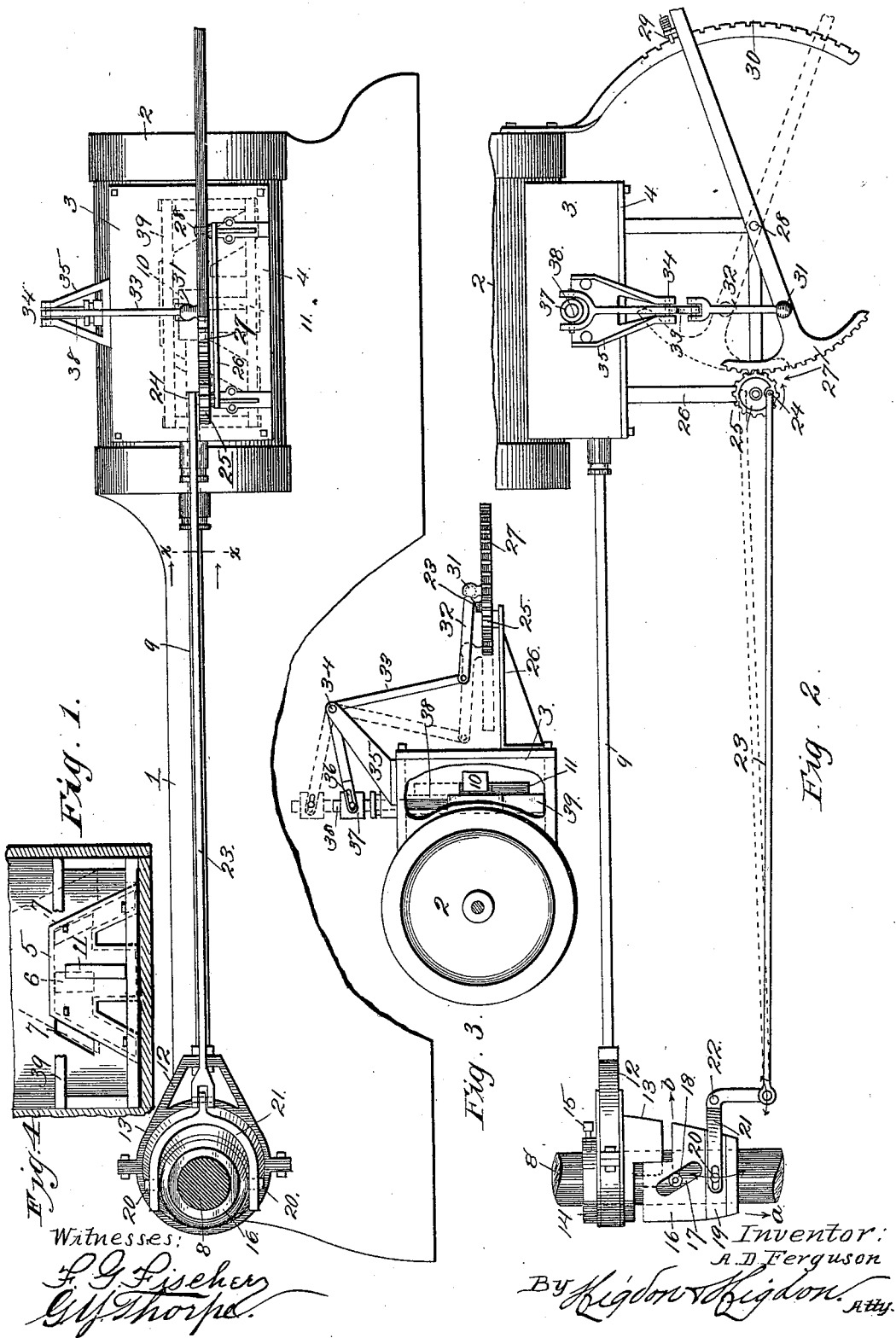


(No Model)

A. D. FERGUSON.
REVERSING MECHANISM FOR STEAM ENGINES.

No. 582,630.

Patented May 18, 1897.



UNITED STATES PATENT OFFICE.

ALFRED D. FERGUSON, OF ODESSA, MISSOURI, ASSIGNOR OF ONE-THIRD TO
HARVEY N. BROWN, OF SAME PLACE.

REVERSING MECHANISM FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 582,630, dated May 18, 1897.

Application filed April 25, 1896. Serial No. 589,082. (No model.)

To all whom it may concern:

Be it known that I, ALFRED D. FERGUSON, of Odessa, Lafayette county, Missouri, have invented certain new and useful Improvements in Reversing Mechanism for Steam-Engines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to reversing mechanism for steam-engines, and more especially to an improvement over my invention as embodied in the patent on reversing mechanism for steam-engines granted to me on July 21, 1896, No. 564,274.

