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C. L. WALKER

2,197,282

INTERNAL COMBUSTION ENGINE

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Fig. 1.

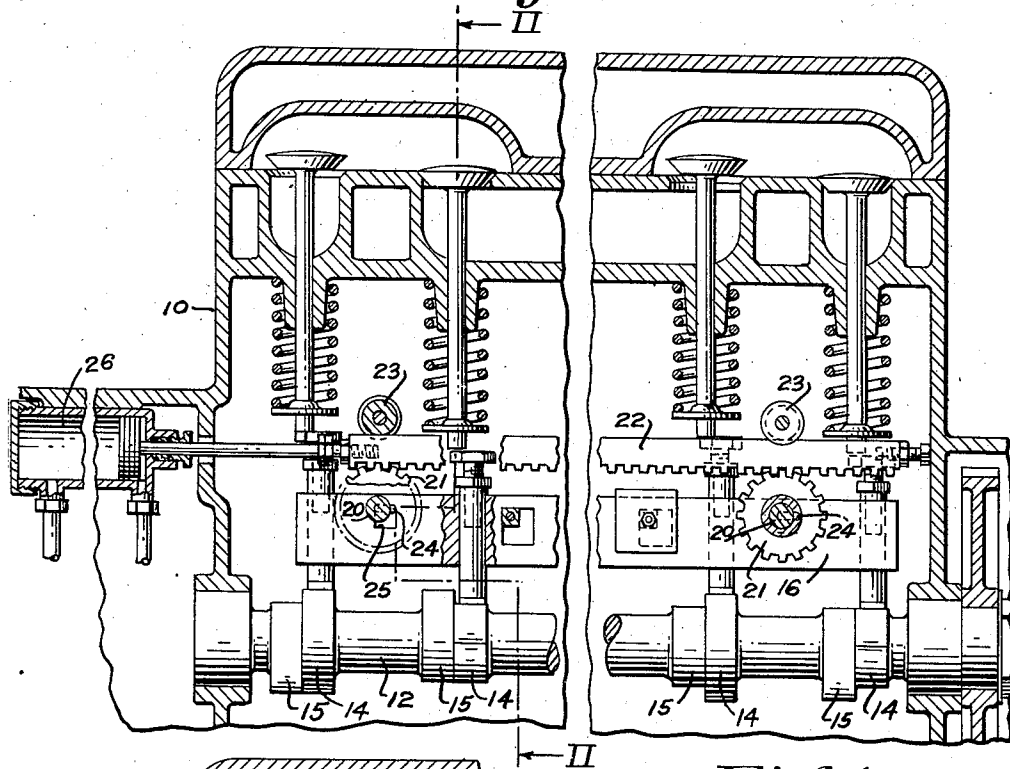


Fig. 2.

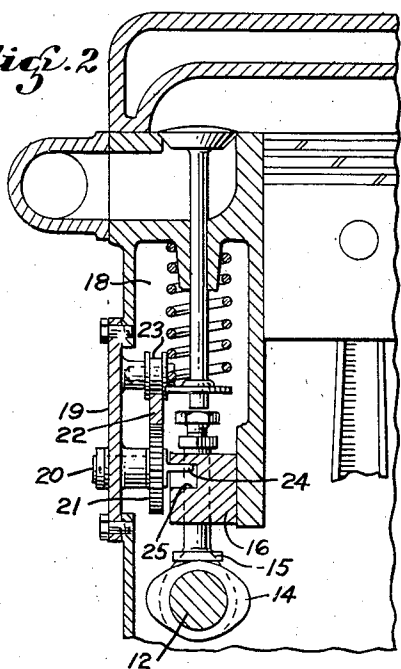


Fig. 4.

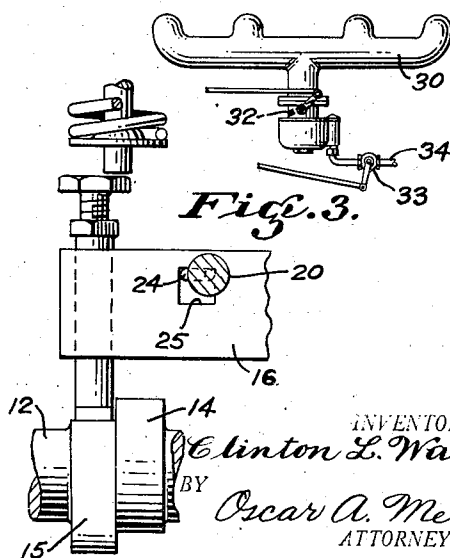
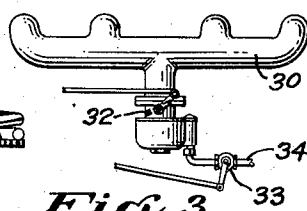


Fig. 3.



