

F. PURDY.  
 MEANS FOR FACILITATING THE STARTING OF INTERNAL COMBUSTION ENGINES.  
 APPLICATION FILED DEC. 23, 1908.

976,493.

Patented Nov. 22, 1910.

2 SHEETS—SHEET 1.

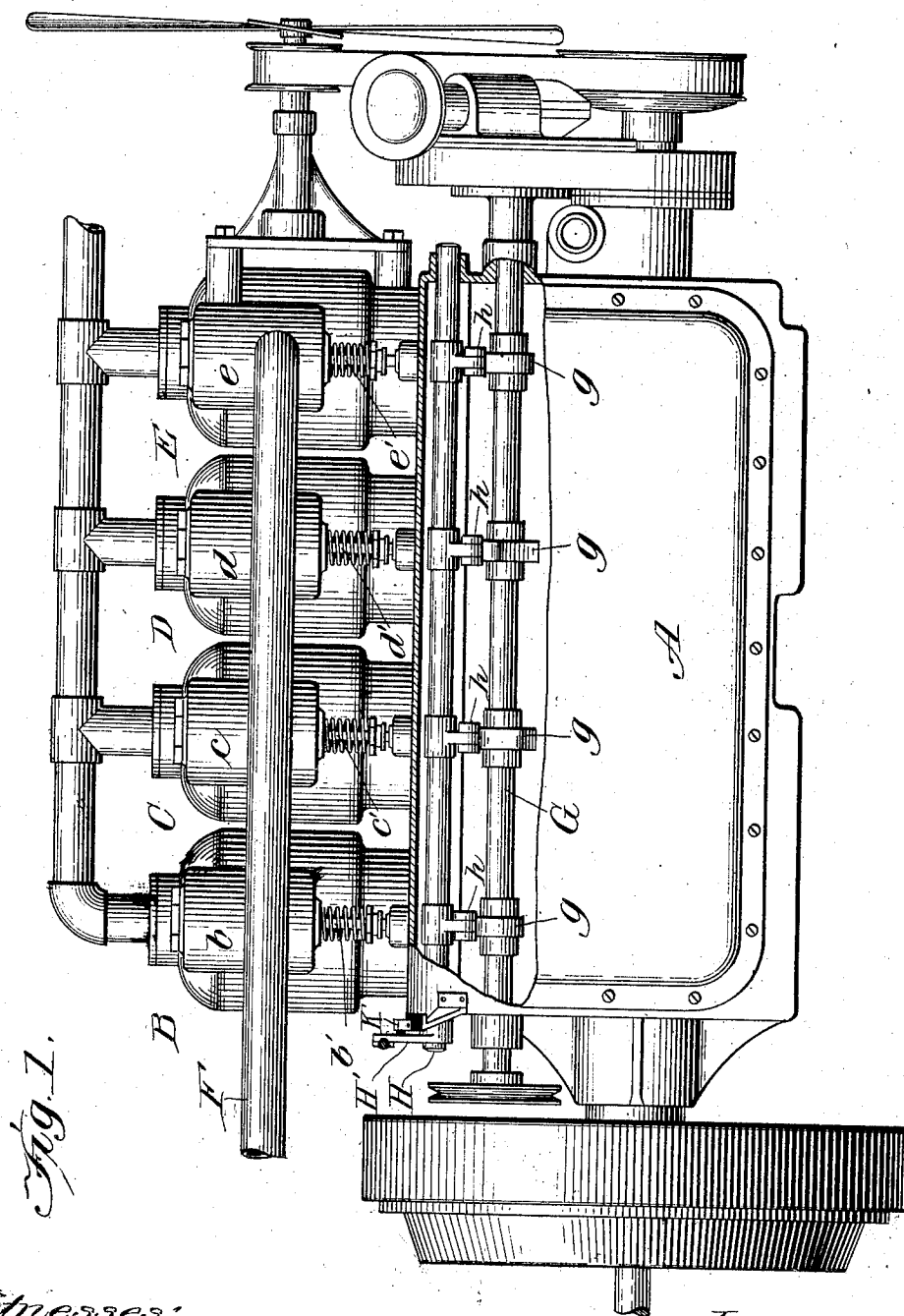


Fig. 1.

