H. W. MOORE.

EXPLOSIVE ENGINE.

APPLICATION FILED DEC. 6, 1911.

1,042,947.

Patented Oct. 29, 1912

2 SHEETS—SHEET 1.

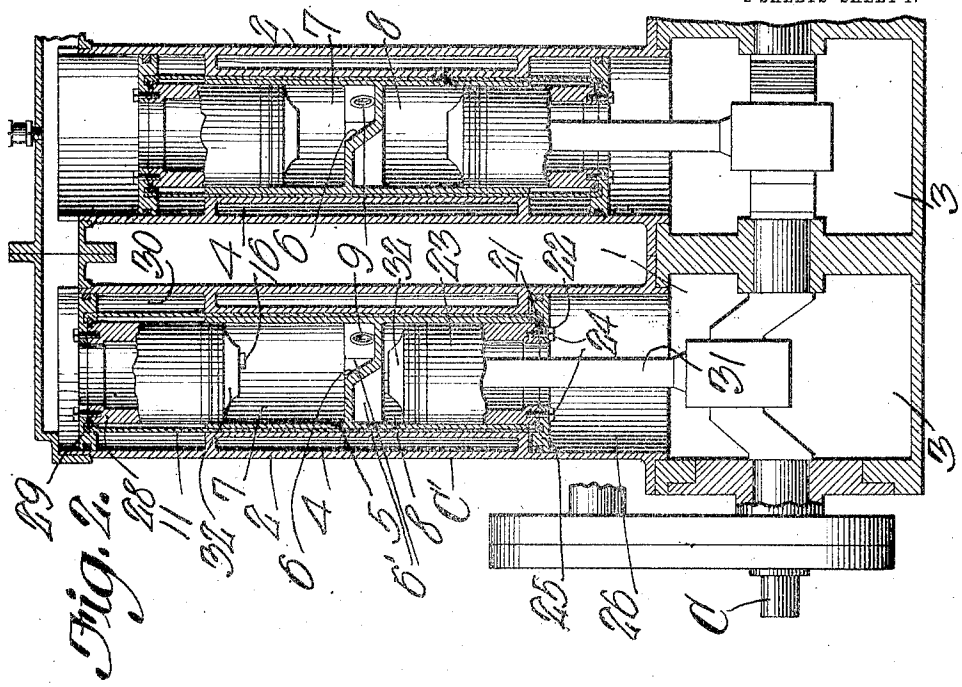

Fig. 2.

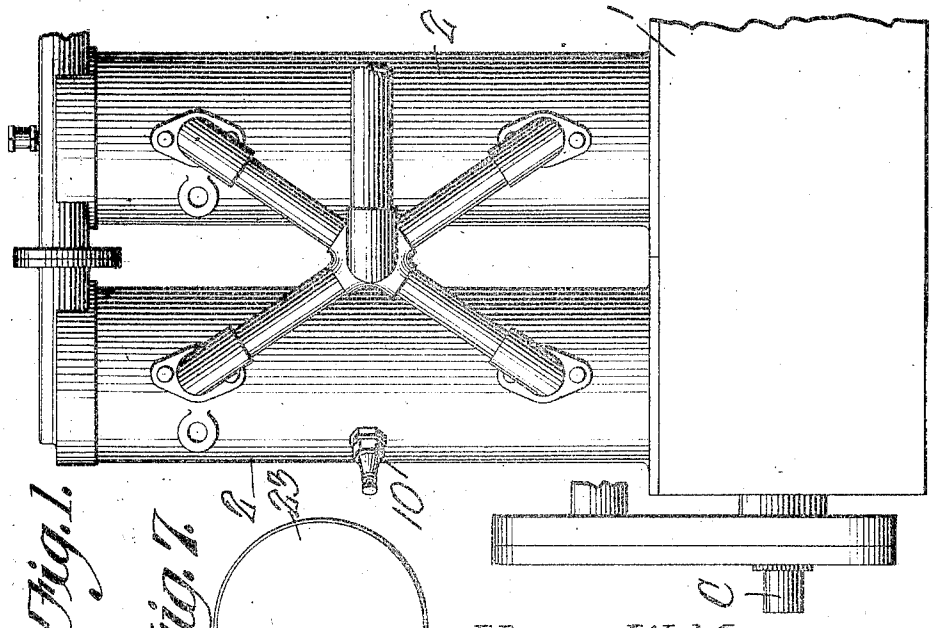

Fig. 1.

