G. D. WARREN.

MEANS FOR COOLING CYLINDERS.

APPLICATION FILED FEB. 25, 1907. RENEWED NOV. 1, 1909.

960,457. **Patented June 7, 1910.**

2 SHEETS—SHEET 1.

Fig. 1.

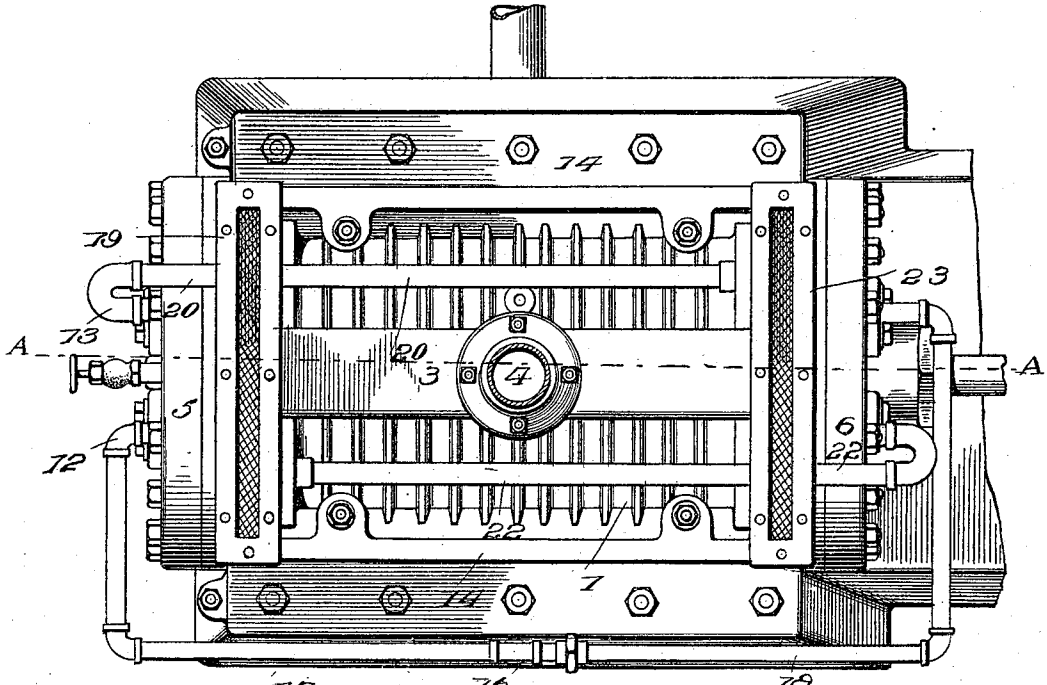
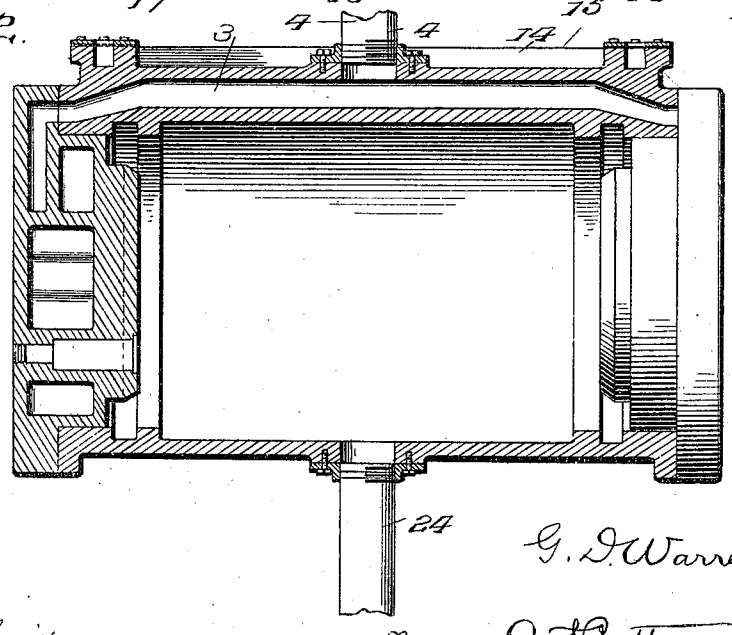


Fig. 2.



Witnesses

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2 SHEETS—SHEET 2.

