UNITED STATES PATENT OFFICE.

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VALVE-GEAR FOR ENGINES.


To all whom it may concern:

Be it known that I, JOHN D. MACLACHLAN, residing at Detroit, in the county of Wayne and State of Michigan, a citizen of the United States, have invented certain new and useful Improvements in Valve-Gear for Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to steam engines.

The objects of my invention are to produce an engine embodying features of simplicity, compactness, strength and cheapness of construction.

A further object is to actuate the inlet and exhaust valves by independent cam shafts, whereby independent timing of the inlet and exhaust valves may be attained and wear reduced.

Other objects are to so organize the engine that the valve-actuating cams may operate in direct alignment with the valves and valve stems; and to so locate the inlet and exhaust valves relatively to the cylinder that the clearance space can be reduced to a minimum and a single passage may be utilized for both steam and exhaust.

To these ends, therefore, my invention consists in certain novel features and combinations of parts, all of which will be more fully set forth hereinafter and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a partial sectional side elevation. Fig. 2 is a vertical cross-sectional view taken through one of the cylinders. Fig. 3 is a top plan view of the cam shifting mechanism.

As shown, A indicates the cylinders mounted on the crank base (R). I have illustrated an engine comprising four cylinders, the upper parts of which are jacketed at (B, C), the jacket having the outlets (D, K). As the cylinders are alike, a description of one will suffice for all.

The cylinder (A) is provided with an exhaust port (E) communicating with the jacket (B, C). The piston (F) uncover the port (E) at the completion of its working stroke.

An inlet valve chest (H) is formed with the cylinder head (G), and in the case of a multiple cylinder engine, such as shown, the chests (H) are connected by a suitable passage (I) having an inlet (J). The inlet valve chest (H) is located at one side of the cylinder, as shown in Figs. 1 and 2, and the corresponding exhaust valve chest (H') is located at the other side. The exhaust valve chests are connected by an exhaust passage (I') communicating with the jacket (B, C). The passage (L) formed in the head (G) connects the inlet and exhaust valve chests of one cylinder. An opening (M) in the cylinder head connects each cross passage (L) with its cylinder.

N is a steam valve and N' is an exhaust valve, both being of the straight lift or puppet type and located in the respective valve chests (H) (H'). Each valve is provided with a vertical stem (O) passing downward through a packing gland (P) and encircled by a compression spring (Q) adapted to retain the valve normally in its seat.

Located within the crank base and parallel with each other are the valve actuating cam shafts (U) (U'). The cam shafts lie on opposite sides of the crank base and directly beneath their corresponding valve stems. Interposed between the cam shaft and the lower ends of the valve stems (O) are vertical sliding rods (X) (X') co-axial with the valve stems. These rods are carried by suitable guides (X') (X') and each rod is provided at its lower end with a hardened steel ball (Y'). The guides (X') (X') are removable mounted on the crank base (R). The crank shaft (S) is suitably journalled in the crank base (R), the shaft being provided with cranks (S') connected by piston rods (T) to the pistons (F). Each cam shaft is connected by a train of gears (W) with the crank shaft (S) in such manner that the cam shafts rotate in the same direction as the crank shaft (S) preferably at the same speed. I prefer to operate the exhaust cam shaft (U') by means of a train of gears located at one end of the crank base as shown at the left in Fig. 3, and the cam shaft (U) operating the steam inlet valve (H) by a train of gears located at the right in Fig. 3. The cam shafts are longitudinally slidable in bearings (V) (V') at opposite ends of the base (R), as shown in Figs. 1 and 3.

The cams (Y) are preferably arranged in pairs as at (1), (2) on shaft (U). Longitudinal shifting of the cam shaft (U) in the bearings (V) brings either cam (1) or (2) into action with the rod (X). The two cam shafts (U) and (U') are moved lengthwise simultaneously, being connected at their outer ends by a yoke (b) held in place by collars (a) or other suitable means. The yoke (b) is actuated by a lever (c) pivoted to a suitable bracket (d). It will be understood that the cams are of suitable form to give the proper amount of opening and closing and the proper duration of opening and closing to the valves. The actual time of opening and closing the valves is, however, controlled by the longitudinal movement of the independent cam shafts.

By arranging the valve, valve stem and rod (X) in co-axial alignment and locating the cam directly beneath and in engagement with the rod (X), I eliminate all cross forces and furthermore, the full movement due to the configuration of the cam is imparted to the rod (X) and to the valve. Hence the valve may be of comparatively small area on account of the higher lift imparted by the cam, as distinguished from a cam which must act through intermediate levers which reduce the valve travel.

Another advantage in the use of the two independent cam shafts for actuating the inlet and exhaust valves, respectively, is that either cam shaft can be angularly 110
adjusted independently of the other, whereby the operation of the inlet valve may be advanced or retarded or by suitable angular adjustment of the exhaust cam shaft, the operation of the exhaust valve may be advanced or retarded.

Having thus fully disclosed my invention, what I claim as new is—

1. In a steam engine, the combination with the cylinder, crank base, and crank shaft; of a pair of cam shafts located in the base and rotated by the crank shaft, inlet cam shaft on one cam shaft, exhaust cam on the opposite cam shaft, vertically slidable valve-actuating rods mounted in the base, their lower ends being in register with their respective cams; valve stems co-axial with the valve actuating rods, the upper ends of the valve actuating rods adapted to impinge directly against the lower ends of the valve stems; inlet valves seated in the cylinder head at one side of the cylinder and actuated by the inlet cam; exhaust valves seated in the cylinder head at the opposite side of the cylinder and actuated by the exhaust cam; together with a yoke located outside the crank base and connecting the two cam shafts to move them in or out simultaneously.

2. In a steam engine, means for actuating the inlet and exhaust valves, comprising a pair of independent inlet and exhaust cam shafts located in the crank base of the engine, means for rotating the cam shafts simultaneously, and a yoke outside the crank base, said yoke connecting the two cam shafts to move them in or out simultaneously.

3. In a steam engine, means for actuating the inlet and exhaust valves, comprising a pair of independent inlet and exhaust cam shafts located in the crank base of the engine; a train of gears located at one end of the crank base for rotatively connecting the inlet cam shaft and the crank shaft; a train of gears located at the opposite end of the crank base for rotatively connecting the exhaust cam shaft with the crank shaft; and a yoke located outside the crank base, said yoke connecting the two cam shafts to move them in or out simultaneously.

4. In a steam engine provided with inlet and exhaust valves, means for actuating the inlet and exhaust valves, comprising a pair of independent inlet and exhaust cam shafts located in the crank base of the engine, and means operable from without the crank base engaging the cam shafts to move them simultaneously and longitudinally.

5. In a steam engine provided with inlet and exhaust valves, means for actuating the inlet and exhaust valves, comprising a pair of independent inlet and exhaust cam shafts located in the crank base of the engine, means for rotating the cam shafts simultaneously and means engaging the two cam shafts for moving them simultaneously in a longitudinal direction.

6. In a steam engine provided with inlet and exhaust valves, means for actuating the inlet and exhaust valves, comprising a pair of independent inlet and exhaust cam shafts located in the crank base of the engine, means for rotating the cam shafts simultaneously and means located and operated outside the crank base and engaging the cam shafts to move them simultaneously and longitudinally.

In testimony whereof I affix my signature in presence of two witnesses.

Witnesses:

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