

No. 612,345.

Patented Oct. 11, 1898.

W. H. JOHNSON.

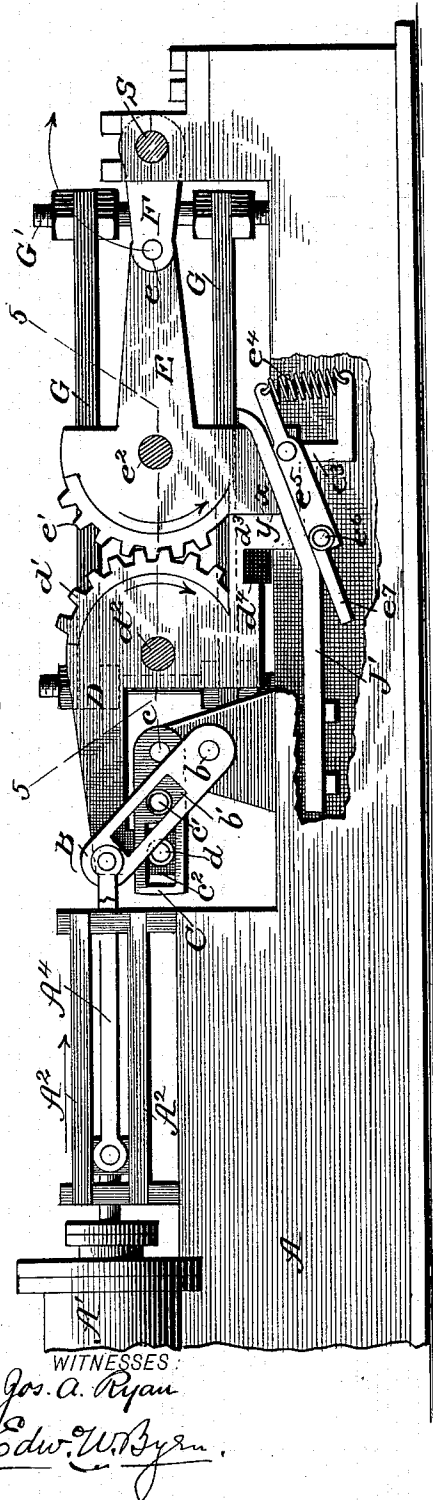
MECHANISM FOR OVERCOMING DEAD CENTERS.

(Application filed Mar. 30, 1898.)

(No Model.)

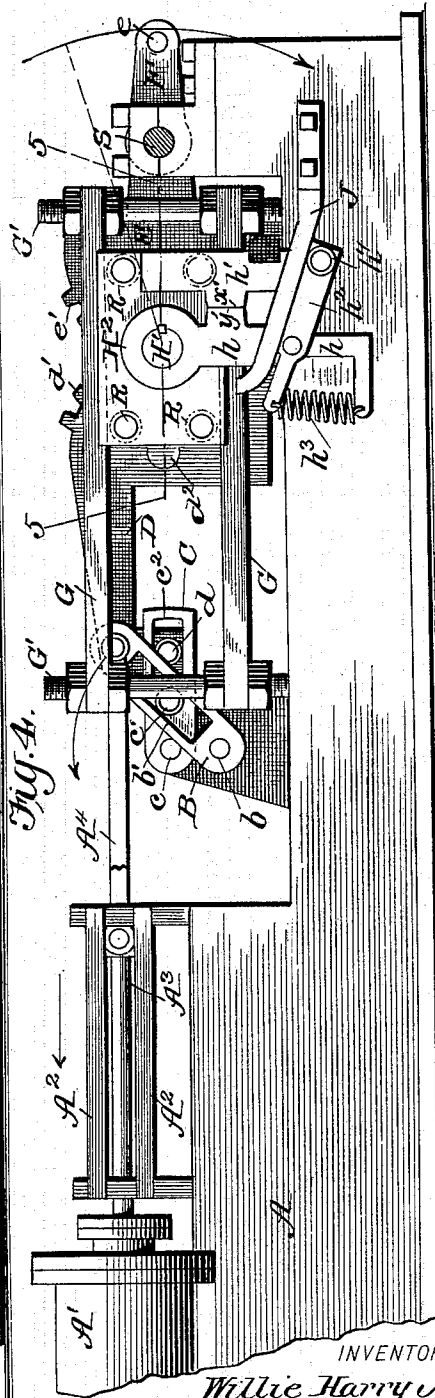
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Fig. 1.



