J. W. PITTS.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED MAR. 1, 1911.

1,090,647

Patented Mar. 17, 1914.

3 SHEETS—SHEET 1.

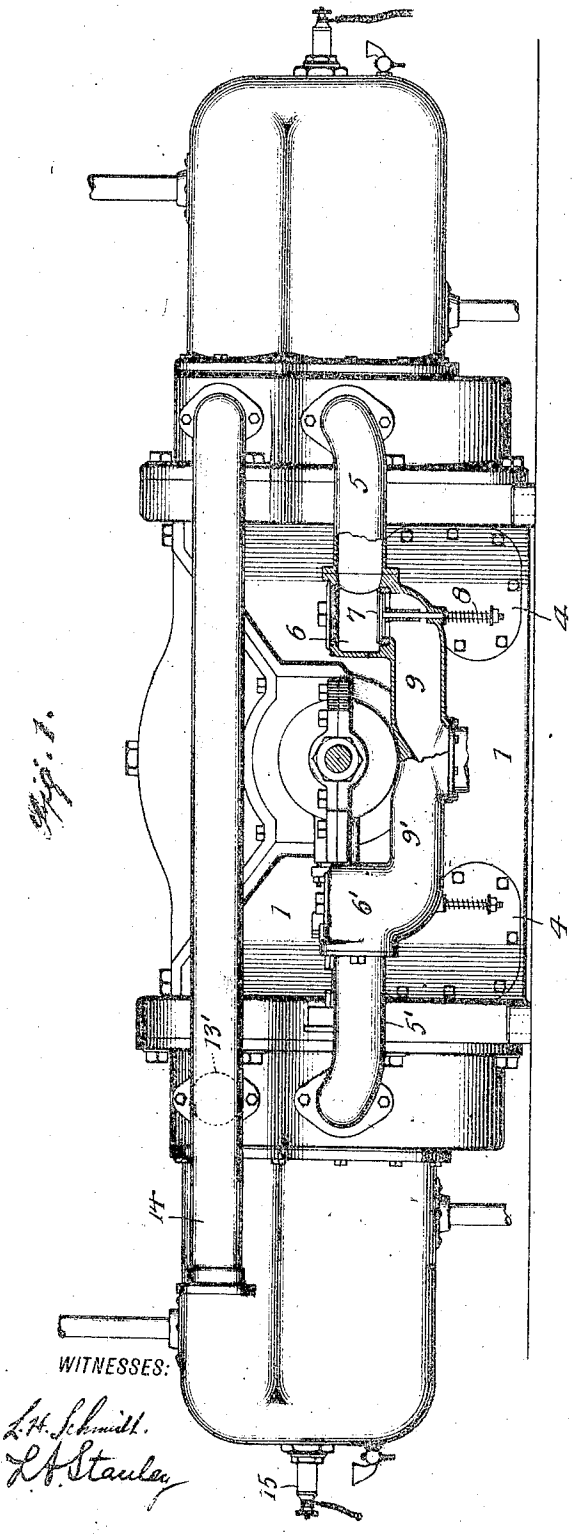

Fig. 1.