The present invention contemplates the employment, in connection with the valve construction therein shown, of additional mechanism whereby each time the valve is adjusted to reverse the engine it will move obliquely in order to insure that a "lead" is obtained for the entrance of the steam to the cylinder at all times. In my aforesaid invention the valve is adjusted to reverse the engine always at right angles to its reciprocatory movement, and it has been found in practice that the engine works more uniformly and satisfactorily by adjusting said valve obliquely to its reciprocatory motion and thereby obtaining a lead for the steam at all times, as hereinbefore explained.

To this end the invention consists in certain new and peculiar features of construction and combinations of parts, as hereinafter described and claimed.

In order that the invention may be fully understood, reference is to be had to the accompanying drawings, in which—

Figure 1 is a side elevation of a stationary engine provided with reversing mechanism embodying my invention, the frame of said engine being broken away and its shaft shown in section. Fig. 2 represents a plan view of the same, except that the frame of the engine is omitted. Fig. 3 is a vertical section taken on the line *xx* of Fig. 1. Fig. 4 is a face view to illustrate clearly the relation between the ports and the valve.

Referring now to the drawings in detail, 1 designates the frame of a steam-engine, 2 the cylinder, and 3 the steam-chest.

4 designates the cap of the steam-chest.

5 designates the reciprocatory valve, which is provided with a recess in its inner side which conforms to the contour of the valve, as illustrated in dotted lines in Fig. 4, and is adapted to communicate simultaneously with the exhaust-port 6 and one of the inlet-ports 7.

The piston-rod (not shown) is connected in the customary manner to the crank-shaft 8, while the valve-stem 9 extends into the steam-chest 3 and is provided with a hook 10 at its end which slidably engages a rib or projection 11 upon the valve 5 in a manner clearly shown and described in my aforesaid patent. At its opposite end it is connected to the eccentric 12 in the customary manner, and said eccentric is mounted rotatably upon the clutch-section 13, arranged to oscillate upon the crank-shaft 8. It is prevented from moving longitudinally upon said shaft at one side by means of a collar 14, secured rigidly by means of a set-screw 15 to the shaft, while at its opposite side it is opposed by the clutch-section 16, which clutch-section is mounted loosely upon the shaft and is provided with an inclined or cam slot 17, engaging a pin 18 or antifriction-roller mounted thereon, which projects radially from the shaft 8, as shown clearly in Fig. 2. Said clutch-section 16 is provided exteriorly with an annular groove, wherein is journaled a collar 19, and projecting outwardly at diametrically opposite points from said collar are the pins 20, engaged by longitudinal slots in a yoke-shaped angle-lever 21, mounted pivotally upon a stub-shaft or pin 22, supported in a suitable manner. Said lever is pivotally connected in turn by a link-rod 23 to the wrist-pin 24, projecting from a cog-pinion 25, mounted rotatably upon a stub-shaft projecting from one corner of the bracket or casting 26, secured to the steam-chest. Said pinion is engaged by a toothed and segment-shaped shifting-lever 27, mounted upon a stub-shaft 28, projecting also from bracket or casting 26, and said lever is provided with the usual spring-actuated pin 29 to engage a notched sector 30, secured rigidly to and projecting from the cylinder or other part of the engine. Connected by a ball-and-socket joint, as at 31, to said lever, forward of its pivot, is a link 32, and said lever is pivotally connected to the lower end of a bell-crank lever 33, mounted pivotally,

as at 34, in a bracket 35, secured to the steam-chest and projecting upwardly therefrom. The opposite end of said lever is bifurcated and provided with longitudinal slots 36, which engage loosely pins projecting outwardly from the collar 37, mounted rigidly upon the upper end of a rod 38, which extends upwardly into the steam-chest at right angles to the valve-stem and is secured rigidly to the rectangular frame 39, which fits snugly against the end walls of the steam-chest, but is narrower than the same, so that it may be moved laterally when the rod 38 is reciprocated to adjust the valve at right angles to its reciprocatory movement, in order to reverse the engine when necessary or desirable. By thus adjusting the said frame, and thereby the valve, which it snugly embraces, the rib or projection 11 simply slides within the hook 10 of the valve-stem without interfering in the least with its reciprocatory movement.

