J. T. WILSON.

VALVE GEAR.

APPLICATION FILED DEC. 11, 1908.

1,034,178.

Patented July 30, 1912.

3 SHEETS—SHEET 1.

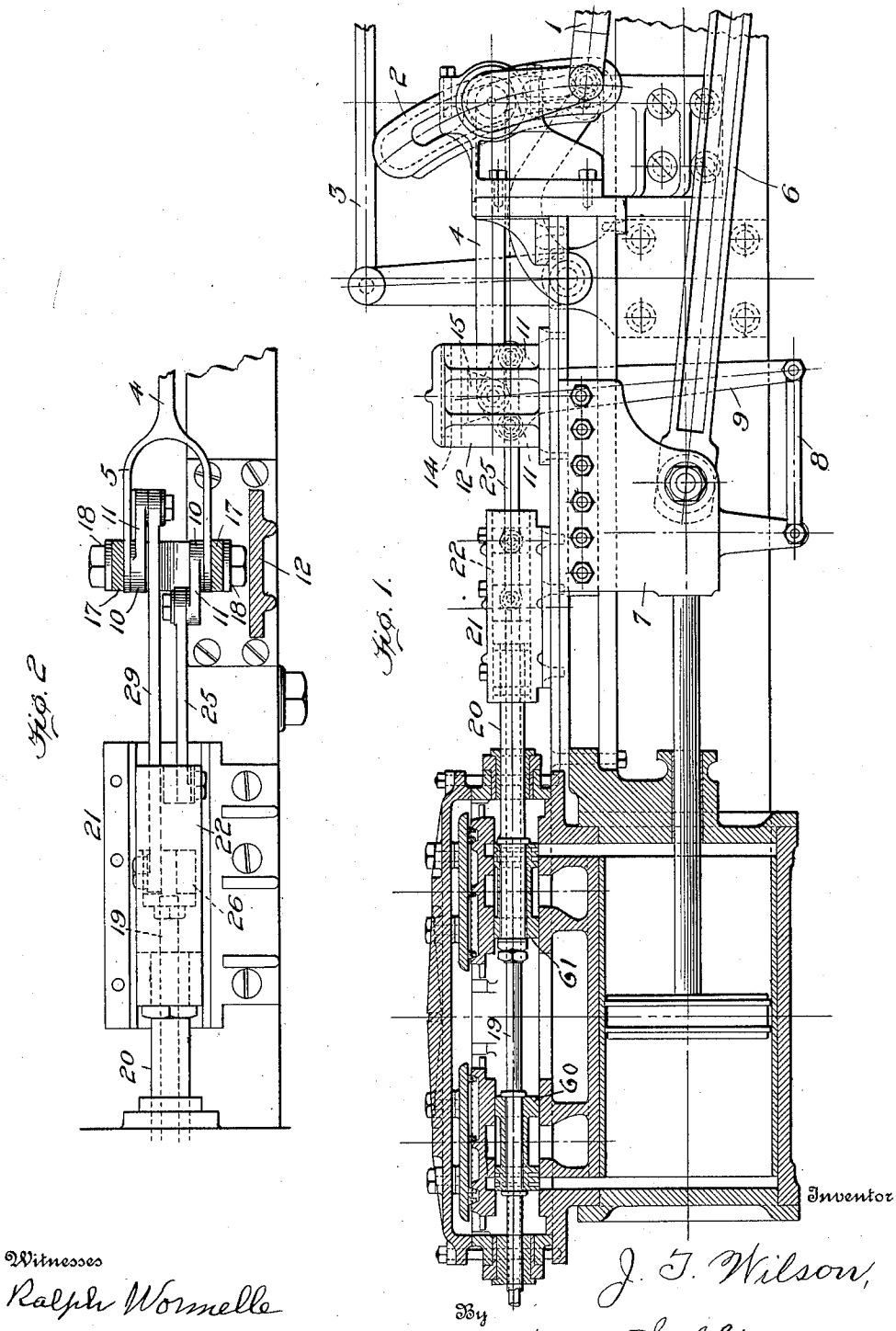

Fig. 1.

