No. 721,994. PATENTED MAR. 3, 1903.

A. D. BAKER.

VALVE GEAR FOR ENGINES.

APPLICATION FILED AUG. 15, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1,

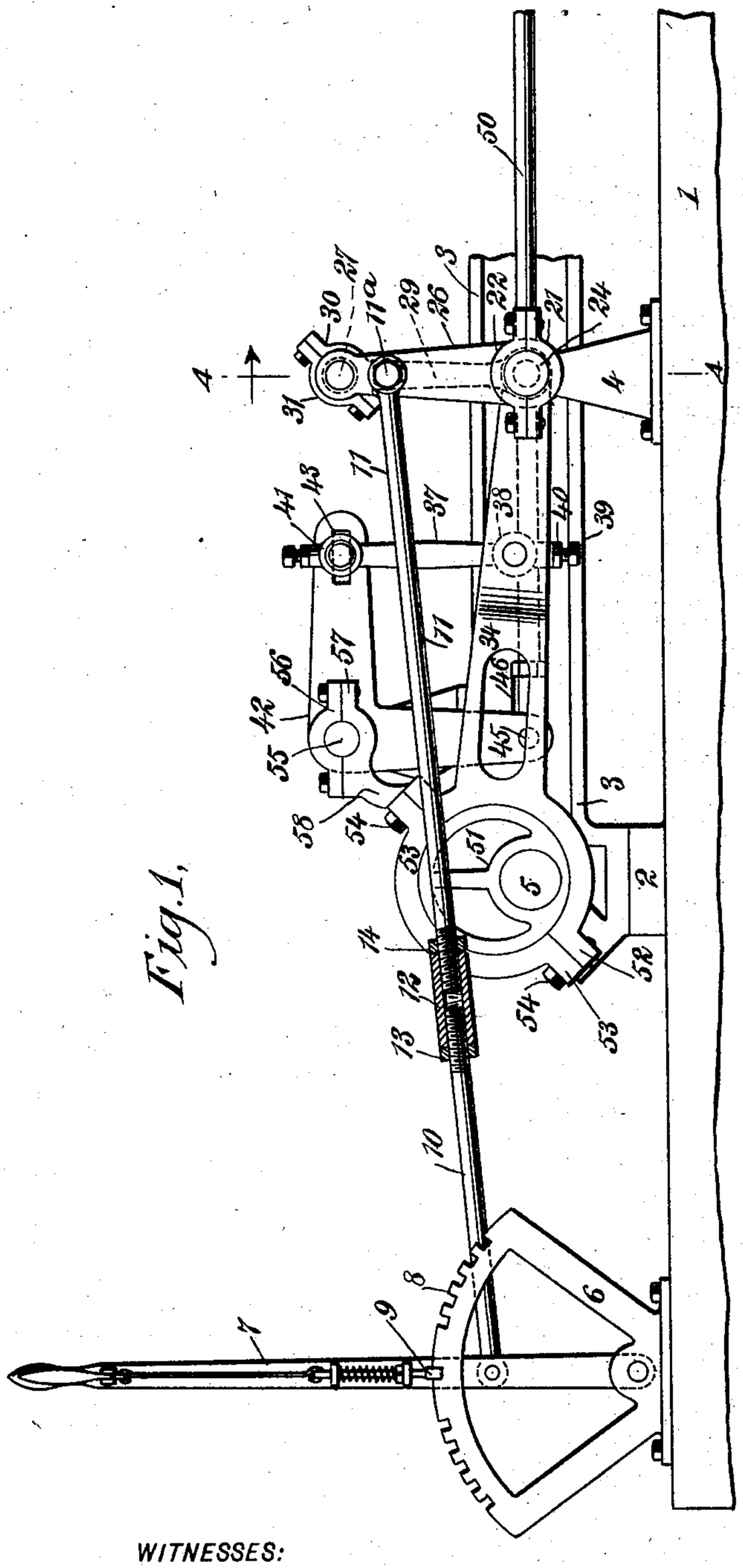
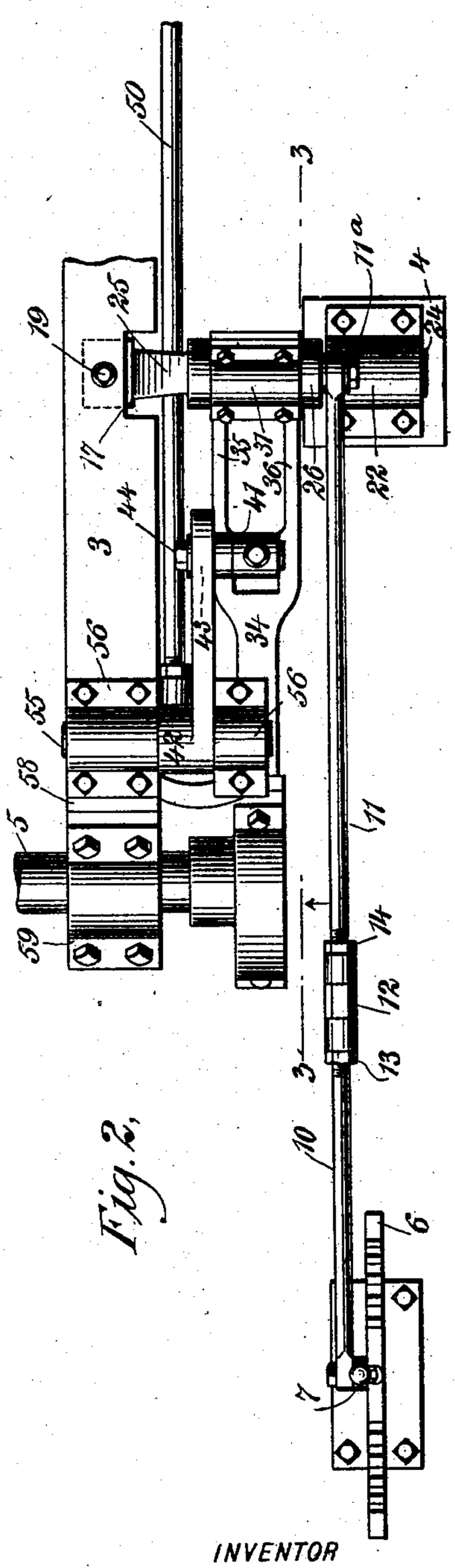