Witnesses:

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Inventor:

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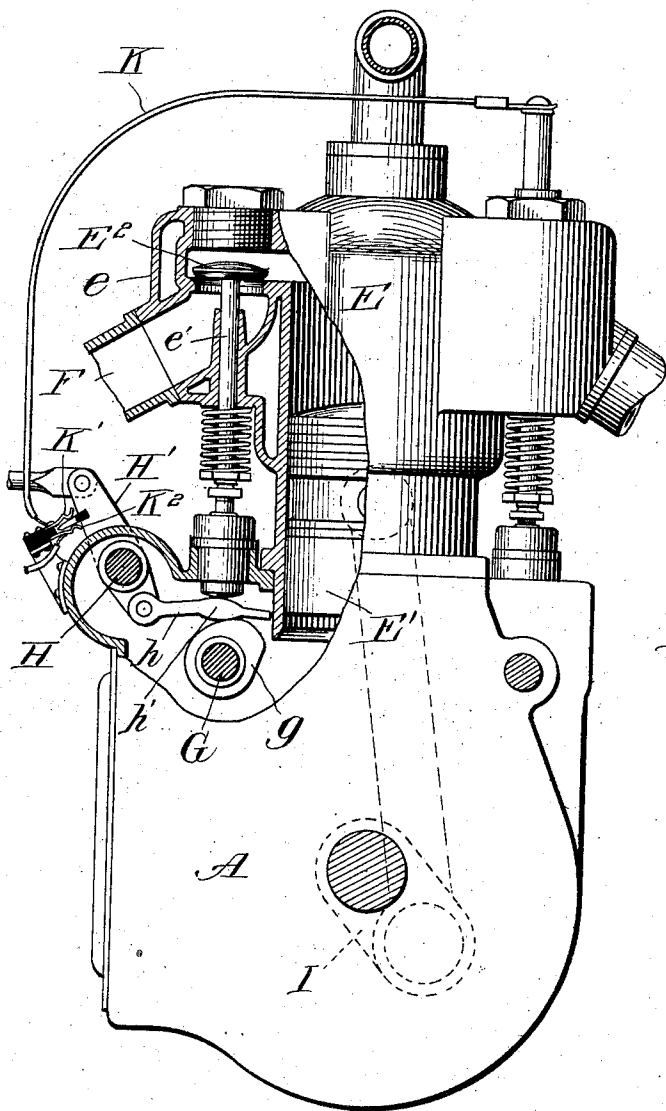
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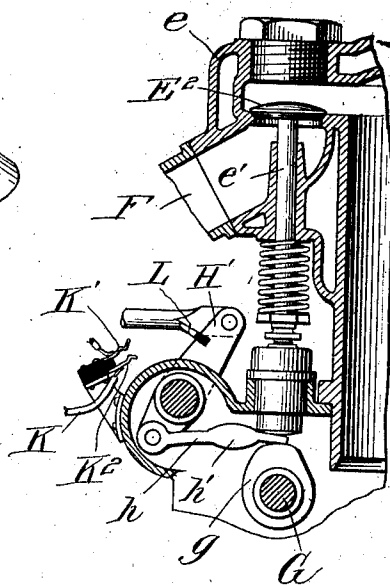
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2 SHEETS-SHEET 2.

*Fig. 2.*



*Fig. 3.*



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# UNITED STATES PATENT OFFICE.

FREDERICK PURDY, OF KENOSHA, WISCONSIN, ASSIGNOR, BY MESNE ASSIGNMENTS, TO KATE E. JEFFERY, CHARLES T. JEFFERY, AND HAROLD W. JEFFERY, EXECUTORS OF THOMAS B. JEFFERY, DECEASED.

MEANS FOR FACILITATING THE STARTING OF INTERNAL-COMBUSTION ENGINES.

976,493.

Specification of Letters Patent. Patented Nov. 22, 1910.

Application filed December 23, 1908. Serial No. 468,889

To all whom it may concern:

Be it known that I, FREDERICK PURDY, a citizen of the United States, residing at Kenosha, county of Kenosha, State of Wisconsin, have invented a certain new and useful Improvement in Means for Facilitating the Starting of Internal-Combustion Engines, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention has for its object the provision of a simple arrangement whereby the exhaust valves of multi-cylinder engines which normally open between the ends of the power strokes are prevented from opening during the power strokes when the engines are stopped, thereby avoiding the loss of pressure in the power cylinder.

The various features of novelty whereby my invention is characterized will herein-after be pointed out with particularity in the claims; but, for a full understanding of my invention and of its objects and advantages, reference may be had to the following detailed description taken in connection with the accompanying drawings, wherein:—

Figure 1 is a side elevation of a four-cylinder gas engine containing my invention; Fig. 2 is a section through one of the cylinders, illustrating the normal operation of the engine; and Fig. 3 is a fragmentary section illustrating the operation in stopping the engine.

Referring to the drawings, A represents a four-cylinder internal combustion engine, the cylinders being indicated at B, C, D and E, respectively. *b*, *c*, *d* and *e* are the casings for the several exhaust valves, these casings communicating with a common exhaust conduit F. All these parts may take any usual or preferred forms, since they are simply illustrative of multi-cylinder internal combustion engines in general.

