O. B. JACOBS.

COOLING SYSTEM FOR EXPLOSIVE ENGINES.

APPLICATION FILED OCT. 12, 1908.

990,742.

Patented Apr. 25, 1911.

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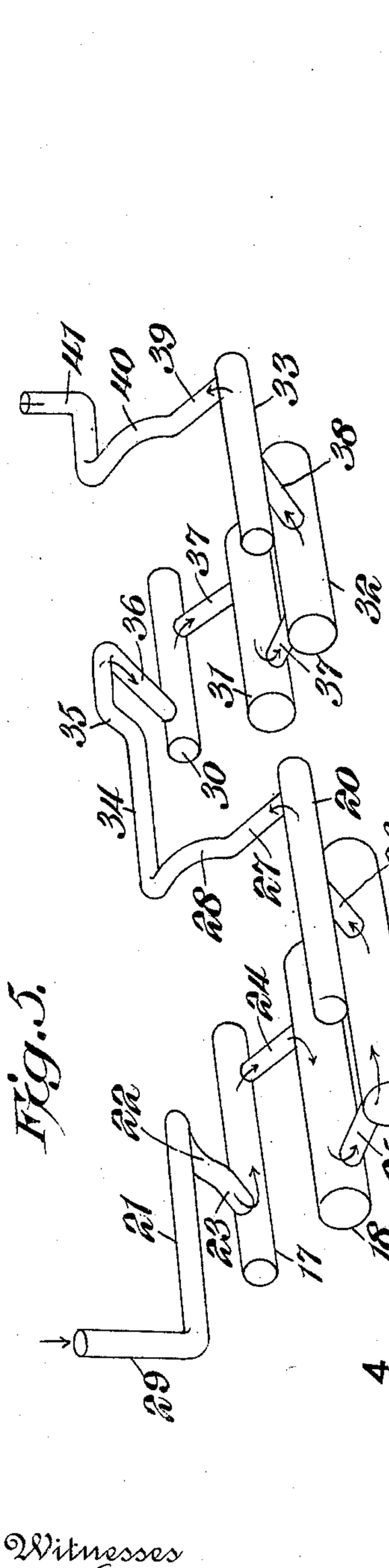

Fig. 5.