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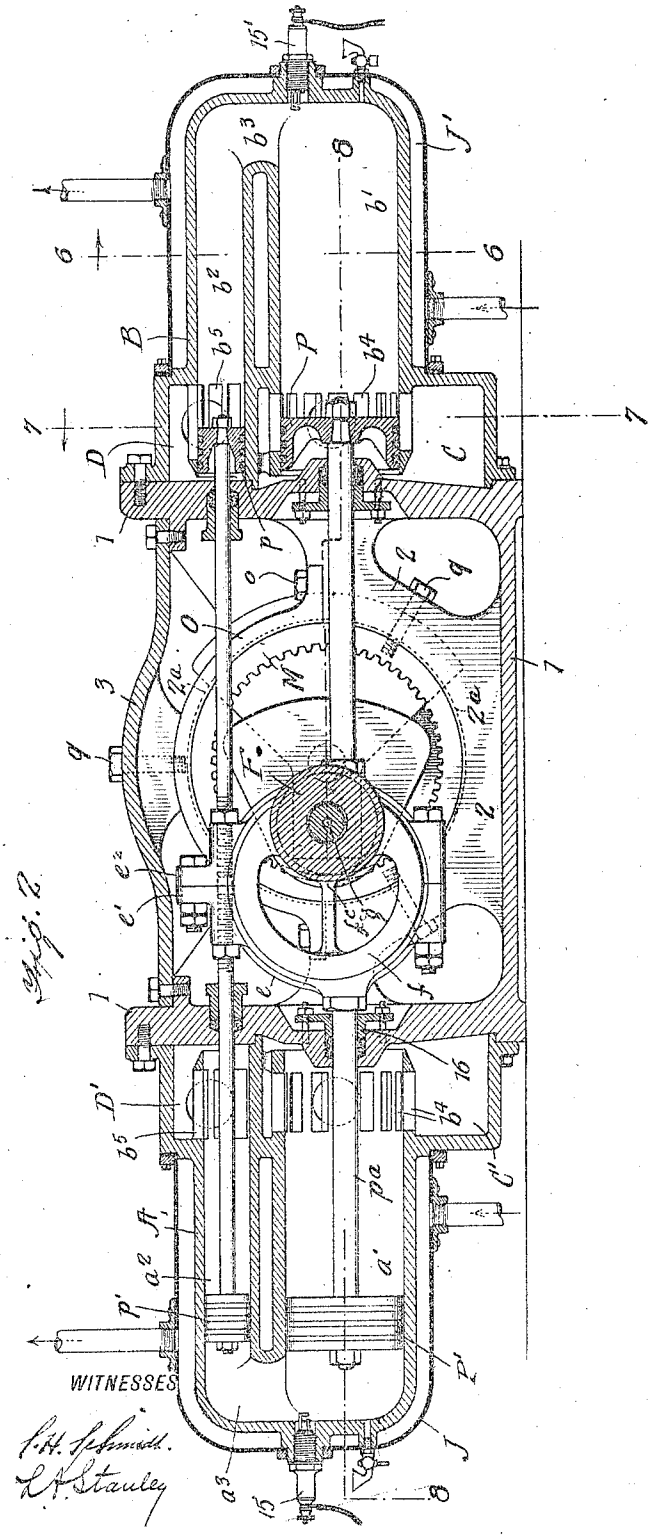

Fig. 2.

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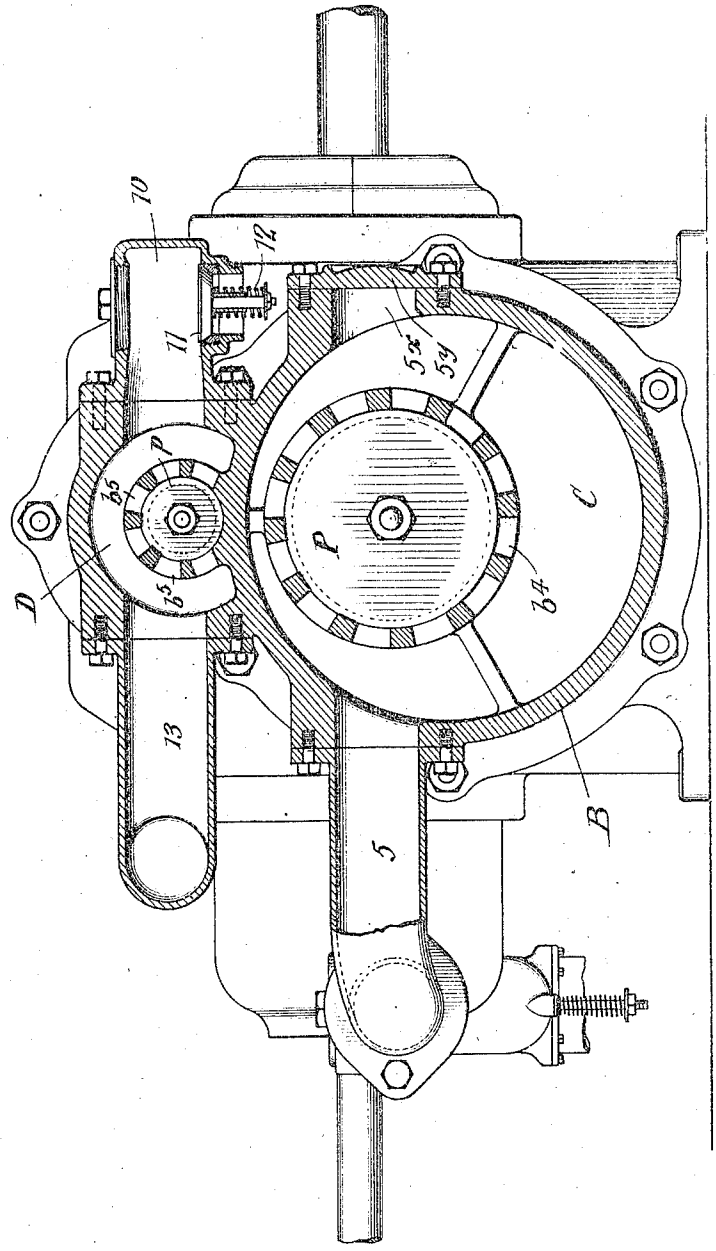

