No. 676,038. Patented June 11, 1901.

O. P. HOLT.

ECCENTRIC FOR STEAM ENGINES.

(Application filed Feb. 1, 1900.)

(No Model.) 2 Sheets—Sheet 1.

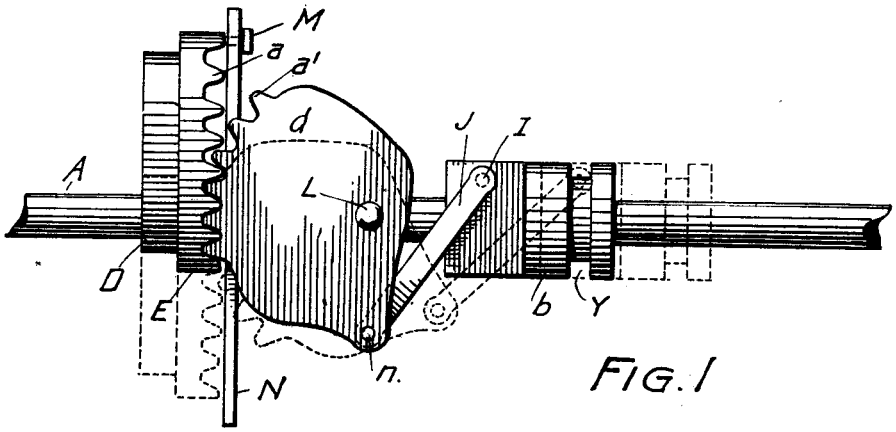


FIG. 1

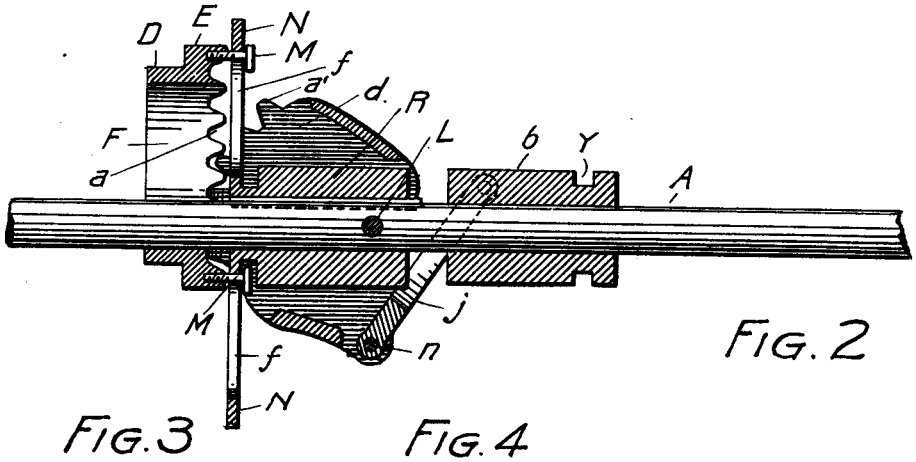
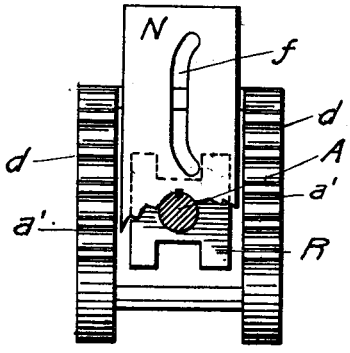


FIG. 2

FIG. 3

FIG. 4



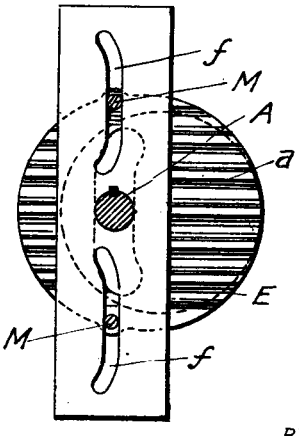
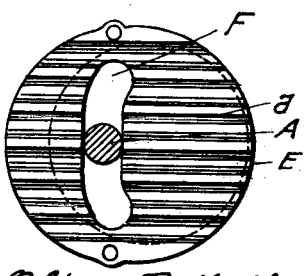


FIG. 5.



WITNESSES:

O. P. Holt

Leon McKesson

Oliver P. Holt

INVENTOR.

BY C. L. McKesson

ATTORNEY.

No. 676,038. Patented June 11, 1901.

O. P. HOLT.

ECCENTRIC FOR STEAM ENGINES.

