E. M. WOOD.

STARTING DEVICE FOR EXPLOSIVE ENGINES.

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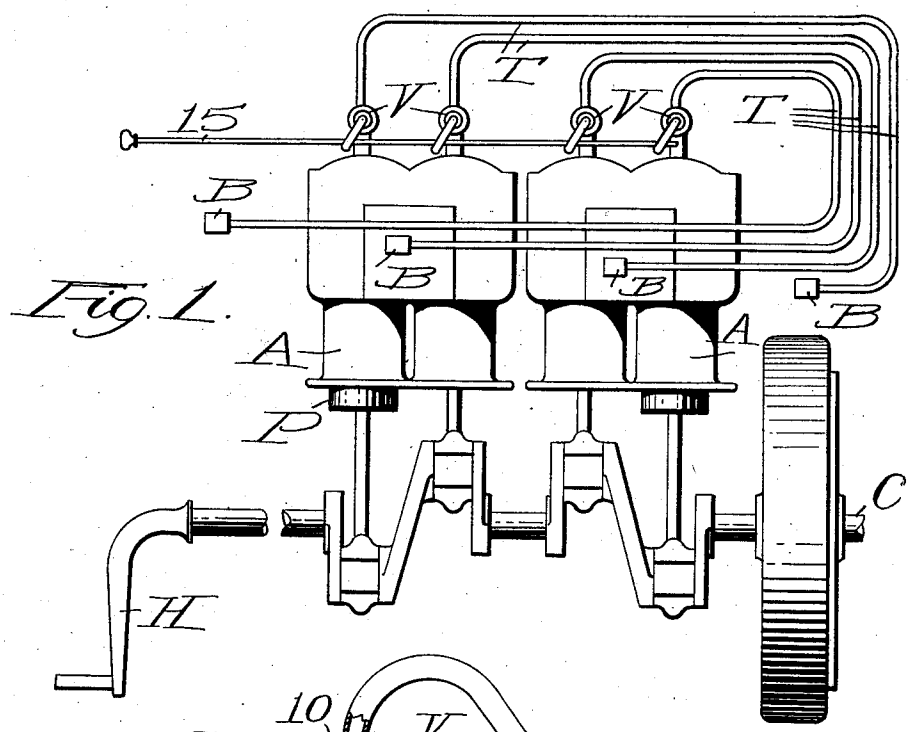

Fig. 1.

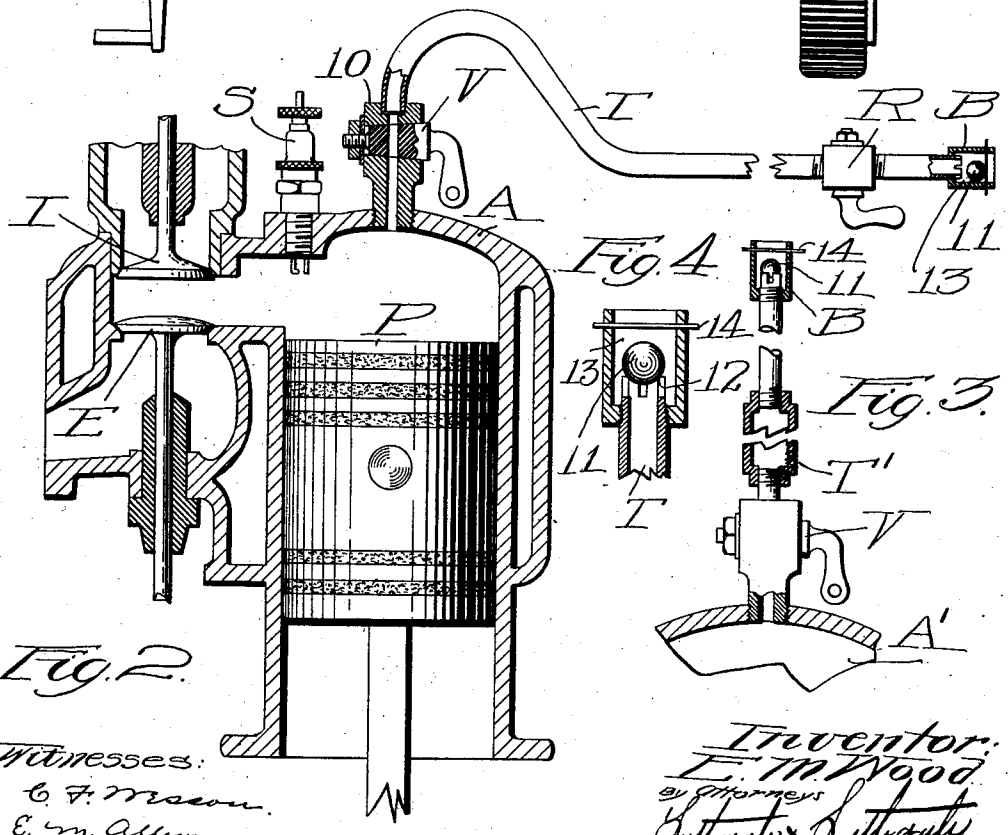

Fig. 2.