WITNESSES:

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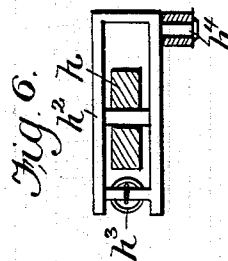
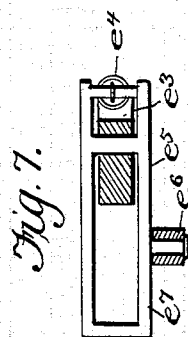
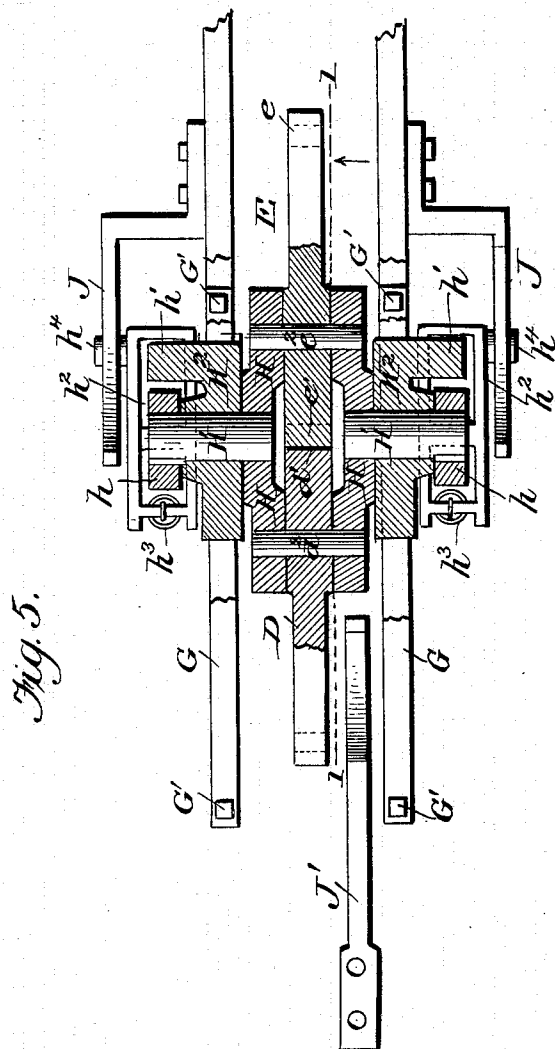
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MECHANISM FOR OVERCOMING DEAD CENTERS.

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4 Sheets—Sheet 3.



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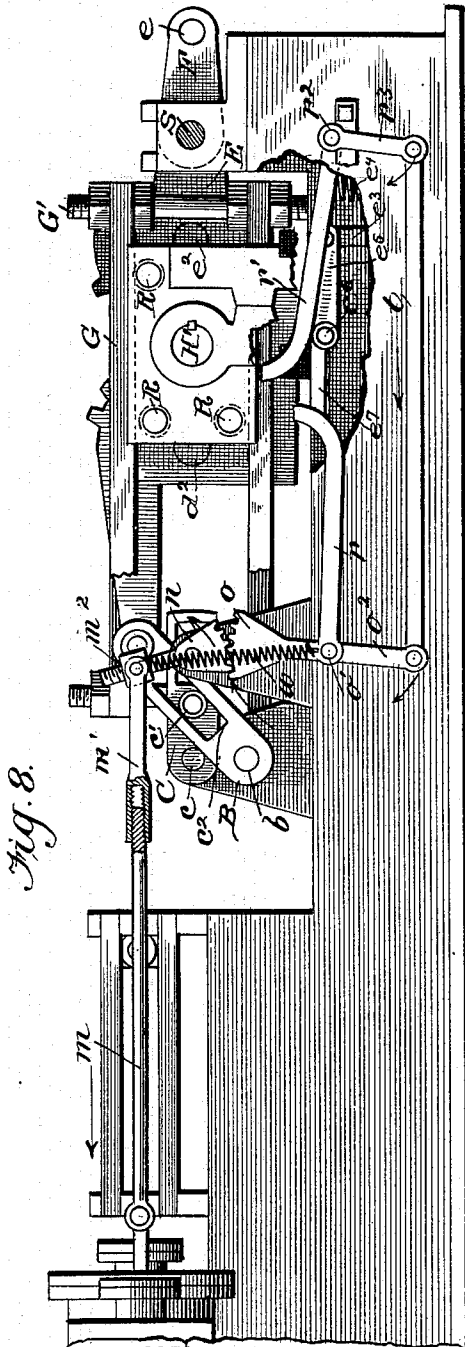