Fig. 2.

Witnesses

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3 SHEETS—SHEET 2.

Fig. 7.

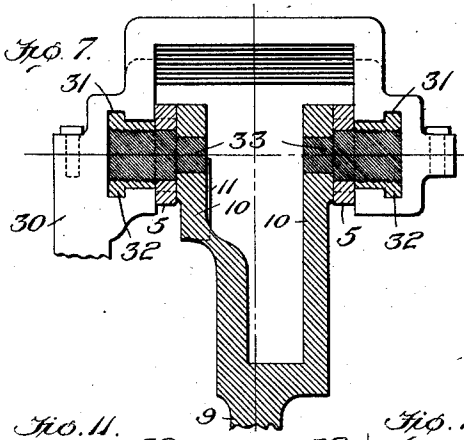


Fig. 8.

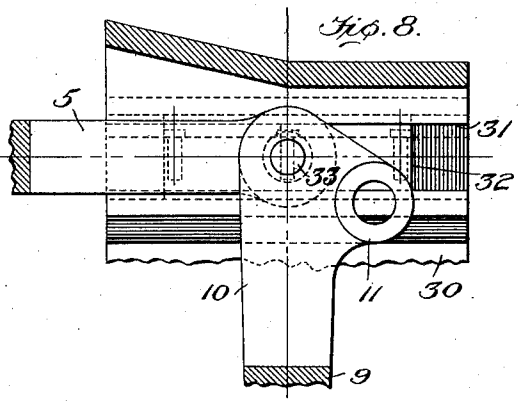


Fig. 11.

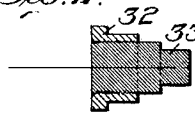


Fig. 10.

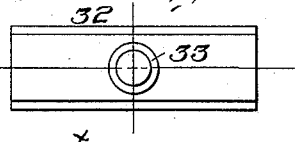
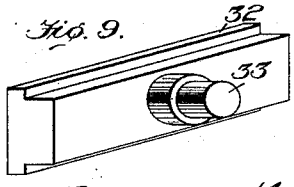


Fig. 9.



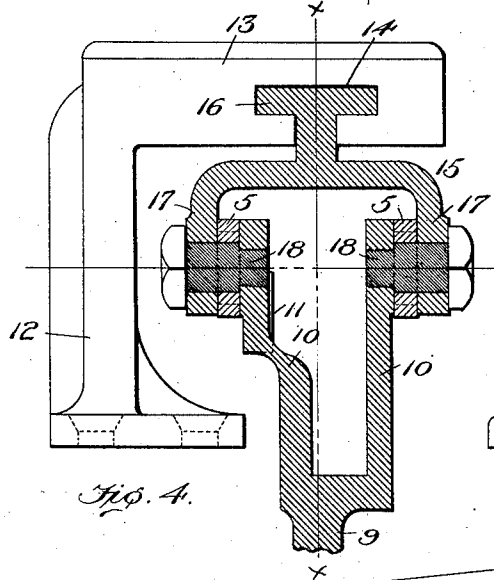


Fig. 4.

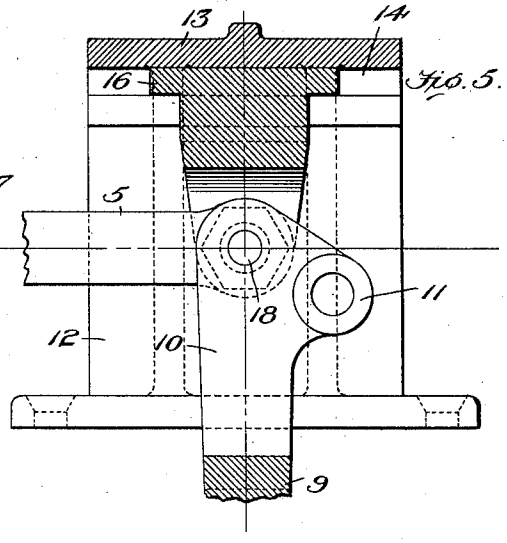


Fig. 5.