Fig. 3.

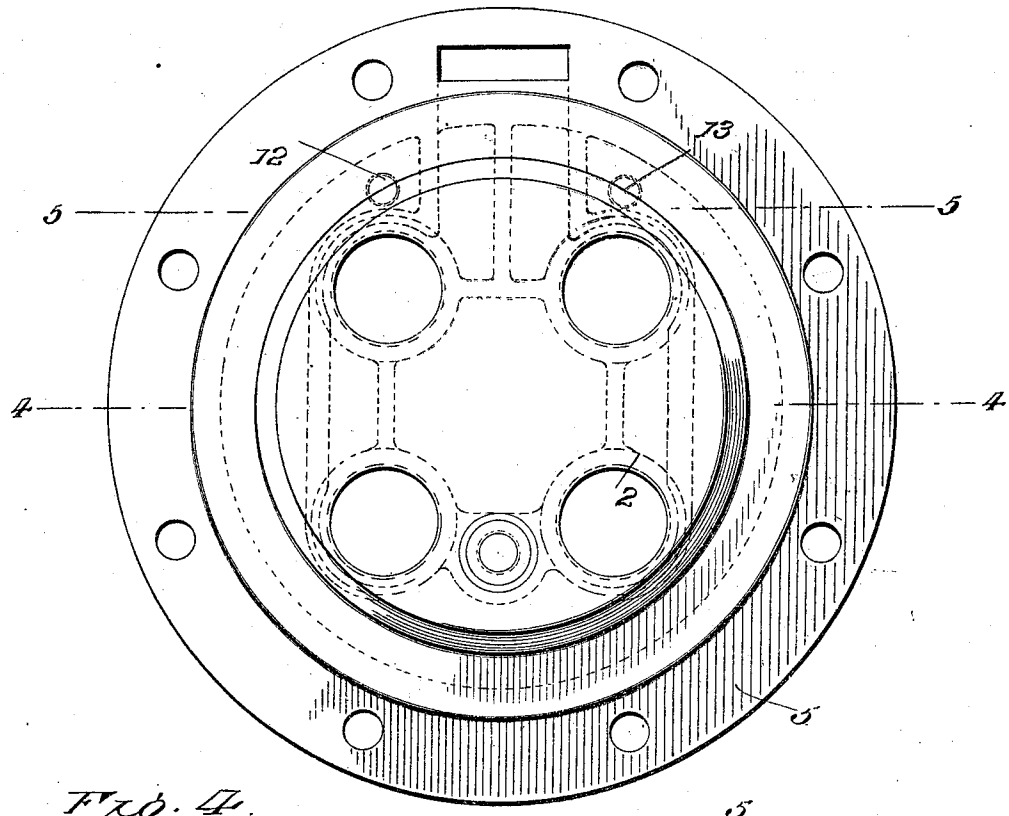


Fig. 4.

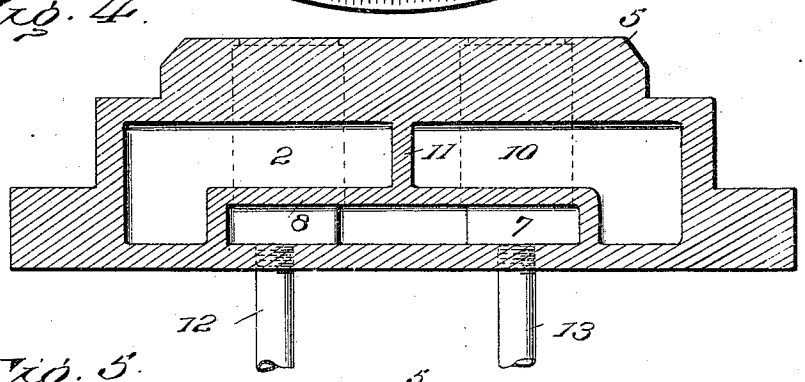
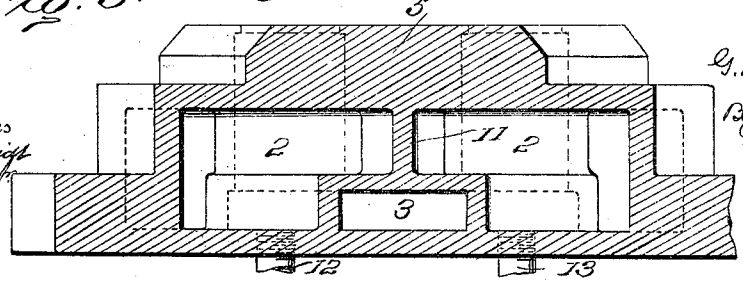


Fig. 5.



