A. F. ROCKWELL.

COOLING MEANS FOR MOTORS.

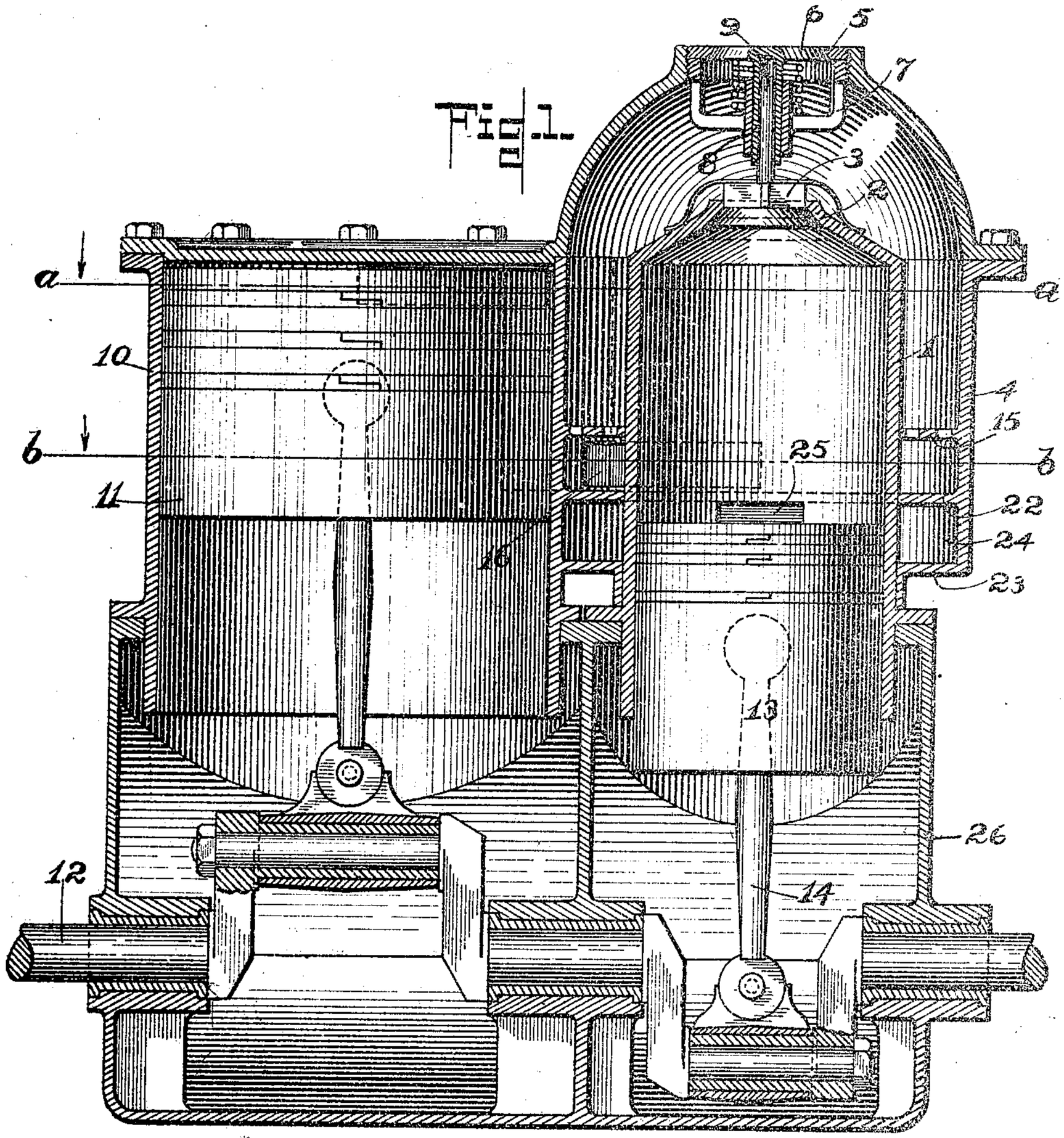
APPLICATION FILED FEB. 5, 1906.

