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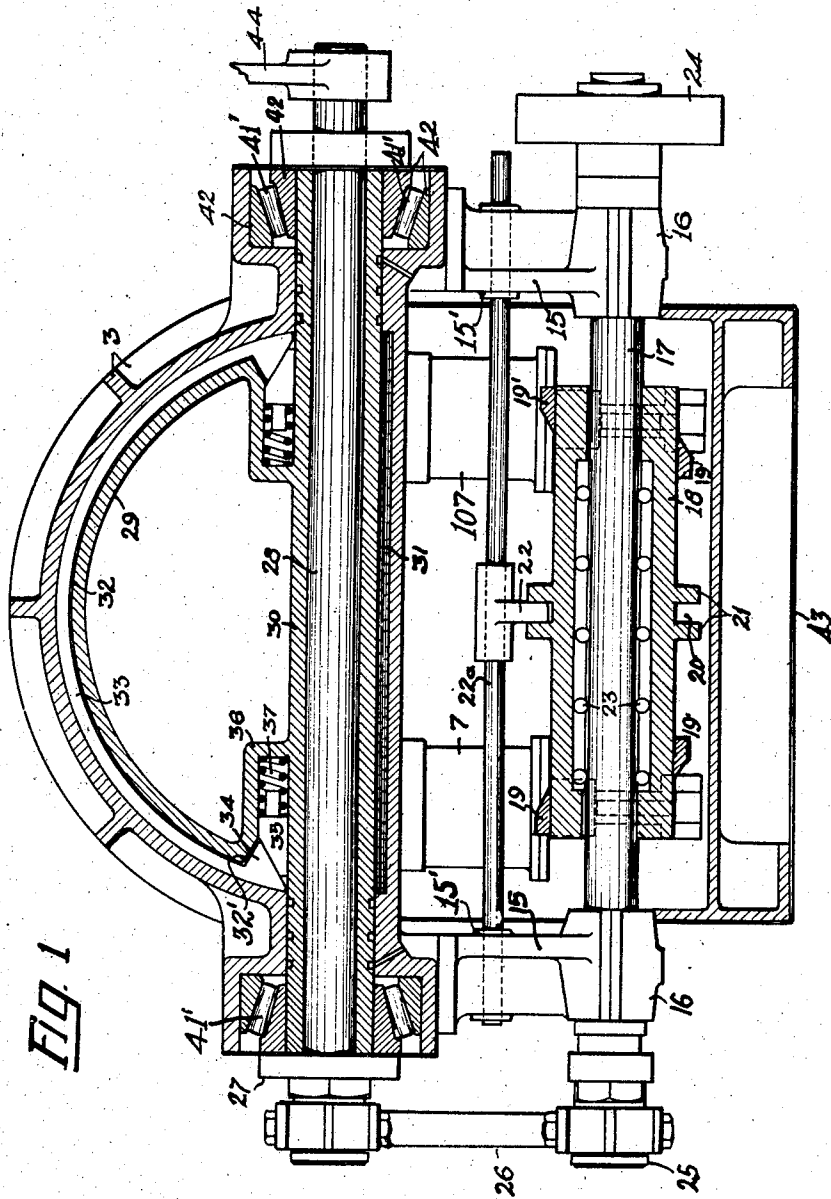
R. H. BLOCKER

2,140,571

STEAM ENGINE

Filed Nov. 30, 1936

3 Sheets-Sheet 1



INVENTOR.
Robert H. Blocker
BY *J. E. Mabrutto*
ATTORNEY.

