whereupon the same tram is used for producing a mark Y on the valve stem proper. These marks X and Y become the standard indicators to show the position of the valve. As the engine is used the valve shifts, owing to wear, etc., and the apparatus now to be described is for the purpose of facilitating the marking of indications on the valve stem which will show the new position of the valve relative to the proper and initial position thereof. In the form of my apparatus shown in the drawings, I provide a spindle 30 which is adapted to be attached to the packing head of the steam chest by suitable links 31. Attached to this spindle and rotatably adjusted thereon by means of a clamping nut 32 is a head 33 which carries an arm 34 supporting at its outer end a plunger 35 carrying an armature 37 adapted to coöperate with the magnet. The plunger 35 extends through the arm 34 and rests upon the outer end of a spring board 38, the inner end of which is supported in a yoke 39 between the forks of which a set screw 40 is arranged so as to bear upon the spring, whereby the screw 40 may be used to kink the support 38, and thus adjust its outer free end. The spring 38 carries a tram 42, the outer end of which is brought to a drop point so as to be capable of scratching the valve stem 20 when brought into contact therewith.

Attached to the cross head 13 by means of suitable clamps 45 is a rod 46 having attached to its middle a metallic adjustable head 47 which carries an insulating block 48 within which is arranged a metal shell 49 which forms one terminal of a circuit 50 in which circuit is arranged the electro magnet 36, and a suitable battery 51. Arranged within shell 49 is a spring 53 and a pair of disks 54, one at each end of the tube 49, said disks being limited in outward movement by engagement with the block 48, as shown in Fig. 2. Slidably mounted in a suitable bearing 55 at each end of block 48 and in alinement with the disks 54 is one of a pair of plungers 56, each of which is adapted to engage the adjacent disk 54 but is normally out of contact therewith. Each plunger 56 is threaded at its outer end so as to receive a suitable check nut 57 and so as to enter the threaded bore 58 of an extension member 59, which member is slidably mounted in a block 60 adjustably attached to the rod 46, the arrangement being such that the effective length of the plunger 56—59, may be readily adjusted. Member 59 is headed near its outer end as at 59′, and a cross piece 61 is adapted to be attached to the member 59 against the head 59′ by means of a nut 62, the arrangement being such that the cross piece 61 may be angularly adjusted on the member 59 so as to be positioned to be brought into engagement with a stationary portion of the engine frame when the cross head is brought close to the end of its stroke.

The operation of the device is as follows: With the parts assembled as shown in Fig. 1, the piston will be reciprocated to produce forward motion by a normal operation of the engine. And when the piston reaches the right hand end of its stroke, or very near it, the right hand cross bar 61 comes into engagement with a stationary portion of the structure, and the right-hand

plunger 56 is projected into engagement with the disk 54, thus completing the electric circuit of the magnet 36, and the spring 53 permitting a considerable further movement of the piston to the extreme end of its stroke, the electric circuit being continued until the piston returns to the point at which original contact between the plunger 56 and its disk 54 took place. The energization of the magnet 36 causes plunger 35 to be drawn downward, and that acts upon the spring 38 to force the sharpened point of the tram 42 into engagement with the valve stem 20, whereupon a mark "A" will be produced on the stem 20, the length of said mark depending upon the length of time of contact between the right hand plunger 56 and its disk 54, and the exact middle *a* of said line indicating the point of the valve stem which stood opposite the point of the tram at the exact end of the right hand movement of the piston. The movement of the piston is then to the left end of the cylinder, and the operation is repeated, the left hand cross-bar 61 coming into contact with a stationary portion of the frame in a manner already described, and causing the tram 42 to make a mark A′, the exact middle *a′* of which similarly indicates the point of the valve stem which lay exactly opposite the tram point upon the exact end of the leftward stroke of the piston so reached. If the points *a* and *a′* lie equidistant from the adjacent lines X and Y, and the distance between the point *a* and the line X is equal to the desired amount of lead of the valve on the forward stroke, there is no need of adjustment of the corresponding eccentric, or valve-operating means, but if the points *a* and *a′* do not bear the relation specified, the exact relation between said point and the lines X and Y give a proper and exact indication of the amount of adjustment necessary. The clamping screw 32 is then loosened, and head 33 shifted lightly on spindle 30, and the parts clamped in the new position. The engine is then run backward so as to produce lines B and B′ which correspond, for the backward movement, to the lines A and A′ respectively, for the forward movement, and the middles *b* and *b′*, respectively, of these lines, together with a corresponding indication of the relation which the movement of the valve bears to the standard tram lines X and Y, respectively, when the engine is running backward and these points *b* and *b′* serve as an indicator to determine the amount of adjustment which may be necessary to obtain the proper position of the valve for the backward stroke.

