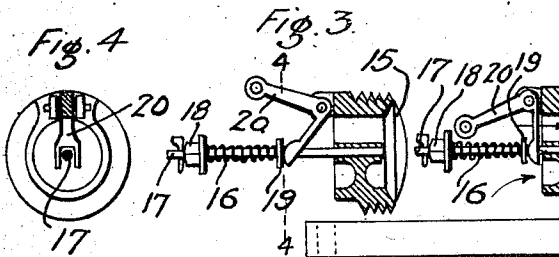
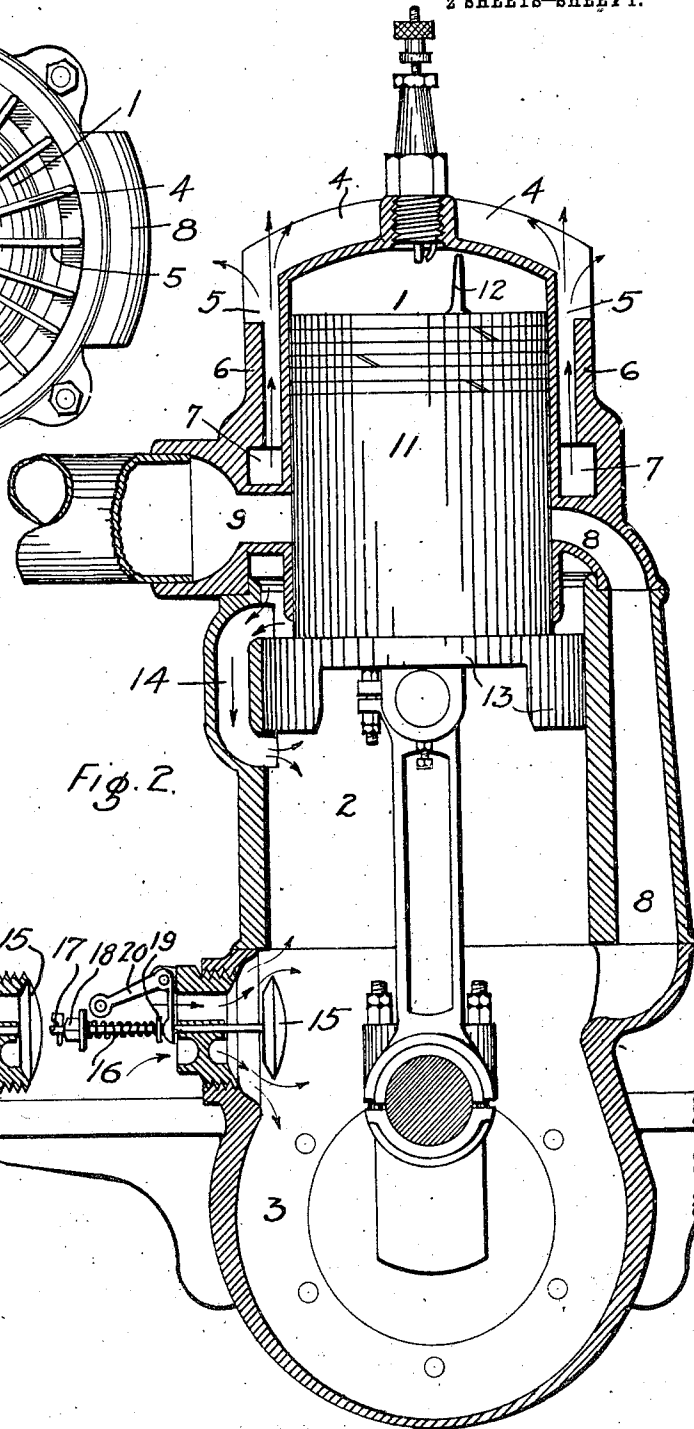
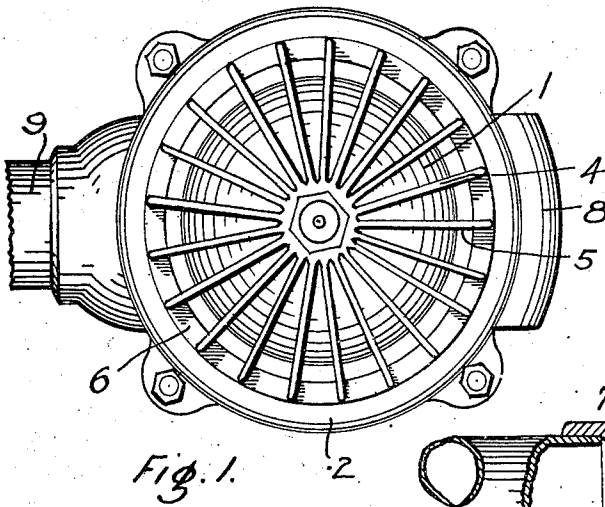


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AIR COOLED EXPLOSION ENGINE.
APPLICATION FILED DEC. 1, 1909.

