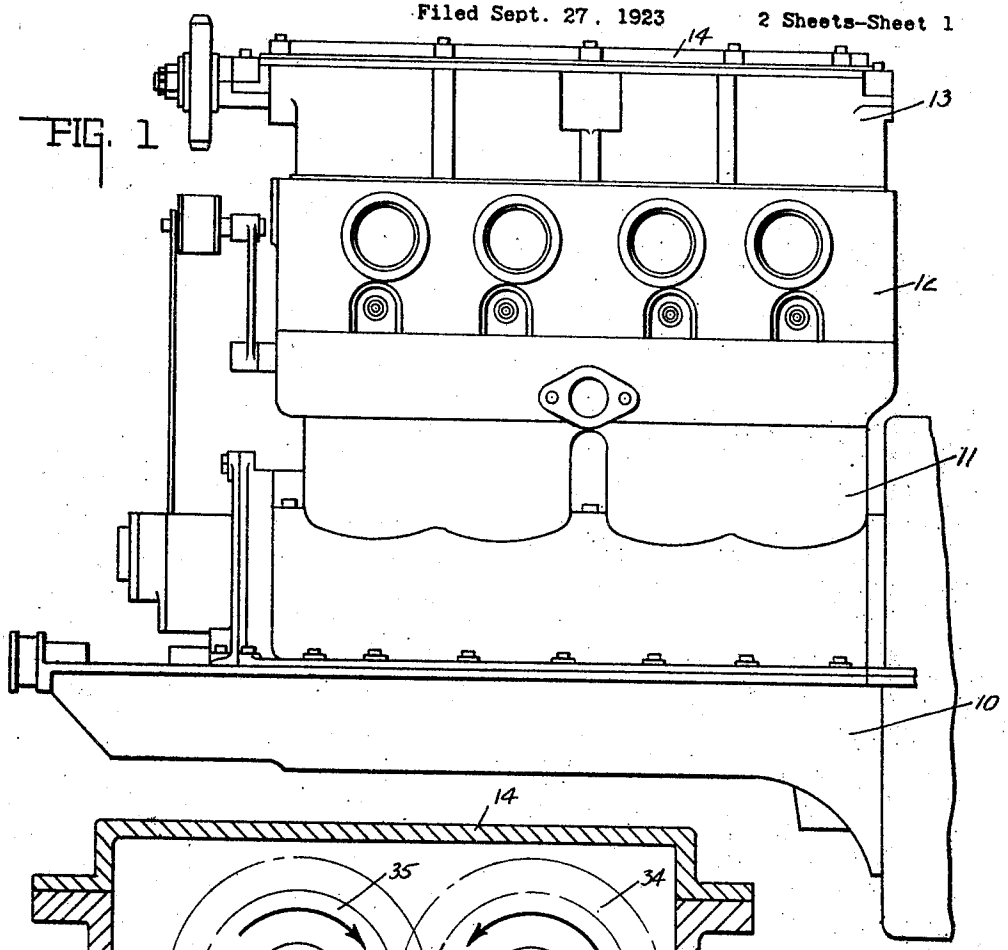
Sept. 23, 1924. 1,509,611

R. M. ROOF

DUAL OVERHEAD CAM SHAFT AND OILING SYSTEM THEREFOR

Filed Sept. 27, 1923 2 Sheets-Sheet 1

FIG. 1



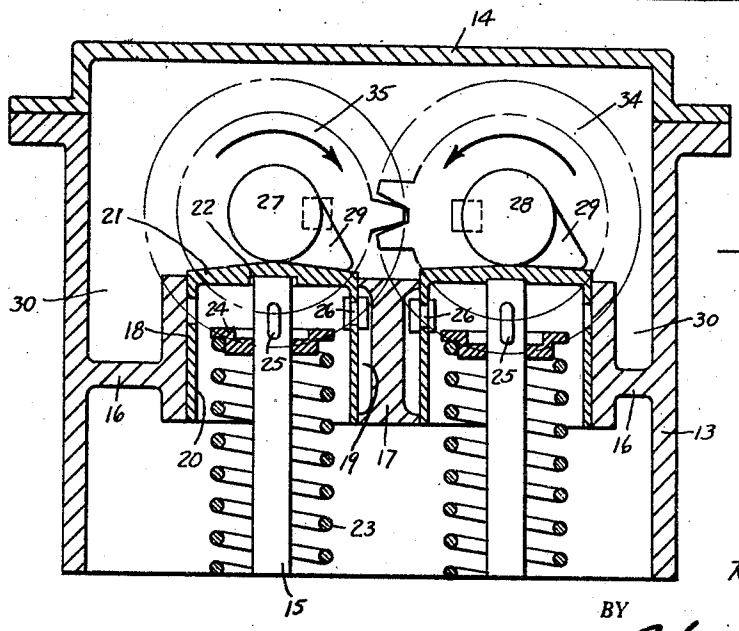




FIG. 2

INVENTOR.
ROBERT M. ROOF.

BY

ATTORNEYS.