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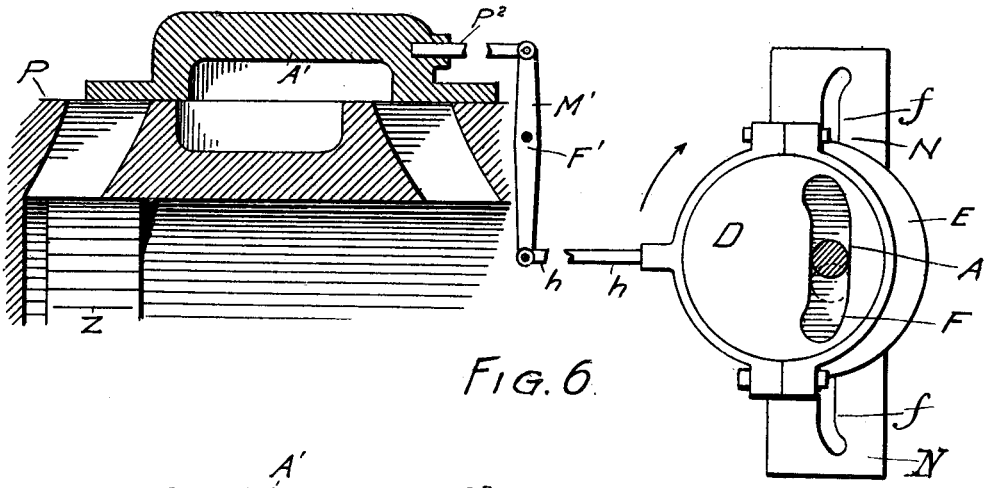


FIG. 6.

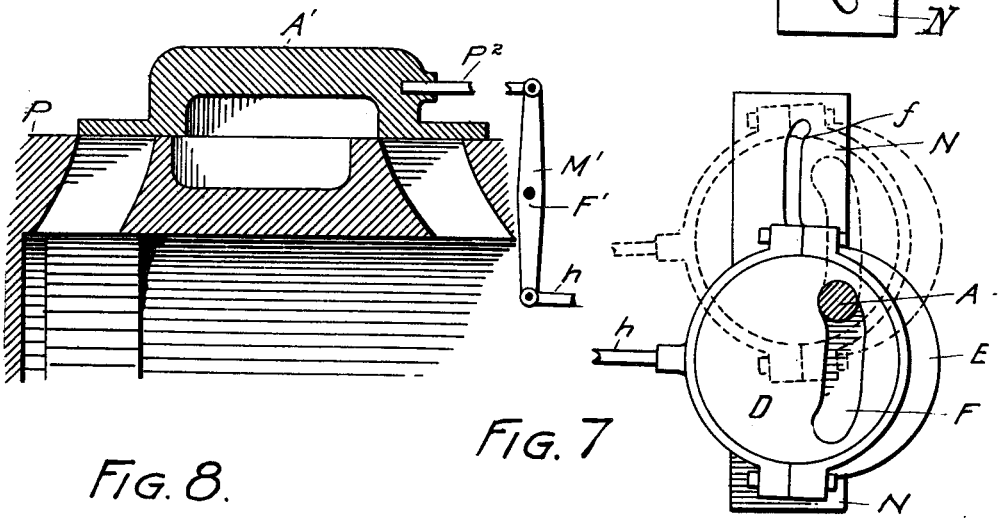


FIG. 7.

FIG. 8.

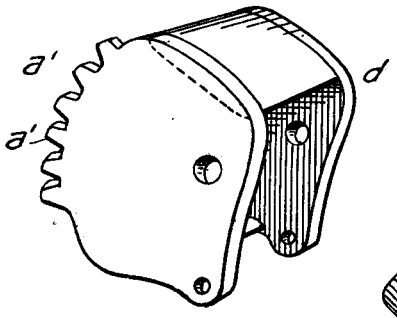
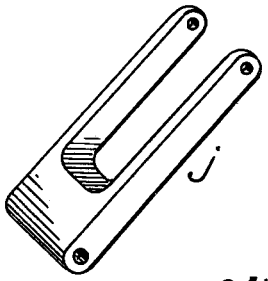


FIG. 9.



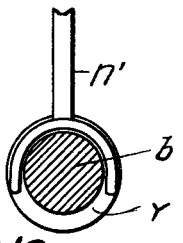


FIG. 10.

WITNESSES:
O. F. Grimes
Leon McKesson

Oliver P. Holt INVENTOR.
BY L. L. McKesson
ATTORNEY.

UNITED STATES PATENT OFFICE.

OLIVER P. HOLT, OF COLORADO SPRINGS, COLORADO.

ECCENTRIC FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 676,038, dated June 11, 1901.

Application filed February 1, 1900. Serial No. 3,643. (No model.)

To all whom it may concern:

Be it known that I, OLIVER P. HOLT, a citizen of the United States, residing at Colorado Springs, in the county of El Paso and State of Colorado, have invented a new and useful Eccentric for Steam-Engines, of which the following is a specification.