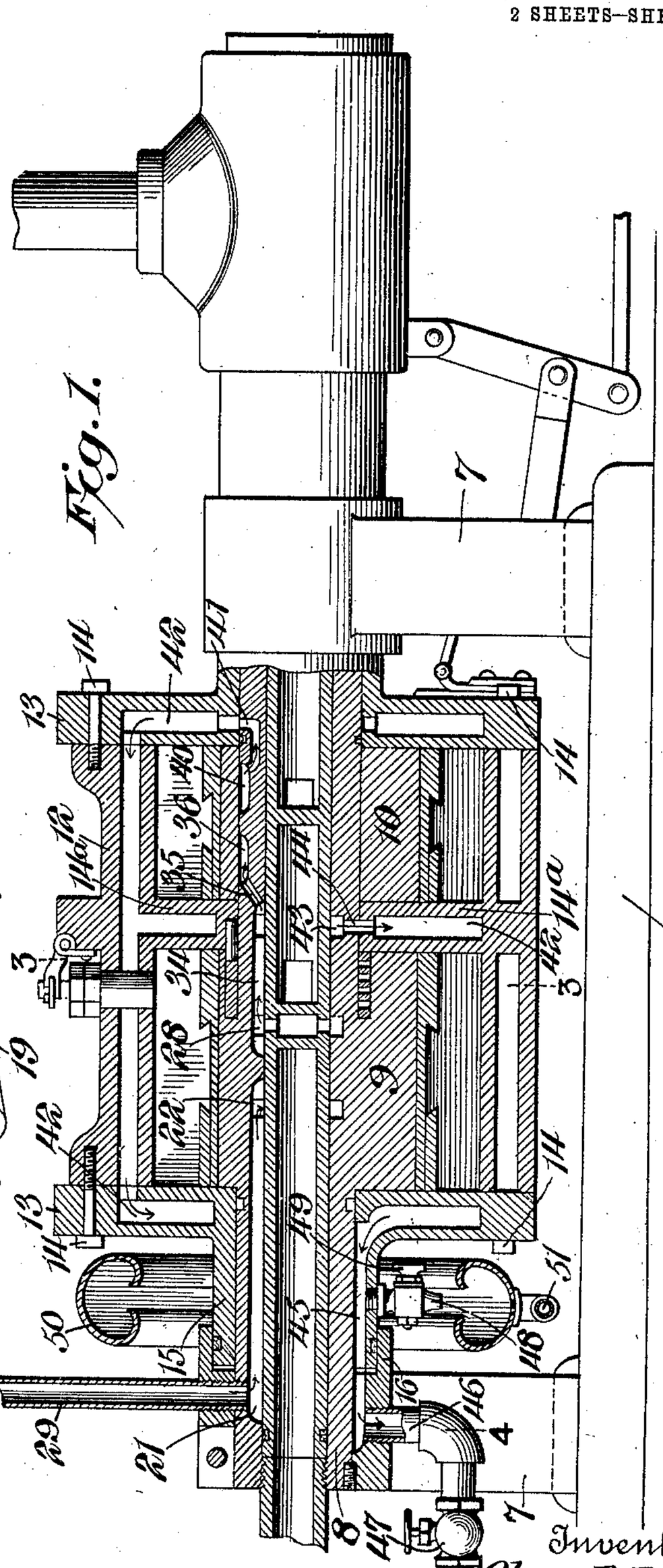

Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 3.

