E. J. IRWIN.

MEANS FOR OVERCOMING DEAD CENTERS.

APPLICATION FILED JUNE 14, 1912.

1,066,905.

Patented July 8, 1913.

2 SHEETS—SHEET 1.

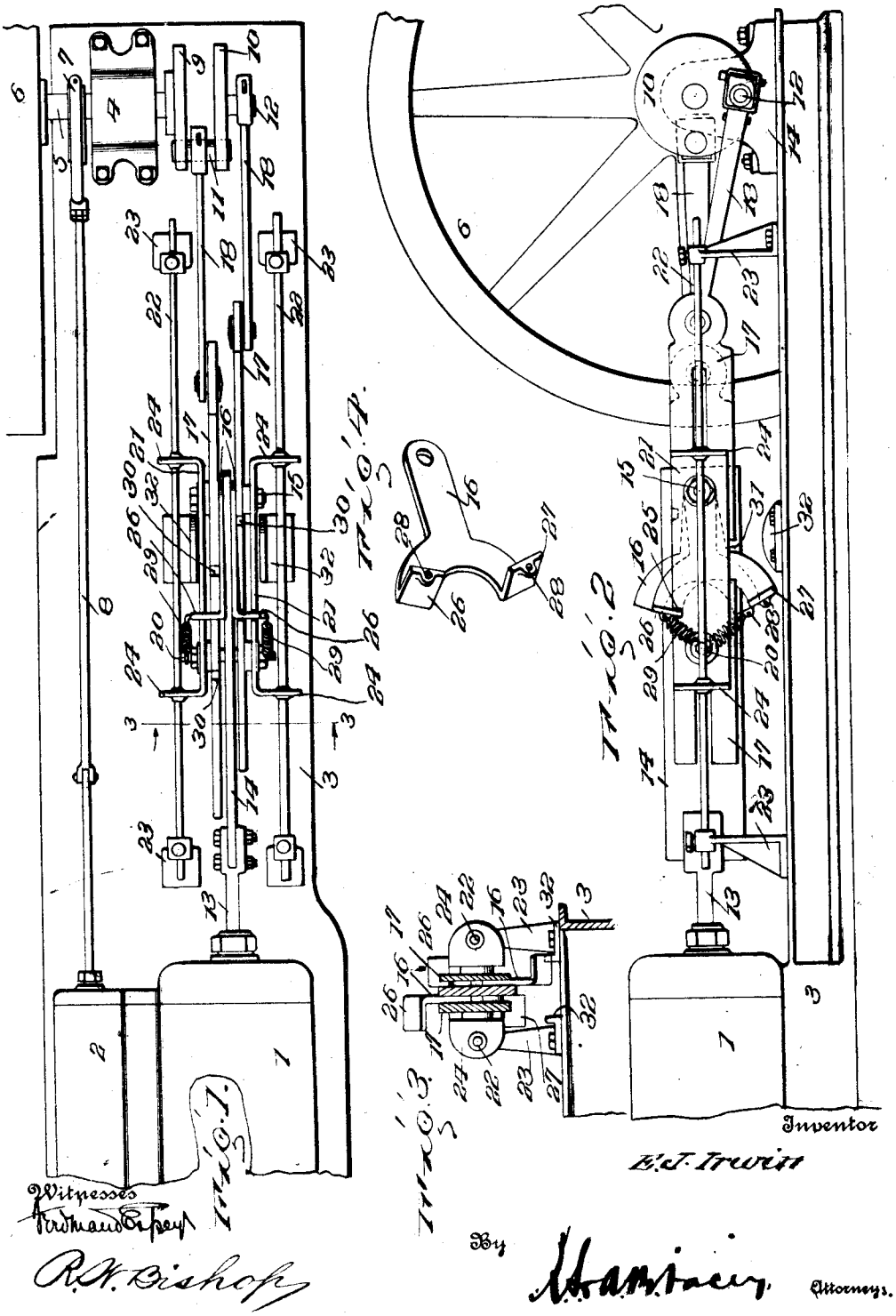


FIG. 1.

FIG. 2.

FIG. 3.