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INTERNAL COMBUSTION ENGINE

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4 Claims. (Cl. 123—90)

This invention relates to internal combustion engines of the four-stroke cycle type.

It is well known that automotive trucks and other large automotive vehicles are difficult to properly control on down grades with the present day type of braking equipment. The brake resistance required to properly control a heavy automotive vehicle overheats the brakes, causing spinning out of the drums and rapid wearing and burning out of the brake lining. This results in breakdowns, increases operating costs and not infrequently results in serious accidents.

It is the object of my present invention to provide a conventional type of automotive engine operating on the four-stroke cycle principle with a selectively operative mechanism enabling the engine to operate either normally or as a two-stroke cycle compressor, so that it may be employed as a braking medium to retard the speed of the vehicle on which it is mounted on down grades.

In practicing my invention, I provide a mechanism which may be operated to change the timing of the intake and exhaust valves so that the latter may be timed so that the engine may operate normally as a four-stroke engine or as a two-stroke cycle compressor. That is to say, I provide two sets of cams, one for operating the valves so that the engine will operate as a four-stroke cycle engine and the other set to operate the engine as a two-stroke cycle compressor. Selective means are provided for operatively associating either of these sets of cams with the valves to accomplish my object.

One form which the invention may assume is exemplified in the following description and illustrated by way of example in the accompanying drawing, in which:

Fig. 1 is a fragmentary view in side elevation and section of an internal combustion engine showing the preferred embodiment of my invention.

Fig. 2 is a vertical sectional view through the engine taken on line II—II of Fig. 1.

Fig. 3 is an enlarged fragmentary view showing the operative connection between the tappet carrier and its operating cranks.

Fig. 4 is a diagrammatic view showing the control for controlling the fuel intake to the engine.

Referring more particularly to the accompanying drawing, I have illustrated a portion of a four-stroke cycle internal combustion engine, preferably of the automotive type, and which is conventional in all respects with the exception of the cam shaft and valve operating mechanism. In the drawing the engine is illustrated as the L-head type, although it will be readily apparent from my disclosure herein that the invention is

equally applicable to an overhead valve or F-head type.

In the drawing 10 indicates an internal combustion engine and 12 indicates the cam shaft thereof. The engine, of course, may be of the multiple cylinder type as is standard in automotive practice. The engine is fitted with the usual intake and exhaust valves, as illustrated, and which are operated from cams on the cam shaft 12 through the medium of tappets in the usual fashion.

The cam shaft 12 is provided with two sets of cams 14 and 15, one set of which, or that indicated at 14, will operate the intake and exhaust valves in the conventional timing so that the engine will operate as a four-stroke cycle engine. The cams of the other set 15 are so formed that when operatively associated with the intake and exhaust valves, the timing of the latter will be such that the engine will operate as a two-stroke cycle compressor. It will be noticed that the cams of both sets for each valve are arranged in juxtaposition, so that the tappet of the valve may be placed in operative relation to either cam.

The tappets are mounted for operation in a movable tappet carrier 16 which is mounted on the engine block in a manner so that it may be shifted both vertically and longitudinally. That is to say, the tappets may be shifted from operative relation with respect to the set of cams 14 to operative relation with respect to the set of cams 15. This shifting movement, however, does not change their operative relation with respect to the valves of the engine. It is apparent from this that when the tappets are in operative relation with respect to the cams 14, they will be actuated by the cams to operate the valves in such timed relation to the crankshaft of the engine that the engine will operate as a normal four-stroke cycle motor, and when the tappets are shifted into operative relation with the cams 15, that the valves will operate in such timed relation to the crankshaft that the engine will be in effect a two-stroke cycle compressor.

From the drawing it will be seen that the tappet carrier is mounted in the tappet chamber 18 of the cylinder block, which is covered at the exterior of the block by a cover plate 19. This cover plate rotatably supports two stub shafts 20 which project into the chamber 18. Secured on each stub shaft is a spur gear 21 in mesh with a rack 22, which rack is guided by rollers 23. At the ends of these stub shafts 20 are cranks 24 engaging crank sockets 25 formed in the tappet carrier 16. It is obvious that when these cranks are turned by turning movement of the shafts 20, assuming that the carrier is in the position shown in the drawing, the tappet carrier will be first elevated so as to disengage

the tappets from the cams 14 and thereafter the carrier will be shifted longitudinally the proper amount to align the tappets with the cams 15, and then lower the tappet carrier so that the tappets will engage these latter cams. This shifting movement of the tappet carrier 16, however, is insufficient to disengage the upper ends of the tappets from the valve stems or push rods as illustrated.