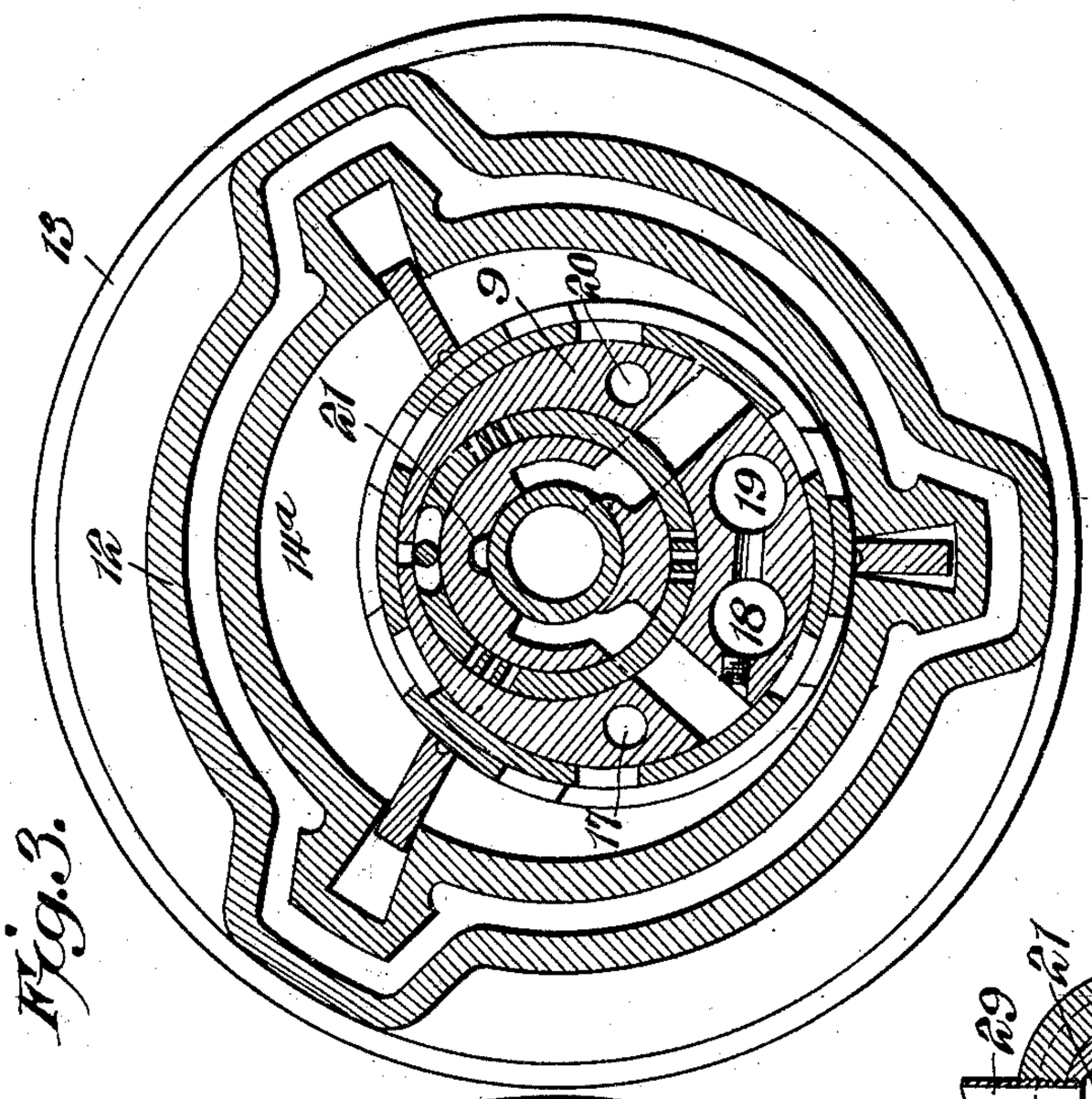


Fig. 4.

