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D. S. NEAL

2,269,035

EDUCATIONAL INTERNAL COMBUSTION ENGINE

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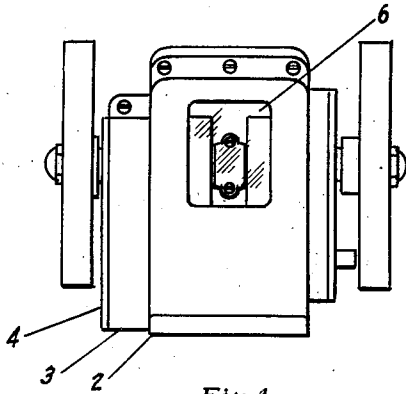


Fig. 1.

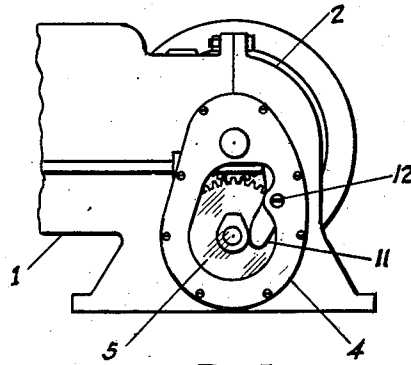


Fig. 2.

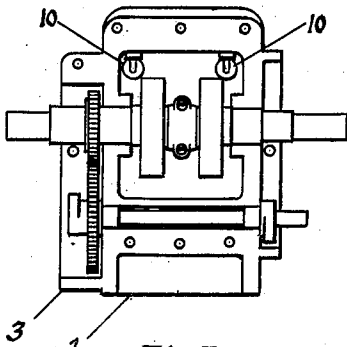


Fig. 3.

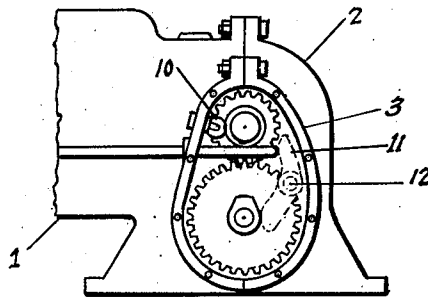


Fig. 4.

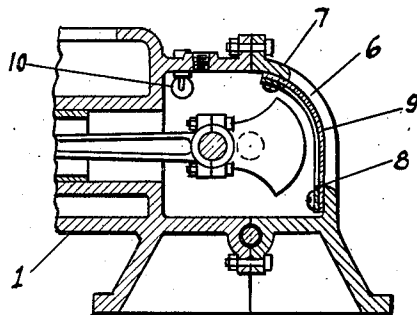


Fig. 5.

INVENTOR.

DAVID S. NEAL

BY

W. S. Babcock
ATTORNEY.

UNITED STATES PATENT OFFICE

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EDUCATIONAL INTERNAL COMBUSTION
ENGINE

David S. Neal, Harrod, Ohio

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3 Claims. (Cl. 35-13)

The invention to be hereinafter described relates to educational equipment and more particularly to an educational internal combustion engine.

One important field of education which has been growing rapidly is that of industrial arts and especially machinery. With the tremendous national defense program now beginning, greater and greater interest and emphases will steadily develop. In a large proportion of machinery, many of the operating or moving parts are wholly hidden or only partly visible, or are only momentarily partly or wholly visible. Framework, casing, housing and guards obstruct the view. The most generally accepted method of partially offsetting such obstructions is the use of drawings, blue prints and the like, showing the parts not visible. Obviously, however, movement can not be embodied in such illustrations. Successive positions may be shown, but not the actual movements or travel of a part from one position to another. And, of course, each set of drawings etc. could represent only relative successive positions under any one set of conditions. Changing the time or rate of travel of moving parts, or changing other controlling factors correspondingly changes relative movements and relative positions. For each such change corresponding new drawings would be required, even to disclose only corresponding relative new positions. And, of course, when a full size machine, such as an internal combustion engine is relied upon for teaching, the class or students must be taken to the engine. It is too heavy, cumbersome and unwieldy to be brought into a class room, as well as otherwise objectionable.