1,004,836.

Patented Oct. 3, 1911.

2 SHEETS-SHEET 1.



WITNESSES:

Harry C. Young
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INVENTOR.

Alven E. Wolcott

by

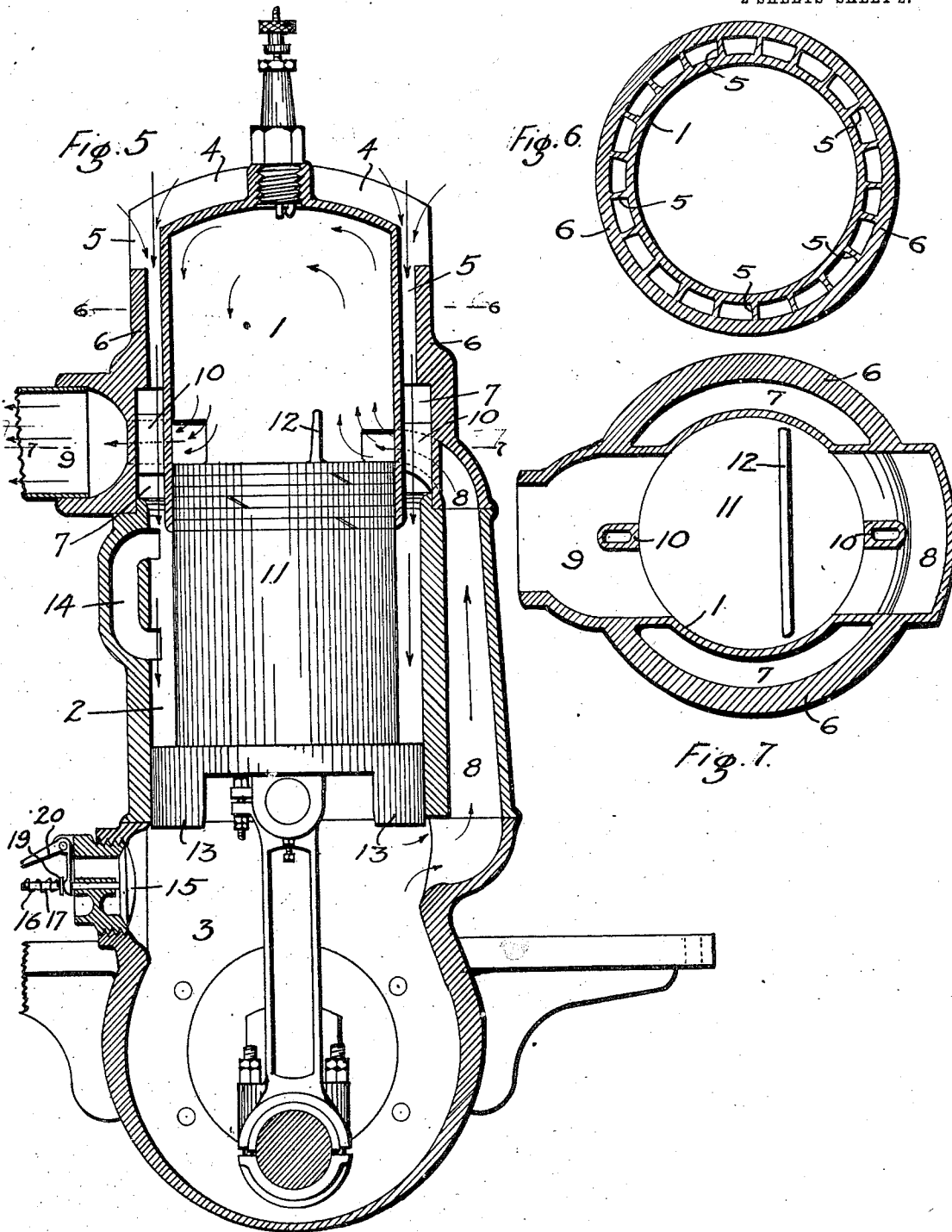
R. F. Ellison
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UNITED STATES PATENT OFFICE.

ALVEN E. WOLCOTT, OF LOWELL, WASHINGTON.

AIR-COOLED EXPLOSION-ENGINE.

1,004,836.

Specification of Letters Patent.

Patented Oct. 3, 1911.

Application filed December 1, 1909. Serial No. 530,825.