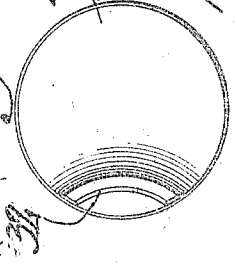

Fig. 7.

Witnesses

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2 SHEETS—SHEET 2.

Fig. 6.

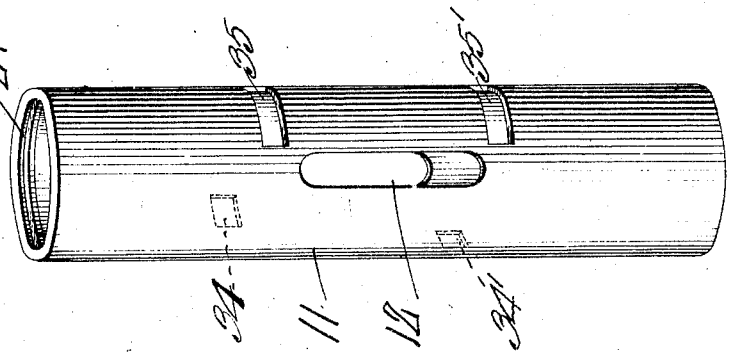


Fig. 4.

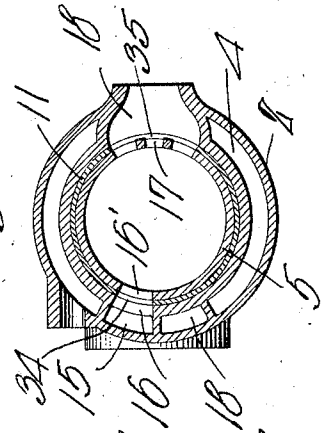
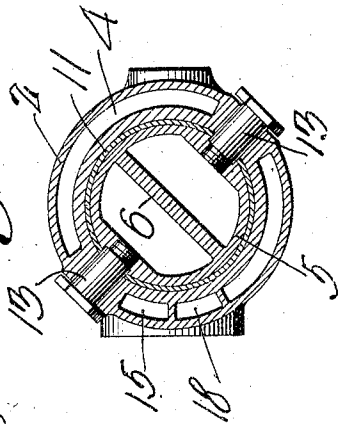


Fig. 5.



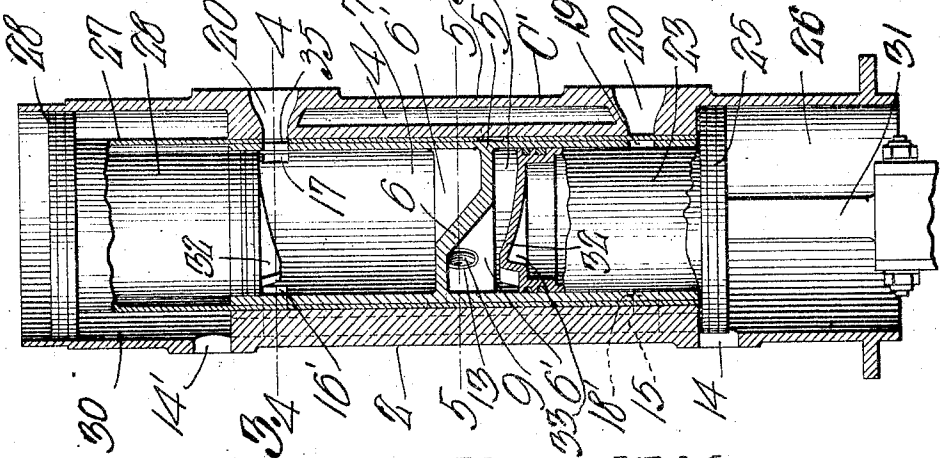


Fig. 3.

Witnesses

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UNITED STATES PATENT OFFICE.

