G. E. HOLLMANN.

ROTARY VALVE HYDROCARBON ENGINE.

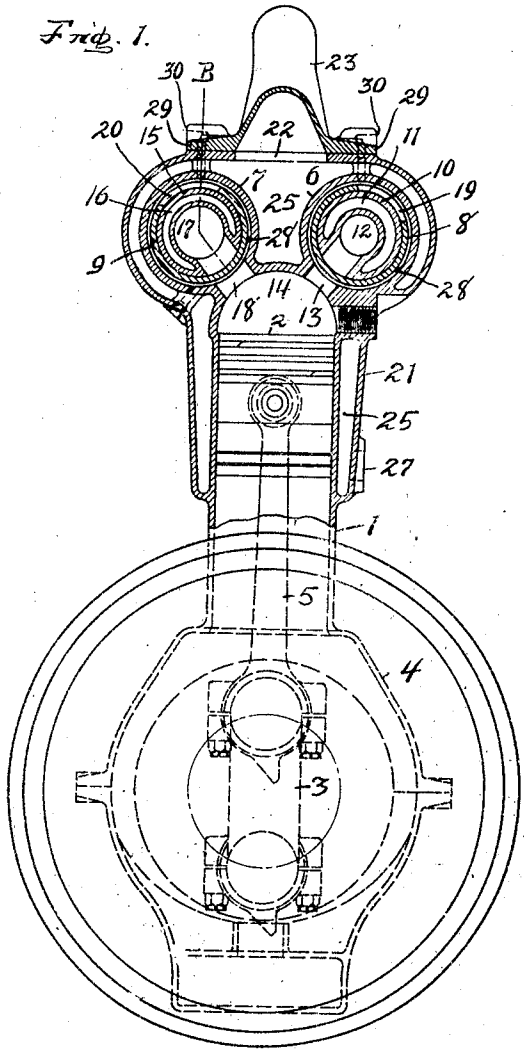
APPLICATION FILED MAY 12, 1915.

**1,213,873.**

Patented Jan. 30, 1917.

4 SHEETS—SHEET 1.

Fig. 1.




WITNESSES:

C. J. Dell.

B. F. Topham

INVENTOR.

George E. Hollmann

BY

A. G. Burns ATTORNEY

G. E. HOLLMANN.

ROTARY VALVE HYDROCARBON ENGINE.

APPLICATION FILED MAY 12, 1915.

1,213,873.

Patented Jan. 30, 1917.

