

**July 10, 1928.**

**1,676,512**

**H. E. ALLEN**

## TWO-CYCLE GAS ENGINE

Filed June 17, 1924

2 Sheets-Sheet 1

*Fig. 1.*

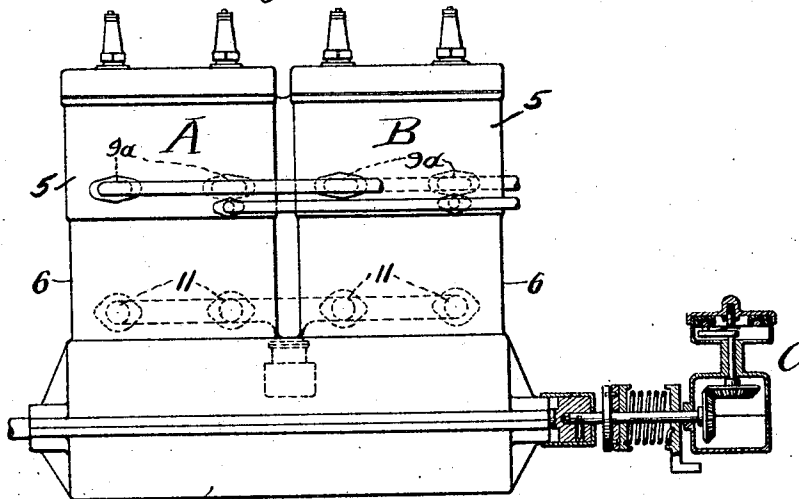
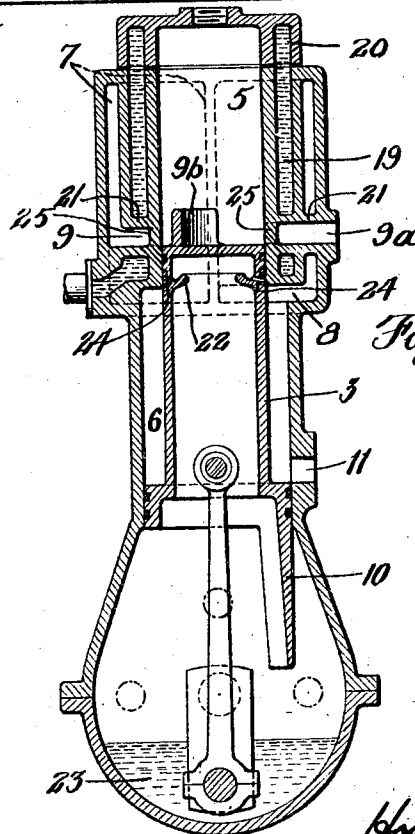


Fig. 2.