HARRY W. MOORE, OF NEBRASKA CITY, NEBRASKA, ASSIGNOR TO RALPH A. DUFF, OF NEBRASKA CITY, NEBRASKA.

EXPLOSIVE-ENGINE.

1,042,947. Specification of Letters Patent. Patented Oct. 29, 1912.

Application filed December 6, 1911. Serial No. 664,256.

To all whom it may concern:

Be it known that I, HARRY W. MOORE, a citizen of the United States, residing at Nebraska City, in the county of Otoe and State of Nebraska, have invented a new and useful Explosive-Engine, of which the following is a specification.

The present invention relates to improvements in explosive engines, this particular construction being an improvement upon applicant's pending application filed September 13, 1911, Serial No. 649,010, in which a cylinder is provided with two superposed and connected pistons with the main carbureted air inlets at the upper end and the base of the engine, with means for drawing the explosive charge to the opposite ends of the cylinder for feeding to the opposite piston, a partition being disposed intermediate of the cylinder to divide the same into opposite disposed explosive chambers, the present invention having a connecting cylindrical sleeve employed for connecting the respective pistons together instead of rods, said sleeve providing a better connection and at the same time assisting as a carbureting medium, in that the heat therefrom, when projected beyond the ends of the cylinder will assist in the rapid carburation and expansion of the gas and air while it itself will be cooled by the inrush of the carbureted air.

A further object of the present invention is the provision of a cylindrical sleeve for connecting the respective pistons for movement in unison, said sleeve being composed of a material having the same coefficient of expansion as the casing and pistons so that the fit therebetween will be proper at all times, the said sleeve also acting as a sliding valve to control the intake and exhaust of the explosive mixture from the respective explosive chambers of the engine.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of invention herein disclosed can be made within the scope of what is claimed without departing from the spirit of the invention.

In the drawings—Figure 1 is a side elevation taken from the intake side of two cylinders of an engine embodying the present invention. Fig. 2 is a vertical longitudinal sectional view therethrough. Fig. 3 is a cross section taken through the exhaust ports of the main cylinder of one unit, with the pistons in their highest positions. Fig. 4 is a section taken on line 4—4 of Fig. 3. Fig. 5 is a section taken on line 5—5 of Fig. 3. Fig. 6 is a perspective view of the connecting sleeve for the two piston heads. Fig. 7 is a top plan view of one of the piston heads.

Referring to the drawings, it will be noted that the exterior construction of the present engine is identical with the structure of the engine set forth in the aforementioned application, and that the greater portion thereof is identical.

In the present instance, the numeral 1 designates the crank case and base of the engine, to which may be connected any number of cylinders 2, a crank shaft C being journaled in the casing, and forming with the crank case a splash lubricating system for properly lubricating the moving parts of the engine.

As clearly shown in Fig. 2 the crank case is divided into separate compartments 3 one to each cylinder 2 of the engine, so that each cylinder of the engine is a unit as in the aforementioned application.

Each cylinder is provided with the peculiarly shaped centrally disposed water jacket 4, and mounted centrally within the main cylinder C′ is a main explosive cylinder 5, which is divided centrally by means of the diaphragm or partition 6 into the oppositely disposed explosive chambers 7 and 8 respectively. This partition or diaphragm 6 is provided with the depressed portions 6′ which are in line with the spark plug apertures 9 for the spark plug 10. In order to properly retain the spark plug and at the same time hold the explosive cylinder 5 in its proper relative position to the outer cylinder 2 of the engine and provide a concentric space therebetween, the two couplings 13 are employed, the same being secured through the diametrically disposed apertures of the main cylinder 2 and being threaded into the apertures 9 of the cylinder 5. By this means the respective explosive chambers may be supplied with the proper spark, and the plug may be removed for cleaning when necessary.

Mounted for sliding movement in the concentric space between the cylinder 5 and the

inner wall of the main cylinder 2 is a cylindrical sleeve 11 provided with the diametrically disposed elongated slots 12 which are mounted to slide upon the respective couplings 13, the said elongated slots 12 being so positioned and of such a length as to permit of the proper reciprocatory movement of the sleeve 11.