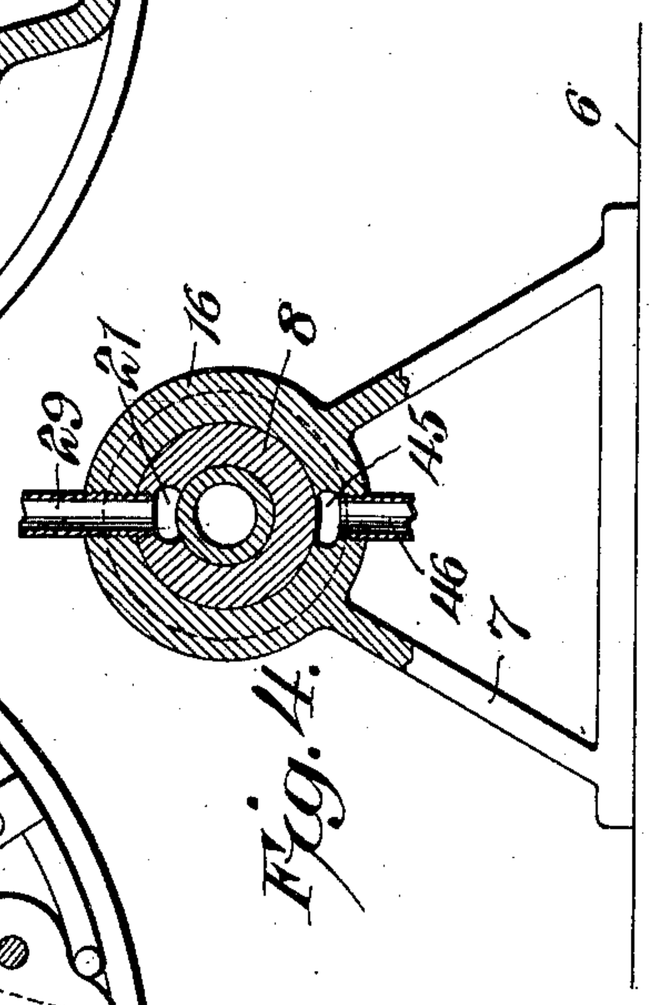
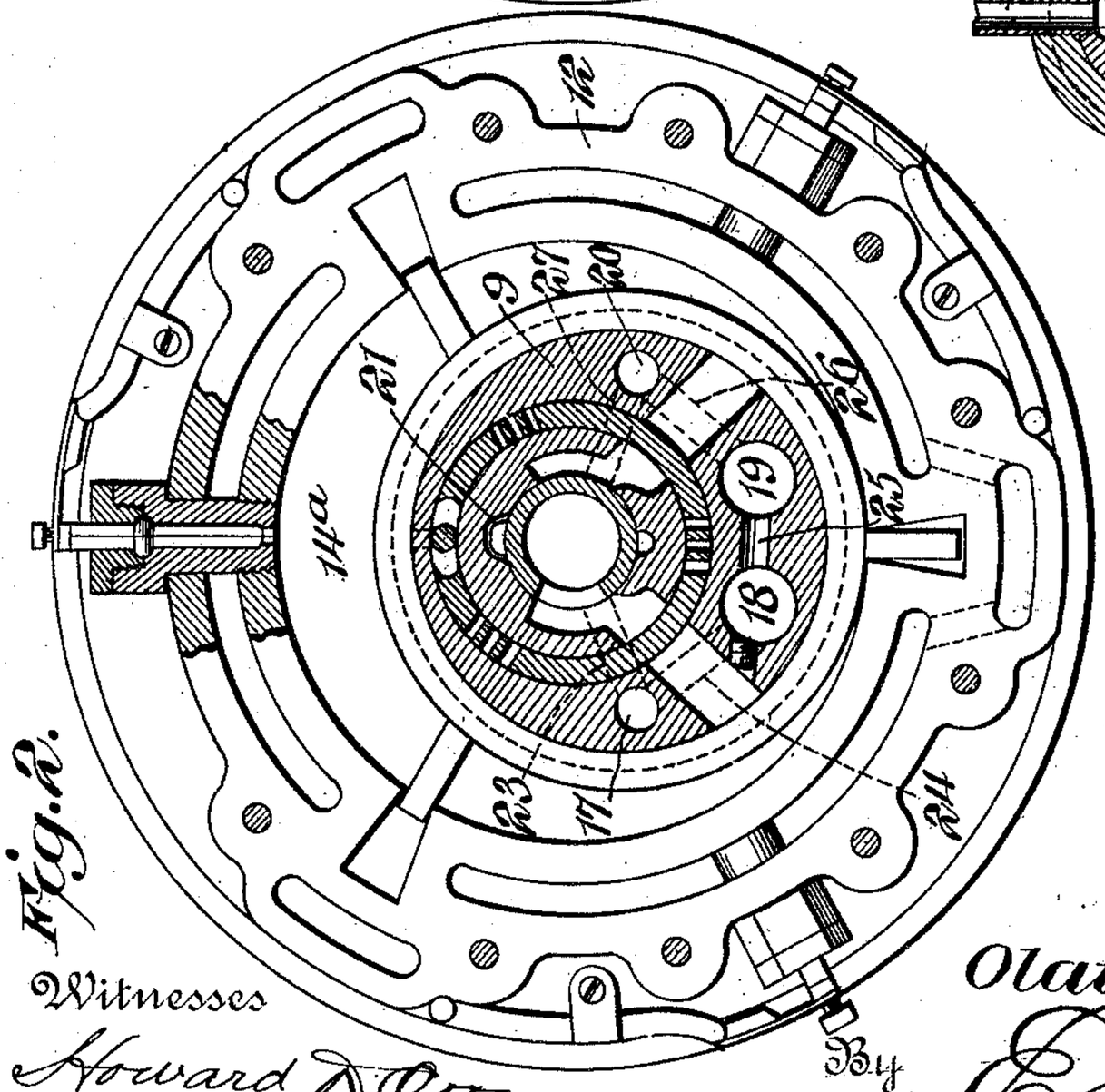


Fig. 2.



Witnesses

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UNITED STATES PATENT OFFICE.

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COOLING SYSTEM FOR EXPLOSIVE-ENGINES.