Sept. 23, 1924. 1,509,611

R. M. ROOF

DUAL OVERHEAD CAM SHAFT AND OILING SYSTEM THEREFOR

Filed Sept. 27, 1923 2 Sheets-Sheet 2

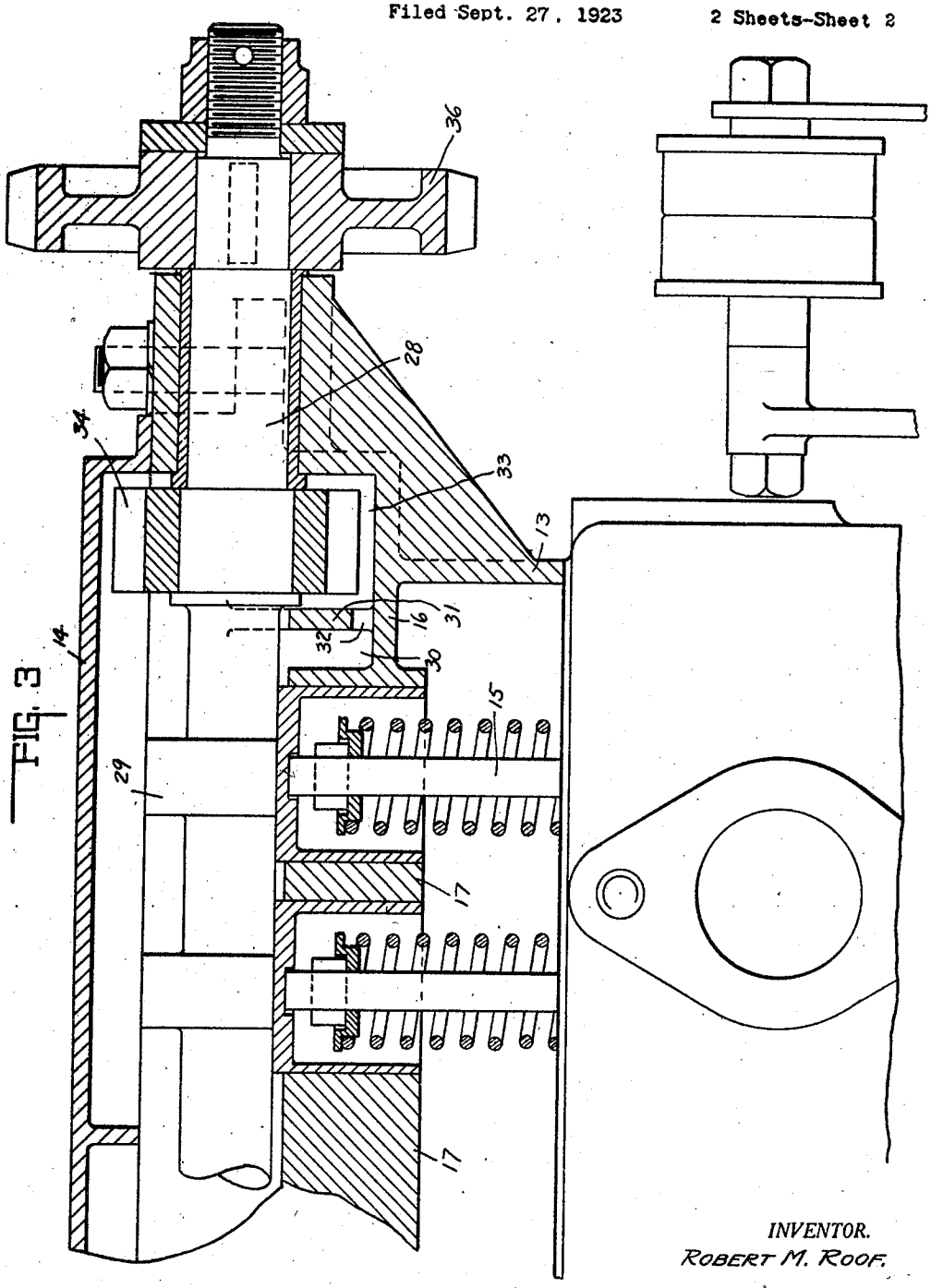



FIG. 3

INVENTOR.
ROBERT M. ROOF.

BY

ATTORNEYS.

Patented Sept. 23, 1924. 1,509,611

# UNITED STATES PATENT OFFICE.

ROBERT M. ROOF, OF ANDERSON, INDIANA, ASSIGNOR TO LAUREL MOTORS CORPORATION, OF ANDERSON, INDIANA, A CORPORATION.

## DUAL OVERHEAD CAM SHAFT AND OILING SYSTEM THEREFOR.

Application filed September 27, 1923. Serial No. 665,222.

*To all whom it may concern:*

Be it known that I, ROBERT M. ROOF, a citizen of the United States, and a resident of Anderson, county of Madison, and State of Indiana, have invented a certain new and useful Dual Overhead Cam Shaft and Oiling System Therefor; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings in which like numerals refer to like parts.

This invention relates to internal combustion engines of the overhead valve type, and more particularly to the overhead cam type of overhead valve type of engine.

The chief object of the invention is to improve internal combustion engines of the aforesaid type in several particulars, to-wit, reduction of vibration in the valve actuating mechanism, reduction of friction in the same, and improvement in the lubrication of the same.

The two chief features of the invention consist in providing an internal combustion engine with a pair of parallel cam shafts, and running said cam shafts in a bath of lubricant, which lubricant is circulated to the rotating and moving parts by means of a pump carried by said shafts.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims:

In the drawings, Fig. 1 is a side elevational view of an internal combustion engine equipped with the invention. Fig. 2 is an enlarged transverse sectional view of the valve and cam mechanisms and the mounting thereof. Fig. 3 is an enlarged longitudinal section of a portion of the parts illustrated in Figs. 1 and 2.

In the drawings 10 indicates the crank case of an internal combustion engine to which is secured the cylinder block 11 and the cylinder head 12. Above the cylinder head which may or may not be detachable, there is positioned a cam housing 13 which in turn supports a cover 14.

It will be understood that fuel is supplied to the cylinder controlled by poppet valves having the stems 15 which extend upwardly through the head and project beyond the same. Herein the cylinders are shown in longitudinal or row formation. Each cylinder herein is shown provided with a pair of intake valves and a pair of exhaust valves, the intake valves of all the cylinders being positioned in line, and the exhaust valves of all the cylinders being positioned in line, which lines are parallel.