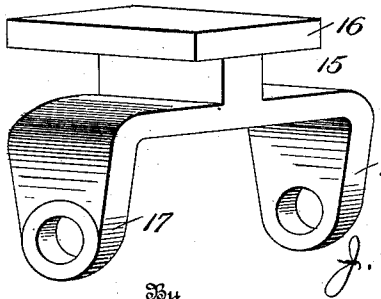


Fig. 6.

Witnesses

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3 SHEETS—SHEET 3.

Fig. 12.

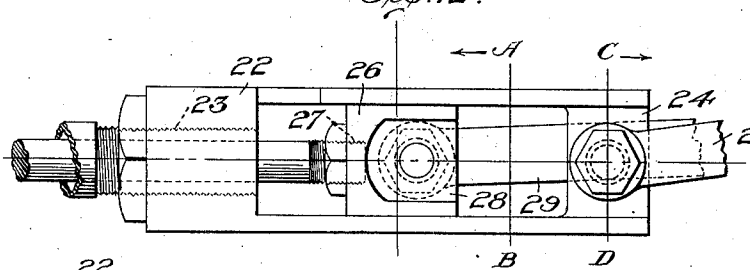
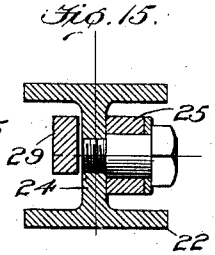


Fig. 14.

Fig. 13.

Fig. 15.



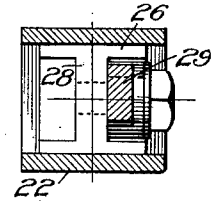


Fig. 16.

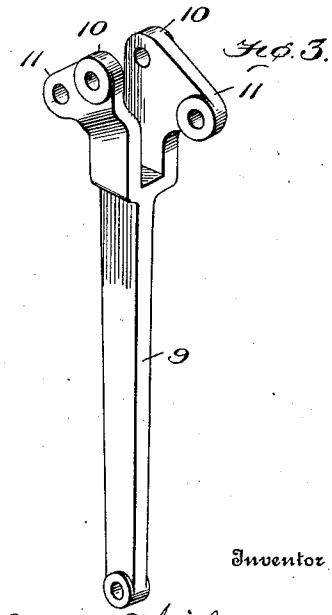


Fig. 3.

Fig. 17.

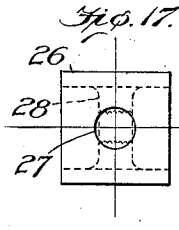
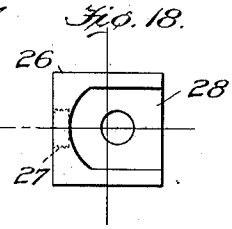


Fig. 18.



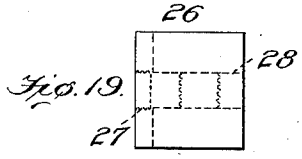


Fig. 19.

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UNITED STATES PATENT OFFICE.

JOHN T. WILSON, OF JERSEY SHORE, PENNSYLVANIA.

VALVE-GEAR.

1,034,178. Specification of Letters Patent. **Patented July 30, 1912.**

Application filed December 11, 1908. Serial No. 467,038.

To all whom it may concern:

Be it known that I, JOHN T. WILSON, a citizen of the United States, residing at Jersey Shore, in the county of Lycoming and State of Pennsylvania, have invented new and useful Improvements in Valve-Gears, of which the following is a specification.