My invention relates to improvements in eccentrics for steam-engines; and the objects of my improvements are, first, to give a variable cut-off; second, to increase the lead and give an earlier exhaust as the speed is increased; third, to give a sharper cut-off and a more excellent distribution of steam; fourth, to provide a simple, instantaneous, and effectual means of reversing an engine. I accomplish these objects by means of a sheave having a curved slot and actuating machinery illustrated in the accompanying drawings, in which—

Figure 1 shows my eccentric and shifting mechanism attached to the drive-wheel shaft of a locomotive or other reversible engine. Fig. 2 is a sectional view of Fig. 1, taken through the shaft. Fig. 3 is an end view of the eccentric, showing the ends of the cog-lever *d*, also the box R in position on the shaft. Fig. 4 is a side view of the guide-plate N and sheave-plate E. Fig. 5 shows the cogs on the back of the sheave-plate E. Fig. 6 is a view of my eccentric at mid-gear, together with the steam-chest, and showing the relative position of the port-valve slides. Fig. 7 is a view of the eccentric-sheave with the shaft in the extreme end of the curved slot. Fig. 8 is a perspective view of the cog-lever, and Fig. 9 is a perspective view of the bar used to connect the shipper-sleeve with the cog-lever. Fig. 10 is a side view of the forked lever which connects the reverse-lever rods with the collar on the shipper-sleeve.

My steam-engine eccentric is adapted to be used on a locomotive or other reversible engine.

In order to explain the use and manner of operation of my eccentric, it will be necessary to refer particularly to Figs. 1, 2, 6, and 7 and explain the operation of the various parts shown in these figures. A is the drive-wheel shaft of a locomotive or other reversible engine. In Figs. 6 and 7, P and P represent the ports of a steam-cylinder, and A′ the slide-valves covering the same. P^2 is a rod used to connect the slide-valve with the rocker-arm M′. The rocker-arm M′ is connected with the eccentric-strap which encircles the sheave D by eccentric-rod *h*. The eccentric-sheave D has the curved slot F cut through it and the sheave-plate E, which is attached to the back of the sheave. The curved slot F is made curved, as will be more fully explained in another portion of this specification, and is large enough to permit the sheave to move easily on the shaft A from end to end of the slot F, as is shown in Fig. 7. The back of the sheave-plate E is covered with cogs, which are adapted to engage the teeth on the ends of the double cog-lever *d*, which cog-lever rotates on the pivot L. On the back of the sheave-plate E are the arms M, which move in the slots *f f* in the guide-plate N. The guide-plate N is permanently secured to the box R. It is essential that the slots *f f* be reverse curves, with the same degree of curvature as the slot F in the sheave D, as is shown in Fig. 4. The arms M have collars on the inner side of the guide-plate N, which keep the arms from slipping out of the guide-plate. Pivoted on the box R is the double cog-lever *d*, one end of which is provided with teeth adapted to engage the cogs which extend across the back of the sheave-plate E, as hereinbefore described. The other end of the cog-lever is pivoted to the two arms *j j*, as shown in Fig. 1. I prefer to make this cog-lever of a single piece cast in the desired shape, as shown in Fig. 8; but it may be made of two plates substantially fastened together by means of connecting bars, bolts, or bands at the top and bottom, with sufficient space between the cog-lever plates to permit the box R to rest easily between them and to allow one of the cog-plates to engage the teeth on the plate E on one side of the shaft A and the other on the opposite side of said shaft, the cogs on the plate E being made to extend across the plate, so that the cog-lever plates can engage them, as above described. The cog-lever *d* raises and lowers the plate E and the sheave D, to which the plate E is permanently fastened, and the action of the lever on both edges of the plate obviates side draft or unnecessary friction. The cog-lever *d* is shown in Fig. 8, *a′ a′* being the teeth on each

end of the plates forming the lever. The cog-lever is pivoted on a fulcrum at L in Fig. 1, and when it is caused to rotate on this fulcrum by means of the shipper-sleeve on the shaft A the plate E is raised or lowered, according to the direction in which the shipper-sleeve *b* is moved. The curved slots *f f* impart to the plate E a curved movement in order to move the sheave D on the shaft A in the curved slot F. The cog-lever permits the plate E to move in the direction above indicated, because, as the plate moves obliquely across, the cogs on the lever slide along and continue to engage the cogs running across the plate E, the lever-cogs describing the same arc in the cogs on the plate E that the sheave D makes in moving across on the shaft A. I thus secure what I believe to be a mechanical movement never before attained by the use of cogged mechanism, and I wish to call particular attention to this feature of my invention. The plate E has cogs extending across its inner surface. The guide-plate N is permanently secured to the box R, which remains stationary on the shaft A and turns with said shaft. The cog-lever rotates on the fulcrum L, and the position of the fulcrum L is such in the cog-lever that as the lever is rotated on the fulcrum the cogs on the end of the lever come into engaging contact with the cogs *a a*, extending across the plate E, so that the plate E can be moved in a curved direction by means of the lever *d* when the shipper-sleeve is moved backward and forward by means of its actuating mechanism, which consists of the collar encircling the shipper-sleeve, a forked lever rotating on a fulcrum, and a rod which connects with the reverse-lever. The shipper-sleeve *b* is connected to the ends of the cog-lever by means of the bars *j j*. The ends of the bars *j j* may unite in a common head at the end next to the cog-lever, as shown in Fig. 9, or they can be attached separately to the ends of the cog-lever by means of bolts without being connected.