G is the usual cam shaft having thereon cams *g*, *g*, *g*, *g* for lifting the exhaust valves through their stems *b*<sup>1</sup>, *c*<sup>1</sup>, *d*<sup>1</sup> and *e*<sup>1</sup>.

H is a shaft arranged parallel with the cam shaft and having fingers *h* *h* *h* each of which is adapted normally to lie between

one of the cams and the corresponding valve stem as indicated in Fig. 2.

In Fig. 2 the piston E<sup>1</sup> in the cylinder E is shown as approaching the end of its power stroke, the crank I connected thereto being still a considerable angular distance from the lower center. The exhaust valve E<sup>2</sup> has just been lifted from its seat so as to permit some of the power charge to escape, this being the usual condition in many types of engines. Now suppose that the operator, desiring to stop the engine, interrupted the firing circuit before the charge in the cylinder could explode: then there will be equal charges in the cylinder E and in the other cylinder of the engine wherein compression is taking place. As a result, the engine will seek a position of equilibrium which would ordinarily be that wherein the pistons are midway of their strokes. However, if there is considerable oscillation of the pistons before coming to rest, the piston E<sup>1</sup> may reach and even pass the position in which it is shown in Fig. 2 before returning to its position of rest. In such case a portion of the power charge would ordinarily be lost, the position of equilibrium would be such that the piston in the power cylinder could not exert a maximum leverage on the crank, and the engine would be unable to start under its own power, making it necessary to crank in order to set the engine in operation. By making the shaft H revoluble so as to enable it to withdraw the fingers partly from between the cams and the valve stems, and properly shaping the fingers, then, upon stopping the engine, the exhaust valve on the power cylinder can be prevented from opening even though the preliminary oscillation of the engine preceding the condition of rest be great enough to carry the piston to or beyond the position indicated in Fig. 2. Consequently there will be no loss of gas from the power cylinder and the engine will always come to rest with the power piston in the most advantageous position for starting.

The fingers *h* may take any desired shape: thus, they may have a bulging portion *h*<sup>1</sup> so located that when the fingers occupy the position shown in Fig. 2 the exhaust valves will be operated in the normal way; while, when the shaft H is oscillated to bring the

fingers to the positions indicated in Fig. 3, the cams are unable to lift the exhaust valves.

In order to insure that the charge in the power cylinder will not be exploded when the exhaust mechanism is rendered inoperative, there may be in the firing circuit a switch which is controlled by the shaft H or its operating lever H<sup>1</sup>.

K indicates a portion of the firing circuit in which are two separated contacts K<sup>1</sup> and K<sup>2</sup>. L is a bridging member for the contacts K<sup>1</sup> and K<sup>2</sup>, this member being carried upon the lever H<sup>1</sup> in such position that it engages with the cooperating contacts only when the enlarged portions of the fingers lie between the cams and the valve stems.

For the sake of clearness and brevity I have described in detail only a single practical arrangement for preventing the exhaust valves from opening when the engine is stopped, and thereby avoiding loss of pressure in the power cylinder; but I desire to cover the various other mechanical expedients which may be adopted to effect this end as will be evident from the terms employed in the definitions of my invention constituting the appended claims.

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

1. In an internal combustion engine, a plurality of engine cylinders, pistons in said cylinders, exhaust valves, valve-actuating cams, movable members arranged between said cams and said valves, said members having two positions in one of which the cams are permitted to open said exhaust valves between the ends of the power strokes

of the pistons and in the other of which the cams are prevented from opening the exhaust valves before the pistons reach the ends of their power strokes.

2. In an internal combustion engine, a plurality of engine cylinders, pistons in said cylinders, exhaust valves, valve-actuating cams, movable fingers arranged between said valves and said cams, said fingers having portions which will permit the exhaust valves to be opened between the ends of the power strokes of said pistons when said portions lie between the valves and the cams, said fingers also having reduced portions, proportion to prevent the cams from opening said valves before the pistons reach the ends of their working strokes and means for actuating said fingers to bring either the first-mentioned portions thereof or the last-mentioned portions thereof between the cams and the valves so as to permit the valves to be opened between the ends of the power strokes of said pistons or prevent them from being so opened.

3. In an internal combustion engine, a plurality of engine cylinders, pistons in said cylinders, exhaust valves for said cylinders, means for normally actuating said exhaust valves at predetermined points between the ends of the working strokes of said pistons, a firing circuit, and a switch device in said circuit controlled by said latter means.

In testimony whereof, I sign this specification in the presence of two witnesses.

FREDERICK PURDY.

Witnesses:

J. P. ZENS,

L. J. HAMMOND.