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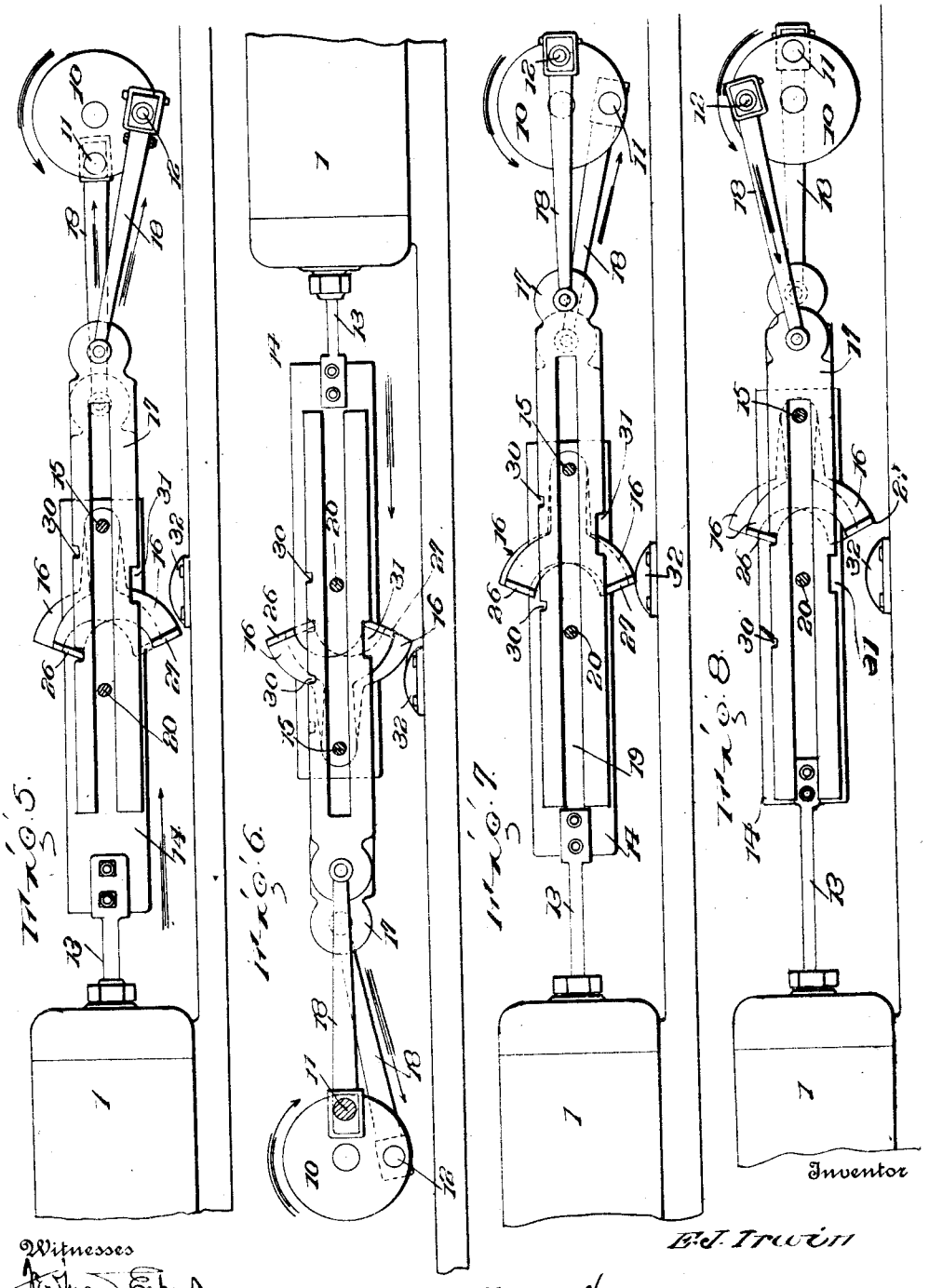
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UNITED STATES PATENT OFFICE.

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MEANS FOR OVERCOMING DEAD-CENTERS.

1,066,905. Specification of Letters Patent. Patented July 8, 1913.

Application filed June 14, 1912. Serial No. 703,734.

