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J. HENSLEY

MECHANICAL MOVEMENT

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Fig. 1.

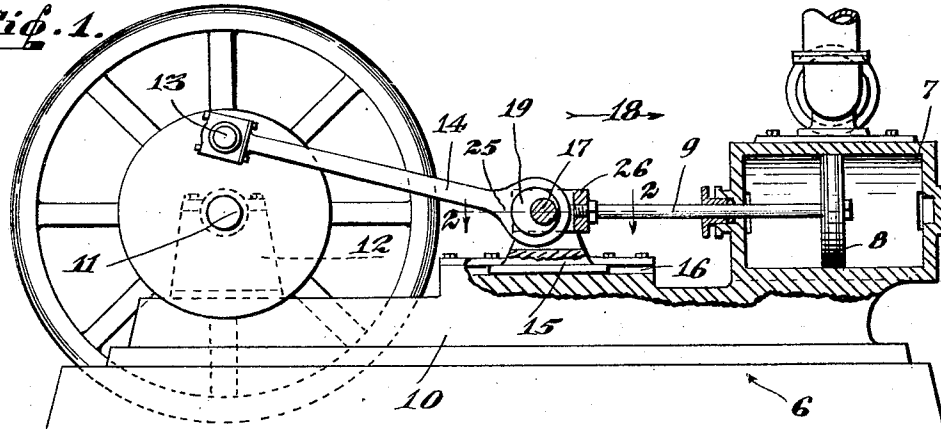


Fig. 2.

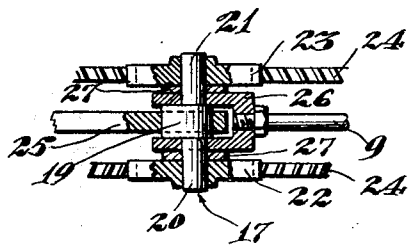


Fig. 3.

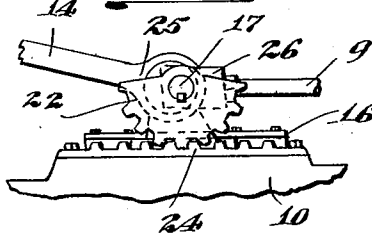


Fig. 4.

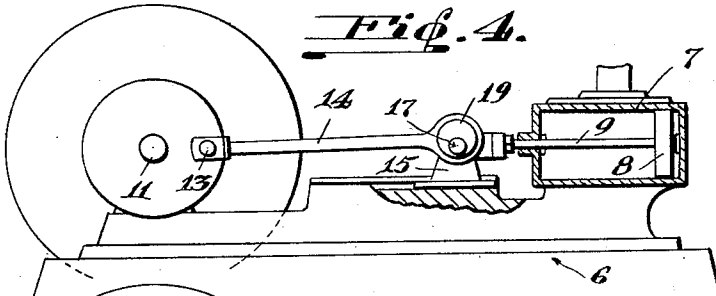
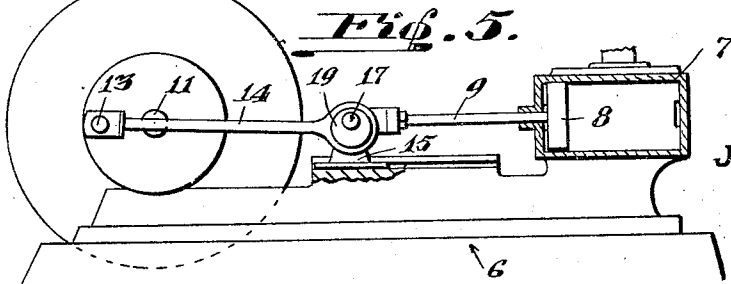


Fig. 5.



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MECHANICAL MOVEMENT.

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To all whom it may concern:

Be it known that I, JOHN HENSLEY, a citizen of the United States, residing at Burbank, in the county of Los Angeles and State of California, have invented new and useful Improvements in Mechanical Movements, of which the following is a specification.

My invention relates to steam engines, and more particularly to the relative positions of the piston and the crank pin when at the center of travel of their respective stroke and throw, due to the angularity of the connecting rod.

