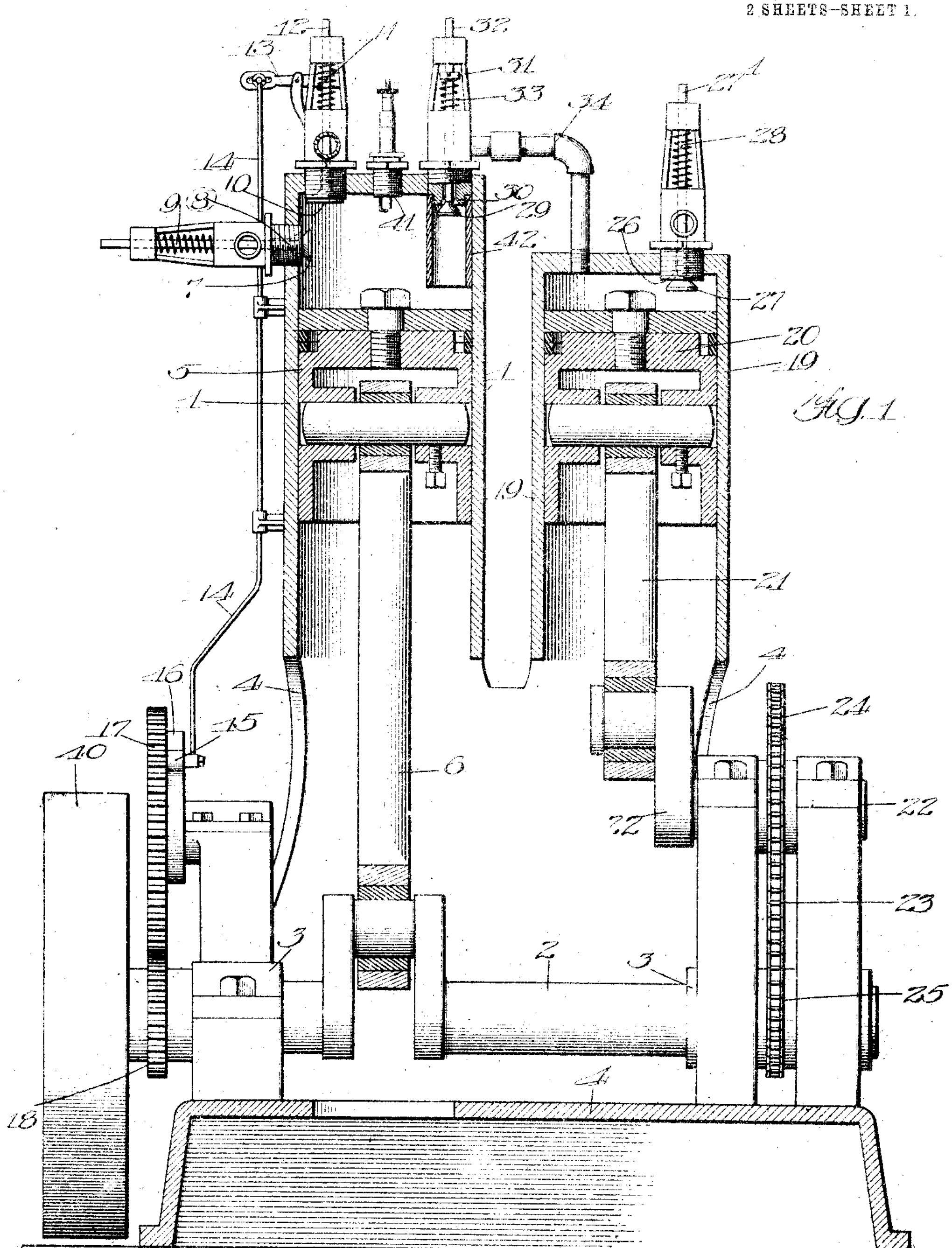
W. C. WESTAWAY.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED AUG. 3, 1908.

1,048,922. Patented Dec. 31, 1912.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 2.