Fig. 3.

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UNITED STATES PATENT OFFICE.

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INTERNAL-COMBUSTION ENGINE.

1,090,647. Specification of Letters Patent. Patented Mar. 17, 1914.

Application filed March 1, 1911. Serial No. 611,551.

To all whom it may concern:

Be it known that I, JOHN W. PITTS, a citizen of the United States, and a resident of Bisbee, in the county of Cochise and State of Arizona, have made certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

My invention relates to internal combustion engines, and it consists in the combinations and arrangements herein described and claimed.

An object of my invention is to provide novel means for ridding the cylinders of the spent gases or products of combustion and for cooling the cylinders.

A further object of my invention is to provide means for doing away with the back pressure on the exhaust. This I accomplish by means of a device which makes use of the momentum acquired by the gases themselves.

A further object of my invention is to provide a device whereby a plurality of pistons may be connected to work absolutely in unison.

A further object of my invention is to provide a novel form of compression chamber for the explosive charges.

Other objects and advantages will appear in the following specification and the novel features of the device will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawings forming part of this application in which—

Figure 1 is a side view of the device, certain portions being broken away to show the details, Fig. 2 is a longitudinal vertical section through the device, Fig. 3 is a section along the line 3—3 of Fig. 2, looking in the direction of the arrows.

Referring now particularly to Figs. 1 and 2, I have shown therein a main frame 1, having vertically extending integral webs 2 (see Fig. 2). At the upper end of the frame 1 is secured a cover 3, which is designed to protect the eccentric and to form with the interior parts of the frame 1 and with the removable plates 4 (see Fig. 1) a protective casing for the mechanism contained therein.

At one end of the casing or frame 1 is bolted the cylinder A. A similar cylinder B is secured to the opposite end of the casing. I have used the term "cylinder", although the member A is really made up of a pair of cylinders, one cylinder a' being a driving cylinder and the other cylinder a^2 being an auxiliary cylinder, for a purpose hereinafter described. The member B consists also of two cylinders b' and an auxiliary cylinder b^2, these cylinders being identical in all respects with their companion cylinders a' and a^2. An examination of Fig. 2 will show that at the rear end of the member A is a passage-way a^3 by which the cylinder a' communicates with the cylinder a^2. A piston P′ is disposed in the cylinder a', while a piston p' is disposed in the cylinder a^2. The opposite cylinders b' and b^2 are provided with pistons P and p, corresponding to the pistons P′ and p' of the member A. In Fig. 3, I have shown a section through the member B. From Figs. 2 and 3, it will be seen that there is a series of openings b^4, which establish communication between the interior of the cylinder b' and a compression chamber C formed in the member B itself. A similar series of openings b^5 permits communication between the auxiliary cylinder b^2 and an arc-shaped passage or chamber D.

Communicating with the interior of the chamber C is a pipe 5 (see Fig. 3) which leads to a valve casing 6 (see Fig. 1). In this valve casing is a valve 7, which is normally held closed by means of a spring 8, but which will open to allow a charge to be sucked in through the pipe 9, which communicates with a carbureter (not shown). It will be understood that the opposite member A is provided with a compression chamber C′ which communicates, by means of a pipe 5′, with a valve chamber 6′ having a valve similar to that shown at 7 in Fig. 1, the valve chamber 6′ in turn communicating, by means of a pipe 9′, with the common carbureter (not shown). In Fig. 3, I have shown an opening 5^x, which is covered by a plate 5^y. This plate may be removed and the pipe 5 may be placed on the opposite side of the engine if desired.