Provided in the upper and lower portions, respectively, of the main cylinder 2 are carbureted air intake ports 14 and 14′ and leading from the respective chambers into which the said carbureted air is drawn, are the vertically disposed conduits 15 and 18 respectively, the conduit 15 being the supply conduit for the upper explosive chamber 7 and terminating in the intake port 16 at the upper end thereof, as clearly shown in Figs. 2 and 3. The other conduit 18 leads into the upper end of the main cylinder 2 and secures its explosive mixture through the intake 14′ to be delivered through the intake port 18′ to the lower explosive chamber 8.

Both of the respective explosive chambers 7 and 8 are provided with exhaust ports 17 and 19 respectively and are in line with the respective exhaust ports 20 and 20′ the same remaining in the same relative position at all times.

The sleeve 11 is provided upon its lower end with the grooved inwardly projecting annular portion 21 for the reception of the locking ring 22 which is adapted to fit within the grooved portion thereof and upon the lower end of the piston 23, the enlarged piston 25 being connected to the lower end of the piston 23 by means of the bolts 24 which lock the lower end 21 of the sleeve 11 thereto so that the piston 23 and piston 25 will be properly connected together, the piston 25 fitting the carbureted air compression chamber 26 at the lower end for supplying the carbureted air through the passage 15 to the intakes 16 and 16′ of the main cylinder 2 and the explosive chamber 7. The upper end 27 of the sleeve 11 is formed in the same manner and carries the piston head 28 and the enlarged piston disk 29 for supplying the carbureted air from the compression chamber 30 through the vertical conduit 18 to the intake 18′ of the lower explosive chamber 8. By this means it will be seen that the two piston heads 23 and 28 will reciprocate in unison in a like manner to those shown in the aforementioned application, the lower piston head 23 being connected directly by means of the piston rod 31 to the crank shaft C so that the proper rotary motion may be imparted thereto.

As clearly shown in Fig. 3 the pistons 23 and 28 are formed with a peculiar shaped baffle 32, the same instead of being a plate secured to the top thereof being an enlarged portion providing the under depression 33 in communication with the lower hollow portion of the piston so that the upper surface of said piston may be properly cooled and not permitted to be super-heated during the explosion, and operation of the engine. This projection also fits within its respective chamber 6′ formed in the diaphragm 6 and permits the maximum stroke within the minimum space.

From the foregoing description taken in connection with the drawings, it is evident that the lower and upper ends of the sleeve 11 which projects into the respective chambers 26 and 30 and due to the heat from the explosive charge will provide an increased carbureting surface in that the charge of the carbureted air being taken into the respective intakes 14 or 14′ will be projected suddenly upon the warm cylindrical surface encircling the same, thus being rapidly heated and consequently expanded so that when the piston moves in the opposite direction the explosive charge will be propelled in a thoroughly mixed and heated condition into the respective intake ports of the casing or cylinder 5 so that a proper heated and expanded carbureted air will be the resultant. By this means it is also evident that the explosive chambers 7 and 8 will be properly scavenged so that the burnt gases will be properly expelled from the respective chambers and the desired explosive mixture will be retained therein at the highest point of compression to be exploded. It is also evident by providing a sleeve such as 11 for connecting the respective pistons together that the projection of the carbureted air thereagainst will act as a cooling medium and will assist in cooling the same, and further by reason of the fact that the metal of the sleeve 11 is the same as the metal of the cylinder 5 and outer casing 2, such metal having the same co-efficient of expansion as the respective surrounding metal, that the liability to bind is lessened. It is also evident that by reason of the ports 34 and 34′ and 35 and 35′ formed in the walls of the cylindrical connector and sleeve 11 and adapted to register with the respective intake and exhaust ports 16, 16′, 17, 19, 20 and 20′, that the opening and closing thereof will be regulated entirely by the movement of the respective pistons so that the intake of the carbureted air and the exhaust of the burnt gas will be properly timed and will be controlled entirely by means of the said connecting sleeve 11.