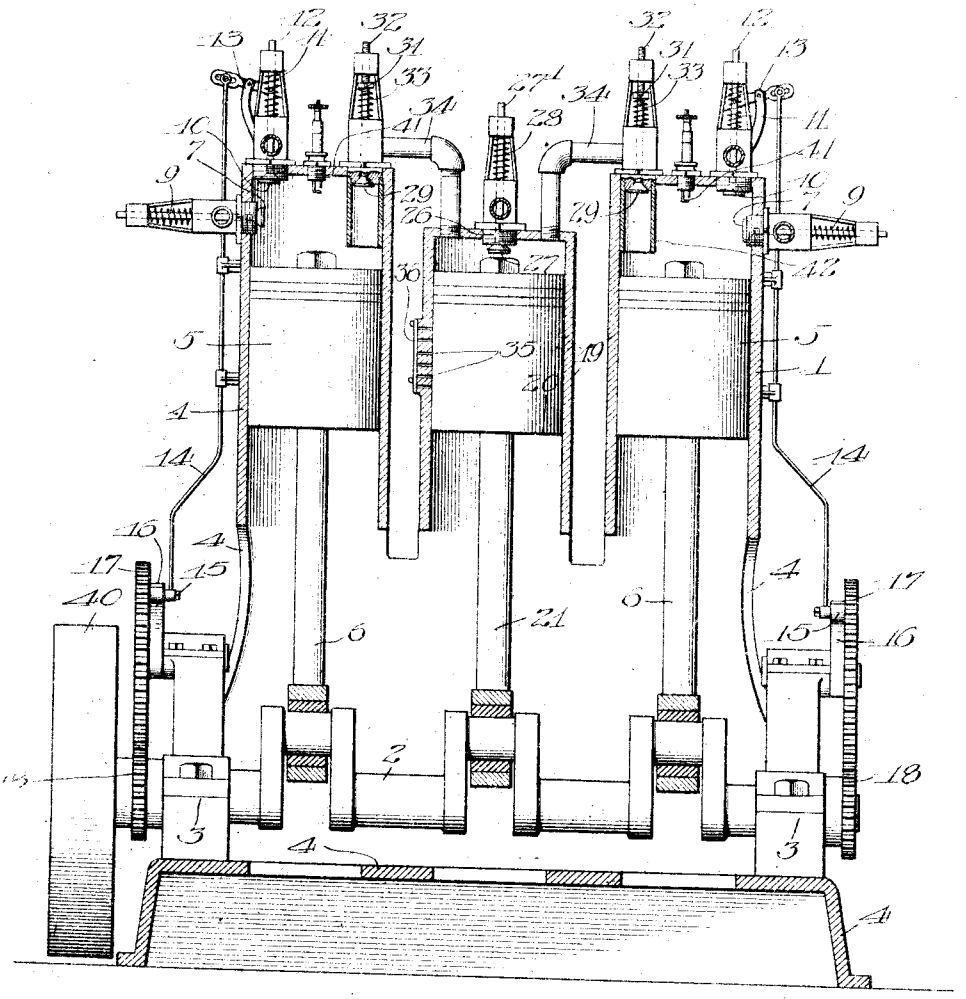


Fig. 3.

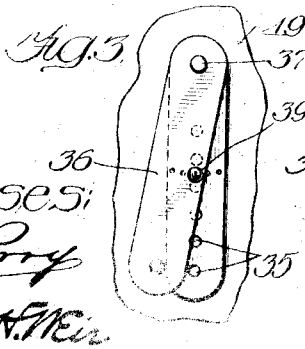
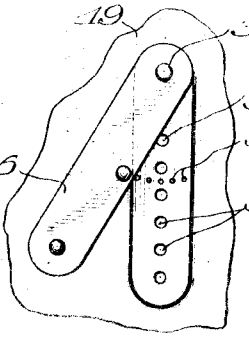


Fig. 4.



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UNITED STATES PATENT OFFICE.

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INTERNAL-COMBUSTION ENGINE.

1,048,922. Specification of Letters Patent. Patented Dec. 31, 1912.

Application filed August 8, 1908. Serial No. 446,673.

To all whom it may concern:

Be it known that I, WALTER C. WESTAWAY, a citizen of the United States, residing at Rockford, in the county of Winnebago and State of Illinois, have invented certain new and useful Improvements in Internal-Combustion Engines or the Like, of which the following is a description.

My invention belongs to that class of devices known as internal combustion engines or motors and particularly to an engine in which the cylinder walls are internally cooled and the efficiency of the engine increased, and has for its objects the production of a simple, convenient, reliable and efficient device of the kind described for use wherever applicable.

To this end my invention consists in the novel construction, arrangement and combination of parts herein shown and described and more particularly pointed out in the claims.

In the accompanying drawings, wherein like or similar reference characters indicate like or corresponding parts, Figure 1 is a sectional view of an engine embodying my preferred construction, Fig. 2 is a sectional view of an engine provided with a plurality of cylinders and embodying my improved construction, Fig. 3 is a view in elevation of a portion of the cooling fluid receptacle shown in Fig. 2, and Fig. 4 is a substantially similar view showing a slightly different adjustment.

Referring to the drawings my improvements are shown as applied and forming a part of what is commonly known as a four-cycle internal combustion engine, or that type of engine or motor in which a charge of combustible is drawn into the cylinder of the engine at each alternate rotation of the crank shaft. As shown, 1 is the cylinder of the engine, and 2 the crank shaft supported on suitable bearings 3—3 connected to the cylinder by the usual frame members 4—4. The piston 5 of the usual or any preferred form, is fitted in the interior of the cylinder 1 and connected to the crank shaft 2 by means of a suitable connecting rod 6 or its equivalent in substantially the usual or in any preferred way.