Fig. 8.

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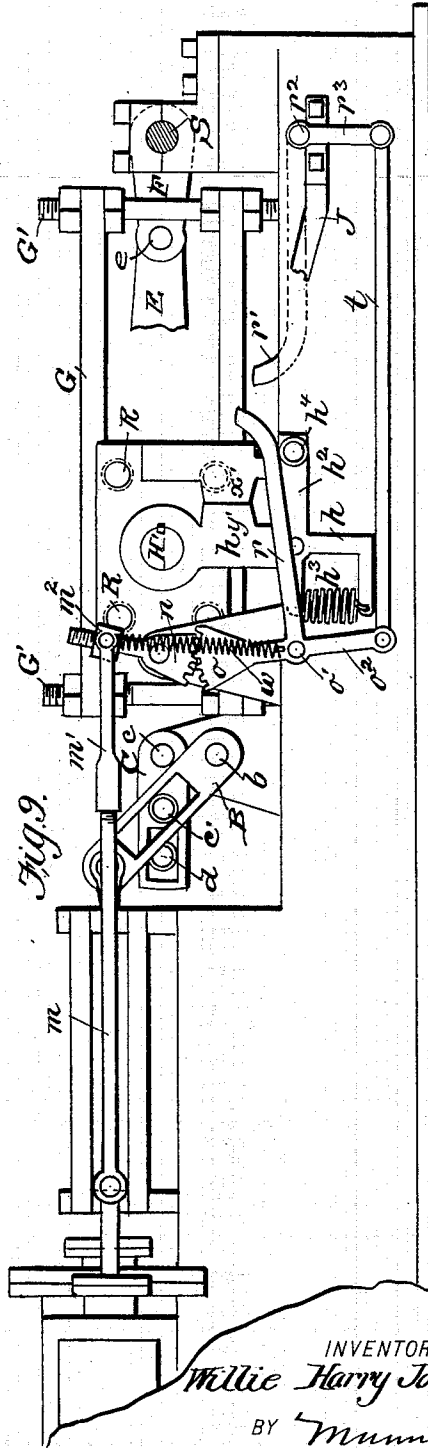


Fig. 9.

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UNITED STATES PATENT OFFICE.

WILLIE H. JOHNSON, OF NAVASOTA, TEXAS.

MECHANISM FOR OVERCOMING DEAD-CENTERS.

SPECIFICATION forming part of Letters Patent No. 612,345, dated October 11, 1898.

Application filed March 30, 1898. Serial No. 675,761. (No model.)

To all whom it may concern:

Be it known that I, WILLIE HARRY JOHNSON, of Navasota, in the county of Grimes and State of Texas, have invented a new and useful Improvement in Mechanism for Overcoming Dead-Centers, of which the following is a specification.

My invention is in the nature of an improvement upon the devices patented by me February 4, 1896, No. 554,223, for overcoming dead-centers; and it has for its object the simplification and cheapening of those devices, the reduction of friction and wear, and to provide also means for regulating the admission and discharge of steam to increase the efficiency of those devices.

