E. W. ROBERTS.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED AUG. 31, 1908.

1,101,332. Patented June 23, 1914.

Fig. 1.

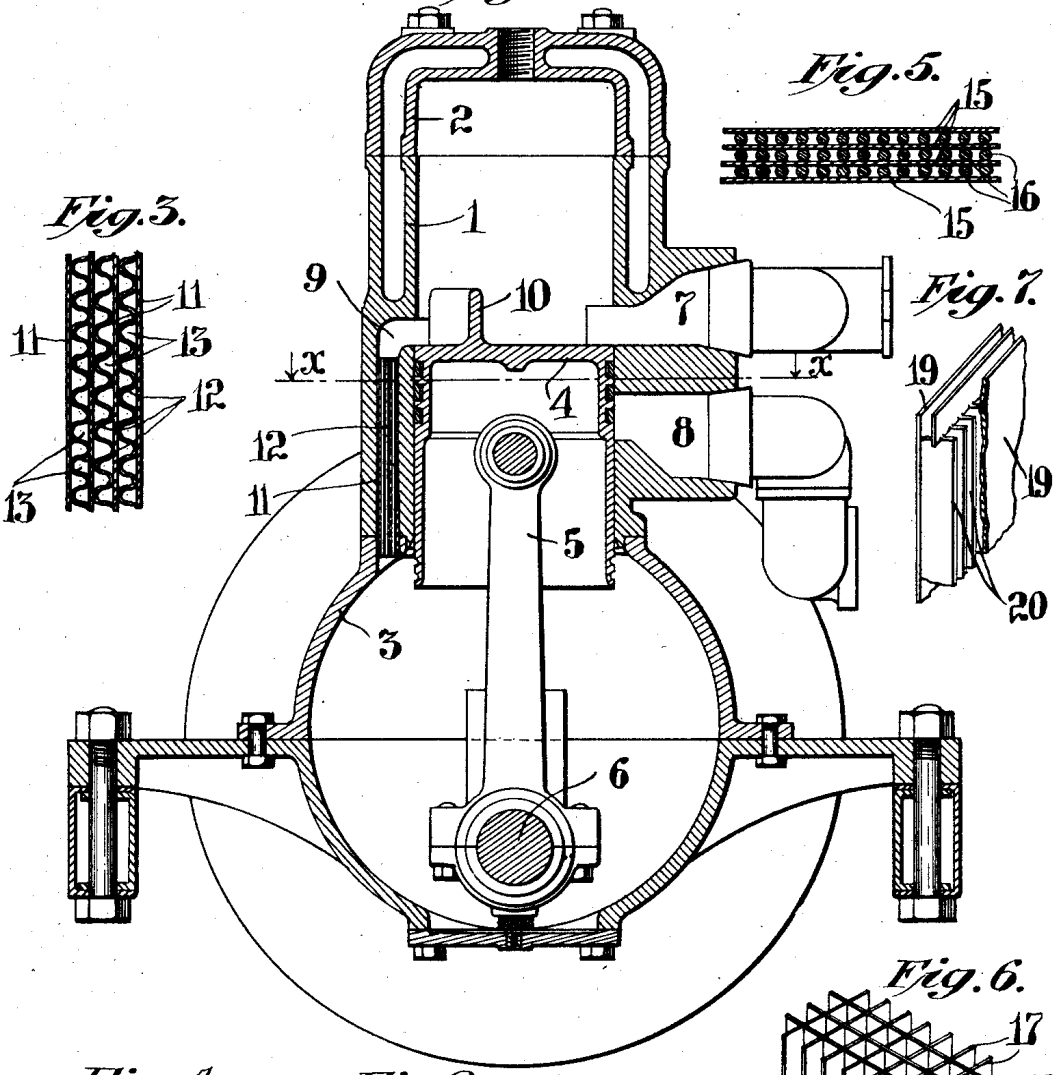


Fig. 5.

Fig. 3.

Fig. 7.

Fig. 6.

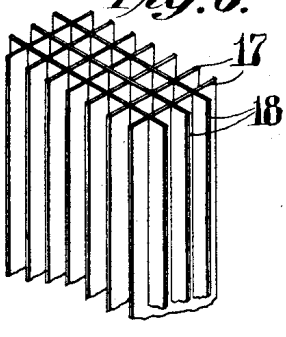


Fig. 4.