To all whom it may concern:

Be it known that I, EDMOND J. IRWIN, citizen of the United States, residing at Willow Creek, in the county of Gallatin and State of Montana, have invented certain new and useful Improvements in Means for Overcoming Dead-Centers, of which the following is a specification.

This invention has for its object the provision of means whereby cranks of a driving shaft will be effectually caused to overcome dead centers, and easy, smooth running qualities thereby imparted to an engine or other motor.

The invention seeks to provide means for overcoming dead centers, which will be simple in the construction and arrangement of its parts and positive in its operation, and which will be capable of adjustment to permit an engine to run forward or be reversed, as may be necessary under varying conditions.

These stated objects, and such other objects as will incidentally appear as the invention is better understood, are attained in the use of mechanism of the type illustrated in the accompanying drawings and hereinafter described, and the invention consists in certain novel features which will be particularly pointed out in the claims following the description.

In the drawings:—Figure 1 is a plan view of an engine embodying my present invention; Fig. 2 is a side elevation of the same; Fig. 3 is a transverse section taken on the line 3—3 of Fig. 1; Fig. 4 is a detail perspective view of one of the latches; Fig. 5 is a side elevation, diagrammatic in its nature, of the operating parts of the device; Fig. 6 is a view similar to Fig. 5, but looking at the opposite side of the apparatus; Figs. 7 and 8 are side elevations showing the parts as they appear at successive stages of the operation.

The engine cylinder, 1, is of the usual construction and is equipped with a valve chest 2 of any preferred design, the cylinder and the valve chest being mounted upon a bed plate 3, upon which is also mounted one or more bearings 4 in which the driving shaft 5 is journaled, said shaft being equipped with a fly wheel 6, as will be readily understood.

7 designates the ordinary eccentric on the driving shaft, which actuates the slide valve through an eccentric rod 8 in the usual manner.

The driving shaft in my present invention is equipped with a pair of crank disks 9 and 10, which are spaced apart, one of the wrist-pins, 11, serving as a connection between the disks, and the other wrist-pin, 12, projecting laterally from the disk 10, as shown. The piston rod 13, extending through the cylinder in the usual manner, is equipped at its free end with an extension plate 14 which extends toward the driving shaft and carries a bolt 15 at its outer end. Latches 16 are pivoted at their front ends upon the said bolt 15 and are disposed at the opposite sides of the extension plate 14, while laterally beyond the said latches are the connecting plates 17, the outer ends of which are pivotally connected to the inner ends of pitmen 18, which have their outer ends in turn pivoted upon the wrist-pins 11 and 12, as clearly shown in Fig. 1. The connecting plates 17 are longitudinally slotted, as shown at 19, to extend over and past the bolt 15, and a connecting bolt 20 which is inserted through the extension plate 14 adjacent but beyond the rear ends of the latches. The bolts 15 and 20 also pass through and are secured to slides 21 which are mounted upon guides 22 which are supported upon the bed 3 by pedestals 23, or in any other convenient manner, the guides being disposed at opposite sides of the piston and extension plate and parallel therewith, and the slides having their ends turned laterally outward, as indicated at 24, to engage the guides. The slides and the latches, with the connecting bolts 15 and 20, form a substitute for the ordinary crosshead usually employed in reciprocating engines.

The slides 21 are provided with notches 25 in their upper edges, which are adapted to be engaged by the upper out-turned lip 26 formed on the latch 16, the free end of

the said latch being forked, as shown clearly in Fig. 4, and the ends of the fork being bent laterally to provide the said lip 26 and a similar lower lip 27 which extend respectively across the upper and lower edge of the slide and the adjacent connecting plate. The said lips 26 and 27 are provided with perforated ears 28 which may be engaged by a spring 29 carried by the adjacent end of the bolt 20, so that the latch will be held down in engagement with the notch 25 in the slide, or upwardly out of engagement with said notch, accordingly as the spring is connected with the upper or lower lip. The forked end of the latch 16 is of such dimensions that the lips 26 and 27 will as stated extend across the edges of the connecting plates 17, and these connecting plates are provided in their upper edges with spaced notches 30, and in their lower edges with a single notch or recess 31 located between the vertical planes of the notches 30 and of considerably greater extent.