4 SHEETS—SHEET 2.

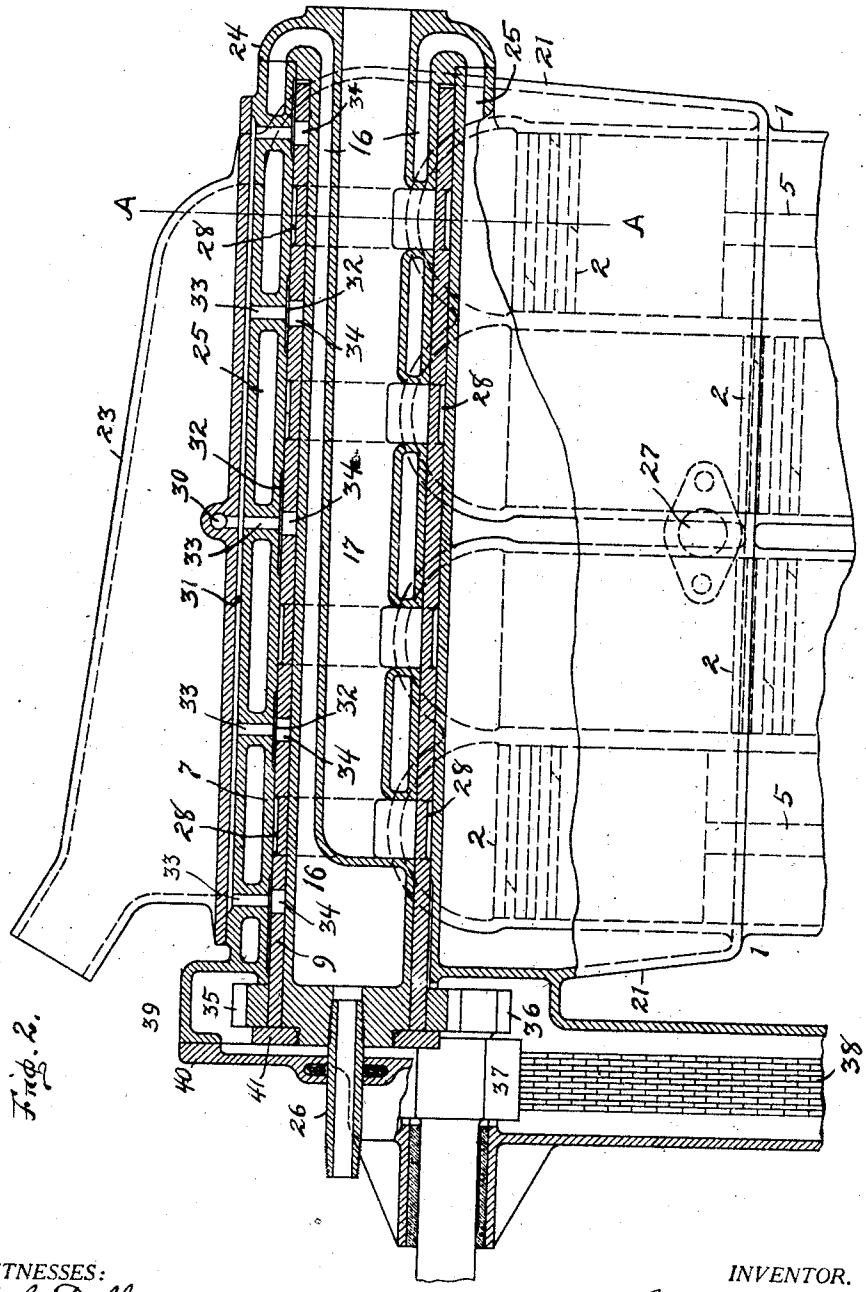



Fig. 2.

WITNESSES:

C. J. Dolb

B. K. Topham

INVENTOR.

George E. Hollmann

BY

G. E. Burns ATTORNEY

G. E. HOLLMANN.

ROTARY VALVE HYDROCARBON ENGINE.

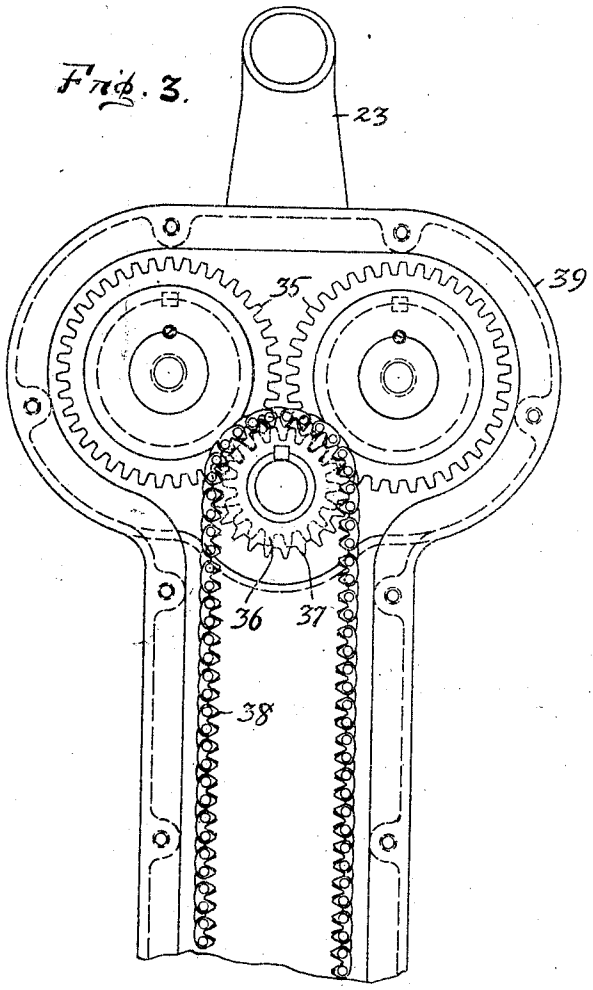
APPLICATION FILED MAY 12, 1915.