It consists in the peculiar construction and arrangement of devices, which I will now proceed to describe with reference to the drawings, in which—

Figure 1 is a side elevation with parts broken away to the line 1 1 of Fig. 5. Fig. 2 is a similar view showing another position of the parts. Fig. 3 is still another view broken away to the same plane, but showing another position of the parts. Fig. 4 is a side elevation from the outside. Fig. 5 is a horizontal section on line 5 5 of Figs. 1 and 4. Fig. 6 is a detail of one of the locking-yokes. Fig. 7 is a detail of another locking-yoke, and Figs. 8 and 9 are side views showing different positions of the valve-gear.

In the drawings, A represents the base of the engine; A', the cylinder; A² A², the guides; A³, the piston-rod, and A⁴ the pitman or connecting-rod. This connecting-rod has its wrist-pin connected to an arm B, which latter is pivoted at *b* to the framework to rock about said point *b* as a center. Within the arm B there is a longitudinal slot *b'*, within which plays a pin *c'*, having friction-roller, which pin is fixed to an arm C. This arm C is pivoted at its lower end at *c* to the framework and at its upper end is provided with a longitudinal slot *c''*, that receives a pin *d*, with friction-roller, on the end of a rocking head D. This head D is fulcrumed upon trunnions or an independent axis *d'*, Figs. 1 and 5, and has a toothed segment-gear *d'*, that engages with a corresponding toothed segment-gear *e'* on a corresponding rocking head E. This latter rocking head is fulcrumed upon trunnions

or an independent axis *e'* and is connected at *e* to the crank F of the driven shaft S.

H H, Fig. 5, are side plates carrying the trunnions or axes *d'* *e'* of these heads D and E. These side plates H H have trunnions H' H', rigid with the heads, arranged centrally and rocking in bearing-plates H² H², (see Figs. 4 and 5,) which slide within guides G G, friction-rollers R being arranged at the bearing-surfaces. Outside the sliding plates H² each trunnion H' has rigidly keyed to it a downwardly-projecting arm *h*, and beside it, rigidly bolted to the plate H², is a downwardly-projecting arm *h'*. Fulcrumed upon the lower end of arm *h* is a locking-yoke *h'*, one end of which has an opening (see Fig. 6) that is adapted to lock over the end of the rigid downwardly-projecting arm *h'* from the action of a spiral spring *h'*, interposed between its opposite end and a foot or offset of the arm *h*, as seen in Fig. 4. A pin *h'*, with friction-roller, is carried on one end of the locking-yoke and is adapted to strike against the inclined stationary bar J and be deflected down against the tension of spring *h'* to throw the yoke *h'* off the arm *h'*.

On the lower side of the segment-gear *d'* (see Figs. 1 and 2) is formed an arm *d'*, with elastic cushion *d'*, and on the lower side of segmental gear *e'* is formed an arm *e'*, above which is pivoted or fulcrumed a locking-yoke *e'*, which has an opening in it (see Figs. 7, 1, and 2) that is adapted to lock over the arm *d'* from the action of a spiral spring *e'*, arranged between the end of said yoke and an offset or foot on the end of arm *e'*. A pin *e'*, with friction-roller, is arranged on the side and adapted in the horizontal reciprocation to strike an inclined and stationary arm J' to throw the yoke *e'* off the arm *d'* against the tension of spring *e'*.

The operation of these parts is as follows: It will be borne in mind that the two segment-heads D and E and the sliding journal-plates H H and H² H² reciprocate in the guides G G and transmit the power of the piston-rod to the crank F and shaft S. Their peculiar construction and arrangement also serve to turn the crank F past the dead-center line as follows: Assuming the parts to be in the position shown in Fig. 1, with the crank F on the dead-center, as the piston-rod moves