Fig. 2,



WITNESSES:

Edward Thorpe

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INVENTOR

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NO MODEL. 2 SHEETS—SHEET 2.

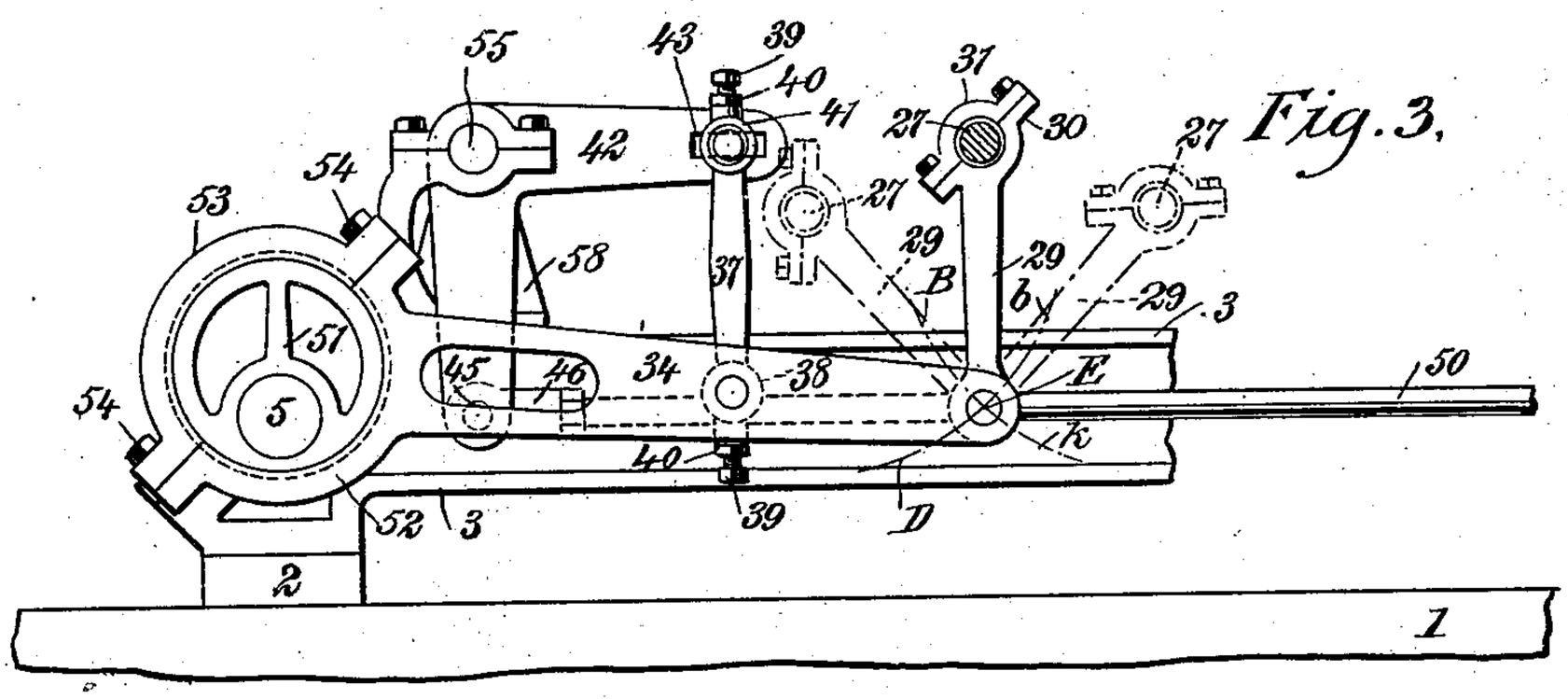


Fig. 3.

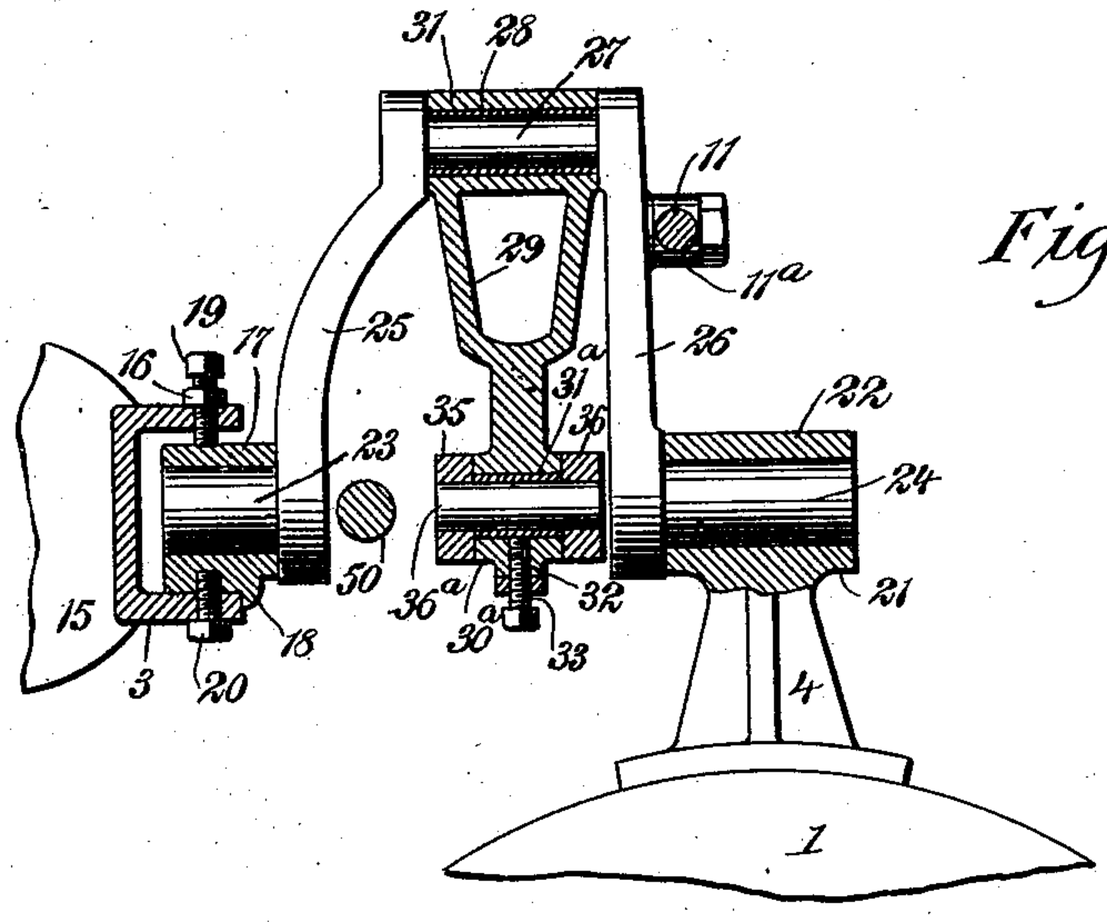


Fig. 4.