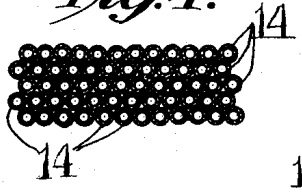
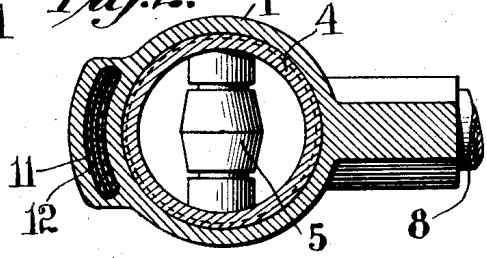


Fig. 2.



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UNITED STATES PATENT OFFICE.

EDMUND WILLSON ROBERTS, OF CLYDE, OHIO, ASSIGNOR TO THE ROBERTS MOTOR COMPANY, OF SANDUSKY, OHIO, A CORPORATION OF OHIO.

INTERNAL-COMBUSTION ENGINE.

1,101,332. Specification of Letters Patent. Patented June 23, 1914.

Application filed August 31, 1908. Serial No. 451,090.

To all whom it may concern:

Be it known that I, EDMUND W. ROBERTS, citizen of the United States of America, and a resident of Clyde, in the county of Sandusky and State of Ohio, have invented a certain new and useful Improvement in Internal-Combustion Engines, of which the following is a specification.

My invention relates to improvements in internal combustion engines, and particularly in that type thereof commonly known as "two-cycle" engines, wherein a charge is drawn into a compression chamber, commonly the closed crank case of the engine, and is delivered thence to the working cylinder of the engine while the piston is at the lower or the forward end of its stroke, the connection between the said crank case or combustion chamber and the working cylinder being usually by a port opened and closed by the piston itself. In engines of this sort, considerable trouble has been experienced from occasional ignition of the charge in the crank case or compression chamber. This has been particularly the case in large engines and when the engine is being run at speeds much below the normal speed. To prevent such back firing, it has been common to operate the engine, when running under conditions apt to bring about back firing, with early ignition and with a very rich mixture; but nevertheless the adjustments necessary to prevent such back firing have been delicate. Running on an abnormally rich mixture is not only wasteful but is objectionable in that the engine does not ordinarily respond promptly and on quick opening of the throttle may stop entirely instead of speeding up as it should. This back firing in the compression chamber is due to passage of the flame from the cylinder through the connecting port. It has been proposed, and to a certain extent attempted, to prevent this passage of flame through the connecting port by placing a screen across such port, and adapted to act on the familiar principle of the Davy safety lamp, namely, to chill the gases passing through said screen below the temperature at which ignition will occur. These screens across the connecting port have been found objectionable, however, because they restrict unduly the flow of gas through the passage, particularly when they become clogged more or less, as they inevitably do in time. The proper proportioning of ports and passages in a two-cycle engine is, at best, a delicate matter, and anything that tends to vary progressively the rate of flow of gas through the connecting port from that rate which was contemplated in the original design of the engine, is apt to interfere materially with the good working of the engine.

I have discovered that the desired effect of chilling gases tending to pass from the cylinder to the compression chamber, to a temperature below that at which they will burn, may be accomplished by dividing the connecting port into a large number of passages by means of partitions, or the like, inserted in such connecting passage, the large area of heat-conducting surface thereby provided giving a cooling effect equivalent, and even superior, to that given by the screen above mentioned, while the cross sectional area of each of the sub-passages into which the main connecting passage is so divided, is very much greater than that of the several perforations of a screen of a size adapted to prevent back firing, for which reason the sub-passages into which the main passage is divided, according to my invention, do not tend to choke up to any material extent, during the operation of the engine, and hence, do not interfere with the normal working of the engine.

My invention consists, therefore, in a passage connecting the cylinder and compression chamber, divided into a large number of sub-passages having heat-conducting walls; or, stated in other words, my invention consists in a large number of passages connecting the compression chamber and working cylinder and having heat-conducting walls of surface area and heat-conducting capacity adequate to prevent back firing.