**1,213,873.**

Patented Jan. 30, 1917.

4 SHEETS—SHEET 3.

Fig. 3.




WITNESSES:
C. J. Dell
B. B. Topham.

INVENTOR.
George E. Hollmann

BY
H. G. Burns ATTORNEY

G. E. HOLLMANN.

ROTARY VALVE HYDROCARBON ENGINE.

APPLICATION FILED MAY 12, 1915.

**1,213,873.**

Patented Jan. 30, 1917.

4 SHEETS—SHEET 4.

Fig. 5.

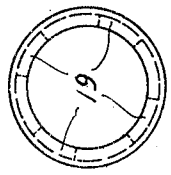



Fig. 7.

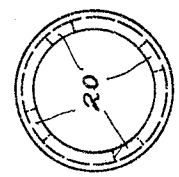



Fig. 4.

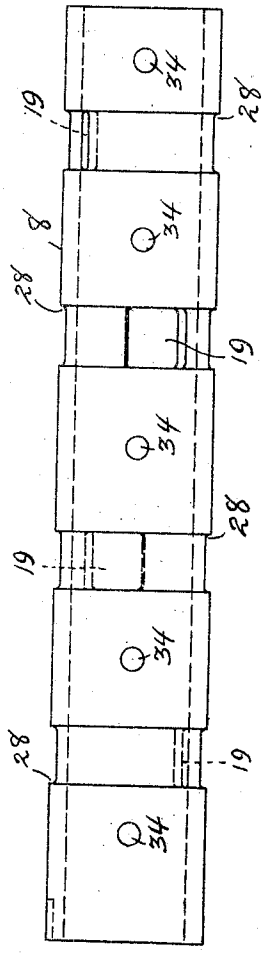
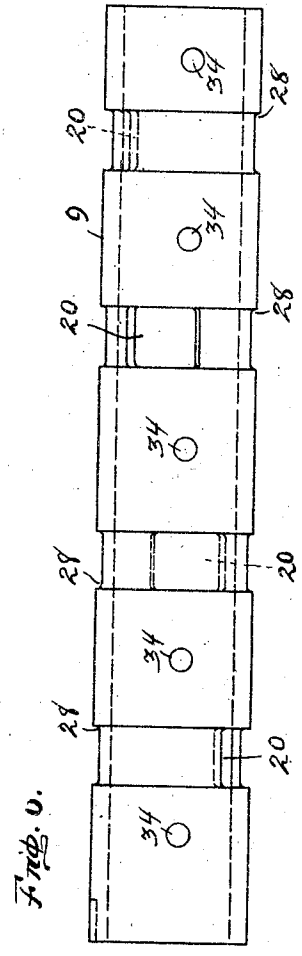



Fig. 6.




WITNESSES:

C. J. Doll.

B. J. Topham

INVENTOR.

George E. Hollmann

BY

H. G. Burns ATTORNEY

# UNITED STATES PATENT OFFICE.

GEORGE E. HOLLMANN, OF FLINT, MICHIGAN.

## ROTARY-VALVE HYDROCARBON-ENGINE.

1,213,873. Specification of Letters Patent. Patented Jan. 30, 1917.

Application filed May 12, 1915. Serial No. 27,526.