962,250.

Patented June 21, 1910.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

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2 SHEETS—SHEET 2.

Fig. 2.

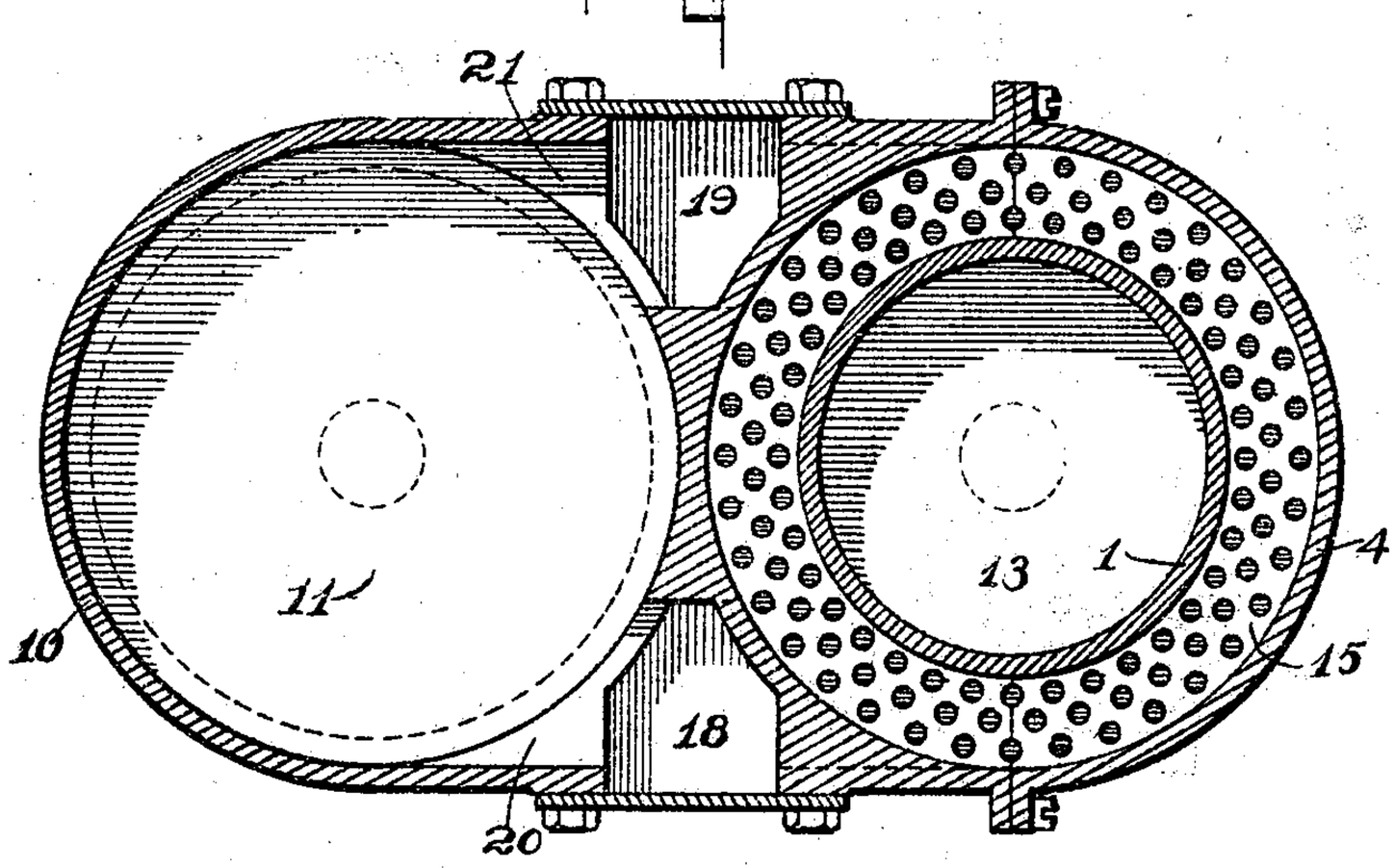

Fig. 3.