The purpose of the invention is to perfect the well known Stevens gear as disclosed in Letters Patent issued to A. J. Stevens, on November 6, 1883, No. 288,133. In practice the oscillating lever, radius bar and valve rods of the said gear were supported by a link having a pendulous motion from a fixed pivot. This arrangement allowed the parts to wabble and failed to maintain the alinement of the radius bar and valve rods, and consequently the gear soon became deranged and partially inoperative and required frequent inspection and repairs. Furthermore, no support was provided for the pivotal connections between the valve rods and valve stems which still further allowed the sidewise displacement of the parts when motion was being transmitted from the link to the valve stems. By reason of these essential imperfections the gear was removed from a large number of locomotive engines to which it had been applied and its use practically abandoned.

My invention consists broadly in positively supporting the oscillating lever, radius bar and valve rods at their points of union or where they are pivotally connected so that the parts will be held in their proper relative positions when reciprocating motion is transmitted from the link to the valve rods and from the oscillating lever to the said rods.

Still further, the invention consists in the provision of a support for the pivotally connected ends of the valve rods and valve stems.

Finally, the invention consists in certain novelties of construction and combinations of parts as hereinafter set forth and claimed.

The accompanying drawings illustrate one complete example of the physical embodiment of my invention, and a modification of the support for the oscillating lever, radius bar and valve rods, all constructed according to the best mode I have so far devised for the practical application of the principle.

Figure 1 is a side view of the main parts of the gear in full lines and of the cylinder and valves in section; Fig. 2 is an enlarged top plan view of the part of the gear shown by Fig. 1 between the steam chest and link; Fig. 3 shows the oscillating lever detached; Fig. 4 shows the stand or bracket with the T-headed hanger and forked end of the oscillating lever in section; Fig. 5 is a section on line *x*—*x*— of Fig. 4; Fig. 6 shows the sliding hanger in perspective; Figs. 7, 8, 9, 10 and 11 illustrate a modified form of movable support for the oscillating lever and connected parts; Figs. 12, 13 and 14 are side, top plan, and end views of the back valve guide block; Fig. 15 is a section on line C D of Fig. 12; looking in the direction of the arrow. Fig. 16 is a section on line A B of Fig. 12; looking in the direction of the arrow. Figs. 17, 18 and 19 are end, side and top plan views of the front valve guide block.

Referring to the several figures, the numeral 1 designates an eccentric rod operated in any suitable way by a drivewheel or axle; 2, the link of well known construction; 3, the reach rod; 4, the radius bar; 5, the forked and perforated front end of the radius bar; 6, the main rod; 7, the cross head with a downwardly projecting and perforated bracket; 8, a union link, preferably with forked and perforated ends; 9, the oscillating lever, with its lower end pivoted to the union link; 10, the forked upper end of the oscillating lever, each branch thereof being perforated and having screw threads; 11, perforated wings, one extending from each of the branches in opposite directions, one toward the right and the other toward the left; 12, a stand or bracket secured to the frame in any suitable way; 13, the horizontally projecting arm of the bracket; 14, a T-shaped open slot in the arm; 15, a sliding support or hanger; 16, the T-head adapted to fit and slide with-

in the T-shaped slot in the bracket arm; 17, the perforated arms of the support or hanger; 18, the bearings for the oscillating lever and forked end of the radius bar, said bearings being threaded at the ends and screwed into the threaded perforations in the forked end of said lever and also passed through the perforated arms of the hanger and forked ends of the radius bar; 19, the front valve stem; 20, the back valve stem consisting of a tube within which is located the front valve stem; 21, a guide stand or bracket of box shape secured by bolts to the frame, the said bracket or stand having side walls, a removable top cover, and said stand being open at the ends and adapted to receive and guide sliding blocks; 22, the back valve guide block; 23, a threaded opening at the end to receive the threaded end of the back valve hollow or tubular stem; 24, a perforated and threaded web; 25, the back valve rod pivoted as shown at one end to the web 24 by means of a threaded bearing stud and at the opposite end to the left hand perforated wing 11 on the front branch of the forked upper end of the oscillating lever; 26, the front valve guide block; 27, the perforated and threaded end of the block, within which perforated end is located and secured the end of the front valve stem; 28, the perforated and threaded web of the block; and 29 is the front valve rod pivoted at one end to the web 28 of the block 26 by a bearing stud and at the other end to the perforated wing 11 on the rear branch of the forked upper end of the oscillating lever. The number 60 designates the front valve, and 61 the back valve.