- 10 To operate the shafts 20, the rack 22 is connected to a double-acting oil cylinder 26 connected with a source of oil pressure through a control valve preferably operative from the driver's compartment of the vehicle. By operating this control valve, the driver may position the tappet carrier 16 so that the cams 14 through the valves will operate the engine in the normal four-stroke cycle manner, or to position the valve tappet carrier so that the cams 15 will operate the valves so that the engine will be in effect a two-stroke cycle compressor.

In operation of the device, the engine is constructed substantially as illustrated and described, and assuming that the tappet carrier 16 is in the position illustrated in Fig. 1, the cams 14 will operate the tappets and through them operate the intake and exhaust valves of the engine so that the latter will operate as a four-stroke cycle engine. When it is desired to use the engine for braking purposes, the operator may, by operating the valve which controls the cylinder, cause the tappet carrier to be shifted so that the tappets will be in operative relation with respect to the cams 15, which will change the valve timing so that the engine will operate as a two-stroke cycle compressor.

It is seen that the piston of the oil cylinder is connected to the rack 22 so that when this piston is actuated, the rack will move longitudinally and revolve the shafts 20 sufficiently so that the cranks 24 will effect the proper movement of the tappet carrier 16. This movement is, as previously described, an upward movement of the tappet carrier to disengage the tappets from the cams and then a longitudinal movement of the tappet carrier to place the tappets in register with the other set of cams, and then lowering movement of the carrier to place the tappets in operative relation to the valves.

When the valve timing is changed so that the motor operates as a two-stroke cycle compressor, it will offer the resistance of compression to provide sufficient braking resistance for fully controlling a heavy vehicle on a down grade.

In the drawing I have illustrated diagrammatically the intake manifold of the engine at 30 which is entirely conventional and in which is mounted the usual throttle butterfly valve 32 which is controlled from the driver's compartment of the vehicle so that it may be operated by the vehicle operator. By manipulating the valve 32, the effectiveness of the engine as a compressor may be varied. That is to say, since the resistance of the engine, when operated as a compressor, is proportional to the compression pressure, it is obvious that the operator may control the braking resistance of the engine by actuating the throttle valve 32. By closing the conventional throttle intake, the compression pressure will be comparatively low and the braking effect of the engine in the vehicle would be cor-

respondingly low. If it is desired to increase the resistance or braking effect of the motor, the operator needs only to increase the opening of the throttle valve. By this means the compression pressures will increase and the braking effect of the engine correspondingly increase.

In Fig. 4 I have shown a valve 33 interposed in the fuel line 34 to the carburetor, which valve 33 may be led to the driver's compartment of the vehicle so that the fuel supply to the carburetor 10 may be cut off when the engine is used as a compressor so as not to discharge the unburned fuel into the exhaust line.

In the present instance I have shown only one mechanical medium for practicing my invention, but it will be apparent to those skilled in the art that various other mechanical equivalents of it may be substituted for the specific mechanism shown, without departing from my invention. For example, it is readily apparent that the cam shaft may be in itself shifted to effect the desired result in substantially the same manner as herein disclosed, and likewise various other mediums may be used for shifting the tappets as herein described, and while I have illustrated and described a specific embodiment of my invention, it is to be understood that various changes may be made therein by those skilled in the art without departing from the spirit of the invention as defined in the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. An internal combustion engine having cylinders, pistons, connecting rods, crankshaft, and intake and exhaust valves, including in combination, a shiftable element, tappets carried by said element, a cam shaft having one set of cams to operate the valves in one sequence and a second set of cams to operate the valves in a second sequence, and means for moving said element to raise said tappets out of contact with said cams and to shift said tappets from one to the other set of cams.

2. An internal combustion engine having cylinders, pistons, connecting rods, crankshaft, and intake and exhaust valves, including in combination, a shiftable element, tappets carried by said element, a cam shaft having one set of cams to operate the valves in one sequence and a second set of cams to operate the valves in a second sequence, means for moving said element to raise said tappets out of contact with said cams and to shift said tappets from one to the other set of cams, and power means for operating said moving means.

3. In an internal combustion engine, a cam shaft secured against material axial movement, two sets of cams on said cam shaft, tappets aligned with one set of cams, a tappet carrier, and means for shifting said carrier to raise said tappets and move said tappets from one to the other set of said cams.

4. In an internal combustion engine, a cam shaft secured against material axial movement, two sets of cams on said cam shaft, tappets aligned with one set of cams, a tappet carrier, means for shifting said carrier to raise said tappets and move said tappets from one to the other set of said cams, and power means for operating said shifting means.

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