By dispensing with the connecting rods as shown in the above mentioned application and employing in lieu thereof the sleeve 11 with the respective diametrically disposed slots 12, the assembling of the present structure is more easily accomplished and it is not so liable to prevent the proper alinement of the various ports and by

reason of the peculiar connection between the piston heads and the lower and upper ends of said sleeve 11, a proper and rigid connection is provided and one which will not leak at any point as it is connected tightly throughout the entire ends thereof. Further by constructing the same in the form of a sleeve instead of rods, it is only necessary to provide an annular chamber between the outer wall of the cylinder 5 and the inner wall of the cylinder 2, thus reducing the machine work from a plurality of vertical passages. The main advantage, however, that the sleeve 11 has over the respective rods in the former case, is that the same provides a better and rigid connection between the pistons and at the same time reduces the size of the respective chambers 26 and 30 and causes the inrush of cool carbureted air to be circulated about the entire surface of the extended end of the sleeve 11 within the respective chambers so that each of the said projected ends of the sleeve 11 will produce a rapid means for increasing the carburation and expansion of the gas to produce a better explosive mixture. The other result of this is the cooling of the respective projected ends of the sleeve 11 by the inrush of the carbureted air through the respective ports 14 or 14'.

What is claimed is;

1. An explosive engine, having an outer cylinder, an inner cylinder of lesser length and diameter disposed therein in fixed relation thereto, said inner cylinder being divided centrally into oppositely disposed explosive chambers, each of which is provided with intake and exhaust ports, a piston in each cylinder, a carbureted air supplying piston in each extended end of the outer cylinder, and a sleeve connected at each end to one main piston and a carbureted air supplying piston, said sleeve having ports and disposed to act as an exhaust and intake valve for the respective chambers and to hold the pistons for simultaneous movement.

2. An explosive engine, having an outer cylinder, an inner cylinder of lesser length and diameter disposed therein in fixed relation thereto, said inner cylinder being divided centrally into oppositely disposed explosive chambers each of which is provided with intake and exhaust ports, a piston in each cylinder, a carbureted air supplying piston in each extended end of the outer cylinder, a sleeve connected at each end to one main piston and a carbureted air supplying piston, said sleeve having ports and mounted to act as an exhaust and intake valve for the respective chambers and to hold the pistons for simultaneous movement, the ends of the main cylinder beyond the ends of the inner cylinder being provided with carbureted air supply ports to supply the carbureted air to the respective carbureted air supplying pistons and against and around the respective ends of the sleeve.

3. An explosive engine, having an outer cylinder, an inner cylinder of lesser length and diameter disposed therein in fixed relation thereto, said inner cylinder being divided centrally into oppositely disposed explosive chambers each of which is provided with intake and exhaust ports, a piston in each cylinder, a carbureted air supplying piston in each extended end of the outer cylinder, a sleeve connected at each end to one main piston and a carbureted air supply piston, said sleeve having ports and mounted to act as an exhaust and intake valve for the respective chambers and to hold the pistons for simultaneous movement, the ends of the main cylinder beyond the ends of the inner cylinder being provided with carbureted air supply ports to supply carbureted air to the respective carbureted air supplying pistons and against and around the respective ends of the sleeve, the said carbureted air supplying pistons being disposed to supply carbureted air to the opposite explosive chamber.

4. An explosive engine, having an outer cylinder, an inner cylinder of lesser diameter and length disposed therein and providing a concentric space thereabout the full length thereof and enlarged chambers beyond the ends thereof, said inner cylinder being divided centrally into oppositely disposed explosive chambers each of which is provided with its respective intake and exhaust ports, two diametrically disposed spark plug carrying couplings mounted in the outer cylinder and connected to the inner cylinder one upon each side of the division of the inner cylinder for holding the inner cylinder relatively to the outer cylinder, a sleeve of greater length than the inner cylinder mounted in the concentric space therearound for sliding movement, the same being provided with intake and exhaust ports at its respective ends adapted to be placed into registration with the respective intake and exhaust ports of the inner cylinder, and an explosive propelled piston and a carbureted air supplying piston connected to the respective ends of said sleeve and slidable within the respective chambers of the inner cylinder and at the extreme ends of the outer cylinder.

