Jan. 13, 1925. 1,522,551

D. N. SHEPHERD

COMBUSTION SYSTEM FOR INTERNAL COMBUSTION ENGINES AND THE LIKE

Filed April 9, 1923

Fig. 1

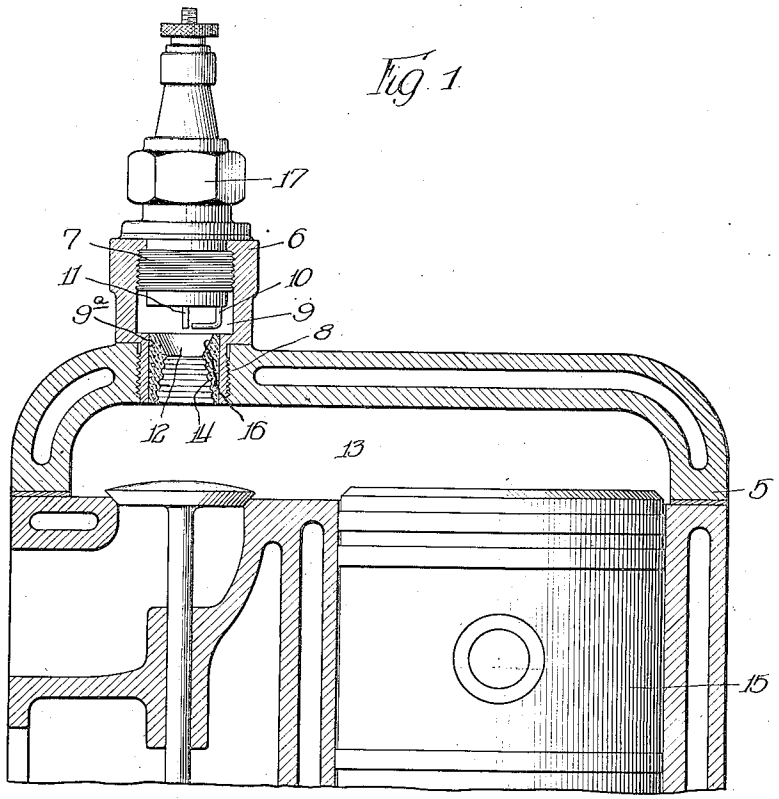
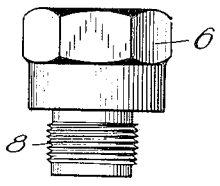


Fig. 4

Fig. 2



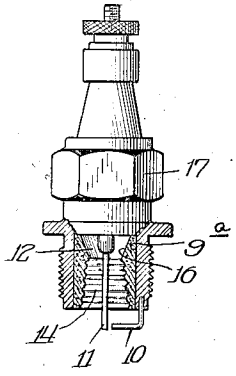
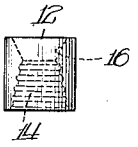


Fig. 3



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1,522,551

UNITED STATES PATENT OFFICE.

DONALD N. SHEPHERD, OF CHICAGO, ILLINOIS.

COMBUSTION SYSTEM FOR INTERNAL-COMBUSTION ENGINES AND THE LIKE.

Application filed April 9, 1923. Serial No. 630,723.

To all whom it may concern:

Be it known that I, DONALD N. SHEPHERD, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Combustion Systems for Internal-Combustion Engines and the like, of which the following is a specification.

This invention has to do with certain improvements in combustion systems for internal combustion engines. The invention has reference particularly to improvements in the construction of the engine at and adjacent to the spark plug, which improvements serve to materially improve the action of the spark plug in firing the charge.

The main object of the invention is to provide an arrangement whereby oil or fuel of any kind in a liquid state is prevented from coming into direct contact with the spark plugs, and also in this connection to prevent carbonizing or fouling the plugs.

Another object of the invention is to provide an arrangement which will spread or flare the flame of ignited combustible gases from the spark plug to the combustion chamber, thus providing a greatly improved igniting effect, enhancing the propagation of the flame into all portions of the combustion chamber, and reducing the tendency towards detonation.