Referring to Figs. 7, 8, 9, 10 and 11 which show the modified form of movable or sliding support for the oscillating lever, radius bar and valve rods, 30 designates the stand or bracket; 31—31, oppositedly disposed T-shaped slots at opposite sides of the bracket; 32—32, T-shaped slide blocks fitting and movable within the slots; and 33—33 are studs, each threaded at the end, passed through holes in the T-shaped blocks, the perforations in the forked ends of the oscillating lever, and also passed through the perforated ends of the radius bar and constituting bearings for the same. This modified form of support having a sliding block each side of the forked ends of the oscillating lever and radius bar and carrying the bearing studs very effectively holds the parts in their proper relative positions, preventing any displacement and insures an even wear of the frictional surfaces.

The *modus operandi* is as follows: Reciprocating motion is transmitted from the eccentric rod 1 to the link 2, which in turn reciprocates the radius bar 4, the sliding hanger 15, the oscillating lever 9, the valve rods 25 and 29, the guide blocks 22 and 26, and the valve stems 19 and 20. While the above reciprocating motion is taking place, reciprocating motion is transmitted to the lower end of the oscillating lever 9 by the main rod 6, cross head 7, and union link 8. As the back valve rod 25 and front valve rod 29 are pivoted to the wings 11—11 of the oscillating lever at points on opposite sides of its pivots on the sliding support 15, said lever when moved in either direction from the position it occupies in Fig. 1 will cause the said rods to move in opposite directions, thus accelerating and retarding the movements of the valves relative to their seats at certain points of their travel. The front valve stem obviously moves within the back valve stem and the front valve guide block moves within the back valve guide block under the action of the oscillating lever.

From the foregoing description taken in connection with the drawing it is clear that I have provided a positive movable support for the oscillating lever, radius bar and valve rods which will maintain the parts in their proper relative positions and prevent any displacement either sidewise or longitudinally; also that I have provided an effective guide support for the pivotal ends of the valve stems and valve rods, which will maintain said valve stems and rods in their proper relative positions. Furthermore, it will be observed that the lines of force between the valves and the link approximately co-incide with the substantially horizontal plane within which the valve stems and valve rods are located, thus insuring a diminution of friction and the wear of the parts as well as the saving of power.

What I claim is:

1. The combination in a valve gear, of an oscillating lever adapted simultaneously to oscillate about a pivotal center at one end thereof and also to move bodily; two valve rods pivoted to the oscillating lever at different points adjacent to its pivotal center; two valve stems in connection with the valve rods; two valves in operative connection with the valve stems; means for connecting the end of the lever opposite its pivotal center end with the cross head so the end of the lever can be reciprocated by the movement of said cross head; a bar in operative connection with the pivotal center end of the oscillating lever adapted to reciprocate the lever, valve rods, valve stems and valves; and means consisting of a fixed bearing and a support in bodily movable engagement with and guided by said fixed bearing, and to which support the oscillating lever is connected, for holding the piv-

otal center end of the oscillating lever and the ends of the valve rods connected thereto so said end of the lever cannot move bodily in a plane at right angles to the path of the bodily reciprocating movements thereof.

2. The combination in a valve gear, of an oscillating lever adapted simultaneously to oscillate about a pivotal center at one end thereof and also to move bodily; two valve rods pivoted to the oscillating lever at different points adjacent to its pivotal center; two valve stems in connection with the valve rods; two valves in operative connection with the valve stems; means for connecting the end of the lever opposite its pivotal center end with the cross head so the end of the lever can be reciprocated by the movement of said cross head; a bar in operative connection with the pivotal center end of the oscillating lever adapted to reciprocate the lever, valve rods, valve stems and valves; means for movably supporting the oscillating lever; and means consisting of a fixed element and a guiding element in connection with said fixed element, and also in connection with the valve rods and valve stems, for holding the ends of the valve stems and ends of the valve rods at their pivotal connections in alinement.