Fig. 5.

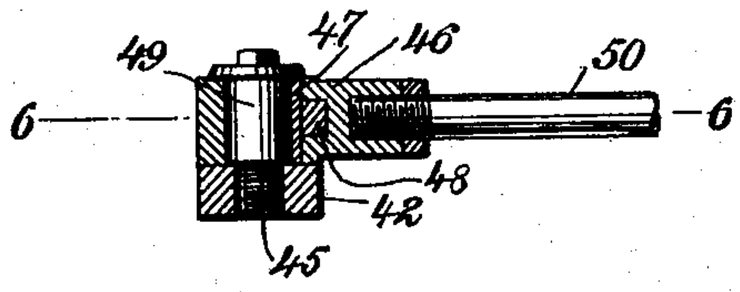
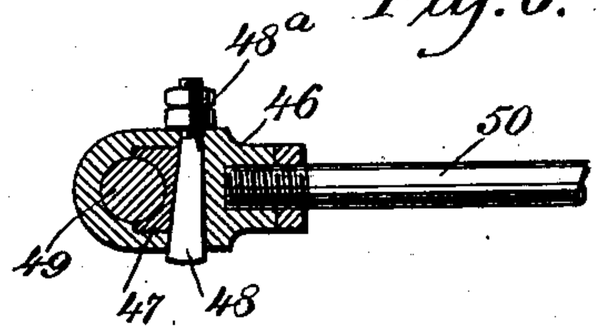


Fig. 6.



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UNITED STATES PATENT OFFICE.

ABNER D. BAKER, OF SWANTON, OHIO.

VALVE-GEAR FOR ENGINES.

SPECIFICATION forming part of Letters Patent No. 721,994, dated March 3, 1903.

Application filed August 15, 1902. Serial No. 119,730. (No model.)

To all whom it may concern:

Be it known that I, ABNER D. BAKER, a citizen of the United States, and a resident of Swanton, in the county of Fulton and State of Ohio, have invented new and useful Improvements in Valve-Gears for Engines, of which the following is a full, clear, and exact description.

My invention relates to improvements in valve-gears for steam, gas, and air driven engines. It relates more particularly to the production of an improved reversing-gear utilizing a maximum amount of power.

A further object is to provide a variable cut-off mechanism of improved construction so arranged that all wearing parts are easily adjusted to take up lost motion and work on a center line relative to each other, thereby obviating side strains and unnecessary wear.

A still further object is to overcome the irregularity of the crank and cause the valve to cut off at the same distance from either end of the cylinder, whether the piston be moving forward or backward, and also to maintain the same lead to early and late points of cut-off.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation of my device. Fig. 2 is a plan view of the same. Fig. 3 is a section upon the line 3 3 of Fig. 2 looking in the direction of the arrow. Fig. 4 is a section upon the line 4 4 of Fig. 1 looking in the direction of the arrow. Fig. 5 is a horizontal section showing the end of the connecting-rod and its crank-pin, and Fig. 6 is a vertical section upon the line 6 6 of Fig. 5.

Upon the boiler-platform 1 are mounted brackets 2, supporting the engine-bed 3, and also the pedestals 4 for supporting certain of the moving parts. The main shaft is shown at 5, the quadrant at 6, the reversing-lever at 7, the pawl of the reversing-lever at 9, and the sector at 8. From the reversing-lever 7 the reversing-rod, consisting of two parts 10 11, connected together by a threaded sleeve 12, fitted with locking-rings 13 14, extends to the bearing 11^a, whereby motion is communicated from the reversing-lever to the engine proper.

Upon the engine-bed 3, to which the cylinder 15 may be secured directly, are lock-nuts 16 for the purpose of adjusting the upper and lower boxes 17 18. Bolts 19 20 engage the engine-bed 3, as indicated more particularly in Fig. 4. Mounted integrally upon the upper end of the pedestal 4 is a lower bearing-box 21, to which is detachably connected an upper bearing-box 22. The rocking-shaft consists of two journals 23 24, connected together by crank members 25 26, and a crank 27, surrounded by a bearing-sleeve 28, as indicated more particularly in Fig. 4.

A link 29 is journaled upon the sleeve 28, the upper ends of this link 29 terminating in a bearing-box 30, integral therewith, as indicated in Fig. 3, this box being engaged by another box 31. The lower end of the link 29 terminates in an annular bearing 30^a, which is journaled upon the bearing-sleeve 31^a. A bolt 32, provided with a lock-nut 33, passes through the bearing 30^a and engages the sleeve 31^a, as indicated more particularly in Fig. 4.