*To all whom it may concern:*

Be it known that I, GEORGE E. HOLLMANN, a citizen of the United States of America, and resident of Flint, in the county of Genesee and State of Michigan, have invented certain new and useful Improvements in Rotary-Valve Hydrocarbon-Engines, of which the following is a specification.

This invention relates to improvements in hydro-carbon engines and particularly to the valves for the admission of fuel and the discharge of the product of combustion which takes place within the cylinders.

The objects of the improvement are: First, to provide valves so constructed and arranged in connection with the engine as to insure lubrication thereof and also the maintenance of a proper degree of temperature for the continuous operations of the valves; second, to construct the valves and casings therefor, so that deposits of carbon and other matter that pass into and out of the combustion chamber through the valves, will not foul the bearing surfaces of the valves; and third, an especial object of the invention is to provide an internal and external application of the cooling agent directly to the bearings of the valves.

The objects of the invention are accomplished by the construction illustrated in the accompanying drawings in which;

Figure 1 is a vertical transverse section through the engine on the line A—A of Fig. 2; Fig. 2 is a longitudinal section on the line B of Fig. 1, the scale being somewhat enlarged; Fig. 3 is a detail view showing the means for transmitting motion to the valves; Fig. 4 is a side view of the valve for regulating the admission of the explosive mixture to the engine cylinder; Fig. 5 is an end view thereof; Fig. 6 is a side view of the valve for controlling the exhaust from the engine cylinders; and Fig. 7 is an end view thereof.

Similar numerals of reference indicate corresponding parts throughout the several views and referring now to the same, the present invention applies to an engine of the hydro-carbon type in which a series of cylinders (1) having reciprocating pistons (2) therein that are connected with a crank-shaft (3) that extends through a crank-case (4), the connections being made respectively by means of pitmen (5).

The number of cylinders employed may be varied, the drawings show four arranged in the usual manner as an example. Two tubular valve-casings (6) and (7) respectively are formed in connection with each of the cylinders (1), the former for the admission valve (8) and the latter for the exhaust valve (9) each of which are of tubular form and fit within the casings respectively so as to rotate therein. The casing (6) has a chambered core (10) extending therethrough and which affords a bearing for the sleeve-valve (8). The core has two chambers (11) and (12) respectively, the former serving as a space for cooling water, and the latter for conducting the explosive mixture to the various cylinders through communicating ports (13) that lead from the chamber (12) into the corresponding combustion chambers (14) of the cylinder. The casing (7) is similarly formed with a core (15) having chambers (16) and (17), the former serving for a space for cooling water, and the latter for conveying from the combustion chambers of the cylinders the exhaust gases, there being a series of ports (18) leading respectively from the cylinders into the chamber (17). It is the intention that the valves (8) and (9) shall have a running fit between the corresponding valve-casing and core, and when the valves are in place the corresponding ports (13) and (18) are closed by the valves except when the ports (19) and (20) respectively in the corresponding valves register with the ports.

A jacket (21) is formed around the upper portion of the cylinders and also around both of the valve casings, and has communication in its upper part through an opening (22) with a manifold (23) that is attached along the top of the jacket. Each of the cores (10) and (15) respectively has a head (24) at its outer extremity and the water chamber therein communicates through said head with the space (25) between the jacket and the cylinder and casings. The opposite end of each of the cores

is closed except for a feed-pipe (26) that extends through the end of the core and affords means for the introduction of cooling water into the cooling chamber of the core. A port (27) in the lower part of the jacket (21) is also provided for the introduction of cooling water into the space (25). The cold water introduced into the port (27) and into the chambers (11) and (16) through the feed-pipes (26) passes out through the opening (22) into the manifold from whence it is directed in the usual manner to a radiator which is customarily used for the reduction of the temperature of the cooling water. The radiator and its connections with the apparatus are not shown in the drawings as appliances of that character are well understood in the art.