Upon the bed of the engine, about midway between the cylinder and the driving shaft, I provide a trip or cam 32, upon which the lower lip of the latch is adapted to ride, the latch being thereby lifted out of engagement with the notches in the upper edges of the connecting plate and the slide, as the several parts reciprocate, it being understood that this cam or trip may be wide enough to extend under both latches, or a cam or trip may be provided in the path of each latch, the latter arrangement being preferred and being illustrated.

It is thought the operation of the apparatus will be readily understood. In the arrangement illustrated, the spring 29, acting upon the near latch or the one at the same side as the crank disk 10, tends to hold the said latch down, while the spring acting upon the far latch, at the opposite side of the apparatus, tends to hold the same up, the latter latch consequently being constantly in engagement with the notch or recess 31 in the adjacent connecting plate. This arrangement is employed when the engine is to drive forward, and when the engine is to be reversed, the near latch should be held upward by its spring and the far latch held down. Presuming the piston to be at the inner limit of its stroke, as illustrated in Figs. 1, 2, 5, and 6, as the piston moves outward, the extension plate 14 will carry the bolts 15 and 20 forward, thereby actuating the slides 21 so that they move forward upon the guides 22, the latches 16 being carried in the same direction by reason of their connection to the bolt 15. The raised latch will always be in engagement with the recess 31 in the adjacent connecting plate 17, while the lowered latch will, at the start of the stroke, engage the rearmost notch 30 in the connecting plate adjacent thereto so that said plate will be moved forward. The said connecting plate will transmit motion to the wrist-pin 12 through the connecting pitman 18. As the wrist-pin 12 approaches the dead center, the wrist-pin 11, which is arranged at an angle of 90° from the first-mentioned wrist-pin, will approach a point midway between the dead centers, as shown in Fig. 7. As the wrist-pin 12 approaches the dead center, the latch 16 at that side of the apparatus will be brought into engagement with the trip or cam 32 so as to ride over the same and be thereby lifted out of engagement with the rear notch 30 of the adjacent connecting plate 17. The piston, however, continues to move forward, so that the slide and the latch will follow the movement of the piston, and the latch will be brought into position to engage the forward notch 30 in the connecting plate, the connecting plate remaining practically stationary while the wrist-pin is upon the dead center and immediately before it reaches and immediately after it leaves said position. The far latch will, of course, move forward with the piston and the extension plate, so that as the near latch is disengaged from the adjacent connecting plate, the far latch will engage the forward end of the recess 31 in the connecting plate adjacent thereto and will thereby cause said plate to move forwardly and transmit the power of the piston through the pitman pivoted thereto to the wrist-pin 11, until the parts reach the position shown in Fig. 8, so that the driving shaft will be continuously rotated, and may be easily started from any position which may be assumed when the engine is stopped. As the wrist-pin 12 passes to the position shown in Fig. 8, the pitman 18 pivoted thereto imparts a rearward movement to the adjacent connecting plate, so that the forward notch 30 in the upper edge of said plate will be engaged by the adjacent latch, and consequently the said connecting plate will be locked to the slide and the extension plate of the pitman, so that the rearward movement of the piston will then be transmitted to the driving shaft through the wrist-pin 12. On this rearward movement, as the wrist-pin 12 moves into the position occupied by the wrist-pin 11 in Fig. 5, the near latch will again ride over the trip or cam so as to be released from the connecting plate and ride into engagement with the rear notch 30 therein, the far latch, which is held in its upper position, shifting from one end to the other end of the recess 31 in the connecting plate adjacent thereto, during the intervals when the lowered latch is in engagement with either notch 30. It will thus be seen that there is a connection between the piston and a wrist-pin which is not on dead center, during every portion of the movement of the piston and the rotation

of the driving shaft and the power is applied through the two wrist-pins alternately.

It will be readily seen that I have provided a very efficient mechanism by which the crank shaft will be positively carried over dead centers without placing any additional strain upon the engine, so that nearly all the power generated may be utilized for the performance of the work intended to be accomplished by the engine.

The several parts of the apparatus are exceedingly simple in their construction and are compactly arranged, so that the space occupied by my improved device will not be very much greater than that occupied by the ordinary type of reciprocating engine now in common use.

