

June 29, 1926.

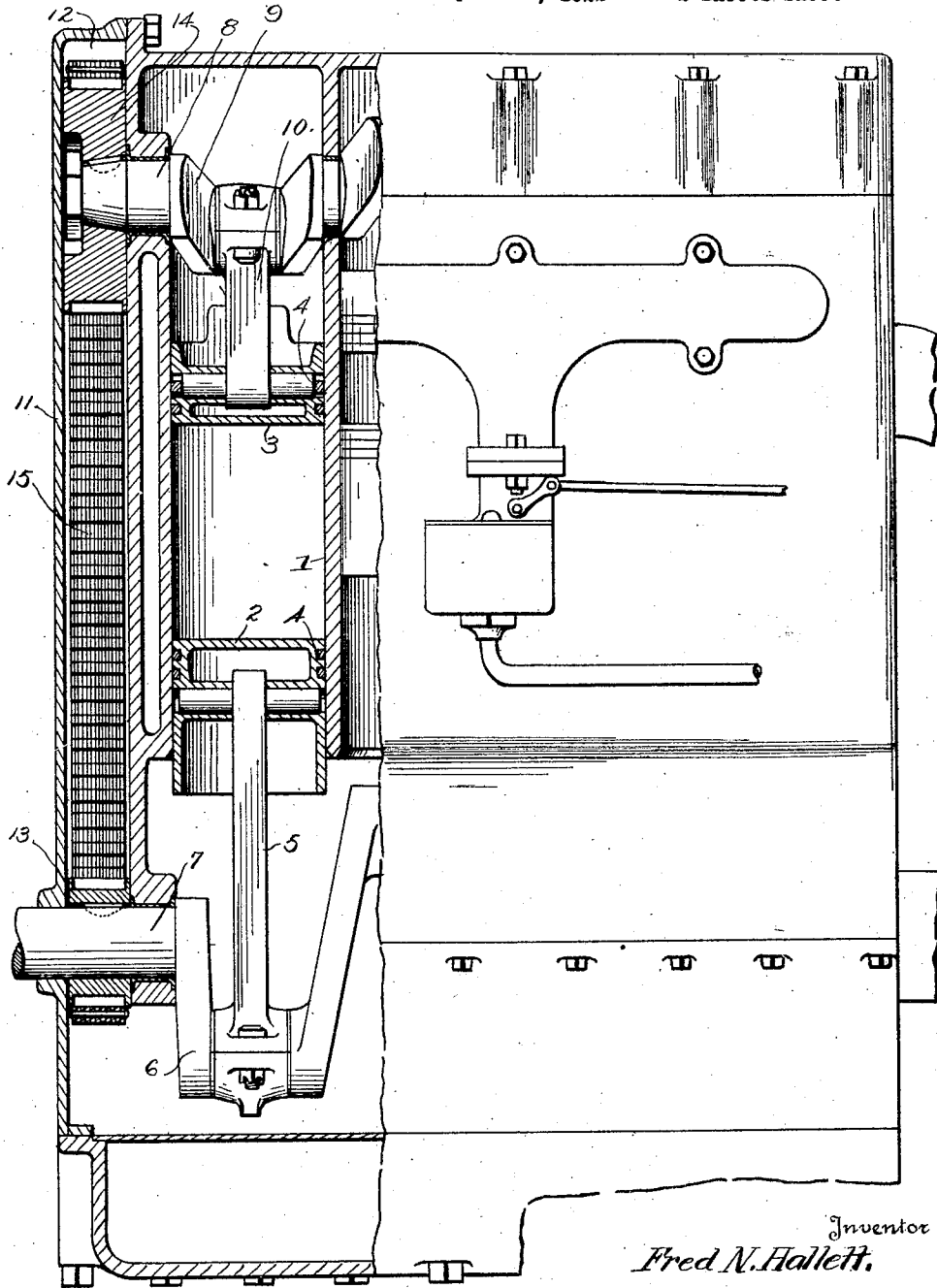
F. N. HALLETT

1,590,940

GAS ENGINE

Filed April 18, 1922

2 Sheets-Sheet 1



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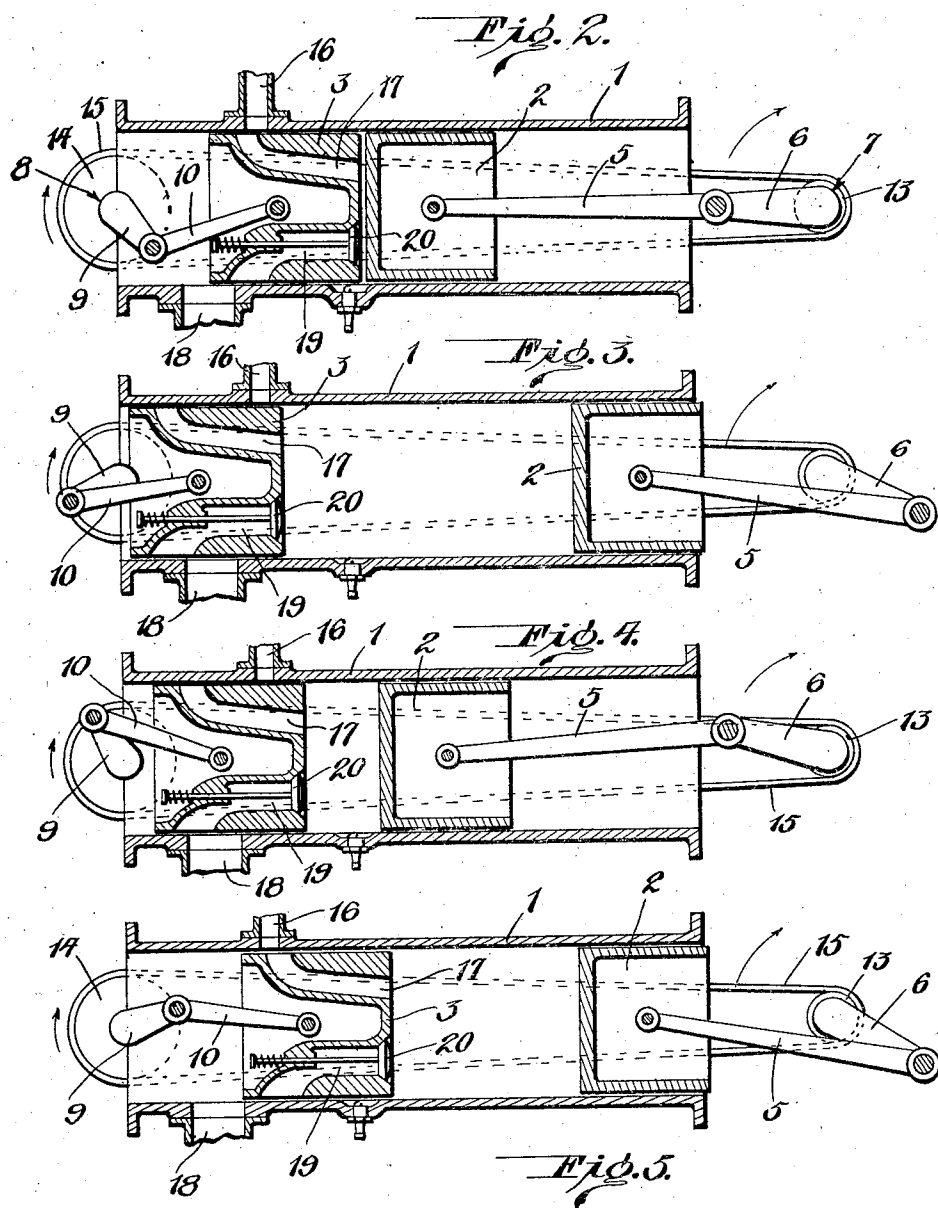
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Filed April 18, 1922

2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

FRED N. HALLETT, OF SEATTLE, WASHINGTON.

GAS ENGINE.

Application filed April 18, 1922. Serial No. 554,913.

This invention relates to an improvement in explosive engines, wherein a plurality of movable pistons are provided in each cylinder, the relative movement of the pistons being timed to insure an effective intake, compression, and firing of the compressed gases, the relative movements of the pistons on the exhaust stroke causing said pistons to so approach each other as to practically clear all exhaust gases from the cylinder.