In operation the valve reciprocates longitudinally with the motion imparted to it by its eccentric connection by the crank-shaft in the customary manner, and in case it is desired to reverse the engine it is only necessary to operate in one direction or the other the frame 39, in a manner clearly explained in my patent, to which reference has been frequently made. In the construction embodied in said patent, however, this lateral adjustment of the valve is accomplished by moving the frame 39 by means of a lever operated entirely independent of the mechanism for reciprocating the valve longitudinally. In the present construction, however, it is impossible to adjust the valve laterally by means of said frame without at the same time changing its position longitudinally with relation to the shaft 8—that is to say, supposing the valve to be in position as illustrated in Fig. 4, and it be desired to reverse the engine, the shifting-lever is thrown to the position indicated in dotted lines, thereby rotating the pinion 25 half-way around, or a distance of one hundred and eighty degrees, which obviously, by reason of the cam-slot engaging the pin 18, causes the clutch-section 16 to slide outwardly upon the shaft in the direction indicated by the arrow *a*, and at the same time oscillate upon the shaft in the direction indicated by the arrow *b*, and this movement, owing to the fact that one of the shoulders of said clutch-section bears against the opposing shoulder of the section 13, rotatably operates said section also in the direction indicated by the arrow *a*, and consequently changes the relation of the eccentric to the shaft, and thereby longitudinally adjusts or moves for a slight distance the valve within the steam-chest. At the same instant, through the medium of the link 32, the bell-crank lever 33, and the rod or stem 38 of the frame 39, the latter adjusts the valve laterally, and these two movements taking place simultaneously consequently cause the valve to partake of the movement of each and thereby

move obliquely or at an angle to both a direct longitudinal and a direct lateral movement. By such movement the valve when its lateral movement is ended has assumed the position illustrated in dotted lines, Fig. 4, and exposes slightly one of the inlet-ports of the steam-chest, whereby a lead for the steam passing to the cylinder is obtained. When the shifting-lever is thrown to the position illustrated in dotted lines, it is obvious that it first moves the clutch-section 16 in the direction indicated by the arrows *a* and *b*, and thereby adjusts the section 13, and then reverses such movement of the section 16 in order to cause the other shoulder of the same to abut against the opposite or opposing shoulder of the clutch-section 13. When so arranged, to reverse the engine again and to obtain a lead at the same time it is only necessary to swing the shifting-lever back to the position shown in full lines, and this operation obviously rotatably and longitudinally adjusts the clutch-section 16 as before, and consequently rotates the clutch-section 13, by reason of the other pair of shoulders being engaged, back to its original position—that is, to its original position with relation to the shaft 8, as will be readily understood. By such operation the clutch-section 16 is again brought into engagement with the clutch-section 13—that is, with the shoulders originally or first referred to again in contact, as illustrated in Fig. 2.

From the above description it is obvious that I have produced a mechanism whereby the valve can be obliquely adjusted and the lead consequently obtained.

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

1. The combination with a steam-engine, a slide-valve therefor, and a laterally-adjustable frame embracing said valve, of a rotatable collar upon the crank-shaft, an eccentric mounted thereon and connected to the stem of the valve, and means to adjust said valve obliquely by simultaneously moving its embracing frame laterally and said eccentric-carrying collar rotatably, substantially as described.

2. The combination with a steam-engine, a slide-valve therefor, and a laterally-adjustable frame within the steam-chest and embracing said slide-valve, of a clutch-section mounted rotatably upon the shaft of the engine, an eccentric mounted thereon and connected to the stem of the valve, a second clutch-section upon said shaft and engaging the first-named clutch-section, and means to longitudinally and rotatably shift said last-named clutch-section upon the shaft and simultaneously move the laterally-adjustable frame embracing the valve, substantially as set forth.

3. The combination with a steam-engine, a slide-valve therefor, and a laterally-adjustable frame embracing said slide-valve, of a

clutch-section mounted rotatably upon the shaft of the engine, an eccentric rotatably mounted thereon and connected to the stem of the valve, a pin projecting radially from the shaft, a second clutch-section mounted
5 loosely upon the shaft and provided with an inclined slot engaging said pin, and means to move said last-named clutch-section outwardly and thereby rotatably from its relation to the said pin, and simultaneously shift
10 the laterally-adjustable frame embracing the valve, substantially as described.

4. The combination with a steam-engine, a slide-valve therefor, and a laterally-adjustable frame embracing said slide-valve, of a
15 clutch-section mounted rotatably upon the shaft of the engine, an eccentric rotatably

mounted thereon and connected to the stem of the valve, a pin projecting radially from the shaft, a second clutch-section mounted
20 loosely upon the shaft and provided with an inclined slot engaging said pin, a yoke-lever embracing said clutch-section, a gear-pinion linked to said yoke-lever, and a toothed ship-
25 ping-lever engaging said pinion, and pivotally coupled to the stem of the valve-embracing frame, substantially as described.

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

ALFRED D. FERGUSON.

Witnesses:

G. Y. THORPE,
H. E. PRICE.