Fig. 4.

Fig. 3.

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UNITED STATES PATENT OFFICE.

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STARTING DEVICE FOR EXPLOSIVE-ENGINES.

1,021,812. Specification of Letters Patent. Patented Apr. 2, 1912.

Application filed April 7, 1910. Serial No. 553,914.

To all whom it may concern:

Be it known that I, EDWARD M. WOOD, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Starting Device for Explosive-Engines, of which the following is a specification.

The object of this invention is to provide a new and improved starting device for explosive engines, particularly gas engines of the two or four-cycle type. It is well known that it is often very hard to start engines of this character, particularly when the same are cold or have been standing for a long time. This arises usually from the difficulty of getting an initial charge of proper mixture into the explosive chamber of each cylinder, because in cranking or turning over the engine, the air or vitiated charge originally in the compression chamber will not be completely expelled and because the initial charge is apt not to remain in proper mixture or condition to explode when drawn into the explosion chamber. The cranking or turning over of the engine under these conditions is very often a laborious and unsuccessful task.

The object of my invention is to relieve these conditions. To this end I connect a storage chamber or receptacle to each explosion chamber by a comparatively large passage, which passage is controlled by a valve or cock and which chamber is open to the atmosphere. This additional storage chamber is preferably provided at its end with a baffle or outwardly opening check-valve which does not quite come to its seat. This additional storage chamber or reservoir can be made in various forms but preferably is made in the form of a tube of a length proper to give the desired storage capacity. I have discovered that a tube tends to keep the explosive charge in very stable form. By using this arrangement, the engine can be very easily cranked, as the same will not have to be turned against compression and the explosion chambers can be quickly filled with a charge of the proper mixture and the engine can be easily started on the spark after a few turns.

The operation is more fully described in the following specification.

The best form now known to me for practicing the invention is illustrated in the accompanying drawing, referring to which,

Figure 1 is a diagrammatic view of a four-cylinder explosive engine of the automobile type with my invention applied thereto. Fig. 2 is a sectional view on an enlarged scale through one of the cylinders, showing the storage chamber or reservoir attached thereto. Fig. 3 is a view showing my invention applied to the cylinder of an ordinary stationary explosive engine, and Fig. 4 is a detail on an enlarged scale illustrating the baffle or check-valve.

The invention will first be described in its application to an automobile engine and reference to follow this description should be had to Figs. 1, 2 and 4. Referring to these figures and in detail, A designates the cylinders of an ordinary four-cylinder engine of this type. Each cylinder has working therein the usual piston P. I designates the inlet valve and E the exhaust valve. S designates the spark plug. C designates the crank shaft which is provided with the usual fly-wheel and with the usual starting crank H. These parts may be of any ordinary or improved type or form. Connected to the top of each cylinder so as to connect with the compression and explosion chamber formed above the piston and between the valves is a storage reservoir preferably made in the form of a tube T. The tube T is threaded into a bushing 10 which is threaded into the top of the cylinder and the bushing is provided with a valve V. The tube T is made of a diameter and of a length necessary to get the proper capacity. A baffle or outwardly opening check-valve B is arranged at the end of the tube. This valve may be made in the form of a ball 11 which can seat on the end of the tube T. The end of the tube is slotted or cut away, as shown at 12, so that when the ball is bearing on the end of the tube, the passage into the tube will not be entirely closed. The ball 11 is arranged in a cap 13 screw-threaded on the end of the tube and is kept in place therein by a pin 14 driven through the cap. The arms of the valves V may be connected to a rod 15 which may extend to the front of the engine or to some convenient point for manipulation.

The operation is as follows, assuming that the engine is of the ordinary four-cycle