The main objects of the present invention are to overcome the above and other serious drawbacks and disadvantages and provide an internal combustion engine for educational or teaching uses, having the crank shaft and timing gears and related parts all readily completely exposable in operative relation and position, by removal of a single housing part or case section, the same moving or operative parts being continually readily observable through such removable section during operation of the engine.

In order to more clearly disclose the construction, operation and use of the invention, reference should be had to the accompanying drawing forming part of the present application. Throughout the several figures of the drawing, like reference characters designate the same parts in the several views.

In the drawing:

Fig. 1 is an end elevation of a single cylinder, four-cycle engine embodying the invention, omitting the spark-gap adjusting devices;

Fig. 2 is a left hand side elevation of Fig. 1, partly broken off and with the fly wheel at that side removed;

Fig. 3 is a view similar to Fig. 1, but with the removable crank case section, both fly wheels, and both side or cover plates removed;

Fig. 4 is a view similar to Fig. 2, but omitting the fly wheel shown in Fig. 2, and the plate 4 of that view; and,

Fig. 5 is a vertical, longitudinal cross section of Fig. 4, showing the clamping plate or frame for the window, the plate and window being exaggerated considerably in thickness.

As a matter of simplicity, the invention has been shown as applied to an ordinary single cylinder four-cycle internal combustion engine with the cylinder disposed horizontally. It is equally applicable to multiple cylinder engines and to engines mounted in other than horizontal planes. As here illustrated, the invention is applied to the crank-shaft and timing gear areas. For that reason, only enough of the standard construction has been disclosed to show the relation between it and the invention, the remainder being broken off. In addition to the parts shown, this engine has all parts and accessories necessary to its operation. They, their operations, and their relative dispositions, are all well known, form no part of this invention, and, therefore, do not require to be and are not illustrated.

Since the engine is for purely demonstrative or educational use, to show or disclose the operations of such machines, and not for normal power delivery or turning out appreciable work, it can be made very small and of very light weight. It is, however a complete and fully operative engine in every detail. In fact, the drawing of this application has been made from an engine embodying the invention and which I have carried about by hand to wherever desired. I find a simple and convenient way to handle it is to make a case in the form of a bottomless box to fit down from the top over and about it and have a grip or handle like that of a travelling bag or suit case. By running a rod through the lower edges of the case and beneath the base of the engine, the case is locked to the engine and it may be easily picked up and carried about as you would carry a travelling bag or suit case, in one hand. This particular one, complete, weighs only a few pounds and, therefore, of course, may be readily picked up,

set on a table, desk or where else desired, and turned about to any desired position for most convenient observation and best use of available lighting arrangements.

In the present invention, the crank case, designated as a whole by the numeral 1, housing the crank-shaft and carrying the timing gears and immediately cooperating parts, is cut, vertically, completely through on the line of the axis of the crank-shaft, providing a readily removable crank case section operable as a bearing clamp 2 and crank-shaft case section. When removed, as in Fig. 3, the crank-shaft, in operative position, in its bearings, is exposed and visible, from end to end. This, of course, gives a full length view of the crank-shaft, including the bearings in the crank case. Obviously, the engine could not practically operate that way. Suppose that it could, there would certainly be great danger of serious injury by the moving parts. Also, everything in the neighborhood would be sprayed and spattered with oil. Looking in the direction of the arrows, Fig. 3, the direction in which Fig. 4 is taken, a clear end view is given of all of the timing gears, crank-shaft bearings, push-rod tappet and related parts. A raised portion or shoulder 3, projecting appreciably beyond the surface of the base 1 and crank-case and enclosing the area of the crank-shaft bearing, timing gears and timing gear bearings, provides an oval or egg-shaped face, shoulder or surface, for a purpose to be later disclosed. Preferably, the rear part of this shoulder practically merges into and forms part of the rear end and edge of the removable crank case section 2, while the forward curve lies considerably forward of the junction between section 2 and case 1. Thus, where the removable section is in operative position, shoulder 3 provides an oval rib or raised portion surrounding the timing gear, the ends of the crank-shaft and timing gear shaft, push-rod tappet and corresponding cam. Cooperating with shoulder 3 is a clamp plate 4 adapted to be secured by screws or any other suitable means to clamp against the shoulder. This plate provides the means for adequately securing in place a window or transparent pane 5 which completely spans and covers the oval area within shoulder 3. Plate 4, therefore, is cut out to leave only a narrow strip of the same width and outline as the lower half, approximately, of shoulder 3. This cut out portion is further extended somewhat irregularly upwardly to the left, as in Fig. 2, so that, when in place, it will expose the push-rod end and contacting tappet. This tappet 11 is journaled to rock on a pivot post 12 on the inner face of 4, so that the tappet and its post are removable with plate 4. With the fly wheel at that side removed, the moving parts within that oval space may be clearly observed during operation, with none of the dangers or disadvantages accompanying observation of unprotected exposed parts. They are viewed through a transparent protecting pane or guard clamped between 3 and 4, with a usual gasket or washer, of course.