To all whom it may concern:

Be it known that I, ALVEN E. WOLCOTT, a citizen of the United States of America, residing at Lowell, in the county of Snohomish and State of Washington, have invented certain new and useful Improvements in Air-Cooled Explosion-Engines, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to explosion engines and has special reference to the means for cooling the engine by the circulation of air.

The objects of my invention are, first, to secure an absolute circulation of cold air uniformly around the outside of the explosion cylinder; second, to secure an adequate supply of fresh air to scour the inside of the cylinder and free it from the hot burned gases of the explosion; and third, to provide means for regulating the temperature of this scouring air supply. I attain these and other objects by the devices, mechanisms, and arrangements illustrated in the accompanying drawings, in which—

Figure 1 is a plan of an explosion engine made in accordance with my invention; Fig. 2 is a vertical cross-section thereof showing the piston at the beginning of the stroke; Fig. 3 is a section of the intake valve mechanism showing the valve spring tightened; Fig. 4 is a cross-section thereof on the line 4—4 in Fig. 3; Fig. 5 is a view similar to Fig. 2 showing the piston at the end of the stroke; Fig. 6 is a cross-section of the cylinder on the line 6—6 in Fig. 5; and Fig. 7 is a similar view on the line 7—7 in Fig. 5.

Similar numerals of reference refer to similar parts throughout the several views.

The invention is illustrated in connection with a two-cycle explosion engine but it is possible to use it on a four-cycle engine. Further, this invention has no connection with any particular system of supplying fuel to the engine and hence no further reference to the fuel will be made.

The frame of the engine comprises an explosion cylinder 1; a circulation or respiration cylinder 2; and a closed crank-case 3. This frame is preferably made in three separate castings as shown, suitably secured together. The cylinder 1 has thin inner walls and is provided with a number of radiating cooling flanges 4 on its upper end

and these flanges join the vertical flanges or partitions 5 which surround the cylinder 1 and connect it to the heavy outer wall 6 of the cylinder casting. The heavy outer wall 6 of the cylinder casting does not extend to the top of the cylinder 1. The passages between the partitions 5 are open at both ends and form cooling ports. The partitions extend about one-half way down the cylinder where the cooling ports between them merge into a large chamber 7. The inlet passage 8 and the exhaust passage 9 pass through this chamber 7 into the cylinder 1 near the bottom of the stroke and are suitably walled from the chamber 7 so that no communication can be had therewith. Also air passages pass through the two cooling bars 10 in the passages 8 and 9. The piston 11 fits the cylinder 1 in the usual manner and is of the common plunger form and is provided with a baffle plate 12 on its top. The circulation or respiration cylinder 2 is of larger diameter than the explosion cylinder 1 and is open at its upper end to the chamber 7 and the air passages 10. The piston 11 joins with the circulation piston 13 which works in the cylinder 2 and draws air down between the partitions 5 into and through the chamber 7 and then forces this warmed air out again on the return stroke thus simulating the complete respiration cycle. A by-pass passage 14 is made in the upper part of the circulation cylinder 2 around the piston 13, when it is at the beginning of its stroke, the purpose of which is to draw some of this warmed air into the crank case if desired, and the quantity of air thus drawn in can be controlled as hereinafter described.

The crank-case 3 is of substantially the usual construction common in two-cycle engines, and has the usual passage 8 leading therefrom to the inlet port in the lower end of the cylinder 1. The air is normally admitted to the crank-case through an inlet valve 15 against the action of a spring 16. As illustrated in Figs. 2, 3, 4, and 5, this spring 16 is wound on the shank 17 of the valve 15 between the nut 18 thereof and a loose washer 19. This washer 19 bears on the forked end on a bell-crank lever 20, suitably pivoted adjacent to the valve, in such a manner as to allow the degree of compression of said spring to be adjusted as desired: in Figs. 2 and 5 the spring is in its loosest position, while in Fig. 3 it has been

tightened by the lever. The lever 20 can be operated by means of a rod, chain, screw or other suitable device