990,742. Specification of Letters Patent. **Patented Apr. 25, 1911.**

Application filed October 12, 1908. Serial No. 457,350.

To all whom it may concern:

Be it known that I, OLAUS B. JACOBS, a citizen of the United States, residing at Cleveland, in the county of Pawnee and State of Oklahoma, have invented a new and useful Cooling System for Explosive-Engines, of which the following is a specification.

This invention relates to means for cooling explosive engines, and more particularly rotary engines of the type disclosed in my co-pending application, Serial No. 468,042, filed December 17, 1908.

The primary object of the present invention is to provide a circulatory system for the cooling medium which will maintain all the parts of the engine at a sufficiently low temperature, said system being so arranged that it will not interfere with the various mechanisms of the engine.

A further object is to provide mechanism in which centrifugal force is brought into play to effect the circulation of the cooling medium through the system.

The preferred form of the invention is illustrated in the accompanying drawings, wherein:—

Figure 1 is a longitudinal sectional view through the engine. Fig. 2 is an end view with one of the cylinder heads removed, and showing one of the piston bodies in elevation. Fig. 3 is a sectional view substantially on the line 3—3 of Fig. 1. Fig. 4 is a detail sectional view on the line 4—4 of Fig. 1. Fig. 5 is a diagrammatic view illustrating the arrangement of channels and ports of the piston members.

Similar reference numerals designate corresponding parts in all the figures of the drawings.

No claims are herein made to the engine structure outside of the cooling system, inasmuch as said engine structure constitutes the subject-matter of co-pending application, already referred to. Suffice it to state that a base or bed 6 is employed having standards 7, which support the engine body comprising an outer rotatable cylinder member and an inner stationary piston member. The piston member includes a hub 8 and spaced bodies 9 and 10 disposed eccentrically to the hub 8, as will be clear by reference to Figs. 1, 2 and 3. The cylinder member comprises a cylindrical wall 12 surrounding both of the bodies 9 and 10 with heads 13 bolted, as shown at 14 or otherwise secured to the cylindrical wall 12, and located at the outer ends of the piston bodies. A partition 14ª, carried by said cylindrical wall 12, is interposed between the said bodies 9 and 10. The head 13 is provided with an outstanding hub 15 that is journaled upon the stationary hub 8 of the piston member, and has its outer end located in a bearing box 16 carried by the adjacent standard 7.

The piston body 9 is provided with a plurality of longitudinally disposed channels, designated respectively 17, 18, 19 and 20, which extend from end to end of said body, but have their ends closed by one of the heads 13 and the partition 14ª. An intake channel 21 extends longitudinally in the hub 8 of the piston body, and at its inner end communicates with an annular channel 22. From this channel, a port 23 leads to one end portion of the longitudinal channel 17. The other end portion of said channel is in communication with the corresponding end portion of the next channel 18 by another port 24. The channels 18 and 19 are in communication through the medium of a port 25 communicating with the opposite ends of said channels, and still another port 26, leading from the channel 19, extends to the channel 20. From one end portion of this channel 20 a port 27 leads to an annular duct 28. It will thus be evident that a cooling medium introduced into the intake channel 21, will pass through the various channels of the body and thus keep the same in cooled condition. Said supply is introduced through a pipe 29 and may be from any suitable source of supply. Thus in a co-pending application, filed October 12, 1908, Serial No. 457,349 I have disclosed means for feeding water and also for feeding motive fluid to the engine, and either or both may be employed for the purpose. No claim, however, is made in this application to such feeding means.

The piston body 10 in like manner is provided with four or more longitudinally disposed channels successively designated 30, 31, 32 and 33, the ends of said channels being closed by the adjacent partition and head 13.

From the annular duct 28, a longitudinal channel 34 leads to an offset 35, and from said offset a port 36 extends to the first of the longitudinal channels 30. These vari-

ous channels, except the last two are in communication through the medium of ports 37 located at the opposite ends of said channels. The last two channels, designated 32 and 33 have their central portions connected by a port 38, and from one end of the channel 33, a conduit 39 leads to a curved duct 40. From said duct, an offset 41 opens through the periphery of the piston member in line with the adjacent head 13 of the cylinder member. It will thus be evident that the cooling medium will flow freely through both of the piston bodies, and while in said piston bodies, it will come into contact with the partition and the heads of the cylinder member, inasmuch as the ends of the various longitudinal channels are closed by the same.