to the right it raises arm B about center b and through pin c' also raises arm C. This, through pin d , lifts that end of head D and rocking it about center d^2 rotates the inter-
 5 meshed segment-gears d' e' about their centers and throws the far end of head E, connecting with crank F, in an upward direction, as shown by the arrows, and turns it off the
 10 dead-center. Then, following this action, as the piston nears the end of its stroke (see Fig. 2) the downward movement of arm B rocks the segment-heads D and E back again, as
 15 shown by the arrows, and then the heads D and E and plates H and H² move longitudinally in their guides to the extreme right of the stroke, as shown in Figs. 3 and 4. The action performed in the latter part of this stroke
 20 is to lock the two heads D and E on their centers and establish a new center of oscillation about the trunnions H' H', in which action the two heads D and E instead of acting as
 25 two levers are made rigid and act as one lever about the new fulcrum-point of the trunnions H'. This is for the purpose of giving the reverse action or downward thrust to the
 30 crank F necessary to carry it past the dead-center when in the position shown in Fig. 4. This is effected as follows: First, to lock the heads D and E about their centers, (see Fig.
 35 1,) as soon as the heads D and E move to the right far enough to carry the pin e^4 away from the inclined bar J the spring e^4 throws up the end e^7 of the locking-yoke e^5 , and the latter encircles the arm d^3 , locking the heads together, as shown in Fig. 3. Then when the
 40 extreme limit of the stroke to the right is reached (see Fig. 4) the pin h^4 of locking-yoke h^2 strikes the inclined bar J, and the locking-yoke h^2 (which has heretofore locked together the arms h and h' and prevented the trunnions
 45 H' of plates H from rocking) is now thrown off the rigid arm h' , and the trunnions H' are left free to rock. This they do as follows, referring still to Fig. 4: As the piston moves to the left arms B and C rise, and the
 50 connected end of head D also rises with them, and the heads D and E being now rigidly locked and acting as one lever about trunnion-fulcrum H' the crank end of E descends, as shown by the arrow, and the crank is carried
 55 past the dead-center. As the heads and plates pass to the left the yoke h^2 passes off the inclined bar J, and the spring h^3 causes the two arms h and h' to be again rigidly
 60 locked as soon as they resume their position parallel to each other, and when the extreme limit of their stroke is reached (see Fig. 1) the head-locking yoke e^5 again passes under its inclined bar J', and the heads D and E are
 65 unlocked again for individual action about their centers to carry the crank F past the dead-center on its upward sweep again.

In my patent herein referred to I have employed the general principle of two centers of oscillation between the piston-rod and crank alternating with one center of oscillation, and I do not claim this, broadly; but

with the toothed segments it will be seen that I not only simplify and lighten the weight of these moving parts, but I get a uniform motion between the segments, and by making
 70 on the lower side of these toothed segments abutting faces x and y , which come together, the segment-gears are stopped in proper position for the alinement of centers during
 75 the thrust upon and travel of these parts in the horizontal sliding movement. Corresponding abutting stop-faces x' and y' are also formed on the arms h and h' .

In adapting my device to work with the
 80 greatest efficiency I have devised a valve-gear that is correlated to the dead-center mechanism. With my devices it is necessary in order to get the best results, for the reason that the engine is enabled to do work
 85 on the dead-center point, to provide means whereby steam is introduced exactly at the dead-center points as follows, referring to Figs. 8 and 9: The rod which operates the slide-valve is shown at m , a screw-threaded
 90 section m' being arranged adjustably on the end of the same, so as to lengthen or shorten the rod, as may be required. This rod at its outer end is connected to a trunnion-
 95 nut m^2 , arranged adjustably upon the screw-threaded end of an oscillating lever n , fulcrumed to an upright portion of the engine-frame and having its lower end wrought
 100 into a toothed segmental head that engages a corresponding segmental head on a lever o , fulcrumed at o' . The lever o has a rigid horizontally-projecting tappet-arm r and a downwardly-projecting arm o^2 , which latter is
 105 connected by a rod t to the lower end of a crank-arm r^3 on a rock-shaft r^2 . This rock-shaft at a point between the side walls of the main frame is provided with a rigid tappet-arm r' , corresponding to the arm r . These
 110 arms r and r' are alternately thrown down and up to operate the slide-valve—i. e., when r is down r' is up, and vice versa. The effect of this is as follows: When r' is thrown up, shaft r^2 is rocked, and the lower ends of crank
 115 r^3 and lever o , with rod t , are thrown to the left of the position shown in Fig. 8 and the segment-gears between levers o and n throw the valve-rod to the left, all as shown by the arrows. When lever r is thrown up and r'
 120 down, the reverse action takes place. To do this exactly at the dead-center points, the tappet-arms r and r' are arranged immediately above the pins h^4 and e^6 of the locking-yokes h^2 and e^5 —that is, e^6 is made to act upon and raise r' and h^4 is made to act upon
 125 and raise r . When one dead-center is reached, the locking-yoke e^5 from its spring e^4 flies up, coupling the two heads together and simultaneously striking and lifting the tappet-arm r' and shifting the valve, and when the other dead-center is reached the
 130 other locking-yoke h^2 outside the framework flies up from its spring h^3 , coupling together the arms h and h' and simultaneously lifting the tappet-arm r and shifting the valve to the