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UNITED STATES PATENT OFFICE.

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MEANS FOR COOLING CYLINDERS.

960,457. Specification of Letters Patent. Patented June 7, 1910.

Application filed February 25, 1907, Serial No. 359,149. Renewed November 1, 1909. Serial No. 525,812.

To all whom it may concern:

Be it known that I, GOVERNOR D. WARREN, a citizen of the United States, residing at Denver, in the county of Denver and State of Colorado, have invented certain new and useful Improvements in Means for Cooling Cylinders, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to improvements in means for cooling cylinders, and pertains more particularly to cooling air compressor cylinders.

In cooling cylinders in the old method, evaporation is impossible, and a sufficient quantity of water must be supplied to the cylinder that its temperature will reduce the cylinder heat by column only, while in my invention I find by spraying a small quantity of water on the upper face of the cylinder and allowing it to flow downward in a thin film over the entire surface of the cylinder to the bottom, in the open atmosphere, it requires a much smaller quantity of water as evaporation is used in cooling the cylinders.

Another object of my invention is to provide a simple, cheap and effective structure to accomplish the above result.

In the accompanying drawings, Figure 1, is a top plan view of a compressor cylinder showing my invention applied thereto. Fig. 2, is a vertical sectional view taken on the line A—A of Fig. 1. Fig. 3, is an enlarged end view of the cylinder heads showing the divisional bridges in dotted lines. Fig. 4, is a transverse horizontal sectional view taken on the line B—B of Fig. 3. Fig. 5, is a transverse horizontal sectional view taken on the line C—C of Fig. 3.

Referring now to the drawings, 1 represents the cylinders which, as shown, are of the compressor type of cylinder used in compressing air, although the same could as readily be applied to a pump cylinder or gas engine cylinder without departing from my invention. The cylinder 1 is provided at its ends with the automatic air intake valves 2, and the upper end of the cylinder is provided with the compressed air discharge passage 3 and pipe 4, all of which could be varied without departing from my invention.

The cylinder 1 is provided with the cylinder heads 5 and 6 which carry the intake valves 2 which may be of any desired structure or form, and are arranged to discharge the compressed air into the inner central spaces 7 which passes out through the passages 3. The said cylinder heads, as shown, are provided with the transverse bridge 8 which divides the cylinder heads into an inner air receiving and conveying space 7, and the outer water receiving compartment 10. The said compartment 10 is divided by the vertical bridge 11, the purpose of which will be hereinafter more fully described. Each of the cylinder heads on opposite sides of the vertical bridge 11 is provided with a water supply pipe 12 and an outlet pipe 13, all of which will be hereinafter more fully described.

The cylinder 1 is completely surrounded by a casing 14 which has its upper end 15 open to the outside atmosphere, while the heads 5 and 6 of the cylinder close the ends of the casing and form a water-tight jacket surrounding the cylinder, but the cylinder heads are not in communication with the space between the cylinder and casing. A water supply pipe 16 leads from any desired water supply and the same can be supplied with a pump for forcing the water thereto. The pipe 16 has connected thereto the two branch pipes 17 and 18. The pipe 17 extends around the cylinder and is connected to the water supply pipe 12 at the right of the bridge 11, and the water passing around the bridge 8 and engaging the valve casing keeps the valves comparatively cool and passes outward through the pipe 13. The said pipe 13 extends upwardly and inwardly through the air intake passage 19 at one side of the cylinder, as shown at 20, and extends longitudinally of the cylinder at one side of the center to a point adjacent the air intake 21 and has a closed end. The said pipe 20 in its lower face is provided with perforations through which the water is sprayed upon one side of the cylinder. The water supply pipe 18 extends toward the opposite end of the cylinder and is likewise connected to the cylinder head 6 on the opposite side of the bridge 11 from that of the supply of the opposite head, so that the discharge 22 on the head 6 will be on the same side as the inlet head 5. The discharge pipe 22 extends through the air intake 23 and longitudinally

of the cylinder on the opposite side from the pipe 20, and is arranged and constructed to spray the water thereon. The lower end of the casing 14 has a discharge pipe 24 connected thereto, whereby the water may be discharged from the casing as it runs off of the cylinder, and may be conveyed back to the water supply, whereby it is used over and over again, thus enabling the use of a small amount of water to keep the cylinder cool.