The cylindrical wall 12, the heads 13 and the partition 14[a] of the piston member are hollow, or in other words, have channels or chambers 42 that are in communication with one another. The offset port 41 communicates with the chamber 42 of the head 13 that is farthest from the intake 29. If desired an annular duct 43 may be formed in the piston member between the two bodies, and have communication with the chamber of the partition through one or more ports 44. The hub 15 is provided with a longitudinal outlet channel 45 that is preferably extended into the bearing box 16, and a discharge pipe 46 may be in communication therewith, said pipe preferably having a controlling valve 47. This pipe can be part of the fuel supply system of the engine as disclosed in my co-pending application, Serial No. 457,349 to which reference has already been made. Where water or other medium of a similar character is employed, for cooling purposes, a discharge nipple 48 is employed, secured to the rotatable hub 15 and communicating with the outlet channel 45. This nipple has a controlling valve 49 therein. A receiving trough 50 surrounds the path of movement of the nipple 48 and has its open side in line therewith. The side walls of the trough are curved inwardly, and an outlet pipe 51, leads from the lower side thereof. This trough is spaced from the orbit of the nipple so that the water will be thrown outwardly through the intervening air and is thereby partially cooled before entering the trough.

The cooling fluid may be forced through the engine under pressure, and it will be evident that it has access to all the parts that need to be maintained at a low temperature. If water or liquid under pressure is not convenient, the nipple 48 will act somewhat in the nature of a suction pump, for the centrifugal force developed by the water that flows out of said nipple due to the rotation of the cylinder member will cause a partial vacuum at the discharge so that the liquid will be impelled through the system, and a thorough circulation thereof thus insured. While the present invention is particularly useful in connection with rotary explosive engines of the type disclosed, it is to be understood that it is not necessarily limited to such use, but may be employed on any rotary engine or pump where such a system is found desirable.

From the foregoing, it is thought that the construction, operation and many advantages of the herein described invention will be apparent to those skilled in the art, without further description and it will be understood that various changes in the size, shape, proportion and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is:—

1. In an explosive engine, the combination with relatively rotatable cylinder and piston members having communicating channels for the circulation of a cooling medium through both members, of independent hubs for said members, one of the hubs having an intake channel, and the other having an outlet channel, and means for supplying a cooling medium to the intake channel.

2. In an explosive engine, the combination with a stationary piston member having a projecting hub, of a rotatable cylinder member surrounding the piston member and having a projecting hub surrounding and rotatable upon the piston member hub, said members having communicating liquid conducting channels and the hubs being provided one with a longitudinally disposed intake channel, the other with a longitudinal outlet channel.

3. In an explosive engine, the combination with relatively rotatable piston and cylinder members, the piston member having spaced longitudinally disposed substantially parallel channels therein and transverse ports connecting successively the alternate end portions of the channels, and the cylinder member being formed with a chamber, one end of the system of connected channels of the piston member having a connection with the chamber of the cylinder member within the confines of the cylinder, of means for supplying a cooling medium to the other end of the system of channels in the piston member for circulation in order through the piston member channels and then through the cylinder chamber.

4. In an explosive engine, the combination of a cylinder member having end walls and a partition, piston members arranged at opposite sides of the partition and each having a plurality of longitudinally-disposed substantially parallel channels connected together in a series of transverse ports, means

for connecting the channels of one piston member with those of the other, said cylinder member being formed with a chamber extending through its side and end walls, means for connecting the said chamber through an end wall of the cylinder member with the channels of one of the piston members, and a supply conduit for a cooling medium connected with the channels of one of the piston members whereby the medium flows through the latter and thence through the other piston member and finally through the cylinder member.