opposite position. By this means the dead-center mechanism will at the moment the dead-center is reached open the valve and cause steam to be admitted to the cylinder, thus doing effective work when the crank is on the dead-center.

To hold the valve to the position to which it is thrown by the instrumentalities described, a spiral spring w connects the trunnioned nut m^2 to the lever o at or beyond its fulcrum o' , so that when the valve is shifted the spring w passes from one side to the other of the fulcrum of lever n and holds the valve-gear to the limit of its throw.

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

1. In a dead-center mechanism, the combination of two rocking heads having intermeshing segment-gears, reciprocating journal-plates for these heads, said journal-plates having an independent and intermediate fulcrum, and means for locking the gears to rock about their individual axes and means for locking the gears to rock about their common axis, substantially as shown and described.

2. In a dead-center mechanism, the combination of two rocking heads between the cross-head and the driving-crank having intermeshing segment-gears and abutting stop-faces, an oscillating support for said heads and locking devices for the gears and said support substantially as shown and described.

3. The combination with the connecting-rod and the crank-axle; of the rocking heads with intermeshing toothed segments d' e' , and subjacent arms d^3 e^3 abutting faces x and y , the locking-yoke e^5 pivoted to one of said arms and arranged to lock over the other, and means for operating it substantially as described.

4. The combination with the connecting-rod, and the crank-axle; of the support for the rocking heads and means for locking the same the rocking heads with intermeshing toothed segments d' e' and subjacent arms d^3 e^3 , the locking-yoke e^5 with pin e^6 and spring e^4 , and the stationary inclined bar J' adapted to operate upon the yoke e^5 and unlock the

toothed heads substantially as and for the purpose described.

5. The combination of the rocking heads arranged on independent axes and provided with intermeshing toothed segments; the locking devices for these heads, journal-plates H carrying the bearings of the heads and having intermediate trunnions or central shaft, bearing-plates H^2 for the shaft, a rigid arm h' on said bearing-plates, an arm h rigidly fixed to the trunnion or central shaft, a locking-yoke h^2 fulcrumed on arm h and having pin h^4 and spring h^3 , and an inclined bar J for unlocking the yoke h^2 substantially as and for the purpose described.

6. The combination with the crank-shaft and the reciprocating rod in an engine; of a means interposed between the two for overcoming the dead-center, and a valve-gear operated upon by said means for admitting steam to the cylinder at the dead-center points, substantially as and for the purpose described.

7. The combination with the crank-shaft, and the reciprocating rod in an engine; of an intermediate dead-center mechanism operating alternately about two centers as two levers, and then about one center as one lever, locking devices for alternately locking said mechanism about its single and double centers, and a valve-gear operated by these locking devices substantially as and for the purpose described.

8. The combination with the dead-center mechanism; of the valve-rod, the toothed segment-levers n and o , the lever o having fixed thereto arm r adapted to be operated upon by the dead-center mechanism, a second arm r' also adapted to be operated upon by the dead-center mechanism, a rock-shaft r^2 rigidly attached to said arm r' and having also arm r^3 , and a connecting-rod t connecting arm r^3 and lever o substantially as and for the purpose described.

WILLIE H. JOHNSON.

Witnesses:

EDW. W. BYRN,
 SOLON C. KEMON.