Aug. 25, 1925. 1,551,437

A. C. STALEY

STEAM ENGINE

Filed Sept. 26, 1921

Fig. 1.

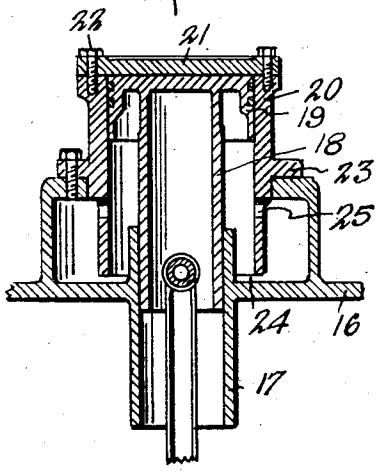


Fig. 2.

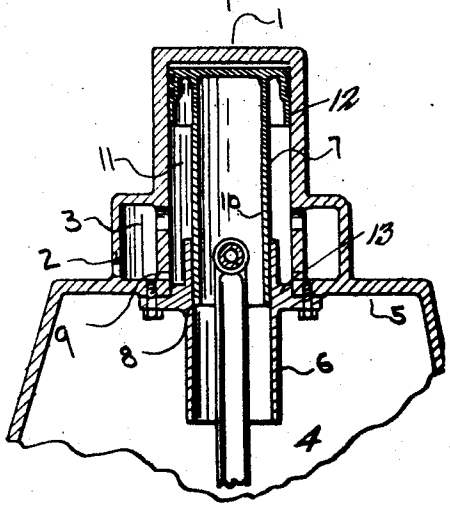


Fig. 3

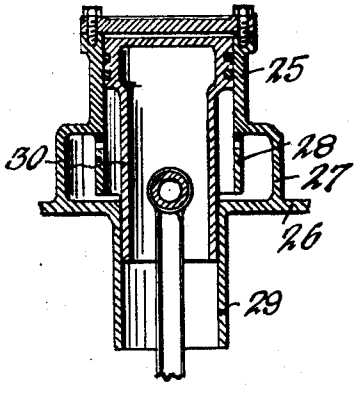
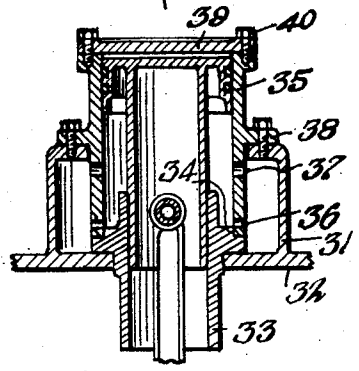


Fig. 4



INVENTOR

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BY

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UNITED STATES PATENT OFFICE.

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STEAM ENGINE.

Application filed September 26, 1921. Serial No. 503,469.

To all whom it may concern:

Be it known that I, ALLEN C. STALEY, a citizen of the United States of America, and resident of the city of La Fayette, in the county of Tippecanoe, State of Indiana, have invented new and useful Improvements in Steam Engines, of which the following is a specification.

This invention relates to single acting steam engines as applied particularly to automotive apparatus, rather than to stationary use where devices for oil and water separation may be easily applied, as space and weight are of little relative importance in the latter, while in the former these are generally a matter of serious import.

In practice, it is very desirable to secure the manifold advantages of the single acting high speed automobile type of engine used in internal combustion engined cars, owing to compactness, high power weight ratio, and ease of production by machine tools developed for use by the gas car industry.

Owing, however, to the fact that heretofore it has been practically impossible to prevent water and steam from blowing past the pistons and entering the crankcase, where the resulting contamination of the oil by the water and condensed steam, either creates an emulsion causing failure of the lubrication system, or in cases where special non-emulsifying lubricants are used, the inconvenience of drawing off the accumulated water at frequent intervals is an annoyance not acceptable to modern automobile standards and requirements.

This water accumulates, first upon starting from cold when large quantities seep past the piston, however well fitted and constructed, and enter the crankcase and lubrication system. Also, owing to the high difference in pressure existing between the top and bottom of the pistons while the engine is operating under power load, a continual leakage of steam, however minute, occurs and eventually finds its way into the lubricating oil in the form of water with the usual detrimental effects.

Referring to the accompanying drawings which are made a part hereof—

Figure 1 represents a sectional view of one form of my invention wherein the cylinder is cast in three pieces.

Figure 2 represents a sectional view showing another embodiment of my invention wherein the cylinder is cast in a single piece, the lower exhaust ports being also somewhat different from the showing in Figure 1.

Figure 3 shows a sectional view of a further modification in which the cylinder is cast with a removable top portion, the piston construction also being somewhat different from the pistons shown in Figures 1 and 2.

Figure 4 represents a sectional view of a further modification embodying the cylinder construction shown in Figure 1 and the exhaust port arrangement of Figure 2.