In steam engine construction most engines are built with connecting rods of short length as compared with the length of the piston stroke. For this reason, when the crank pin is turning above the crank shaft and toward the cylinder the piston will not have reached the center of its stroke when the crank pin reaches the upper center of its throw at a right angle to the start thereof or vertically above the crank shaft center, so that at the time the crank pin has moved to the vertical center line of the crank shaft the piston will have been moved to a position less than the center of its stroke, and therefore has not traveled a distance half its stroke. After the crank pin has continued and completed its throw the piston has been moved the remainder of its stroke which is more than the first part of the stroke. By comparison it will be seen that a variation exists between the corresponding centers of the piston stroke and the crank throw and on the return throw the relative difference in length of travel is somewhat reversed due to the angularity of the connecting rod.

The principal object of my invention is to overcome and correct the angularity of the connecting rod causing a relative variation in the piston stroke as compared with the crank throw to their respective positions when at the centers of the length of stroke and throw in either direction of travel pointed out in the foregoing explanation.

Another object is to accomplish the principal object with positive means adapted to automatically cause the piston to be evenly and gradually accelerated in the travel to

the center of its stroke from one end of the cylinder or retard its travel from the other end so that the crank pin and piston will arrive at their respective centers of throw and stroke simultaneously when traveling in either direction.

Another object is to so place the parts causing the increased throw that they are arranged to form in a substantially direct alignment at the time half the throw of the crank pin has taken place as at this point it is believed the greatest stress to the parts is encountered.

With the foregoing and other objects in view my invention consists in certain novel features of construction and arrangement of parts that will be hereinafter more fully described and claimed and illustrated in the accompanying drawings in which:

Figure 1, is a side elevational view with parts broken away and shown in section of a stationary reciprocating type of steam engine provided with my stroke correcting device.

Fig. 2, is a horizontal sectional detail view on the line 2—2 of Fig. 1, showing the cross head construction.

Fig. 3, is a fragmentary side elevational view of the cross head connecting parts.

Fig. 4, is a diagram partly in section to show the relative position of the wrist pin at the completion of a stroke as shown in Fig. 1.

Fig. 5, is a diagram partly in section to show the position of the wrist pin at the ends of the return stroke.

Referring to the drawing, more specifically 6 indicates a conventional stationary horizontal reciprocating type of steam engine in which 7 is the cylinder with a piston 8 and piston rod 9 slidably mounted therein, the cylinder being mounted at one end of a bed plate 10 and at the other end of which is crank shaft 11 rotatably journaled in bearings 12. A crank pin 13 is fixed to the crank shaft 11 on which a connecting rod 14 is pivotally secured. Substantially midway the cylinder 7 and crank shaft 11 a cross head 15 is slidably mounted in guides 16. The connection for the piston rod 9 connecting rod 14 and cross head 15 is ef-

fectured by a wrist pin 17 that is constructed to effect the objects hereinbefore stated.

Assuming the direction of travel to be as indicated by the arrow 18 in Fig. 1 with the crank pin 13 on the vertical center line of the crank shaft 11 the piston 8 as in engines of this type has not reached the center of its length of stroke, and the reason for this is as stated before.

In order to correct this condition and cause the piston to reach the center of its stroke at the time the crank pin 13 reaches its vertical center of throw I provide the novel construction in the wrist pin 17 with co-operating parts as follows:

A body 19 is formed integrally on the wrist pin 17 midway of its ends 20 and 21 and is positioned eccentrically thereto. Gears 22 and 23 are keyed to the respective ends 20 and 21 of the wrist pin 17 that mesh with gear racks 24 extending parallel to the piston rod 9.

The wrist pin end 25 of the connecting rod is strapped around the eccentric body 19 which is placed within the piston rod yoke 26, and the ends 27 of the crosshead 15 are brought up between yoke 26 of the piston rod 9. The gears 22 and 23 are keyed on the wrist pin 17 and positioned as shown in Fig. 1 so the centers of the wrist pin 17 and eccentric body 19 are substantially on a horizontal plane at the time the stroke is half completed and the gears 22 and 23 have traversed half the length of the racks 24.

The amount of increased travel necessary for the piston 8 to reach the center of its stroke when the crank pin 13 has reached the center of its horizontal throw will be found to be the difference between the distance from the center of the crank shaft 11 to the center of the wrist pin 17 and the distance between the crank pin 13 and the wrist pin 17.