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UNITED STATES PATENT OFFICE.

ALBERT F. ROCKWELL, OF BRISTOL, CONNECTICUT, ASSIGNOR TO THE NEW DEPARTURE MANUFACTURING COMPANY, OF BRISTOL, CONNECTICUT, A CORPORATION OF CONNECTICUT.

COOLING MEANS FOR MOTORS.

962,250. Specification of Letters Patent. Patented June 21, 1910.

Application filed February 5, 1906. Serial No. 299,611.

To all whom it may concern:

Be it known that I, ALBERT F. ROCKWELL, a citizen of the United States, residing at Bristol, county of Hartford, State of Connecticut, have invented a certain new and useful Cooling Means for Motors, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

This invention relates to air cooled motors and one of the objects thereof is to provide means for cooling the exterior as well as the interior of the cylinder.

Another object of the invention is to provide means for distributing the air around the entire active part of the cylinder, that is, the part surrounding the combustion chamber.

Another object is to provide means whereby the air will be caused to pass around the cylinder and then into it.

A further object of the invention is to provide an efficient means for scavenging the interior portion of the cylinder so as to remove extraneous matter from the motor cylinder as well as to assist in causing the heat to pass from the combustion chamber. Moreover I aim to provide means for maintaining an efficient circulation of air around the piston cylinder whereby the temperature of the cylinder will at no time become excessive.

Another object of my invention is to provide a jacket around the cylinder which will remain closed during the time that the air is entering the combustion chamber of the cylinder and open only when the combustion chamber is closed. In like manner the communication between the source of air supply and the combustion chamber will be cut off during the time that the casing is open, the communication being effective only when the casing is closed.

Other objects and advantages of this invention as well as the novel details of construction thereof will be specifically described hereinafter, it being understood that changes in form, proportion and minor details of construction may be resorted to without departing from the spirit of the invention or sacrificing any of the advantages thereof.

In order to illustrate the invention I have shown a simple form of mechanism whereby the desired result may be accomplished in which—

Figure I is a vertical, longitudinal, sectional view through an explosive motor cylinder, a pump and appurtenances coöperating therewith. Figure II is a cross sectional view on the line *a*—*a* looking in the direction of the arrow and Fig. III is a cross sectional view on the line *b*—*b* of Fig. I looking in the direction of the arrow.

The cylinder 1 of the motor is provided with an air inlet opening 2 normally closed by a spring retained check valve 3. Surrounding the cylinder 1 is a casing or jacket 4, which jacket is closed with respect to the outside atmosphere except through an opening 5 which is normally closed by a spring pressed check valve 6, held in the valve yoke 6 carried by the casing 4. The valve 6 is provided with a tubular stem 8 to receive the stem 9 of the valve 3, these valves being arranged to open and close alternately as will be explained hereinafter. Adjacent to the casing 4 is a pump cylinder 10 in which is a pump piston 11. In the present instance I have illustrated the pump piston as being of the reciprocatory type and connected to the crank shaft 12 of the motor where the crank shaft receives communication from the piston 13 of the motor through the medium of a piston rod 14. At an intermediate point within the casing is a perforated ring 15 arranged adjacent to the openings 16 and 17 which communicate with the ports 18 and 19 leading from the jacket into the pump cylinder through the openings 20 and 21 respectively.

The bottom of the cooling portion of the casing 4 is designated by the reference numeral 22, said bottom being arranged to cooperate with the end 23 of the casing whereby the exhaust chamber 24 is formed, said chamber being in communication with the motor cylinder through the exhaust opening 25. The pump cylinder as well as the engine cylinder and its jacket are supported upon suitable parts preferably a casing 26 which incloses the cooling shaft in which may be retained a suitable lubricant to facilitate the easy operation of the motor. It is to be understood that the motor cylinder is to be provided with a suitable sparking plug, fuel ports and other necessary

appurtenances, but as these form no part of the present invention I have deemed it unnecessary to illustrate them in this application.