Any desired form of valve mechanism may be provided to control the admission of the combustible to the interior of the cylinder and the exhaust of the gases or waste products of combustion therefrom. In the form of engine shown the admission valve consists of a check valve 7 of suitable form preferably provided with a resilient member 9 or its equivalent for the purpose arranged to normally hold the valve on its seat or in closed position. The valve 7 is positioned in the passage 8 between the source of supply of the combustible and the cylinder of the engine and is adapted to be automatically operated by the reduction of the pressure within the cylinder to less than the pressure of the supply of the combustible so that a charge of the combustible is drawn into the combustion chamber of the cylinder at each suction or admission stroke of the piston 5.

As shown the cylinder 1 is provided with an exhaust valve 10 which is normally resiliently held in a closed position by means of the resilient member 11. Any suitable or preferred arrangement may be employed for positively opening the exhaust valve 10 to permit the escape of the waste products of combustion. The arrangement shown comprises an arm 13 operatively connecting the stem 12 of the valve member 10 and a rod 14 which is operatively connected with the crank shaft 2. In the construction shown the rod 14 is provided with a roll 15 or its equivalent coöperating with the cam 16 which is driven by the gear 17 meshing with a gear 18 secured to the crank shaft. The ratio of the gears 17 and 18 is such that the exhaust valve is opened at every alternate stroke of the piston from the crank shaft after an explosion has taken place.

In operation the first movement of the piston toward the crank shaft draws a charge of combustible through the passage 8 or inlet and by the intake valve 7 into the combustion chamber in the cylinder 2, the charge being compressed by the return movement of the piston, the momentum of the fly wheel 40 carrying the piston back. When the piston reaches the limit of its movement from the crank shaft 2, the charge is ignited by any suitable mechanism, a spark plug 41 of the usual form being shown, the pressure produced by the explosion supplying the power to again move the piston toward the crank shaft. Upon the return stroke of the piston after the explo-

sion the waste products produced by the piston are driven out through the exhaust port controlled by the valve 10 which is preferably opened when the piston has reached the limit of travel toward the crank end of the cylinder at the time of the explosion. The timing mechanism controlling the spark plug 41 forms no part of my invention and is not shown, it being sufficient to say that a spark is produced at each time the charge is compressed.

At each time when the charge of combustible is fired, the cylinder walls and piston are heated by the combustion. My preferred form of engine is provided with means for forcing a cooling fluid, such as air or the like, into the cylinder of the engine preferably while the engine is discharging the waste products of combustion thereby cooling the cylinder walls and piston and at the same time driving out substantially all of the foul mixture.

As shown the engine cylinder is provided with a cooling fluid inlet 30 controlled by a suitable valve 29. The valve member 29 is preferably extended as at 32 and provided with a resilient member 33 adapted to normally retain the valve member on its seat, an adjustable nut or collar 31 being provided for controlling the pressure required to open the valve. Any suitable means may be employed for forcing the cooling fluid into and through the passage or inlet 30 into the engine cylinder, the preferred construction comprising what may be termed an auxiliary or cooling fluid cylinder 19. The cylinder 19 is provided with a piston or plunger 20 of any suitable form arranged therein and preferably operatively connected by suitable means to the crank shaft 2. In the construction shown the connecting means is arranged to drive or reciprocate the piston 20 one complete stroke, that is, a stroke in one direction and return while the engine piston 5 is making two complete strokes. As shown the piston 20 is provided with a piston rod 21 which is driven by a secondary shaft 22 suitably connected by means of a chain 23 and sprocket wheels 24 and 25 to the crank shaft 2. It is obvious however, that any other suitable arrangement may be employed to reciprocate the piston 20 and that if desired it may be entirely independent of the engine itself. The cooling cylinder is provided with an inlet 26 controlled by a suitable valve 27 or its equivalent, resilient means 28 normally retaining the valve in its closed position. The chamber in the cooling cylinder 19 is connected with the cooling fluid inlet 30 of the engine combustion chamber by means of a pipe 34 or an equivalent arrangement whereby the cooling fluid may be forced or discharged from the cooling cylinder 19 into the engine cylinder.