The cam housing 13 between the top and the bottom thereof, the housing being substantially rectangular in outline, is provided with a partition plate 16. The partition plate 16 carries a central suporting portion 17. Said supporting portion 17 herein is shown projecting above and projecting below the partition 16. The supporting portion 17 is suitably apertured in registration with the valves so as to provide the cylindrical openings 18 extending therethrough. Communicating with the cylindrical opening 18 and formed in the support 17 is a keyway 19. A valve tappet herein shown in the form of an inverted cup or sleeve having its upper end closed is indicated at 20 and is slidably supported in the cylindrical opening 18. The closed upper end 21 of said tappet is recessed at 22 to receive the free and upper end of the valve stem 15 and seat the same. Surrounding the valve stem 15 is the usual coiled spring 23 retained in position by a spring seat 24 secured by the key 25 carried by said stem 15. A key 26 is carried by the valve tappet 20 and is slidably supported in the keyway 19 to prevent rotative movement of the tappet, but permit longitudinal movement thereof.

A pair of cam shafts 27 and 28 are positioned above said tappets and in parallel relation with each other and with their axes lying in substantially the same plane including the valve stems of the intake and the exhaust valves. Thus one cam shaft actuates the intake valve and another cam shaft actuates the exhaust valve, the cam portions 29 of each of said shafts serving to engage the upper and free face of the closed end 21 of the tappet 20 to depress the same in the support 17 and thereby compress the spring 23 and open the valve, by moving the stem 15 downwardly.

As shown clearly in Figs. 2 and 3, a rectangular channel 30 substantially surrounds the central support 17, and if desired said channel 30 may be so formed that it will pitch toward one end, and preferably that now to be described. In one end of the cam housing 13 there is provided an apertured partition 31 having the aperature 32

therein which communicates with the groove 30 and permits said channel or groove 30 to communicate with a well 33, likewise formed in the cam housing. In said well and carried by the shafts 27 and 28 are the gears 35 and 34 respectively. Said gears mesh with each other and form a drive for driving one cam shaft from the other. and naturally at the same speed. These gears 34 and 35 also constitute a pump for circulating lubricant supplied to the cam housing 13 and retained therein by the cover 14.

One of the shafts 27 or 28, and herein the shaft 28 is shown extended beyond the housing 13 and carries upon its free end a sprocket wheel or gear 36 by which the cam shafts are operated. The sprocket wheel 36 may be driven by any suitable chain from some rotating portion of the engine, such as the crank shaft, and at the usual speed ratio.

From the foregoing it will be noted that the direction of rotation of the two cam shafts is opposite to each other. It will be furthermore noted that, by reason of the opposite rotation of said cam shafts, a balanced construction results which reduces vibration of the overhead cam construction to a minimum. The rotation of the gears 34 and 35 in the well 33 serves to direct a stream or spray of lubricant from said well through the cam housing so as to lubricate all of the rotative and moving parts in said cam housing positioned above the partition 16.

Reference will now be had to Fig. 2. Therein it will be noted that the top 21 of the hollow tappet 20 is substantially flat, although slightly tapered. This construction permits the top of the tappet to be ground to the desired pitch or slope (therefore conical) to vary the valve timing without in any way changing the cams on the cam shaft.

The invention claimed is:

1. In an internal combustion engine, the combination of a cylinder head including valves with upwardly extending stems, a pair of overhead cam shafts, a support positioned therebetween, tappet means slidably supported by said support and interposed between said shafts and said valves and removable with said support without removing the valves, a pair of meshing gears on said shafts, and a cover for said support for enclosing said shafts and gears whereby said gears are adapted to spray lubricant upon said shafts and tappets.

2. In an internal combustion engine, the combination of a cylinder head including valves with upwardly extending stems, a pair of overhead cam shafts, a support positioned therebetween and including a well, tappet means slidably supported by said support and interposed between said shafts and said valves and removable with said support without removing the valves, a pair of meshing gears on said shafts and positioned in said well, and a cover for said support for enclosing said shafts and gears whereby said gears are adapted to spray lubricant upon said shafts and tappets.

3. In an internal combustion engine, the combination of a cylinder head including valves with upwardly extending stems, an elongated enclosing wall supported by said head including a partition between the top and bottom thereof, a plurality of tappets slidably supported in said partition and detachably associated with said upwardly extending valves, cam shaft means positioned above said tappets for operating the same, and a cover for closing said enclosing wall.

In witness whereof, I have hereunto affixed my signature.

ROBERT M. ROOF.