**WITNESS**

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Gustav Genglinger

**INVENTOR**

INVENTOR  
Howard E. Allen

BY *Symmett & Lechner*  
ATTORNEYS

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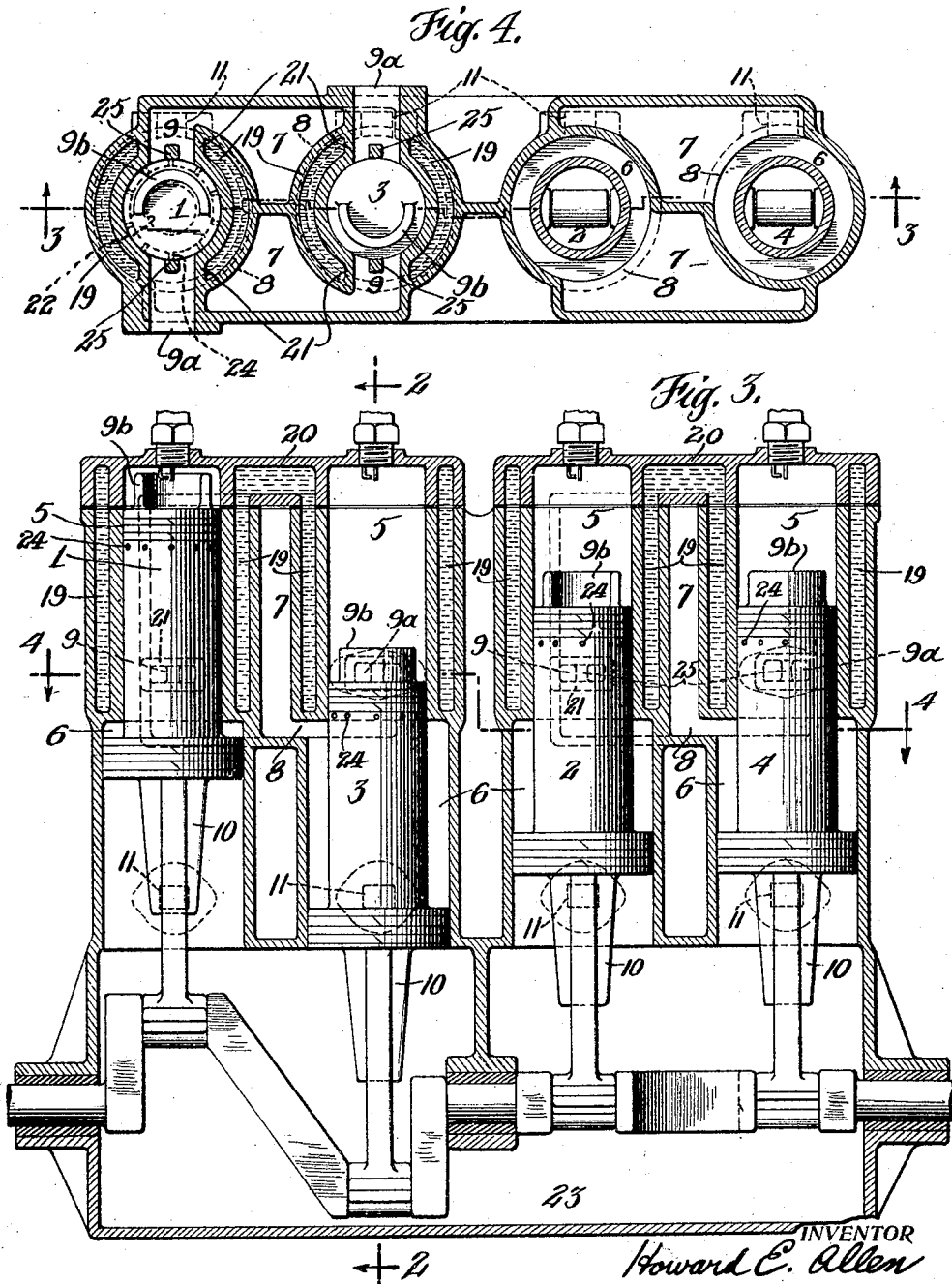
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WITNESS  
*Gustav Henglinger*

INVENTOR  
*Howard E. Allen*  
BY  
*Symmett & Lechner*  
ATTORNEYS

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# UNITED STATES PATENT OFFICE.

HOWARD E. ALLEN, OF LIMA, OHIO.

## TWO-CYCLE GAS ENGINE.

Application filed June 17, 1924. Serial No. 720,491.

This invention relates to gas engines of the two cycle type in which the engine takes in a charge of gas or vapor, compresses it, fires it and discharges the burnt gases while the crank makes but a single revolution and while the piston makes one complete travel backward and forward.

In general my invention contemplates the simplification of engines of this type, particularly as regards lubrication.

More particularly one of the objects of my invention is to provide effective lubrication for two cycle engines of the type in which the fuel admission and exhaust is controlled by the piston.

Another object of my invention is to provide a simple arrangement whereby the upper piston of a two diameter piston may be effectively lubricated by the splash system.

Still another object of my invention is to provide lubrication for engines of the class described in such manner as to prevent lubricant from entering the fuel ports.

How these and various other objects and advantages can be realized through my invention will appear from my description hereinafter of the best embodiment for the purpose known to me.

In the drawings, Fig. 1 is an elevation of my improved engine with the timing mechanism shown in section.

Fig. 2 is a transverse cross section through one of the cylinders taken on the line 2-2 of Fig. 3.

Fig. 3 is a vertical longitudinal section through a four-cylinder engine constructed in accordance with my invention, taken on the line 3-3 of Fig. 4.

Fig. 4 is a plan section taken on the line 4-4 of Fig. 3.

In order that the application of my invention may be better understood I will first describe the particular engine shown in the drawings.