3. The combination in a valve gear, of an oscillating lever adapted simultaneously to oscillate about a pivotal center at one end thereof and also to move bodily; two valve rods pivoted to the oscillating lever at different points adjacent to its pivotal center; two valve stems in connection with the valve rods; two valves in operative connection with the valve stems; means for connecting the end of the lever opposite its pivotal center with the main rod so the end of the lever can be reciprocated by said rod; a bar in operative connection with the pivotal center end of the oscillating lever adapted to reciprocate the lever, valve rods, valve stems and valves; and means for supporting the pivotal center end of the oscillating lever and the ends of the valve rods connected thereto, consisting of an element fixed to the frame and an element to which the oscillating lever is pivotally connected in sliding engagement with said fixed element so said end of the lever cannot move bodily at right angles to the path of its bodily reciprocating movements.

4. The combination with a frame, of an element in sliding engagement with said frame and confined against vertical and sidewise movements; a bar and an oscillating lever pivoted to said element, two valve rods pivoted to the pivotal end of the oscillating lever at opposite sides of the pivotal point of oscillation, valve stems and valves in connection with the valve rods; a movable cross head; and means for pivotally connecting the end of the oscillating lever to the cross head.

5. The combination in a valve gear operating substantially as described, of a radius bar; an oscillating lever with a forked top end; valve rods; and sliding means in connection with the forked top end of the lever for holding the parts in alinement; said valve rods being pivoted to the oscillating lever at opposite sides of the longitudinal axis of the lever whereby said rods may have rocking movements.

6. The combination in a valve gear, of a radius bar with a forked end; an oscillating lever with a forked end; valve rods pivoted to the oscillating lever at opposite sides of the longitudinal axis of said lever; and means for movably supporting the bar, lever and rods.

7. The combination in a valve gear, of a radius bar with a forked end; an oscillating lever with a forked end; valve rods pivoted to the oscillating lever; a support with a T-slot; and a hanger having a T-head located within the said slot.

8. The combination with a cylinder having a steam chest with two seats and two independently movable valves, of two valve stems each separately connected to a valve; two valve rods located side by side and connected to the valve stems; an oscillating and bodily movable lever to which the ends of the valve rods are pivoted; means for oscillating the lever; a bar adapted to move the lever bodily; a support; and means to which the oscillating lever and bar are pivoted in engagement with and having a sliding movement relative to the said support, whereby the said bar, oscillating lever, and valve rods are held in alinement.

9. The combination in a valve gear, of a radius bar; an oscillating lever; valve rods; valve stems with which the valve rods have pivotal connections; and means for supporting the valve rods and stems at their points of connection and confining them so they cannot move in a plane at right angles to their paths of reciprocating motion.

10. The combination in a valve gear, of a radius bar; an oscillating lever; valve rods; valve stems with which the valve rods have pivotal connections; a guiding element suitably supported; and sliding means in connection with the guiding element and the stems and rods for guiding and holding said stems and rods in alinement.

11. The combination in a valve gear, of a radius bar; an oscillating lever; valve rods; valve stems; a guiding element suitably supported; and movable blocks to which the stems are connected and to which the rods are pivotally united.

12. The combination in a valve gear, of two valve stems one located and movable

within the other; two blocks one movable within the other and to which the valve stems are secured; two valve rods pivoted to the blocks; and means with which the blocks are in sliding engagement for guiding the blocks.

13. An oscillating lever having one end forked and each branch provided with a perforation intermediate its ends, said perforations being at opposite sides of the longitudinal axis of the lever.

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

JOHN T. WILSON.

Witnesses:
W. BRUCE HARLAN,
JNO P. STEVENS.