type: When it is desired to start the engine, the rod 15 is pulled to open the valves V. Then the engine is turned over a few times by the starting crank H. This can be very readily done, as the pistons do not have to compress the charges or work against compression by reason of the fact that the valves V are opened into the tubes T and the tubes are open to the atmosphere. Neither do the pistons have to work against a heavy vacuum on the descending strokes, because the baffle valves B do not seat absolutely on their seats. Therefore, it is a matter calling for very little physical effort to revolve the crank shaft a few turns when the valves V are open. On the downward induction movement of a piston, a certain amount of explosive mixture will be drawn into the explosion chamber through the inlet valve. On the upward compression stroke this mixture and whatever air or vitiated charge was previously in the explosion chamber will be forced up into the tube T. On the down explosion stroke, this resultant mixture will be drawn back from the tube T into the explosion chamber. On the upward exhaust stroke part of the resultant mixture then in the explosion chamber will be forced out through the exhaust valve and part will be forced back into the storage chamber or tube T. On turning the crank shaft over again so that the piston will go through another cycle of operation, some more of the explosive mixture will be drawn into the explosion chamber and forced into the storage chamber or tube T, and after the engine has been turned over for a few cycles, the air or spent charge originally in the explosion chamber will have been driven out to the atmosphere or so thoroughly mixed with the indrawn fresh mixtures that a charge of substantially the proper mixture will be left in the explosion chamber. In other words, the initial air or spent charge in the explosion chamber by the cranking previously described, will be gradually commingled with the fresh charges and worked out into the tube T. After the proper mixtures have been obtained in the cylinders in this way, the valves V are closed by pulling on the valve rod and then by causing the spark in the engine on the proper cylinder the engine will start. Sometimes after the engine has been charged in the manner previously described, the valves V may be closed and the engine may be given one or more turns against compression, if it is desired to start the engine with one or more of the charges under compression before sparking.

The invention previously described works just as well on an engine of the two-cycle type as on an engine of the four-cycle type, as by turning the starting crank of a two-cycle engine, the air or vitiated charge originally in the explosion chambers of the cylinders is gradually commingled with the charges freshly forced in and worked out into the storage chambers or tubes.

In some instances, after the storage chambers or tubes T have been utilized in a manner described, it may be desired to turn the engine over against only a part of the compression, and when this is desired, valves R may be arranged in the tubes at any point desired to give a partial compression. These valves R normally are open, but when it is desired to turn or crank the engine against only partial compression, they are closed and the valves V are left open.

The tubes T are preferably made of the same length, or if made of different lengths they are made of different diameters so that when a plurality of tubes is used on a multiple cylinder engine they will each have the same capacity.

In Fig. 3 the invention is shown as applied to the cylinder A′ or to an ordinary stationary gas engine which is usually arranged horizontally. With this arrangement, the tube T′ is provided of a considerable diameter so that the same will not have to be made very long to obtain the proper capacity.

The invention can be applied to any form of gas engine whether stationary or used in automobiles, launches, or other locations.

Many other modifications may be made without departing from the scope of my invention as expressed in the claims.

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

1. In a starting device for an explosive gas engine, the combination of a cylinder, a storage chamber of large capacity connected thereto and normally open to the atmosphere at all times, and a valve between the cylinder and chamber.

2. In a starting device for an explosive gas engine, the combination of the cylinder, a storage chamber of large capacity connected to the explosion chamber and having an opening to the atmosphere, and an outwardly opening check-valve controlling said opening.

3. In a starting device for an explosive gas engine, the combination of the cylinder, a storage chamber of large capacity connected to the explosion chamber and having an opening to the atmosphere, and an outwardly opening check valve which cannot entirely or tightly seat, controlling said opening.

4. In a starting device for an explosive gas engine, the combination of the cylinder, a storage chamber of large capacity connected to the explosion chamber thereof and made in the form of a long tube of small

cross section, and a valve for controlling communication between the storage chamber and explosion chamber.

5. In a starting device for an explosive gas engine, the combination of the cylinder, a storage chamber of large capacity connected to the explosion chamber, said storage chamber being made in the form of a long tube of small cross section having an opening to the atmosphere at all times, and a valve controlling communication between the explosion chamber and the storage chamber.

6. In a starting device for an explosive gas engine, the combination of the cylinder, a storage chamber of large capacity connected to the explosion chamber by a connection having a valve, said chamber being made in the form of a tube, and a shut-off valve arranged at an intermediate position in said tube.

7. In a starting device for an explosive gas engine, the combination of the cylinder, a storage chamber of large capacity connected to the explosion chamber thereof by a passage having a valve, said chamber being made in the form of a tube opening at its end, and an outwardly opening check valve which cannot entirely close, controlling said opening.

8. In a starting device for an explosive gas engine, the combination of an explosion chamber, a passage-way therefrom, a valve controlling the passage-way, and a tubular storage chamber connected with the explosion chamber through said passage-way, said chamber being of large capacity and uniform in cross-section, and normally open to the atmosphere at all times.

9. In a starting device for an explosive gas engine, the combination of an explosion chamber, a passage-way therefrom, a valve controlling the passage-way, and a long horizontally extending tubular storage chamber connected with the explosion chamber through said passage-way.

10. In a starting device for an explosive gas engine, the combination of an explosion chamber, a valve, a passage-way having a valve, and a tube storage chamber connected to the explosion chamber through said valve passage-way and controlled by an outwardly opening valve or baffle.

In testimony whereof I have hereunto set my hand, in the presence of two subscribing witnesses.

EDWARD M. WOOD.

Witnesses:
C. FORREST WESSON,
CATHARINE I. HARTNETT.