The engine illustrated is a four-cylinder engine the cylinders of which are arranged to work in pairs. In the drawings one pair of cylinders is indicated by the reference letter A, and the other pair by the reference letter B, the positions of the pistons 1, 2, 3 and 4 in the various cylinders being shown in Fig. 3 with the reference numerals 1, 2, 3 and 4 applied in the order of firing. These pistons are of differential diameters, the

smaller diameters fitting the upper portions 5 of the cylinders and the larger diameters fitting the lower portions 6 of the cylinders. The upper portions of the cylinders are the explosion chambers, while I have termed the lower portions the initial fuel receiving chambers. Between each pair of cylinders I have provided a pair of chambers or interspaces 7, each communicating by means of a passage 8 from the lower portion 6 of one cylinder with the upper portion 5 of its mate. Following the action of the pair of pistons 1 and 3 it will be seen that on the down stroke of the piston 3 as it approaches the bottom of its stroke, a charge of gas is drawn into the annular space between the piston and cylinder wall in the lower portion 6, and that on its upward stroke the charge taken in is compressed through passage 8 into the interspace 7 which communicates with the explosive chamber in the upper portion 5 of the adjacent cylinder of the pair. The cranks of each pair of cylinders are arranged so that the piston in one cylinder will be at the bottom of its stroke when the piston of the other cylinder is at the top of the stroke. Hence, when the piston 3 which just received a charge approaches the top of its stroke, the piston 1 approaches the bottom of its stroke opening the port 9 thereby admitting the fuel which has been compressed in the interspace, into the explosive chamber above the piston.

The valves 10, for convenience may be termed leg valves they being formed as legs or extensions to the pistons. These valves are of such length as to keep the intake ports 11 covered on the complete upward strokes of the pistons and until they again approach the bottom of their stroke.

On the upward stroke of the piston 1 the charge in the upper portion of the cylinder, which has been transferred from the lower portion of its adjacent cylinder, is compressed such position being shown by the position of the piston 1 which is ready to receive the impact due to the explosion of the charge. The burnt gases are scavenged through the exhaust port 9<sup>a</sup> which port is opened on the downstroke of the piston just a little before the intake port 9 is uncovered. Intermingling of the fresh charge with the burnt gases is prevented by the baffle 9<sup>b</sup> on the top of the cylinder.

The ignition of the charge is timed by

a suitable timing mechanism C which is connected by means of bevel gears to the crank shaft of the engine,

As a means for cooling the engine I have provided the water jacket 19 which surrounds the upper portion of the cylinders, communication between each pair of cylinders being made through the heads 20. At that portion of the cylinders which is toward the interspaces, the water jacket is formed between the cylinder wall and the wall of the interspace. Conduit like passages 21 are provided for the intake and exhaust ports.

In order to keep the cylinder walls well lubricated I provide annular cupped rings or troughs 22 in the hollow portion of the pistons and toward their upper ends for collecting lubricant which is splashed up by the action of the cranks in the oil reservoir 23. Oil which accumulates in the cupped portions of the rings is carried out to the cylinder wall through the medium of small holes 24. The lubricant is carried across the ports 9 and 9<sup>a</sup> by means of webs 25. The lower parts of the cylinders are splash lubricated.

In this connection it will be seen that owing to the particular construction of the cylinders and pistons, the explosion chamber or small diameter piston cannot be lubricated directly by the splash, as is the lower or large diameter piston, and hence lubricant must be supplied thereto by other means. The novel arrangement which I have shown constitutes a simple and effective means for lubricating the upper cylinder and piston from the inside of the hollow piston through the medium of splash lubrication.

Reverting now to the holes 24 in the piston and the webs or bridges 25, it will be seen that these holes are so spaced peripherally of the piston that no holes will open into the fuel ports as the piston moves to uncover said ports, the spacing is such, however, as to supply lubricant to the webs 25, thus carrying lubricant there across as hereinbefore stated.

I claim:

1. In an engine of the class described having hollow pistons the combination of a lubricant collecting member in the hollow portion of the pistons, apertures extending from the collecting members through the piston walls, and webs in the fuel ports of the cylinder, the aforesaid apertures being so spaced that certain apertures register with the fuel port webs whereby to prevent flow of lubricant into the ports.

2. In an engine, the combination of an upper cylinder, a lower cylinder, a connected upper and lower piston fitted to said cylinders, the upper piston having an oil receiving trough and discharge passages leading from the trough to the wall of the upper cylinder, an oil reservoir from which oil is splashed on operation of the engine to reach the wall of the lower cylinder and the trough, fuel ports in the cylinders, and webs in the fuel ports, the aforesaid discharge passages being so spaced that certain passages register with the fuel port webs whereby to prevent flow of lubricant into the fuel ports.

In testimony whereof, I have hereunto signed my name.

HOWARD E. ALLEN.