The operation of my improved engine-cooling device is briefly described as follows: As soon as an explosion occurs in the cylinder 1 the piston 13 starts its downward course and inhales fresh cold air down the sides of the hot cylinder between the partitions 5. This cold air comes from above and around the top of the cylinder. As soon as this air reaches the cooling ports between the outer wall 6 and the thin inner wall of the cylinder 1 its speed is increased until it reaches the chamber 7 where it is again reduced. This warm air is then exhaled from the above cooling ports on the return stroke of the piston 13 so that said piston establishes respiration of the cooling air. Meantime the downward stroke of the piston compresses the cold air in the crank-case 3 until the inlet port 8 of the cylinder 1 is uncovered by the piston 11, and this cold air is then transferred to the cylinder 1, further cooling the said cylinder. The volume of air which is thus forced into the cylinder 1 is greater than the volume displaced by the piston 11, because the piston 13 is greater in diameter than is the piston 11 and I prefer to make the volume of this scouring air somewhat greater than the entire volume of the cylinder 1 so that the burned gases will be entirely exhausted and even some of this fresh air will be passed through the exhaust passage 9. Then on the upward stroke of the piston 13 a partial vacuum is made in the crank-case 3, as soon as the port 8 is closed, thus causing the atmospheric pressure on the valve 15 to overcome the pressure of the spring 16 and to open the valve to draw in cold air into the crank-case. The amount of air will be substantially equal to the volume displaced by the piston 13 in its travel. If now, when the piston 13 has passed between the ports of the by-pass 14, the pressure within the crank-case 3 is less than the atmospheric pressure, then some of the warmed air in the chamber 7 and between the partitions 5 will be drawn into the crank-case and will mix with the cold air therein and will slightly warm it. By manipulating the lever 20 the spring 16 may be tightened so that but comparatively little cold air will enter the crank-case past the valve 15, and in that case a larger quantity of warmed air will be drawn thereinto through the cooling ports. In this way the temperature of this scouring and charging air can be regulated to suit the changes in temperature of the atmosphere and other climatic or extraneous circumstances. Further, the temperature of the exhaust port 9 is reduced by the hollow cooling bar 10 therein.

There are many advantages that result

from this invention, among which may be mentioned, first, that the cylinder is cooled evenly all around; second, the cold air strikes the top of the cylinder which is the hottest part of the cylinder, because the explosion is confined to the top thereof, thus keeping the temperature of the cylinder substantially uniform from top to bottom; third, the scouring is more complete on account of the excess quantity of fresh air admitted into the cylinder; fourth, the friction in the explosion cylinder is confined entirely to the piston rings as there is practically no side pressure thereon because the side pressure is entirely taken up by the piston 13 which is in the cold circulation cylinder 2, thus further reducing the heat in the explosion cylinder; and fifth, the ease with which the temperature of the scouring air is controlled.

Having described my invention, what I claim is;

1. In an explosion engine, the combination with an explosion cylinder and piston working therein; a compression or circulation cylinder of larger diameter than said explosion cylinder; a passage connecting said cylinders, to convey the cold compressed air from the compression cylinder to the explosion cylinder when the passage is opened; and a piston formed integral with the piston in said explosion cylinder and fitting said compression cylinder whereby a greater volume of cold air is forced into the explosion cylinder than is displaced by the piston therein.

2. In an explosion engine, the combination with an explosion cylinder and piston working therein; a compression or circulation cylinder of larger diameter than said explosion cylinder; a passage connecting said cylinders, to convey the cold compressed air from the compression cylinder to the explosion cylinder when the passage is opened; a check valve adapted to admit cold air to the compression cylinder; and a piston formed integral with the piston in said explosion cylinder and fitting said compression cylinder whereby a greater volume of cold air is forced into the explosion cylinder than is displaced by the piston therein.

3. In an explosion engine, the combination with an explosion cylinder and piston working therein; a compression or circulation cylinder of larger diameter than said explosion cylinder; a passage connecting said cylinders, to convey the cold compressed air from the compression cylinder to the explosion cylinder when the passage is opened; an adjustable check valve adapted to admit cold air to the compression cylinder when the pressure therein is below a predetermined point; a piston formed integral with the piston in said explosion cylinder and fitting said compression cylinder

whereby a larger volume of cold air is forced into the explosion cylinder than is displaced by the piston therein; and a bypass in said compression cylinder and connecting said compression cylinder with the outer air when the piston is at the beginning of its stroke.

4. In an explosion engine, the combination with an explosion cylinder and piston working therein; radiation surfaces arranged thereon; an outer wall surrounding said radiation surfaces a part of their length; a circulation or compression cylinder coaxial with and of larger diameter than said explosion cylinder; a passage communicating with the space between the outer and inner walls of the explosion cylinder and leading into the compression cylinder at a point near the top thereof and adapted to admit the warmed air from the said space into the compression cylinder; a passage connecting said cylinders to convey

the cool compressed air from the compression cylinder to the explosion cylinder when the passage is opened; an adjustable check valve adapted to admit cold air to the compression cylinder when the pressure therein is below a predetermined point; and a piston formed integral with the piston in said explosion cylinder and fitting said compression cylinder whereby a greater volume of cool air is forced into the explosion cylinder than is displaced by the piston therein, and adapted to open the passage communicating between the compression cylinder and the space between the outer and inner walls of the explosion cylinder when it is at the beginning of its stroke.

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

ALVEN E. WOLCOTT.

Witnesses:

R. T. WARNER,
C. J. SMITH.