Referring to Figure 2 of the drawing, it will be noted that numeral 1 refers to a steam engine cylinder, numeral 2 to an exhaust passage connected with the cylinder by the port or ports 3. The broken part 5 indicates the top of the crankcase on which the cylinders may be mounted, or as in this case integral with it. Below the part 5 is the ordinary crankcase or chamber containing the crankshaft, connecting rods, bearings, etc., (not shown) the whole lubricated and bathed by a spray of oil created in any usual manner. This last is standard or common practice and is in no way novel or unusual.

The invention relates to the method used in catching or diverting the leakage past the piston into the exhaust passage, or especially in preventing the same from entering the crankcase. This object is obtained by means of the special construction of the piston and the auxiliary sleeve 6. As clearly shown in the drawings, the sleeve 6 has a flange attached to the upper part of the crankcase below the cylinder. The flange has a shoulder 13 concentric with the bore of the sleeve 6 fitting closely in the cylinder bore and arranged to guide or pilot the sleeve in the cylinder in assembling the parts. The flange is arranged at a distance from each end of the sleeve so that one end of the sleeve extends down into the crankcase while the other extends up into the cylinder. The piston 7 has a flange or cuff 12 on the head guided in the cylinder 1.

This prevents the seepage past the piston, which in the usual type of construction enters the crankcase, and forces it to pass into the exhaust cavity 2, if steam by way of ports 3 and 9 and if water through 9, for the following reasons.

The leakage past the upper part of the piston 7, owing to the pressure difference

existing at this point passes into the annular space 11, but does not pass through the small annular space 8, between the lower part of the piston and the sleeve 6, as the pressure in space 11, being in constant communication with the exhaust passage 2, through ports 3 and 9, is at a comparatively low pressure, as determined by the back pressure of the engine exhaust at all times.

This small difference in pressure is insufficient to force any appreciable amount of water or steam through the annulus 8 which is kept to small dimensions by good mechanical workmanship, and against the resistance of the oil film which is always present for lubrication purposes.

The construction or embodiment shown in Figure 2 is but one method of accomplishing the desired result and other drawings are shown illustrating other constructions achieving the same general result to a greater or lesser extent. In Fig. 1 the chamber wall 15 is made integral with the wall 16 of the crankcase and the crankcase is integral therewith, a sleeve 17 providing a bearing for the reduced portion 18 of the piston which has a cuff 19 slidably mounted in the cylinder 20 which in this instance is closed at the upper end by a removable cap 21 held in place by bolts 22. The cylinder 19 has an annular flange 23 resting on the inwardly bent flange which forms the upper wall of the exhaust chamber. In Fig. 1 the cylinder terminates slightly above the wall of the crankcase leaving an escape passage at 24 between the end of the cylinder and the top of the crankcase whereby water and steam may escape to the exhaust chamber. One or more upper passages 25 provide for the escape of steam to the exhaust chamber.

In Fig. 5 the cylinder 25 is integral with the upper wall 26 of the crankcase and with the wall 27 of the exhaust chamber, as well as with the cylinder wall 28 which forms the inner wall of the exhaust chamber. Connections from the cylinder to the exhaust chamber are as in Fig. 1. A sleeve 29 guides the reduced part 30 of the piston and is integral with the wall of the crankcase but does not extend upwardly therefrom as in Figure 1, nor is the piston provided with an overhanging cuff, this piston being merely enlarged at the upper end to fit in the cylinder.

In Fig. 4 the wall 31 of the exhaust chamber is integral with the upper wall 32 of the crankcase. The sleeve 33 guiding the reduced part of the piston is set into an opening in the upper wall of the crankcase and has a thickened part which may be machined to fit in such opening. Above the wall 32 the sleeve has a flange resting on said wall with a shoulder 34 piloting the sleeve in the cylinder 35 which has upper and lower passages 36 and 37 leading to the exhaust chamber as in Fig. 2. The cylinder has an annular flange 38 resting on and secured to the inwardly turned upper part of the exhaust chamber wall 31. A cap 39 forms a closure for the upper part of the cylinder, to which it is secured by bolts 40. The cylinder in Figure 4 is similar to that in Figure 2. The invention relates not only to the special constructions shown but also to any construction embodying the principle of so constructing a piston and the surfaces against which it operates that only the exhaust pressure is effective to force water of condensation into the crankcase.

I claim:

In a vapor pressure engine, a crankcase containing a lubricant, a cylinder, an exhaust chamber encircling the lower end of the cylinder, ports in the cylinder wall leading to said chamber, a piston operating within the cylinder and formed with a skirt of less diameter than the head, a sleeve for guiding said skirt fixed in relation to the cylinder said sleeve having a radial flange closing the space between the sleeve and the cylinder, and a shoulder on the flange concentric with the bore of the sleeve said shoulder fitting in the cylinder bore, substantially as set forth.

In testimony whereof I have hereunto set my hand.

ALLEN C. STALEY.