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R. H. BLOCKER

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3 Sheets-Sheet 2

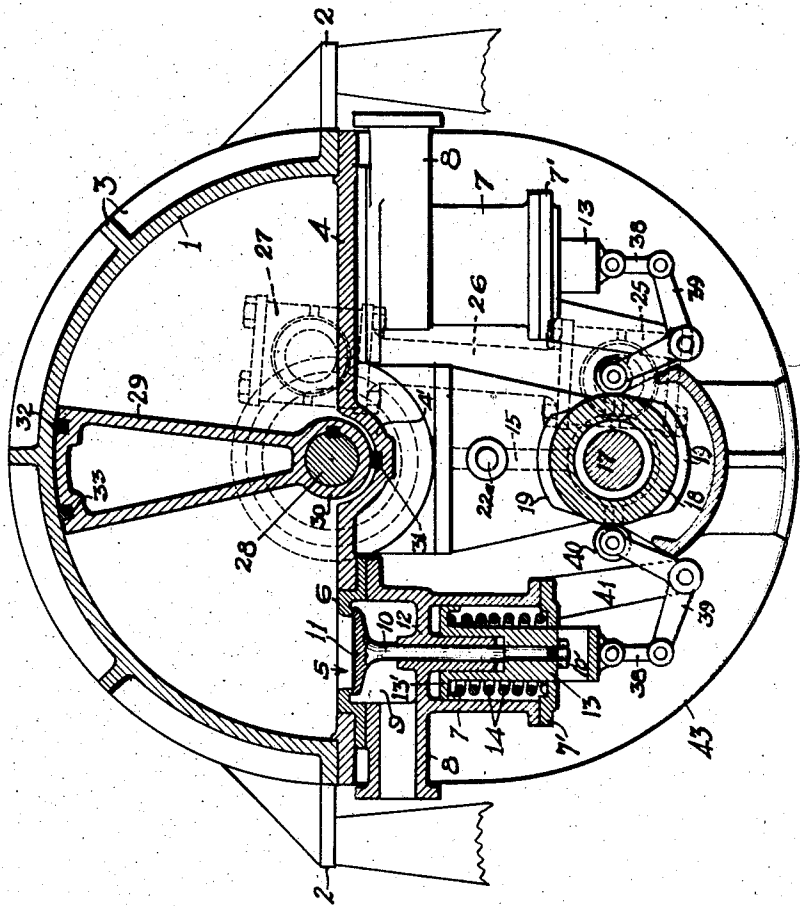


Fig. 2

INVENTOR.
Robert H. Blocker
BY *J. E. Trabucco*
ATTORNEY.

Dec. 20, 1938.

R. H. BLOCKER

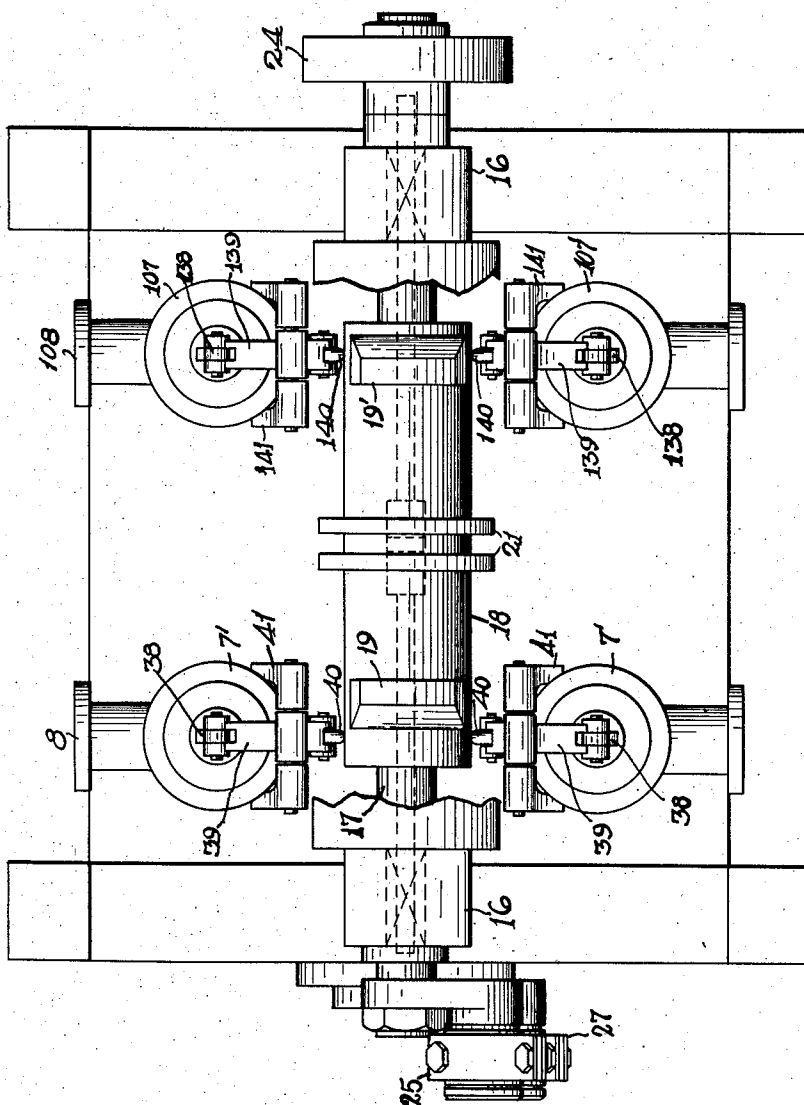
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Fig. 3.