My invention also consists in the various novel structures whereby a single cored passage, such as ordinarily is provided to connect the cylinder and crank case or compression chamber, may be divided into sub-passages by means readily inserted into such main cored passage.

The objects of my invention are, to prevent back firing in engines of the class described, to avoid clogging of the passage connecting the compression chamber and working cylinder, and to make the means by which such back firing is prevented sim-

ple, inexpensive, and readily applicable to existing engines.

I will now proceed to describe my engines with reference to the accompanying drawings, illustrating the application of the engines to a familiar type of two-cycle engine.

In said drawings:—Figure 1 shows a central vertical section of a vertical two-cycle engine having its connecting port divided as described; Fig. 2 shows a transverse section of the cylinder and piston of said engine on the line x—x of Fig. 1; Fig. 3 shows a transverse section on a larger scale of one arrangement of partitions for the connecting passage, comprising a series of straight and corrugated plates alternated one with the other; Fig. 4 is the similar view of an alternative structure comprising a series of tubes placed close together; Fig. 5 is another similar view of an alternative structure comprising a series of plates separated by wires or rods; Fig. 6 is a detail perspective elevation of an alternative structure comprising intersecting plates; Fig. 7 is a detail perspective elevation of a further alternative structure comprising plates held apart by combs.

Referring first to Figs. 1 and 2, 1 designates the cylinder of the engine, 2 the cylinder head, 3 the crank case, 4 the piston, 5 the connecting rod and 6 the crank pin, these parts being all of usual construction. 7 designates the exhaust port, 8 the admission port and 9 the connecting passage connecting the cylinder and crank case, the upper orifice of this passage being arranged to be opened and closed by the piston in its travel, as usual. 10 designates the usual deflector on the piston. The operation of engines of this type being well understood, it is not necessary to describe such operation here. In Figs. 1 and 2 I have shown this passage as sub-divided for the purpose described by means illustrated in detail and on a larger scale in Fig. 3, and comprising plain plates 11 and corrugated plates 12, alternated one with the other and so forming a large number of relatively small sub-passages 13, through which the gas will pass readily. It will be seen that the area of cooling surface thus afforded within passage 9 is enormous as compared with the area of the walls of that passage, and since these plates 11 and 12 are of metal and are of necessity in fairly good contact with the metal of the cylinder, these plates 11 and 12 will conduct away readily the heat of flaming gases tending to pass from cylinder 1 into crank case 3, so rapidly chilling such gases below the temperature of combustion. At the same time, these sub-passages 13 are straight, and are of relatively large cross section as compared with the holes of a screen which would give sufficient cooling action for the same purpose, and because of the large size of these sub-passages they are relatively little subject to clogging, and, moreover, for the same reason, and also because they are straight, they are very readily cleaned; for which purpose it is necessary merely to pass a suitable swab up through them. At the same time, the structure shown is very inexpensive and very easily applied to existing engines.

Obviously, the structure shown in Fig. 3 is susceptible of numerous modifications and has numerous alternatives, a few of which are illustrated in the other figures of the drawings. For example, instead of employing plain and corrugated plates, as shown in Fig. 3, a series of tubes 14 arranged side by side may be provided, as shown in Fig. 4; or, as shown in Fig. 5, I may employ plates 15 separated by rods or wires 16; or, as shown in Fig. 6, I may employ intersecting plates 17 and 18; or, as shown in Fig. 7, I may employ a structure comprising plates 19 separated by combs 20. The operation of all these various alternative structures is the same; that is to say, they all operate to conduct away heat from flaming gases tending to pass down through passage 9 so that no flame or gas hot enough to cause combustion of the mixture in the crank case, can reach said crank case.

What I claim is:—

An internal combustion engine comprising in combination a cylinder and compression chamber, and having a passage connecting said cylinder and chamber, and a plurality of heat-conducting objects within said connecting passage and extending longitudinally thereof, and of surface area and heat-conducting capacity adapting them to chill back flowing gases to below the temperature of combustion, said objects arranged side by side and together dividing said passage into a plurality of sub-passages of relatively great length as compared with their width.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

EDMUND WILLSON ROBERTS.

Witnesses:
B. L. Roberts,
S. L. Saurée.