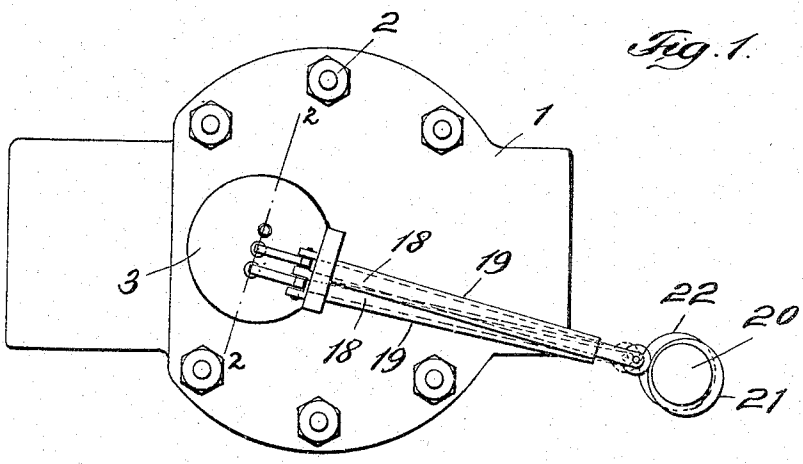
J. H. STRINGHAM.

METHOD AND APPARATUS FOR IGNITION IN EXPLOSIVE ENGINES.

APPLICATION FILED FEB. 14, 1913.

1,203,073. Patented Oct. 31, 1916.

Fig. 1.



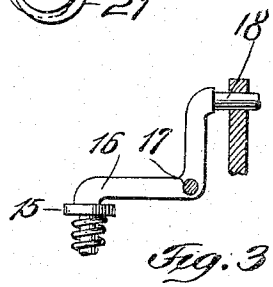
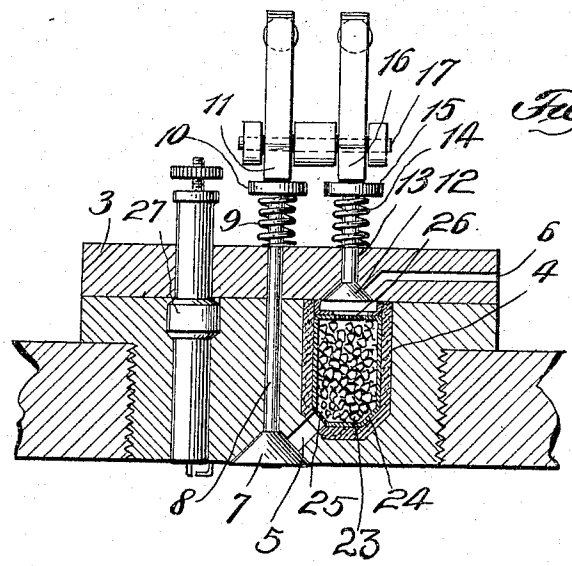


Fig. 3

Fig. 2.



WITNESSES:

Julius Wirth.

Alfred M. Houghton

INVENTOR

John H. Stringham

BY

ATTORNEY

THE NORR'S PETERS CO., PHOTO LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN H. STRINGHAM, OF JERSEY CITY, NEW JERSEY, ASSIGNOR OF TWO-THIRDS TO DWIGHT L. ELMENDORF, OF NEW YORK, N. Y.

METHOD AND APPARATUS FOR IGNITION IN EXPLOSIVE-ENGINES.

1,203,073. Specification of Letters Patent. Patented Oct. 31, 1916.

Application filed February 14, 1913. Serial No. 748,329.

To all whom it may concern:

Be it known that I, JOHN H. STRINGHAM, a citizen of the United States, residing in Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Methods and Apparatus for Ignition in Explosive-Engines, of which the following is a specification.

This invention relates to a method and apparatus for ignition in explosive engines and comprises taking a portion of the combustion products of one explosion, holding the same in contact with a suitable refractory material and then returning the same to the cylinder to ignite a subsequent charge therein, together with suitable apparatus for accomplishing this. By holding the combustion products of one explosion in contact with a suitable material and then releasing them to ignite the next succeeding charge the best results are obtained. The material to be employed for this purpose may be any substance which is susceptible of being heated by the products of the combustion or combustions and is preferably a material susceptible of withstanding high heat without breaking down, used in the form of pieces presenting edges and occupying a large part of the space or receptacle within which the products of combustion are caught and held. Carborundum is particularly satisfactory for this purpose, although other substances, such as, for instance, some species of lava, may be used.