An eccentric-arm 34 is bifurcated, as indicated in Fig. 2, thus forming two members 35 and 36. Sandwiched between these two members and connected therewith by a bearing 38 is a pitman 37, provided at its respective upper and lower ends with bolts 39 and lock-nuts 40 and also provided at its upper end with a bearing 41. The bolts and lock-nuts are for the purpose of adjusting the bearings 38 and 41.

A bell-crank 42 is provided with a slot 43, as shown more particularly in Figs. 1 and 3. The connecting-pin 44 (shown more particularly in Fig. 2) is used for the purpose of adjusting the bearing 41 relatively to the slot 43, thereby giving the bell-crank 42 a greater or lesser length of stroke, according to the distance of the pitman from the outer end of the slot. To adjust the lead, therefore, all that is necessary is to move the connecting-pin relatively to the slot. Mounted upon the lower end of the bell-crank 42 and secured thereto by means of a threaded boss 45 is a crank-pin 49, supporting a head 46, provided

with a gib 47 and a cotter 48, supported in place by nuts 48ª in the usual manner. The valve-stem 50 is screwed into the head 46 and secured thereto as in other well-known machines.

An eccentric 51 is rigidly mounted upon the main shaft 5. The eccentric-arm 34, above described, terminates at one of its ends in a semicircular bearing-strap 52, which is engaged by another semicircular strap 53, held thereto by means of bolts 54. The bell-crank 42 is keyed upon the shaft 55. This shaft rocks in boxes 56 and 57.

The operation of my device is as follows: The main shaft 5 being rotated by the engine, the eccentric 51 is actuated and causes the eccentric-arm 34 to move accordingly. The rocking shaft, which is of substantially U shape and rests upon two bearings, as shown in Fig. 4 and as above described, is controllable directly from the reversing-lever 7. This rocking shaft is free to move to different angles and to assume divers angles, so that the crank-pin 27 may assume different positions, as indicated by full and dotted lines in Fig. 3. The crank-pin 27 being thus moved into different positions and the link 29 being suspended from this crank-pin, it follows that the link 29 must assume substantially similar positions, also as indicated by full and dotted lines in Fig. 3. If now the link 29 is connected with the eccentric-arm 34, being journaled between the members 35 and 36, as above explained and as shown more particularly in Figs. 2 and 3, it necessarily follows that the link 29 must rock in different arcs, as A B C D, each arc crossing a certain common point E, all as indicated in Fig. 3—that is to say, the crank-arm 34 gives a series of thrusts, as it were, and the link 29 being suspended from different points rocks in different arcs. The arm 34 communicates an oscillatory motion to the pitman 37, which in turn causes the bell-crank to rock, and the rocking of this crank causes the valve-stem 50 to work the slide-valve. It will now be seen that the motion given by the eccentric 51, through the mechanism above described, to the valve-stem 50 is controlled within a measure by the relative position occupied by the link 29, and consequently the relative position occupied by the reversing-lever 7. When the link 29 is inclined to the right or left, as indicated by dotted lines in Fig. 3, the arcs described by the lower ends of the link confer different motions upon the valve-stem, thereby correcting the irregularities otherwise inherent in the use of a crank. By thus overcoming the irregularities of the crank the slide-valve is caused to cut off to the same extent on each stroke of the engine, whether the motion be forward or backward. It will also be seen more particularly from Fig. 2 that practically all of the working parts of this engine are in direct alinement with each other—that is to say, they occupy the same vertical plane and are not subjected to side strains and undue wear. Being thus alined, they assume the ideal condition which engineers commonly designate "centrally hung," thereby enabling an engine to be made much more compact and to be operated far more economically than could otherwise be done. It is with this object in view that I make the eccentric-arm 34 bifurcated and also divide the rocking shaft, so as to rest the same upon two bearings, as indicated in Fig. 4.

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

1. A valve-gear for engines, comprising an angularly-movable rock-shaft provided with a crank, means controllable at will for shifting the angular position of said crank relatively to the center of said rock-shaft, a link suspended from said crank, an oscillatory member connected with said link for actuating the same, a bell-crank, means for connecting the same with said oscillatory member, and a valve-stem connected with said bell-crank and actuated thereby.