A further object of the invention is to provide in conjunction with the spark plug and combustion chamber, a porous element such as a tube of ceramic or other material of sufficient porosity to absorb liquid hydrocarbons and oils, and being capable of retaining sufficient heat to distill off the same into vaporous condition within the combustion chamber.

More particularly, it is an object of the present invention to provide an igniting chamber in conjunction with the combustion chamber, the spark plug acting directly within the igniting chamber and acting upon a relatively small quantity of gas contained therein. In this connection, it is a further object to provide between the igniting and combustion chambers a Venturi tube or throat which will greatly restrict the flow of combustible gas into the igniting chamber on the compression stroke and enhance the propagation of the flame from the igniting chamber into the combustion chamber when the firing takes place.

In conjunction with the foregoing, it is a further object to so form this Venturi throat as to materially impede the tendency of liquid oil and fuel to pass into the igniting chamber, and so as to facilitate the outward flow from the igniting to the combustion chamber.

Further objects of the invention are to vaporize and volatilize the explosive mixture within the combustion chamber and thus to reduce carbon formation, cause carbon deposits to burn out, reduce crank case dilution, etc.

Other objects and uses of the invention will appear from a detailed description of the same, which consists in the features of construction and combinations of parts hereinafter described and claimed.

Referring to the drawing:

Figure 1 shows a vertical sectional view through the upper portion of the cylinder and valve mechanism of an internal combustion engine having applied thereto the features of the present invention;

Fig. 2 is a full elevation of the device whereby an igniting chamber is established;

Fig. 3 is a side view of the Venturi tube section independently; and

Fig. 4 shows a modified arrangement in which the Venturi tube section is incorporated directly into the spark plug itself.

In the drawing the upper portion of the engine cylinder is designated by the numeral 5, and the piston by the numeral 15. A usual combustion chamber 13 is established above the piston and within which the major portion of the work of the explosion and compression is performed.

The spark plug 17 is provided for firing the charge. This spark plug is provided with the usual electrodes 10 and 11, or may be formed in any other convenient manner. Ordinarily, the threaded stem 7 of the spark plug threads directly into the threaded opening of the cylinder head, so that the electrodes act directly upon the charge within the combustion chamber 13.

According to one feature of the present invention, I prefer to establish an igniting chamber 9 in immediate proximity to the electrodes 10 and 11, said igniting chamber 9 being also in communication with the combustion chamber 13, but ordinarily this communication is established in such a manner as to control the firing action in a greatly improved manner.

For this purpose, I prefer to form the passage between the igniting and combustion chambers in such a manner as to establish in effect a Venturi throat or passage between the chambers. This Venturi throat or passage is shown at 9a in Fig. 1 and at 9 in Fig. 4. The inner surface 14 of the Venturi throat is preferably roughened or corrugated towards the combustion chamber 13 so as to interfere with the movement of liquid oils or fuel from the combustion chamber into the igniting chamber. On the contrary, it is preferred that the other surface 12 of the Venturi throat should be smooth and capable of passing the flame from the igniting into the combustion chamber with as little interference as possible.

The igniting chamber 9 may be established in any convenient manner; but the arrangement shown in the drawing is a desirable arrangement. It includes a special fixture 6 which has at its upper end an internal thread of proper size to receive the spark plug itself, and at its lower end an exteriorly threaded neck 8 of proper size to thread directly into the spark plug opening of the cylinder. This fixture 6 can, therefore, be seated into the usual spark plug cylinder opening and can then receive the spark plug itself in the manner clearly shown in Fig. 1.

In some cases it may be desirable to make use of a wall of porous material either in the igniting chamber or in the Venturi passage. Such porous material may be either in the form of porcelain, fire clay, stone, zirconium or porous metal. Such porous material when used will serve to absorb any liquid oil or fuel which may be present in the gas, thus considerably reducing the tendency towards carbon deposit, and afterwards this liquid oil or gas will be vaporized due to the heat of the parts, so as to further enhance the firing action.