INVENTOR,
Robert H. Blocker
BY *J. E. Trabucco*
ATTORNEY

UNITED STATES PATENT OFFICE

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STEAM ENGINE

Robert H. Blocker, San Francisco, Calif.

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3 Claims. (Cl. 121—97)

This invention relates to improvements in oscillating poppet valve engines of the type employing steam for propulsion purposes.

The principal objects of my invention are: to provide an oscillating type poppet valve engine embodying a compact assembly wherein reciprocating parts are eliminated; to provide an engine of the type characterized in which, by reason of the absence of the usual reciprocating parts, vibration, leakages and packing difficulties are reduced to a minimum; to provide an engine wherein replacements or removal of parts for inspection purposes are capable of being readily made; and to provide a simplified and highly efficient engine in which by reason of its comparatively few working parts, the cost of manufacture, operation and maintenance are comparatively small.

The present invention embodies the use of poppet valves for controlling the steam or other pressure medium, and an oscillating or swinging wedge-shaped piston which is adapted to actuate suitable mechanism for rotating a crank shaft. The piston is substantially wedge-shaped in cross section and is formed integrally with or suitably secured to a sleeve member, which is secured to a pivoted shaft. The piston at its sides is provided with suitable sealing members which are designed to prevent leakage of the pressure medium and to take up or compensate for the wear due to their frictional engagement with the cylinder wall. The engine also embodies a variable control for the steam admitted to the cylinder comprising roller and cam mechanism, as well as other features not found in engines of this type.

In the accompanying drawings:

Figure 1 is a vertical longitudinal sectional view taken through an oscillating engine embodying my invention; and

Figure 2 is a vertical transverse sectional view taken through the engine.

Figure 3 is a bottom plan view of the engine, with certain parts broken away.

Referring to the drawings the numeral 1 designates an outer casing, substantially semi-spherical in form, and provided with suitable projecting members 2 on its exterior for supporting purposes. The exterior of the casing is preferably provided with a number of reenforcing ribs or projections 3. Suitably secured to the semi-spherical casing 1 is a bottom plate or member 4. The bottom plate is provided with a hole 5 which has a circular valve seat member 6 extending around its circumferential edge, the said

valve seat member being suitably secured to the bottom plate by suitable means. Secured to the valve seat member 6 and to the bottom plate 4, as by studs or other suitable means, is an admission valve throat 7. There are two suitably spaced admission valve throats 7, and each is suitably secured to the bottom plate 4 by studs or other suitable means. There are also provided as part of the engine, two exhaust valve means embodying substantially the same construction as the admission valve means. The admission valve throats each have an inlet pipe 8 which connects with a central passage 9. Axially disposed in the central passage 9 of the throat 7 is a valve stem 10 having a valve head 11 arranged to control the flow of steam or other pressure medium into cylinder 1 through the valve seat member 6. The valve stem 10 slidably extends through a centrally disposed bearing member 12 which is integrally secured to throat 7. The outwardly disposed end of the valve stem is secured as by a nut 10' to a slidable piston 13 which is encircled by and urged inwardly by a spiral spring 14. One end of the spiral spring 14 bears against an end plate 7' secured to the throat 7 and its opposite end bears against an outwardly disposed annular flange 13' provided on the said piston 13. The spring 14 normally, but yieldably, maintains the valve head 11 in a closed position on the valve seat member 6, thereby normally preventing steam from entering the casing 1 from the passage 9.