In its most complete form the invention contemplates that ignition will be secured as follows: The first explosion is ignited by the use of the usual spark plug or other convenient device. Immediately after this explosion takes place, some of the combustion products pass in contact with the refractory material, tending to heat it and clean out the space in which it is contained. Then a small quantity of some of the combustion products are caught and held in contact with the material. Finally these trapped combustion products are released to ignite the next succeeding charge. It is desirable to pass the combustion products in contact with the refractory material and catch and hold them there immediately after the explosion while they are very hot and under high pressure and to provide a suitable inclosed space of proper character to hold them in contact with the material until they are released. It has been found that a particularly satisfactory space for the purpose may be provided by making a chamber of some metal which retains its shape under high heat, packing it with pieces of carborundum or other suitable material, surrounding it with asbestos or other insulator, and providing it with two passages leading, respectively, to the cylinder and exhaust or atmosphere, each passage being provided with a suitable valve, together with means properly timed for opening and closing said valves.

The invention is applicable to all kinds of explosive engines whatever the construction or number of cylinders, but for purposes of exposition an engine of the single cylinder type (constructed along the lines of the well-known Otto gas engine) is shown.

It will be understood that the accompanying drawing shows merely one form of a specific embodiment of an apparatus illustrating the invention and is designed merely to make plain the nature of the invention and a preferred way of practising it without attempting to depict many modifications and variations which will be availed of in its application to the various types of engines in use.

In the accompanying drawing, Figure 1 is a plan view of the cylinder head of an engine, as, for instance, the Otto gas engine, with the apparatus of my invention attached; Fig. 2 is a section on an enlarged scale along the line 2—2 of Fig. 1; Fig. 3 is a detail of the bell crank levers hereinafter mentioned.

1 represents the cylinder head secured to the cylinder of the engine through bolts 2, and 3 indicates an attachment illustrating the invention arranged to be assembled in proper relation with respect to such cylinder head. This attachment is provided with a trap or chamber 4 connected with the cylinder by passage 5 and either to the exhaust or atmosphere by the passage 6, whereby some exploded gases from the cylinder may be passed through such chamber and some may be trapped therein by means of valves.

7 indicates the inlet valve having the stem 8 and spring 9 normally to seat the valve and close the passage 5.

10 is a head on the valve stem arranged

to be depressed against the tension of spring 9 through the arm 11.

Passage 6 is controlled by the valve 12 having the stem 13 and spring 14 similar in construction to valve 7 and provided also with a head 15 which is adapted to be operated through bell crank levers 16 in the same manner that bell crank lever 11 operates the head 10 of valve 7. These levers 11 and 16 are tripping levers suitably journaled or hinged on the small shaft 17 and operated through cam rods 18 preferably working in sleeves 19. The rods and sleeves are directed toward an operating cam shaft 20 suitably geared either to the fly-wheels or the main shaft of the engine, as preferred, and operating in the nature of a timer or commutator whereby the valves may be accurately operated with respect to the explosion of the engine or the revolution of the fly-wheels and shaft. This shaft 20 is provided with the cams 21 and 22 of sufficient length to cause the valves 7 and 12 to operate in such manner that the valve 7, controlling the inlet passage to the chamber 4, remains open until after the valve 12, controlling the exit passage 6, is closed, whereby a portion of the products of combustion may pass through such chamber 4 and to the atmosphere or main exhaust, as preferred, and another portion of these products of combustion may be trapped under pressure in the chamber 4. This chamber 4 is provided with refractory material of any substance adapted to be heated by the heat of the products of combustion. Carborundum is particularly adapted for the purposes in view and its use in the form of pieces having sharp edges is preferable, but the invention is not necessarily limited to the use of said material.

23 designates pieces of carborundum retained in the chamber 4 through a casing 24 made of a heat resisting material having the perforations 25 adjacent the inlet passage to the chamber and perforations 26 in line with the exhaust passage 6.

27 designates any suitable spark plug to ignite the first charges.