The valves (8) and (9) are each in the form of a sleeve or tube, the inner and outer surfaces of which are dressed smoothly so as to afford running bearing surfaces respectively to fit the corresponding core that extends within the interior and the inner surface of the casing. Annular recesses (28) are made in the exterior faces of the tubes coincident with the ports (19) and (20) respectively therein and which recesses register constantly with the corresponding ports (13) and (18) respectively that lead from the casings into the combustion chambers of the cylinders. The purpose of the recesses is to eliminate the bearing surfaces of the valves and their casings at points where direct exposure to the exploding gases in the cylinder occurs and in this way avoid the hindrance that generally is occasioned by deposits of carbon that would otherwise interfere more or less with the lubrication and rotation of the valves.

The manifold (23) is formed with a flange (29) upon each side that fits snugly upon the top of the jacket and a port (30) is made in each of the flanges for the introduction of lubricating oil into corresponding grooves (31) made in the top of the jacket. Upon the interior face of each of the casings is made a series of oil grooves (32) that have communication through suitable openings (33) with the groove (31). The valves (8) and (9) also have openings (34) made therein that register with the openings (33) so that the lubricant introduced into the groove (31) will find its way to both exterior and interior surfaces of the valves.

Each of the valves extends at one end beyond its casing and has fixed thereon a gear-wheel (35) that meshes with a driving gear (36). The gear (36) has fixed relation with a sprocket (37) that is rotated by means of a chain (38) and the latter is driven by the crank-shaft (3) as the latter is rotated. The connection of the chain and crank-shaft is not illustrated in the drawings inasmuch as it consists of the well-known method of driving a chain from a rotating shaft with a pinion fixed thereon. A housing (39) having a cover (40) is formed at the end of the jacket (21) for inclosing the gears, sprocket-wheel and chain, and the water feed pipes (26) extend through the cover (40) into the adjacent corresponding ends of the cores. Collars (41) secured upon the ends of the cores respectively serve to hold the corresponding valves in proper position thereon and the gears (35) in alinement with the driving gear (36).

The ports in the valves (8) and (9) are located so that as the valves are rotated the ports will register with the corresponding ports that lead from the respective casings into the cylinders in succession in the order desired. Explosive gas mixture is introduced into the intake chamber (12) of the core (10) at its outer end by connecting the same with a suitable source of supply by means of a pipe (not shown). The exhaust chamber (17) of the core (15) is also connected at its outer end with a pipe (not shown) for carrying away the product of combustion. Cooling water is introduced through the pipes (26) into the cooling chambers of the cores and also through the port (27) into the jacket, and the water thus introduced flows through the cooling chambers and jacket and passes out through the manifold (23). The continual passage of water at a low temperature through the chambers and jacket has the effect of preventing the internal and external bearing surfaces of the valves from becoming excessively hot.

By constructing the valve casings within the jacket, and the cores with water chambers that completely surround the intake and exhaust chambers of the respective cores, the entire internal and external bearing surfaces of the valves and the corresponding bearing surfaces of the cores and casings are cooled by the passage of water through the chambers and jacket.

What I claim is:—

1. In apparatus of the class described a rotary sleeve valve having internal and external bearing surfaces and ports for the passage of gas, and having in its external face circumferential recesses made therein at points coincident with the ports respectively.

2. In a hydro-carbon engine having a series of cylinders, two cylindrical valve casings having ports communicating respectively with the combustion chambers of the cylinders; a rotary sleeve valve in each of the casings having ports adapted to register respectively with the ports in the casing as the valve is rotated, the valve having circumferential recesses at points coincidental

with each of its ports; a cylindrical core having concentric chambers, the innermost of which is adapted to have communication with the respective combustion chambers of the cylinders through the ports in the valve and casing periodically as the valve is rotated, the outermost chamber being adapted for the passage therethrough of a cooling liquid; and a mechanism for actuating the valves.

In testimony whereof I affix my signature, in presence of two witnesses.

GEORGE E. HOLLMANN.

Witnesses:

MARGARET C. GREEN,

G. C. DOWELL.