Referring again to Fig. 3, it will be seen that on one side of the chamber D and communicating with it is a valve casing 10, provided with an air valve 11, which is normally held against its valve seat by means of a spring 12. On the opposite side of the chamber D is an exhaust pipe 13, which is bent laterally, and which has connected with it

an integral pipe 13′ leading from the chamber D′ of the cylinders A. Attention is called to the fact that these two exhaust pipes 13 and 13′ deliver exhaust gases to a common exhaust pipe 14, as shown in Fig. 1. This forms one of the important features of my invention, which will be fully explained later.

The cylinders A and B are provided with usual water jackets J and J′ and with spark plugs 15 and 15′, respectively. The piston rod p^a of the piston P′ passes through a stuffing box 16 and is connected with the outer member e of the eccentric in the manner shown in Fig. 2. From this figure it will be seen that the piston rod is threaded so as to be screwed into or out of the member e and is provided with a jamb nut, which may be tightened against the member e to hold the rod in place. From Fig. 2, it will be seen that each of the pistons P′, p', P and p is also adjustably connected with the member e, the piston rods of the auxiliary pistons p' and p being connected through the extensions e' and e^2 on the member e. This construction provides for the adjustment of the pistons in their cylinders. Each piston rod is provided with a suitable stuffing box.

The mechanism for converting a reciprocatory movement of the piston rods into rotary movement is shown in Fig. 2. It comprises a circular strap e having extensions e' and e^2 which are secured together. The piston rods p^a and p^b and the auxiliary piston rods p^x and p^y are adjustably connected to the strap as already explained. The strap e is designed to embrace the eccentric F (see Fig. 2). This eccentric is really a combination of a gear and eccentric. It has an arc-shaped portion f (see Fig. 2) having a channel f'' to receive the strap e. The arc-shaped member f is integral with the gears f^2 and f^3, which go to make up part of the rotating member. It will be understood that this rotating member has been termed "eccentric" for want of a better name, and simply because the major portion of the part revolves about an axis which is not centrally located of the part. I do not mean to intimate that the office or function of the eccentric F is like that of the ordinary eccentric, because it is not, as will be fully explained later.

Referring now to Fig. 2, it will be seen that the part f is provided with a central opening f^4 through which extends the central member g of crank mechanism, which includes the parts g' at one end, g^2 at the other end, the shaft H and the shaft H′. In Fig. 2 the central portion g and the portions of the shafts H and H′ are shown in dotted lines. Each of these members is provided with a reduced portion secured to the central member g, and with an enlarged portion similar to that shown at g^x in Fig. 1, and which constitutes a counterweight.

From the foregoing description of the various parts of the device the operation thereof may be readily understood.

Consider now Fig. 2 with the piston P moving toward the right on its intake stroke. The pressure in the chamber C being relieved, fuel is sucked in through the pipe 9, past the open valve 7, and through the pipe 5, following the piston to the end of its stroke and in the usual manner. Now on the return stroke the valve 7 closes and the gas is compressed in the compression chamber C and the pipe 5. As soon, however, as the piston P uncovers the openings b^4, the compressed gas in the chamber C and pipe 5 rushes into the cylinder b' behind the piston. On the next stroke of the piston, the gas is compressed in the rear end of the cylinder, and at the proper time the sparking circuit is closed and the explosion drives forward the piston P. The piston P, it will be remembered, is connected with the strap e, as is the auxiliary piston p in the auxiliary cylinder b^2. The pistons P and p, therefore, travel in unison. An inspection of Fig. 2 will show that the openings b^5 are uncovered by the piston p before the openings b^4 are uncovered by the piston P, partly for the reason that the openings b^5 are of greater length, and partly for the reason that the piston p is slightly ahead of the piston P. When the piston p, therefore, uncovers the openings b^5, the gases of combustion rush out through the passage b^3, through the auxiliary cylinder b^2, through the openings b^5, into the pipe 13 and thence to the exhaust 14.