The invention in the preferred form is illustrated in the accompanying drawings, in which:

Fig. 1 is a view in elevation, partly in section, illustrating the improved construction.

Figs. 2, 3, 4, and 5 are diagrammatic views, illustrating the different operative positions of the pistons.

The improved engine is made up of any usual or preferred number of cylinders 1, in each of which there is arranged a lower piston 2 and an upper piston 3. These pistons have the usual piston rings 4, and aside from the details hereinafter specifically described, may be of any desired construction. The lower pistons 2 are connected by the usual connecting rods 5 with the throws 6 of the main crank shaft 7, there being an auxiliary crank shaft 8 mounted in the upper end of the cylinder block having throws 9, to which, by connecting rods 10, the upper pistons are connected.

The forward end of the cylinder block is provided with a cover plate 11, forming a gear housing 12, and in this housing there is mounted on the main crank shaft 7, a chain sprocket 13, and on the auxiliary crank shaft 8, a chain sprocket 14. The chain gear 13 is so proportioned to the chain sprocket 14 that in the operation of the parts, these sprockets, connected by a chain 15, insure that the main crank shaft 7 makes two complete revolutions to each single revolution of the auxiliary crank shaft. A piston controlled exhaust port 16 is provided for each cylinder, there being an exhaust passage 17 in the upper piston 3 of each cylinder, which exhaust passage opens through the operative face of the piston. A piston controlled inlet port 18 is formed in each cylinder, and an inlet passage 19 controlled by a downwardly opening valve 20 is provided in each upper piston 3. The valve 20 is normally closed under spring pressure, as indicated in Fig. 2, to prevent

the escape of the charge in the cylinder through the inlet passage 19 during the compression, expansion, or exhaust stroke, as the passage 19 is open to the intake during portions of these strokes.

With the parts thus constructed and arranged, and assuming the respective pistons to be in the position indicated in Fig. 2, it will be noted that said pistons have approached so closely together that practically no space exists therebetween and thus, in this position, which is the exhaust position, a complete scavenging of the cylinder will be had, it being noted that at this time the exhaust passage 17 of the upper piston is in registry with the exhaust port 16. Through the indicated movements of the pistons, as seen from the arrows, the pistons then start to move apart, and as the inlet passage 19 registers with the inlet port 18, the exhaust port 16 having been closed in the meantime, by the passage 17 rising beyond said port, a fresh charge of gas is admitted between the pistons. The complete inlet stroke is indicated in Fig. 2. The pistons then approach each other, but as the lower piston 2 is moving twice as fast as the upper piston 3, the latter will have made one fourth of its complete stroke, that is, one half of its inward movement, while the former is making a complete inward movement. This is the compression stroke, and as this stroke of the piston 2 is completed, the piston 3, having completed only one half its stroke, will reach such position that there will be afforded a firing chamber 21 between the pistons, in which the compressed gases are fired. On the next stroke of the pistons, they will have approached each other as indicated in Fig. 2 for the exhaust stroke. This result is again of course through the difference in the speed of the respective pistons.

It will of course be understood that other means than the chain connector may be utilized for driving the auxiliary crank shaft from the main crank shaft, the essential requirement being that the speed of the main or lower piston be twice that of the auxiliary or upper piston, and that these pistons be so timed as to alternately form and eliminate a firing chamber.

Claims:

1. In an explosive engine, a cylinder, a main crank shaft, an auxiliary crank shaft, chain gears of different diameters secured

upon the crank shafts, an upper piston connected to the auxiliary crank shaft, a lower piston connected to the main crank shaft, a chain connecting said chain gears, an exhaust port in the cylinder, an inlet port in the cylinder, an exhaust passage in the upper piston leading through the operative face thereof, and an inlet passage in the upper piston leading through the operative face thereof.

2. An explosive engine, including a cylinder, a main crank shaft, an auxiliary crank shaft at the upper end of the cylinder, a

piston connected to the main crank shaft, a piston connected to the auxiliary crank shaft and formed with an exhaust passage and a valve controlled inlet passage, said cylinder being formed with inlet and exhaust passages for cooperating at predetermined intervals with the passages in the piston, and connecting means between the shafts for driving the auxiliary shaft twice as fast as the main crank shaft.

In testimony whereof he affixes his signature.

FRED N. HALLETT.