In operating the eccentric the engineer moves his reverse-lever, which is connected with the shipper-sleeve, as above set out, thus causing the shipper-sleeve to move backward and forward as desired, and the sheave D is moved on the shaft A by means of the cog-lever *d* and its actuating mechanism. The reverse-lever will be in its backward position when the eccentric-sheave D is in the position shown in Fig. 7 and the engine will be on a dead-center. Should the operator desire to run the engine forward, he throws the reverse-lever forward, thereby moving the eccentric-sheave D until the shaft A will rest at the lower end of the slot F. The engine will then move forward with the steam-pressure in the cylinder the full length of its stroke.

Fig. 6 shows my eccentric in mid-gear. It also shows the position of the valve when the eccentric is in an intermediate position and the engine is on the center and running at high speed in either direction, the throw of the eccentric being on the lower side while running in the direction of the arrow.

Fig. 7 shows my eccentric in such a position that as the engine moves off the center the valve opens the port-hole P, and as the eccentric has a very long radius and very little angular advance the port-hole is opened very wide and does not close until the piston reaches the extreme end of the cylinder. The eccentric in Fig. 7 is in a position for starting out with a heavy load, and as there is little or no inertia it is necessary to confine the steam in the cylinder until the piston almost reaches the end of the stroke before allowing it to escape in order to counterbalance the compression on the opposite side. When the speed of the engine increases, it is necessary to shorten the throw of the eccentric in order to cause the valve to cut off the steam earlier in order to get the benefit of the expansion of the steam, and it is also necessary to have the throw of the eccentric angularly advanced, so as to increase the lead which counterbalances the inertia and also at the same time opens the exhaust-port earlier in order to let the steam out of the way of the piston and obviate back pressure when running at high speed.

In order to secure the angular advance on the eccentric-rod, which advance is essential to accomplish the objects above mentioned, the guide-plate has two elongated curved slots *f f*, which correspond in shape with slot F in sheave D, but are placed in an opposite direction to that in said slot F, thereby permitting the sheave D to move readily on the shaft A in the direction of the curved slot in the sheave.

The degree that the slot F should be curved depends upon the amount of lead desired and the obliquity of the eccentric-rod on the engine upon which my eccentric is used. A short eccentric-rod would require a sharper curve at the ends of the slots than a long one.

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

1. The combination in a steam-engine eccentric of an eccentric-sheave having an elongated curved slot through it adapted to receive the principal shaft of an engine, said slot being of the same width its entire length, the two ends of said slot being curved toward the throw of the eccentric so that the eccentric will be angularly advanced as its radius is shortened, substantially as described and for the purpose set forth.

2. The combination in a steam-engine eccentric of an eccentric-sheave having an elongated curved slot through it adapted to receive the principal shaft of an engine, said slot being of the same width its entire length, the two ends of said slot being curved toward the throw of the eccentric so that the eccentric will be angularly advanced as its radius is shortened, said sheave secured to a circu-

lar plate having cogs extending across its inner surface, and a cog-lever having teeth adapted to engage the cogs on such plate whereby the said sheave is made to move in the direction of the curved slot through it, substantially as described and for the purpose set forth.

3. The combination in a steam-engine eccentric of an eccentric-sheave having an elongated curved slot and a cog-plate with two arms secured thereto, operated by means of a toothed lever a guide-plate having double elongated curved slots through it, and adapted to receive the arms, said plate being fastened to a box secured to the main shaft of an engine, a box adapted to hold the guide-plate and to receive the fulcrum on which the cog-lever rotates, two lever-bars connecting the end of the cog-lever with a shipper-sleeve which can be moved backward or forward on the main shaft of an engine by means of certain actuating machinery, consisting of a band around said shipper-sleeve and a forked rod bent at right angles and fulcrumed in the angle and connected with the reverse-lever, all substantially as described and for the purposes set forth.

OLIVER P. HOLT. [L. S.]

Witnesses:
LAON MCKESSON,
JOHN A. SOULE.