In Fig. 4, I indicate a usual custom in which the lead on the reverse movement is somewhat greater than the lead on the forward stroke.

The lines A and A′, and B and B′ are made longitudinally of the valve stem instead of transversely, as has heretofore been the custom, and it will be noticed that, by reason of this fact, the length of these lines becomes unimportant for, no matter what the length may be, the exact middle is the point of reference desired. This I consider to be a very important distinction between my method and that ordinarily followed.

It will be readily understood that mechanical means might be substituted for the electrical connections between the cross head and the tram without departing from the broad spirit of my invention which I believe to be a provision of a mechanism capable of producing reference indications on the valve stem to indicate the position thereof in its chest when the engine is operated in its normal manner. It will be readily apparent that the desired reference indications are made entirely automatically and, as the movement of the engine is accomplished by its regular motive power, the time consumed in obtaining the necessary indications is exceedingly small.

I claim as my invention:

1. A means for indicating the position of the valve of an engine, which means consists of a marking instrument capable of producing a record on a part associated with the valve, and intermediate connections between said marking instrument and the piston for actuating said marking instrument for a limited period at each end of the stroke of the piston.

2. A means for indicating the position of the valve of an engine, which means consists of a recording instrument capable of making a record on a part associated with the valve and longitudinally thereof, and intermediate connections between said recording instrument and the piston for actuating said recording instrument for a limited period at each end of the stroke of the piston.

3. A means for indicating the position of the valve of an engine, which means consists of a recording instrument capable of producing a record on a part connected with the valve, electrically-controlled means for actuating said recording instrument, and means actuated by the piston for actuating said electrically-controlled means at the ends of the stroke of the piston.

4. A means for indicating the position of a valve of an engine, which means consists of a recording instrument capable of producing a record on a part connected with the valve longitudinal of the movement thereof, electrically-controlled means for actuating said recording instrument, and means actuated by the piston for actuating said electrically-controlled means at the ends of the stroke of the piston.

5. A means for indicating the position of the valve of an engine, said means consisting of a marking tram capable of engaging and marking the valve stem longitudinally, means for holding said tram in operative position, and intermediate connections between said tram and the piston for moving the tram into engagement with the valve stem at each end of the stroke of the piston.

6. A means for indicating the position of the valve of an engine, said means consisting of a tram, means for supporting said tram adjacent the valve stem, an electromagnet, and means controlled by said electro-magnet for bringing the tram into marking engagement with the valve stem.

7. A means for indicating the position of the valve of an engine, said means consisting of a tram, means for supporting said tram adjacent the valve stem, an electromagnet, an electric switch adapted to be attached to the piston rod, contact pieces moved into and out of the circuit of the electro-magnet, and means for actuating said contact pieces at the opposite ends of the stroke of the piston.

8. A means for indicating the position of the valve of an engine, said means consisting of a recording instrument capable of producing a record longitudinally of the movement of a part associated with the valve, and means, dependent upon the movement of the piston, for operating said recording instrument at each end of the piston stroke.

In witness whereof, I, have hereunto set my hand and seal at Indianapolis, Indiana, this 25th day of September, A. D. one thousand nine hundred and five.

ROBERT E. STEPHENSON. [L. S.]

Witnesses:
ARTHUR M. HOOD,
JAMES A. WALSH.