Let us consider now what happens when the piston p makes its return stroke. Ordinarily, it would suck in air or spent gas through the openings b^5. By providing the valve 11 (see Fig. 3), I have found that the momentum acquired by the gas rushing through the exhaust pipe is sufficient to cause the cold air intake valve 11 to open when the piston p begins its rearward stroke, so that the gases which acquire their momentum by the forward stroke of the piston p pass on out through the pipe 14 while at the same time cold, fresh air is drawn through the valve 11 and into the cylinder b^2, thereby cooling the auxiliary cylinder. On the next forward stroke of the piston p the cold air is driven out through the exhaust pipe 13, the valve 11 reseating itself. There is, therefore, an alternate succession of rapid puffs of spent gases and cold air traveling in the same direction through the exhaust pipe. This tends to greatly reduce the back pressure on the engine, because of the momentum acquired by the gases in the exhaust pipe. The other pistons, which correspond to those just described, operate in

the same manner. The position of the pistons, as stated, may be regulated by screwing up, or unscrewing the piston rods, and then clamping them in their adjusted positions by means of their jamb nuts.

I claim:

1. In an internal combustion engine, a casing, a main cylinder, an auxiliary cylinder, each of said cylinders being provided with a series of openings near one end thereof, a common passage connecting said cylinders at the opposite end thereof, a piston for each cylinder, an exhaust pipe communicating with the auxiliary cylinder through the openings of the latter, an air port for admitting air through the openings in the auxiliary cylinder, and a valve for said air port arranged to open on the movement of the piston of the auxiliary cylinder toward said common passage.

2. In an internal combustion engine, a casing, a main cylinder, an auxiliary cylinder, each of said cylinders being provided with a series of openings near one end thereof, a common passage connecting said cylinders at the opposite end thereof, a piston for each cylinder arranged to uncover its respective openings, an exhaust pipe having free communication with the openings in said auxiliary cylinder, an air chamber also having free communication with the openings in said auxiliary cylinder, a check valve disposed in said air chamber and arranged to open to admit air on the movement of the piston of the auxiliary cylinder toward said common passage.

3. In an internal combustion engine, a casing, a main cylinder and an auxiliary cylinder within said casing, a communicating passage at the rear end of said cylinders, each of said cylinders being provided with a series of lateral openings at its forward end, a piston and a piston rod for each cylinder, each of said piston rods being connected to a common reciprocating member, the main piston being adapted to uncover the openings in said main cylinder, and the auxiliary piston being adapted to uncover the openings of said auxiliary cylinder, a compression chamber disposed adjacent said main cylinder and adapted to communicate with it through the lateral openings in said main cylinder, an exhaust pipe disposed adjacent said auxiliary cylinder and adapted to communicate with it through the openings in said auxiliary cylinder, the movement of said auxiliary piston being in advance of said main piston in the forward stroke, thereby permitting the discharge of the gases of combustion before the entrance of the compressed charge through the inlet openings.

4. In an internal combustion engine, a casing, a main cylinder and an auxiliary cylinder within said casing, each of said cylinders being provided with a series of longitudinal openings near one end thereof, a common passage connecting said cylinders at the opposite end thereof, a piston rod for each piston, a common rigid connection for said main piston rod and said auxiliary piston rod, and means for adjustably securing each of said pistons through said common rigid connection so as to vary the relation of the pistons to their respective openings.

5. In an internal combustion engine, a casing, a main cylinder, an auxiliary cylinder within said casing, each of said cylinders being provided with a series of openings near one end thereof, a common passage connecting said cylinders at the opposite end thereof, a piston rod for each piston, a common rigid connection for said main piston rod and said auxiliary piston rod, and means for adjusting the position of the auxiliary piston with respect to the main piston.

6. In an internal combustion engine, a casing, a main cylinder, an auxiliary cylinder, each of said cylinders being provided with a series of openings near one end thereof, a common passage connecting said cylinders at the opposite end thereof, a piston for each cylinder arranged to uncover its respective openings, an exhaust pipe on one side of the auxiliary cylinder having free communication with the openings in the auxiliary cylinder, an air chamber on the opposite side of said auxiliary cylinder also having free communication with the openings in said auxiliary cylinder, and an air inlet valve for admitting air into the air chamber on the movement of the piston of the auxiliary cylinder toward the common passage, said air valve being arranged to close on the reverse movement of the auxiliary piston thereby causing the air to be forced out through the exhaust pipe.

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