By obtaining the measurement of the difference in the distance between these centers, one on the horizontal plane being the shorter and the other at an angle thereto being the longer, the length of increase or decrease in the throw of the piston 8 on either side of center to bring it to the center of its stroke simultaneously with the crank pin 13 at its center of throw may be determined.

The body 19 is eccentrically fixed relative to the wrist pin 17 to make up this difference so the crankpin 13 and the piston 8 will pass the center points of stroke and throw at the same time.

With the eccentric body 19 remaining in its horizontal position the piston 8 would travel further each side of center and for this reason I have geared the wrist pin 17 to the bed plate 10 so that upon movement in either direction it will rock the wrist pin

17 and throw the eccentric body 19 upwardly or downwardly before the piston 8 reaches either end of the piston stroke.

By referring to the diagrams, in Fig. 4 the piston has completed its stroke traveling in the direction of the arrow shown in Fig. 1 and the gears in mesh with the rack have turned the body 19 upwardly so the centers of the body 19 and wrist pin are in a vertical plane.

In Fig. 5 on the return stroke of the piston the body 19 has been rocked in the reverse direction to the movement in Fig. 4 and the center of the body 19 and wrist pin 17 are again in the vertical plane and the body 19 is turned downwardly. Therefore at the end of each stroke the travel of the piston will terminate in the normal position and will be accelerated from one side and retarded from the other side when approaching the center of travel by the body 19 to make an exact one-half stroke each side of the center of piston travel each time the crankpin makes an equal throw each side of its vertical center of throw.

In the operation, beginning the stroke of the piston 8 in the end of the cylinder nearest the guides 16 with the crankpin 13 and the crank shaft 11 on a horizontal plane and the direction of travel as indicated by the arrow 18 the eccentric body 19 is pointed downwardly, the gears 22 and 23 will be at the end of the rack 24 nearest the crankshaft 11.

The crankpin will either ascend or descend forwardly and the action of the gears 22 and 23 and rack 24 will turn the eccentric body 19 in an upward direction, start the longitudinal movement of the body 19 and in so doing the piston will be gradually accelerated respective to half the crank pin throw and will travel a greater distance than the horizontal throw of the crank pin 13, up to the point where the crank pin reaches the vertical center line of the crank shaft 11 and at such time the eccentric body 19 has been rocked to a point at right angles to its starting position wherein it has completed its maximum longitudinal movement. When the piston passes the center of the length of its stroke the eccentric body 19 continues in its upward turning movement by reason of the action of the gears 22 and 23 and rack 24 and in so doing gradually retards the forward movement of the piston respective to the remaining half of the crank pin throw until the end of the stroke of the piston and the body 19 has ended its longitudinal movement.

The difference or variation between stroke and throw varies according to the relative length of the connecting rod compared to the stroke of the piston which may be greater or lesser in various designs of engines, and the wrist pin will be provided with the exact

eccentricity to equal the difference on account of angularity.

Obviously various changes in the construction may be made coming within the scope of the appended claims.

I claim:

1. The combination with a steam engine, having a reciprocating piston and rod, a crosshead, a crank shaft provided with a crank pin, a connecting rod, a wrist pin adapted to connect the piston rod, crosshead and connecting rod, of means fixed to the wrist pin for causing the piston to reach its center of stroke at the time the crank-pin reaches the vertical center of its throw.

2. In an engine, a reciprocating piston and piston rod, a crosshead connected to the piston rod, a crank shaft and connecting rod, a

wrist pin on the cross head, an eccentric connecting the wrist pin and connecting rod, and means operable on reciprocation of the cross head for rotating the wrist pin and eccentric whereby the piston will be caused to reach its center of stroke when the crank shaft reaches the vertical center of its throw.

3. In an engine, having a reciprocating piston and piston rod, a cross head connected to the piston rod, a crank shaft, a connecting rod between the crank shaft and cross head, a wrist pin on the cross head, an eccentric connecting the wrist pin and connecting rod, a gear fixed on the wrist pin, and a gear rack engaged by said gear whereby reciprocation of the cross head will effect oscillation of said wrist pin and eccentric.

JOHN HENSLEY.