The rearwardly dished or curved portion of section 2 which provides clearance or space for operation of the crank, is cut out to provide a large rectangular opening 6 with a narrow surrounding frame 7. A skeleton clamp plate or frame 8 corresponding to and cooperating with frame 7 and secured thereto by screws or other suitable means, binds a transparent window and protecting guard 9 in place across and spanning the opening 6. Through this, all movements of

the entire crank-shaft and all connections may be clearly observed and watched, with perfect safety while the engine is in full operation.

It is desirable, though not essential, to have one or more small electric lights 10 advantageously placed behind the panes 5 and 9 to throw light directly on the moving parts for better observation. They may receive their current from any suitable source, of course, the electrical connections being of any usual and well known type and arrangement and, therefore, unnecessary to illustrate, as forming no part of the invention.

Through these transparent sections or windows, the crank-shaft and timing gears and all immediately related parts may be readily observed and studied at close range and in perfect safety and comfort under every possible desired operating condition. The regulatory and control devices are readily accessible. As each such device is manipulated, its effect is instantly clearly visible, just as though it were in the open and exposed by removal of the section 2. And, too, if the effect is not that desired, change may be made without delay, to get that desired effect. Of course, with an open crank-case, the oil in the crank-case, as the crank rotates rapidly through it, is splashed and scattered or thrown centrifugally over everything nearby, wasting the oil and doing great damage. With this closed case, that is prevented. At the same time, the transparent section 9, by such splashing and spraying, is kept washed and amply clean and clear to provide, at all times, clear and unobstructed vision.

It is thought that the construction, operation and use of the invention will be clear from the preceeding detailed description.

Many changes may be made in the construction, arrangement, and disposition of the various parts of the invention, within the scope of the appended claims, without departing from the field of the invention and it is intended to include all such within this application, wherein only one preferred form has been illustrated, purely by way of example and with no thought to in any way or degree limit the application or the scope of the claims thereby.

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

1. In combination in an engine of the character described, a crank case body provided with bearing seats, mounting in wholly exposed position a crank shaft and immediately accessory parts, a removable crank case section cooperating therewith to clamp said shaft in operative position and to enclose the cranks of said shaft, means clamping said section to said body, said removable section being provided with a window opposite the cranks of the aforesaid shaft and lights disposed in the crank case body on the opposite side of said cranks from said window.

2. In combination in an engine of the character described, a crank case body provided with bearing seats, mounting in wholly exposed position a crank shaft and immediately accessory parts, said body having a laterally projecting rib extending about one side of the timing gear area, a removable crank case section cooperating with said crank case body to clamp said shaft in operative position and to enclose the cranks of said shaft and having a laterally projecting rib about the remaining boundary of said timing gear area, a window in said removable section opposite the cranks of the aforesaid shaft, lights disposed in

the crank case body on the opposite side of said cranks from said window, means securing said removable section in position with its rib in continuation of the crank case rib and its window in alinement with the aforesaid cranks, and a window removably secured across said rib for observation of the timing gears and related parts therethrough.

3. In combination in an engine of the character described, a crank case body provided with bearing seats, mounting in wholly exposed position a crank shaft and immediately accessory parts, said body having a laterally projecting rib

5 extending about one side of the timing gear area, a removable crank case section cooperating with said crank case body to clamp said shaft in operative position and to enclose the cranks of said shaft and having a laterally projecting rib about the remaining boundary of said timing gear area, means securing said removable section in position with its rib in continuation of the crank case body rib, and a window removably secured across said rib for observation of the timing gears and related parts therethrough.

DAVID S. NEAL.