In operation the water passes to the opposite ends of the cylinders and enters one side of the heads, passing around the valves and out on the opposite side of the casing, and is sprayed upon the cylinder, whereby the heads are kept cool and the water by condensation keeps the periphery of the cylinder comparatively cool.

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

1. The combination with a cylinder horizontally arranged, of means for passing water through the heads, and then spraying it upon the periphery of the cylinder on opposite sides in the outside atmosphere.

2. The combination with a cylinder, of a casing surrounding the same, and having an open upper side and a pipe extending across the upper open side of the casing, and discharging water upon the cylinder.

3. The combination with a cylinder, of a casing surrounding the same and having an open upper side, and pipes extending across the upper open side of the casing and discharging water upon opposite sides of the cylinder.

4. The combination with a cylinder, of a casing surrounding the same and having an open upper side, and pipes extending across the upper open side of the casing and discharging water upon opposite sides of the cylinder, and said casing having a discharge opening at its lower side for discharging the water therefrom as fast as it passes from the cylinder.

5. The combination with a cylinder, of a casing surrounding the same and having an open upper side, means for spraying water upon the periphery of the cylinder, and a discharge at the lower side of the casing for discharging the water from the casing as fast as it passes from the cylinder.

6. The combination with a cylinder, of a casing surrounding the periphery thereof and having an open upper side, a casing surrounding the cylinder heads, means for supplying water to said head casing, and means connected to said head casings for spraying water upon the outer periphery of the cylinder through the open portion of the casing.

7. The combination with a compressor cylinder having air inlets in their ends, of a casing surrounding the periphery of the cylinder, and having an open upper side, casings inclosing the cylinder heads, and having a vertical bridge between the heads and the casing, and an annular bridge forming a circular passage around the valves and divided by the vertical bridge, a water supply pipe connected to said casings at each end, one on the right of the vertical bridge and the other on the left, a discharge pipe connected to each casing on the opposite side of the vertical bridge from the water supply, and said discharge pipe leading longitudinally of the cylinder and having perforations in their lower faces for discharging the water upon the cylinder, and the cylinder casing having a discharge opening at its lower side.

8. The combination with a horizontally-arranged cylinder, of a casing surrounding the same and having an open upper side, and a water supply pipe extending longitudinally of the cylinder and adapted to spray water thereon along the entire length of the cylinder.

9. The combination with a horizontally-arranged cylinder, of a casing surrounding the same and having an open upper side, and water supply pipes on each side of the center of the cylinder and extending longitudinally of the cylinder, and adapted to spray water thereon along the entire length of the cylinder.

10. The combination with a horizontally-arranged cylinder, of a casing surrounding the same, a casing surrounding each cylinder head, a water supply for each cylinder head casing, and a pipe extending inwardly from each cylinder head casing on opposite sides of a center line of the cylinder, and having means for spraying water upon the periphery of the cylinder throughout its length.

11. The combination with a horizontally-arranged cylinder, of a casing surrounding the same, a casing surrounding each cylinder head, a water supply for each cylinder head, a pipe extending inwardly from each cylinder head casing on opposite sides of a center line of the cylinder, and having means for spraying water upon the periphery of the cylinder throughout its length, and a bridge between the cylinder head and the casing whereby the water is caused to travel around the cylinder head before entering the spray pipes.

12. The combination with a horizontally-arranged cylinder, of a casing surrounding the same, and having an open upper end, and a discharge opening at its lower end, a casing surrounding each cylinder head, a water supply for each cylinder head on opposite sides of a center line, a pipe extending inwardly from each cylinder head casing on the opposite side of the center line from the

water supply, and having means for spraying water upon the periphery of the cylinder through its length and a bridge within each cylinder head casing between the water supply and spray pipes, whereby the water is caused to travel around the head of the cylinder before entering the spray pipes.

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

GOVERNOR D. WARREN.

Witnesses:
DELPHIA MOHR,
A. MURRAY.