In operation at the time the engine piston 5 starts to move toward the crank shaft under the force of the explosion the piston 20 starts on the return stroke toward the head end of the cylinder 19, the cylinder 19 being substantially filled with the cooling fluid. However, the pressure within the engine cylinder is sufficient to retain the valve member 29 closed until the piston 5 has reached the end of its travel toward the crank end and the exhaust valve 10 has been opened. At this time the piston 20 has traveled half of the distance toward the head end of its cylinder and at the time the exhaust valve 10 of the engine cylinder is open the cooling fluid is forced through the pipe 34 and by the valve 29 into the combustion chamber of the engine. As the piston 5 moves toward the head end of its cylinder forcing out the waste products of combustion, cooling fluid is simultaneously forced into the engine cylinder cooling the cylinder walls and piston and at the same time driving out the waste products of combustion or foul mixture. As a fresh charge of combustible is drawn into the engine cylinder and compressed the cooling fluid is drawn into the cooling cylinder 19 through the inlet 26, the operations continuing as described.

In the ordinary form of engine cooled from without the cylinder at the time a fresh charge of combustible is drawn into the cylinder there remains a quantity of waste products of combustion or foul mixture which mixes with the new charge and fouls it to a more or less extent. With my device the combustion chamber is substantially filled with pure air, when air is used as a cooling fluid, at the time a fresh charge is taken into the cylinder, thus giving a better mixture. If desired or necessary the quantity of air previously mixed with the combustible or charge before entering the cylinder may be varied as necessary or desirable to meet the conditions resulting from the introduction of the cooling fluid. As is obvious the variation in the quantity of air mentioned would depend upon the quantity and condition of the cooling air in the combustion chamber at the time a fresh charge is taken in and the condition of the cylinder walls of the engine.

If desired an extended part 42 may be arranged at the cooling fluid inlet of the engine cylinder so that the cooling fluid is delivered at a point substantially remote from the exhaust port, or if desired the inlet may be arranged at some other point in the cylinder.

The form of engine shown in Fig. 2 is substantially similar to that shown in Fig. 1 with the exception that the engine is provided with a plurality of cylinders and cooperating parts and that the cooling cylin-

der piston is arranged to move in unison with the two engine pistons. With this arrangement one cylinder is preferably arranged to have the charge ignited at one stroke and the other at the alternating stroke, the cooling fluid being forced first into one cylinder and then into the other at the times the respective cylinders are exhausting as heretofore described. It is obvious that there may be any number of engine cylinders or cooling fluid cylinders or receptacles or that the cooling fluid may be forced into the cylinders by any equivalent arrangement than that shown and described.

Any suitable means or arrangement may be employed to control the quantity of cooling fluid forced into the engine cylinder. A very simple arrangement is shown in Figs. 2, 3 and 4 in which the cooling fluid cylinder or receptacle is provided with a plurality of openings 35 therein which are normally covered by a plate 36 pivotally secured to the cylinder as at 37. When it is desired to reduce the quantity of cooling fluid forced into the engine cylinder, the blade 36 is moved uncovering one or more of the openings 35 as shown in Figs. 3 and 4 so that a portion of the fluid escapes. As shown a plurality of holes 38 are tapped in the cylinder 19 and a thumb-screw 39 provided to lock the plate 36 in any desired position. Any equivalent means or arrangement may be employed to control the quantity of cooling fluid forced into the engine cylinder or any suitable arrangement provided to lock plate 36 in the desired position.

Having thus described my invention it is obvious that various immaterial modifications may be made in the form, arrangement or combination of parts herein shown and described without departing from the spirit of my invention, hence I do not wish to be understood as limiting myself to the exact construction or arrangement shown.

What I claim as new and desire to secure by Letters Patent is:—

1. An internal combustion engine of the kind described, in combination with means for introducing a cooling medium into the cylinder for internally cooling the cylinder walls, and a tubular deflector of less diameter than the cylinder extending longitudinally within the cylinder and secured to the cylinder head whereby to separate the cooling medium from the inlet and exhaust of the cylinder.

2. In a device of the kind described, and in combination, an internal combustion engine provided with a power piston cylinder, a combustible inlet and exhaust outlet in the wall of said cylinder, valves for said inlet and outlet, said cylinder also having an inlet for a cooling fluid, and means for delivering a cooling fluid directly into said cylinder through said last mentioned inlet and at a point removed from the exhaust outlet substantially simultaneously with the opening of the engine exhaust valve, said means including a conduit of substantially less diameter than the cylinder, secured to the cylinder head and extending longitudinally within the cylinder.

3. In a device of the kind described, and in combination, an internal combustion engine provided with a power piston cylinder, a combustible inlet and exhaust outlet in the wall of said cylinder, valves for said inlet and outlet, said cylinder also having an inlet for a cooling fluid, and means for delivering a cooling fluid directly into said cylinder through said last mentioned inlet and at a point removed from the exhaust outlet substantially simultaneously with the opening of the engine exhaust valve, said means including a deflector secured to the end wall of the cylinder adjacent the cooling fluid inlet and extending substantially parallel with the side wall of the cylinder.

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

WALTER C. WESTAWAY.

Witnesses:
ARTHUR R. HALEY,
LOUIS F. MEEHAN.