The exhaust valves and their associated mechanisms are similar in construction to the admission valves, and it is to be understood that they are operated in the same way as the admission valves.

Suitably secured to the bottom plate 4 are depending brackets 15 which serve to support a plurality of main bearings 16 that rotatably support the main shaft 17 of the engine. The main shaft 17 is longitudinally disposed and has a slidable cylinder 18 to which are secured suitably shaped admission cams 19 and similarly shaped exhaust cams 19' located at opposite ends of said cylinder. A channel 20 formed by two annular protuberances 21 provided on the cylinder 18 provides a suitable groove in which an operating finger 22 is positioned so as to move the same cylinder longitudinally. The cylinder 18 slides on roller bearings 23 which are positioned in longitudinal grooves in the shaft 17 and corresponding grooves in the said cylinder.

A pulley 24 is mounted at one end of the shaft 17 for operatively connecting the latter to a

mechanism to be actuated, and a crank 25 having a connecting rod 26 is secured to its opposite end. The connecting rod is attached to an oscillating crank 27 mounted on a pivoted oscillating shaft 28. The oscillating crank 27 is so proportioned with respect to the crank 25 that the crank 25 makes one complete revolution when the crank 27 makes its oscillating movement in both directions.

A hollow wedge-like piston 29 having a sleeve or cylinder 30 formed integrally therewith divides the interior of the casing 1 into two chambers and is adapted to be actuated back and forth inside the casing by steam or other pressure medium directed against it, first on one side and then on the opposite side. The sleeve 30 is rigidly secured to the shaft 28, and the piston 29, the sleeve 30 and the shaft 28 are thereby adapted to oscillate as a unit. The bottom plate 4 is provided centrally with a longitudinally disposed curved part 4' which accommodates the sleeve 30, and a sealing strip 31 located in a slot in the said curved part of the plate and engaging with the said sleeve is adapted to prevent leakage of steam around the piston from one chamber of the casing to the other chamber.

The arcuate side and the opposite ends of the piston 29 are provided with grooves 32 which hold sealing members 33, the extreme ends of which are provided with enlarged parts 34 that have inclined surfaces at their underneath sides with which wedges 35 engage. The enlarged parts 34 of each sealing member are provided with oppositely disposed inclined surfaces at their upper sides which engage with beveled sides 32' of the piston, the said beveled sides being located at opposite ends of the grooves 32 and the engagement of the said enlarged parts 34 with the beveled sides 32' thereby prevents the central portion of the said sealing member from engaging too firmly with the dome-shaped wall of the casing. The wedges 35 are housed inside suitable retaining guides 36 formed in the piston, and springs 37 also located in the guides urge the wedges outwardly against the enlarged ends 34 of the sealing members. The sealing members 33 being urged outwardly by the spring pressed wedges 35 into firm contact with the walls of the casing 1, prevent leakage of steam or other pressure medium from one side of the piston to its opposite side. The wear of either the sealing members 33 or the walls of the casing are automatically compensated for by the spring-pressed wedges 35 urging the ends of the sealing members outwardly. The sealing members are prevented from wearing too rapidly at their central portions by their being restrained or held downwardly by the enlarged ends engaging with the piston where the beveled sides 32' of the grooves 32 occur.

The pistons 13 of the admission valves are each connected by a link 38 to a bell-crank 39 which carries a beveled roller 40 at its free end. The bell-crank 39 is pivotally mounted at its central part on a rigid bar 41 secured to suitable supporting means. The beveled rollers 40 are adapted to ride on cam members 19 of the sleeve 18. The cam members 19 have their surfaces suitably formed to provide means for operating the pistons 13 so the valve heads 11 may be opened and closed at proper intervals. The cam members 19 have arcuate raised surfaces, which when the rollers 40 ride thereon, serve to lower the valve heads 11 from their seats 6 and temporarily maintain them thus, thereby allowing a