2. A valve-gear for engines, comprising an angularly-movable rock-shaft provided with a crank, means controllable at will for shifting the radial position of said crank relatively to the center of said rock-shaft, a link suspended from said crank, an eccentric-arm connected with said link for the purpose of actuating the same, a valve-stem, and mechanism connecting said eccentric-arm with said valve-stem.

3. A valve-gear for engines, comprising an angularly-movable rock-shaft provided with a crank, means controllable at will for shifting the angular position of said crank relatively to the center of said rock-shaft, a link suspended from said shaft, a second shaft provided with an eccentric, an eccentric-arm extending from said eccentric to said link, a pitman connected with said eccentric-arm intermediate of said eccentric and said link, a bell-crank connected with said pitman and actuated thereby, and a valve-stem connected with said bell-crank.

4. A valve-gear for engines, comprising an angularly-movable rock-shaft provided with a crank, means controllable at will for shifting the radial position of said crank about said rock-shaft as a center, a longitudinal link journaled at one of its ends upon said crank as a center and free to swing, an oscillatory member connected with the other end of said longitudinal link for the purpose of actuating the same, a valve-stem, and mechanism connecting said oscillating member with said valve-stem, the arrangement being such that different degrees of movement are transferred from said oscillating member to said stem according to the said radial positions of said rock-shaft.

5. A valve-gear for engines, comprising a divided rock-shaft, consisting of a pair of

journals connected together by a U-shaped crank and supported upon separate bearings, means controllable at will for shifting said crank into different radial positions, a link journaled upon said crank and free to swing, an oscillating member connected with said link for the purpose of actuating the same, all of said parts being connected together in a common plane for the purpose of preventing lateral strains, a valve-stem, and mechanism connecting said oscillating member with said valve-stem.

6. A valve-gear for engines, comprising a divided rock-shaft, consisting of a pair of journals connected together by a U-shaped crank and supported upon separate bearings, means controllable at will for shifting said crank into different radial positions, a link journaled upon said crank and free to swing, an oscillating member connected with said link for the purpose of actuating the same, a pitman connected with said oscillating member, a bell-crank connected with said pitman and actuated thereby, and a valve-stem connected with said bell-crank, all of said parts being connected together in a common plane for the purpose of preventing undue lateral strains.

7. A valve-gear for engines, comprising a rock-shaft provided with a crank, means controllable at will for shifting the radial position of said crank relatively to the center of said rock-shaft, a link suspended from said crank, an oscillating member connected with said link for actuating the same, a pitman connected with said oscillating member and provided with a bearing, a bell-crank provided with a longitudinal slot, a journal adjustably mounted relatively to said slot, said pitman being connected with said journal, and a valve-stem connected with said bell-crank, the arrangement being such that the adjustment of said journal relatively to said slot governs the amount of lead of said valve-stem.

8. A valve-gear for engines, comprising a rock-shaft provided with a substantially U-shaped crank having a centrally-disposed crank-pin integral therewith, means, controllable at will, for shifting the angular position of said crank and crank-pin about said rock-shaft as a center, a longitudinal link journaled upon said crank-pin and normally depending vertically therefrom, a bell-crank pivotally mounted at a point adjacent to said rock-shaft, a valve-stem pivotally connected with said bell-crank, a pitman connected with said bell-crank, and an oscillating member connected with said pitman and also with said link.

9. A valve-gear for engines, comprising a rock-shaft provided with a U-shaped crank having a substantially U-shaped crank-pin means, controllable at will, for shifting the angular position of said crank and crank-pin about said rock-shaft as a center, a longitudinal link journaled upon said crank-pin and normally depending vertically therefrom, a bell-crank pivotally mounted at a point adjacent to said rock-shaft and provided with an adjusting-slot, a pitman pivotally connected with said bell-crank and adjusted relatively thereto by means of said slot, a valve-stem pivotally connected with said bell-crank, and an oscillating member connected with both said pitman and said link.

10. A valve-gear for engines, comprising a rock-shaft and a crank connected therewith and provided with a crank-pin, means, controllable at will, for shifting the angular position of said crank and said crank-pin about said rock-shaft as a center, a longitudinal link journaled upon said crank-pin and depending therefrom, a bell-crank pivotally mounted upon a bearing and free to swing, a valve-stem connected with said bell-crank and actuated thereby, a pitman connected with said bell-crank and actuated by the same, means, controllable at will, for adjusting said pitman relatively to said bell-crank for the purpose of governing the throw of said pitman, and an oscillating member connected with both said pitman and said link.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ABNER D. BAKER.

Witnesses:
B. LUDLUM,
JAS. B. TEMPLETON.