5. An explosive engine, having an outer cylinder, an inner cylinder of lesser diameter and length disposed therein and providing a concentric space thereabout the full length thereof, and an enlarged chamber beyond each end thereof, said inner cylinder being divided centrally into oppositely disposed explosive chambers each of which is provided with its respective intake and exhaust ports, two diametrically disposed spark plug carrying couplings mounted in

the outer cylinder and connected to the inner cylinder one upon each side of the division of the inner cylinder for holding the inner cylinder relatively to the outer cylinder, a sleeve of greater length than the inner cylinder mounted in the concentric space therearound for sliding movement, the same being provided with intake and exhaust ports at its respective ends adapted to be placed in registration with the respective intake and exhaust ports of the inner cylinder, an explosive propelled piston and a carbureted air supplying piston connected to the respective ends of the said sleeve and slidable within the respective chambers of the inner cylinder and at the extreme ends of the outer cylinder, said sleeve being provided with diametrically disposed elongated slots to fit slidably upon the spark plug couplings and prevent turning of said sleeve, said outer cylinder being provided with vertically disposed channels in communication with the respective chambers beyond the ends of the inner cylinder and with the opposite explosive chambers of the said inner cylinder whereby the carbureted air is supplied to the respective explosive chambers.

6. An explosive engine, having an outer cylinder, an inner cylinder of lesser diameter and length disposed therein and providing a concentric space thereabout the full length thereof, and an enlarged chamber beyond each end thereof, said inner cylinder being divided centrally into oppositely disposed explosive chambers each of which is provided with its respective intake and exhaust ports, two diametrically disposed spark plug carrying couplings mounted in the outer cylinder and connected to the inner cylinder one upon each side of the division of the inner cylinder for holding the inner cylinder relatively to the outer cylinder, a sleeve of greater length than the inner cylinder mounted in the concentric space therearound for sliding movement, the same being provided with intake and exhaust ports at its respective ends adapted to be placed in registration with the respective intake and exhaust ports of the inner cylinder, an explosive propelled piston and a carbureted air supplying piston connected to the respective ends of said sleeve and slidable within the respective chambers of the inner cylinder and the extreme ends of the outer cylinder, whereby the carbureted air drawn into the outer cylinder at the respective ends thereof will be projected against the projecting portion of the sleeve to assist in the mixing and carburation of the air and to simultaneously cool the sleeve.

7. An explosive engine, having an outer cylinder, an inner cylinder of lesser diameter and length disposed therein and providing a concentric space thereabout the full length thereof and an enlarged chamber beyond each end thereof, said inner cylinder being divided centrally into oppositely disposed explosive chambers each of which is provided with its respective intake and exhaust ports, two diametrically disposed spark plug carrying couplings mounted in the outer cylinder and connected to the inner cylinder one upon each side of the division of the inner cylinder for holding the inner cylinder relatively to the outer cylinder, a sleeve of greater length than the inner cylinder mounted in the concentric space therearound for sliding movement, the same being provided with intake and exhaust ports at its respective ends adapted to be placed in registration with the respective intake and exhaust ports of the inner cylinder, an explosive propelled piston and a carbureted air supplying piston connected to the respective ends of the said sleeve and slidable within the respective chambers of the inner cylinder and the extreme ends of the outer cylinder, said sleeve being provided with diametrically disposed elongated slots to fit slidably upon the spark plug couplings and prevent turning of said sleeve, said outer cylinder being provided with vertically disposed channels in communication with the respective chambers beyond the ends of the inner cylinder and with the opposite explosive chambers of the said inner cylinder whereby the carbureted air is supplied to the respective explosive chambers, and whereby the carbureted air drawn into the outer cylinder at the respective ends thereof will be projected against the projecting portion of the sleeve to assist in the mixing and carburation of the air and to consequently cool the sleeve.

8. An explosive engine, having a cylinder provided with oppositely disposed explosive chambers, a power piston mounted for reciprocation in each one of said chambers, a sleeve of greater length than the cylinder surrounding the same in sliding relation thereto, the two extremities of the sleeve being connected to both of said pistons to retain the same for simultaneous movement, and a piston of larger diameter than the power piston connected to each extremity of said sleeve and to the respective pistons for simultaneous movement with said pistons and sleeve.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

HARRY W. MOORE.

Witnesses:
SELINA WILLSON,
JULIE S. STEVENS.