5. In an explosive engine, the combination of a rotary cylinder, a stationary piston member mounted therein, blades connected with the cylinder and slidable around the said member, hubs connected with the cylinder and member, communicating channels passing through the member, channels in the cylinder, means for connecting the channels of the cylinder and member together, a supply conduit passing through the hub of the member and communicating with the channels thereof, and a discharge conduit passing through the hub of the cylinder and communicating with the channels thereof.

6. In an explosive engine, the combination of a cylinder consisting of a chambered side wall and chambered end walls having their chambers directly communicating with the chambers in the side wall, a piston member mounted in the cylinder, blades connected with the cylinder to rotate therewith, connected channels extending longitudinally of the piston member and having their ends closed by the end walls of the cylinder, a connecting conduit between the channels in the piston member and the chamber of one of the cylinder end walls, an outlet conduit connected with the chamber of the other end wall, and a conduit for supplying a cooling liquid to the channels of the said piston member.

7. In an explosive engine, the combination of a rotary element consisting of a chambered cylinder and chambered end and intermediate walls, the chambers of which communicate directly with the chamber of the cylinder, a fixed element having separate parts arranged in the rotary element at opposite sides of the intermediate wall, channels in each part of the fixed element extending longitudinally thereof and closed by the end and intermediate walls, ports connecting the channels of each part, a conduit connecting the channels of one part with those of the other part, a conduit connecting the channels of one part with one of the end walls, a discharge conduit connected with the other end wall, and means for supplying a cooling liquid through the channels and connecting conduits of the said fixed element and thence through the chambered walls and cylinder of the rotary element.

8. In an explosive engine, the combination with a piston member comprising a body having channels opening through its ends and a hub having a longitudinal channel communicating with said channels, of a cylinder member surrounding the piston member and having hollow walls, the channels formed in said walls communicating with the channels of the piston member, said walls closing the ends of the channels, a hub carried by the cylinder member and surrounding the piston member hub, said cylinder member hub having a longitudinal channel, means for introducing a cooling medium through one of the longitudinal channels, and means for discharging it from the other.

9. In an explosive engine, the combination with a piston member having a hub, said member having channels therein, one of which extends longitudinally in the hub, a supply pipe connected to said longitudinal channel, a cylinder member surrounding the piston member and having channels communicating with the channels of the piston member, said cylinder member having a rotatable hub surrounding the hub of the piston member and provided with a longitudinal channel, a valved nipple mounted on said hub and communicating with the channel, and a trough surrounding the hubs in spaced relation thereto and having an open side disposed in line with the discharge end of the nipple.

10. In an explosive engine, the combination with a plurality of piston members, of a double walled cylinder member inclosing the piston members and in turn provided with a double walled partition entering between the piston members, said piston members each having substantially parallel channels disposed longitudinally therein and extending to said partition and the ends of the cylinder member, transverse ports connecting the alternate ends of adjacent longitudinally disposed channels in the piston members, means for directing a cooling medium in order through the channels of one piston member, means for directing said medium therefrom into and through the channels of the other piston member in order, means within the confines of the cylinder member for directing the medium from the last named piston channels through the cylinder member between the walls thereof, and means for discharging the cooling medium from said cylinder member.

11. In an explosive engine, the combination with stationary connected pistons comprising a hub and bodies disposed eccentrically to the hub, said bodies each having open ended channels and lateral ports leading from one channel to the other, a channel connecting the channels of the different bodies, an intake channel located longitudinally in the hub, a supply pipe connected to

the intake channel, a rotary cylinder member surrounding the bodies and including hollow walls, and a hollow partition interposed between the bodies, means for directing cooling medium from the channels of one of the bodies into the hollow walls, a hub carried by the cylinder member and having a longitudinal outlet channel, a nipple carried by said hub and communicating with the channel, and a receiver trough surrounding the path of movement of the nipple.

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

OLAUS B. JACOBS.

Witnesses:
E. G. TODD,
CARL MULLENDORE.