In place of porous material use may also be made of metal such as brass or steel for establishing the Venturi passage, or the same may be made by the use of mica. In this connection, it is a peculiar characteristic of this latter material that it is capable of absorbing substantial quantities of gas, particularly at high temperature, and it, therefore, will act somewhat in the manner of a porous material when used.

Owing to the shape of the Venturi passage, the same tends to flare or spread the flame flowing from the ignition to the combustion chamber, thus materially improving the firing action.

This application, as to certain of the features herein disclosed, is a continuation of my earlier filed application for Letters Patent of the United States on improvements in means for ionizing and volatilizing the explosive mixture within the combustion chambers of an internal combustion engine, Serial No. 597,982, which was filed October 30, 1922.

In those cases in which a porous material is used, the same will have the effect of considerably reducing the tendency towards pre-ignition, by allowing excess heat to escape readily, and by allowing for a sufficient cooling by each fresh charge of gas entering the combustion chamber. This is because the porous nature of the material itself will allow a more ready dissipation of heat from its body, so that it will cool quicker after each ignition.

In the modified arrangement shown in Fig. 4, the Venturi throat or passage is incorporated directly into the spark plug itself. In the particular form illustrated in Fig. 4, the electrodes 10 and 11 are placed somewhat beneath the contracted portion of the Venturi throat, but in some cases it will be desirable to place the electrodes and point of sparking above the position of contraction of the Venturi throat, and I contemplate equally this additional construction and arrangement as within the scope and protection of my invention.

While I have herein shown and described only a single embodiment of the features of my present invention, still I do not limit myself to the same, except as I may do so in the claims.

I claim:

1. The combination with the combustion chamber of an internal combustion engine having a spark plug port leading thereinto, of an ignition chamber fitting for said port, said fitting including an ignition chamber and a neck threaded to engage the threads of the spark plug port aforesaid, and also including an internally threaded opening adapted to receive the threads of the spark plug itself, and a Venturi throat seated in the neck of said fitting between the ignition shamber and the combustion chamber, said Venturi throat being made of porous material and having its wall which faces towards the combustion chamber roughened or corrugated to impede the backward flow of liquid oils and the like into the ignition chamber, and having its wall which faces the ignition chamber relatively smooth to avoid interference with the free flow of burning gases from the ignition chamber to the combustion chamber, substantially as described.

2. The combination with the combustion chamber of an internal combustion engine having a spark plug port leading thereinto, of an ignition chamber fitting for said port, said fitting including an ignition chamber and a neck threaded to engage the threads of the spark plug port aforesaid, and also including an internally threaded opening adapted to receive the threads of the spark

plug itself, and a Venturi throat seated in the neck of said fitting between the ignition chamber and the combustion chamber, said Venturi throat being made of porous material, substantially as described.

3. The combination with the combustion chamber of an internal combustion engine having a spark plug port leading thereinto, of an ignition chamber fitting for said port, said fitting including an ignition chamber and a neck threaded to engage the threads of the spark plug port aforesaid, and also including an internally threaded opening adapted to receive the threads of the spark plug itself, and a Venturi throat seated in the neck of said fitting between the ignition chamber and the combustion chamber, said Venturi throat being made of material having the property of absorbing liquid oils and the like, substantially as described.

4. The combination wth the combustion chamber of an internal combustion engine having a spark plug port leading thereinto, of an ignition chamber fitting for said port, said fitting including an ignition chamber and a neck threaded to engage the threads of the spark plug aforesaid, and also including an internally threaded opening adapted to receive the threads of the spark plug itself, and including a passage within the neck aforesaid lying between the positions of the spark plug and the combustion chamber and having its inner surface which is exposed to the gases of combustion of ceramic material, substantially as described.

5. The combination with the combustion chamber of an internal combustion engine having a spark plug port leading thereinto, of an ignition chamber fitting for said port, said fitting including an ignition chamber and a neck threaded to engage the threads of the spark plug port aforesaid, and also including an internally threaded opening adapted to receive the threads of the spark plug itself, and including a passage within the neck aforesaid lying between the positions of the spark plug and the combustion chamber and having its inner surface which is exposed to the gases of combustion of porous material, substantially as described.

DONALD N. SHEPHERD.