The connecting plates disposed at the opposite sides of the piston are longitudinally slotted to permit their relative movement, while the bolts, by which the slides are connected with the piston, furnish supports and guides for the said connecting plates.

Should any part be broken, or get out of order, a new part may be easily substituted therefor, as all the parts are accessible, so that cleaning and repairing may be rapidly and thoroughly accomplished.

What I claim is:—

1. The combination of a reciprocating member, a crank shaft, a pair of wrist-pins on different radii of said shaft, slides actuated by the reciprocating member, connecting plates disposed between the reciprocating member and the slides, pitmen connecting the said plates with the wrist-pins, and latches carried by the reciprocating member and adapted to engage the connecting plates respectively adjacent thereto.

2. The combination of a reciprocating member, a crank shaft, a pair of wrist-pins on different radii of said shaft, slides connected with the reciprocating member, connecting plates disposed between the slides and the said member, pitmen connecting said plates with the respective wrist-pins, and latches carried by the reciprocating member and adapted to engage the respectively adjacent connecting plates, said latches being adjustable to permit reversal of the engine.

3. The combination of a reciprocating member, a crank shaft, a pair of wrist-pins on different radii of said shaft, connecting plates disposed adjacent the reciprocating member, pitmen connecting said plates with the respective wrist-pins, latches carried by the reciprocating member and adapted to respectively engage the said connecting plates, and trips arranged in the paths of the latches.

4. The combination of a reciprocating member, a crank shaft, a pair of wrist-pins on different radii of said shaft, latches carried by the reciprocating member and disposed at opposite sides thereof, connecting plates disposed adjacent the said latches, pitmen connecting said plates with the respective wrist pins and means for yieldably holding the latches in engagement with the upper or lower edges of the connecting plates.

5. The combination of a reciprocating member, a crank shaft, a pair of wrist-pins on different radii of said shaft, latches carried by the reciprocating member and disposed at opposite sides thereof, connecting plates disposed adjacent the latches, pitmen connecting said plates with the respective wrist pins, means for yieldably holding one of said latches in engagement with the lower edge of the adjacent connecting plate and the other of said latches in engagement with the upper edge of its adjacent connecting plate, and trips disposed in the path of the latches.

6. The combination of a reciprocating member, a crank shaft, a plurality of wrist-pins on different radii of said shaft, latches carried by the reciprocating member and disposed at opposite sides thereof, connecting plates disposed adjacent the latches, pitmen connecting said plates with the respective wrist-pins, said connecting plates being provided in their upper edges with spaced notches and in their lower edges with recesses, means for holding one of the latches in position to engage the notches in the upper edge of the adjacent connecting plate and the other latch in engagement with the recess in the lower edge of the adjacent connecting plate, and a trip in the path of the latch engaging said notches.

7. The combination of a reciprocating member, a crank shaft, a pair of wrist-pins on different radii of said shaft, a pair of latches carried by the reciprocating member and disposed at opposite sides thereof, the said latches being pivoted to the said reciprocating member and having their free ends forked, connecting plates disposed adjacent said latches and passing through the forks of the same, connections between said plates and the respective wrist-pins, and means for yieldably holding one of the latches in engagement with the upper edge of the adjacent connecting plate and the other latch in engagement with the lower edge of the adjacent connecting plate.

8. The combination of a reciprocating member, a crank shaft, a pair of wrist-pins on different radii of said shaft, a pair of latches pivoted to the reciprocating member and having upper and lower lateral lips at their free ends, connecting plates disposed adjacent the latches, connections between said plates and the respective wrist-pins, said connecting plates having spaced notches in their upper edges and recesses in their lower edges, slides disposed at opposite sides

of the reciprocating member and carrying supports for the latches and the connecting plates, means for holding one of the latches yieldably in position to engage a notch in the upper edge of the adjacent connecting plate, means for holding the other latch in engagement with the recess in the lower edge of the connecting plate adjacent the same, and a trip in the path of the latch which is in engagement with a notch in the upper edge of the adjacent connecting plate.

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

EDMOND J. IRWIN. [L. S.]

Witnesses:
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B. E. GREEN.