charge of steam to enter the casing 1. To provide for a gradual mounting of the rollers 40, the cam members 19 are formed with beveled sides. By changing the horizontal position of the sleeve 18 the cams 19 are each capable of providing a greater or lesser amount of travel for the rollers thereon. The rollers first come in contact with the face of the cam, which is parallel to the shaft, and as they leave the said cam, they do so on a gradually beveled face so as to give a short or long travel, as regulated by sliding the member 18 longitudinally. The exhaust mechanism is provided with similar rollers and cam members, the various elements associated with the exhaust valves being indicated by the same numerical characters with 100 added to distinguish the same from the admission valve characters. (Thus the exhaust valve throats are 107, etc.)

The exhaust mechanism is provided with beveled rollers 140, cam members 19', bell cranks 139, links 138, an end plate 107' secured to each exhaust valve throat and a rigid supporting bar 141 for pivotally supporting a bell crank.

In operation, an admission valve is opened so as to allow a charge of steam to enter the chamber of the casing 1 and exert a pressure upon one side of the piston 29 sufficient to force it through a semi-circular arc. During this movement a cam roller 40 travels on its associated cam 19 until it permits its associated valve head 11 to close the inlet opening 5 and thereby allow the admitted steam to expand and perform its function of actuating the piston 29.

When the piston 29 has reached the end of its stroke, the movement of the slidable cylinder 18 is such as to open the exhaust valve, this being effected by a cam 19' engaging with its associated exhaust roller 140. The opening of the exhaust valve allows the steam on that particular side of the chamber to be discharged, and at the same time the admission valve on the opposite end of the casing opens and through the admitted steam forces the hollow piston 29 to travel in a reverse direction.

The preferred construction for rotatably supporting the oscillating sleeve 30 and the shaft 28 comprises a plurality of tapered bearings 41' supported between races 42 that are suitably housed in semi-annular projections provided on the casing 1 and on the bottom plate 4. A crankcase 43 secured to the bottom plate 4 serves to hold suitable oil for lubricating certain of the working parts of the engine.

The slidable sleeve 18 being mounted on the shaft 17 with the rollers 23 acting as keys to prevent turning of the shaft independently of the sleeve, affords means for regulating the operation of the engine. The engine is started, stopped, reversed and otherwise controlled by shifting the cam sleeve 18 so its cam members are brought into engagement with their associated rollers at properly timed intervals.

The finger 22 is slidably mounted on a rod 22a which is supported in suitable recessed enlargements 15' formed on the brackets 15. The finger 22 may be moved longitudinally back and forth on the rod 22a to actuate the sleeve 18 and thereby effect the control of the engine's operation.

It is of course apparent that by providing a member 44 on the end of the shaft 28, power of an oscillating character may be provided.

In applicant's Patent No. 2,073,385, dated March 9, 1937, entitled Oscillating poppet valve

engines, apparatus similar in certain respects to the present invention is disclosed.

Having described my invention, what I claim is:

5 1. In a packing construction for a steam engine having a semi-spherical casing and an oscillating piston mounted in the casing which has grooves at its sides, sealing members located in the grooves, and spring-pressed wedge means for urging the sealing members outwardly against
10 the wall of the casing.

2. In a steam engine, a semi-spherical casing, a piston in the semi-spherically shaped casing, having an arcuate shaped side conforming substantially to the shape of the casing, the said
15 piston having grooves in its arcuate shaped side, one or more arcuate shaped sealing members positioned in the grooves, having enlarged end portions, and spring-pressed wedges engaging

with the enlarged ends of the sealing members for forcing the sealing members into firm contact with the casing wall.

3. In a steam engine, a dome-shaped casing, a wedge-shaped piston in the casing having an arcuate shaped side conforming in shape to the
5 shape of the casing, the said piston having one or more grooves in its arcuate shaped side, one or more sealing members positioned in the grooves, each having enlarged wedge shaped end
10 portions which normally engage at the upper sides with the piston, and spring-pressed wedges engaging with the under side of the enlarged wedge shaped ends of the sealing members for
15 forcing the sealing members into firm contact with the casing wall.

ROBERT H. BLOCKER.