Assuming my invention to be used in connection with a four-cycle engine and assuming that such engine has been started through the usual means, as, for instance, the spark plug 27 shown, the connections to such spark plug are broken and the cam shaft 20 is thrown into gear with its operating member, as may be readily understood, or such cam shaft may be permanently in engagement with its operating member if desired, such details being immaterial for present purposes and therefore not illustrated. Immediately upon the explosion, the valves 7 and 12 being open the products of combustion from the cylinder are admitted into the chamber 4, travel past the refractory material therein and past the valve 12 to the atmosphere or to the main exhaust as desired until the valve 12 is closed. Because of the particular arrangement of the cams on the cam shaft, valve 12 is closed just prior to the seating of valve 7. Upon the seating of valve 7 some of the products of combustion are trapped under explosion pressure in the chamber and are held in contact with the refractory material. Upon the next cycle valve 7 is opened and the gases trapped in chamber 4, being under pressure and hot are injected into the cylinder to ignite the subsequent charge. Immediately after the explosion takes place and while valve 7 is open, valve 12 opens and some of the products of combustion pass through the trap as before stated, serving to act as a scavenging agent to eject the products of combustion which might possibly remain within the chamber 4 and to increase the heat of the carborundum or other refractory material therein. A small portion of the products of combustion are then trapped as above recited and the operation repeated.

The details of the invention may obviously be varied within a wide range and many modifications and equivalents used without departing from its scope.

The following claims are made:—

1. A method of ignition in explosive engines comprising passing a portion of the products of combustion in contact with a refractory material, holding some of the products of combustion in contact with said refractory material and returning some of said products of combustion to the cylinder to ignite a succeeding charge therein.

2. A method of ignition in explosive engines comprising taking a portion of the products of combustion, holding the same in contact with a refractory material and returning the same to the cylinder to ignite the succeeding charge.

3. An ignition device for explosive engines comprising a refractory material, together with means for bringing and holding a portion of the products of combustion from the cylinder in contact with said material and returning some of said combustion products to the cylinder to ignite the succeeding charge.

4. An ignition device for explosive engines comprising carborundum, together with means for bringing and holding a portion of the products of combustion from the cylinder in contact with said carborundum and returning some of said combustion products to the cylinder to ignite the succeeding charge.

5. An ignition device for explosive engines comprising a chamber containing pieces of refractory material with sharp edges, together with means for bringing and holding a portion of the products of combustion from the cylinder in contact with

said material and returning some of said combustion products to the cylinder to ignite the succeeding charge.

6. An ignition device for explosive engines comprising means adapted to trap a portion of the products of combustion and to return the same to the cylinder to ignite a succeeding charge, said means comprising a chamber having perforations in the walls thereof and a refractory substance in said chamber.

7. An ignition device for explosive engines comprising means adapted to trap a portion of the products of combustion and to return the same to the cylinder to ignite a succeeding charge, said means comprising a chamber having heat resisting walls and a refractory substance held in place in said chamber by said walls.

8. An ignition device for explosive engines comprising a chamber, a passage leading thereto from the cylinder, a valve controlling said passage, a passage leading from said chamber to the atmosphere, and a valve controlling said passage, refractory material contained in said chamber, and mechanism arranged to open and close said valves whereby products of combustion from the cylinder may be passed through said refractory material and whereby a portion of combustion products may be held in contact with the refractory material and be subsequently returned to the cylinder to ignite a succeeding charge.

9. An ignition device for explosive engines comprising a chamber containing refractory material connected with the cylinder, a valve between said refractory material and the cylinder, and means for opening said valve before the time for each explosion and closing it after each explosion and before exhaustion of the products of combustion from the cylinder.

10. An ignition device for explosive engines comprising a chamber containing refractory material connected with the cylinder and with the outside air, a valve between said refractory material and the cylinder, means for opening said valve immediately prior to the time for each explosion and closing it after each explosion and before exhaustion of the products of combustion from the cylinder, a valve between said refractory material and the outside air, and means for opening said valve immediately after each explosion and closing it prior to the closing of the first-mentioned valve.

11. In an ignition device for explosive engines, a chamber containing pieces of refractory material connected with the cylinder by a passage having its cubical contents for a given unit of length as great as the cubical contents of the portion of said chamber not occupied by said refractory material for the same unit of length, and a trapping valve in said passage.

In testimony whereof, I have hereunto affixed my signature in the presence of witnesses.

JOHN H. STRINGHAM.

Witnesses:
HERMAN GUSTOW,
ALFRED M. HOUGHTON.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."