Assuming that all the parts are properly assembled and sufficient fuel has been introduced into the combustion chamber of the cylinder 1 so as to cause an explosion to take place whereby the impulse will be imparted by the piston, the operation of the device will be as follows: Upon the suction stroke of the pump piston the air will be drawn through the opening 5 of the jacket 4 and around the exterior cylinder 1 to cause it to be cool immediately after the explosion has taken place. The perforate plate 15 will prevent the volume of air from passing through the cylinder 1 on the side only at which the openings 16 and 17 are located, because the air cannot pass through the perforations, at the side at which the openings 16 and 17 are located, fast enough to fill the cylinder 10 as the piston 11 moves outwardly and, therefore, the air will have to find its way into the chamber formed by the plate 15 and the bottom 22 through the other perforations in the plate, and in doing this it will pass entirely around the cylinder 1 and thereby act upon the exterior thereof, so as to carry off some of the heat. Upon the return stroke of the piston 11, the air which had previously entered the jacket and passed into the pump cylinder will be expelled from the pump through the same ports through which it entered, whereby it will be forced into the jacket and pass over the entire surface of the cylinder 1 to cool it. The pressure in the jacket caused by the return movement of the piston 11 will be effective in maintaining the valve 6 upon its seat and equally effective in unseating the valve 3 so that while no air has passed into the jacket 4 through the opening 5 the air will be permitted to enter the combustion chamber of the cylinder 1 so as to efficiently scavenge it and force out the burned gases through the exhaust port 25. The relative movements of the pistons 11 and 13 will be so timed that when the pump piston is at approximately the limit of its inward stroke the motor piston will be at approximately the limit of its outward stroke so that the air which has been forced from the jacket may be passed through the motor cylinder to remove the burned gases as well as cool the interior surface thereof. A sufficient amount of air will be maintained within the cylinder 1 when ports 2 and 25 are closed to provide for the proper mixture of air and fuel for the next explosion. It will be seen therefore that the air which had previously served as a cooling medium, or at least part of it, will serve as one of the component elements of the motive fluid to impart the impulse to the motor piston. As soon as the motor piston 13 starts on its compression stroke and has passed the exhaust port 25, the fuel begins to become compressed so that the valve 3 will be held against its seat and further introduction of air will be prevented from entering the cylinder. As soon as the motor piston begins its compression stroke the pump piston will begin its intake stroke, so that as soon as the communication between the air and the interior of the cylinder 1 is cut off, the valve 6 will be unseated and the atmosphere will begin to enter the jacket 4 in the manner heretofore described.

In view of the fact that the openings 16 and 17 are arranged adjacent the periphery of the jacket and furthermore in view of the fact that the air will be discharged from both openings at the same time so as to pass around the motor cylinder and then through the perforated ring, it is obvious that the entire exterior of the cylinder will be effectually cooled.

Under certain conditions I may find it desirable to construct the pump cylinder of sufficient size to enable a larger volume of air to be drawn thereinto than can be held under natural pressure in the cylinder 1. In the event that such a construction is used the discharge stroke of the piston 11 will be sufficient to unseat the valve 3 and force the air through said cylinder 1 under pressure, so that the air will have a tendency to be forced violently against the inner wall of the cylinder 1 to effectually scavenge it. During this operation the cylinder will be cooled and a sufficient amount of air will be permitted to remain in the cylinder 1 to mix with the gas supply preparatory to being compressed and ignited.

What I claim is:

The combination with a motor cylinder, of a casing surrounding the same, a check valve for normally closing a port in the casing, said check valve having a tubular stem, a check valve for closing an opening in the cylinder and having a stem slidable within the tubular stem of the casing valve and means for drawing air into the casing and then introducing it into the cylinder.

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

ALBERT F. ROCKWELL.

Witnesses:
JOSEPH D. BROWN,
CLARA H. VOORHEES.