

H. SÖHNLEIN.

GAS ENGINE.

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905,598.

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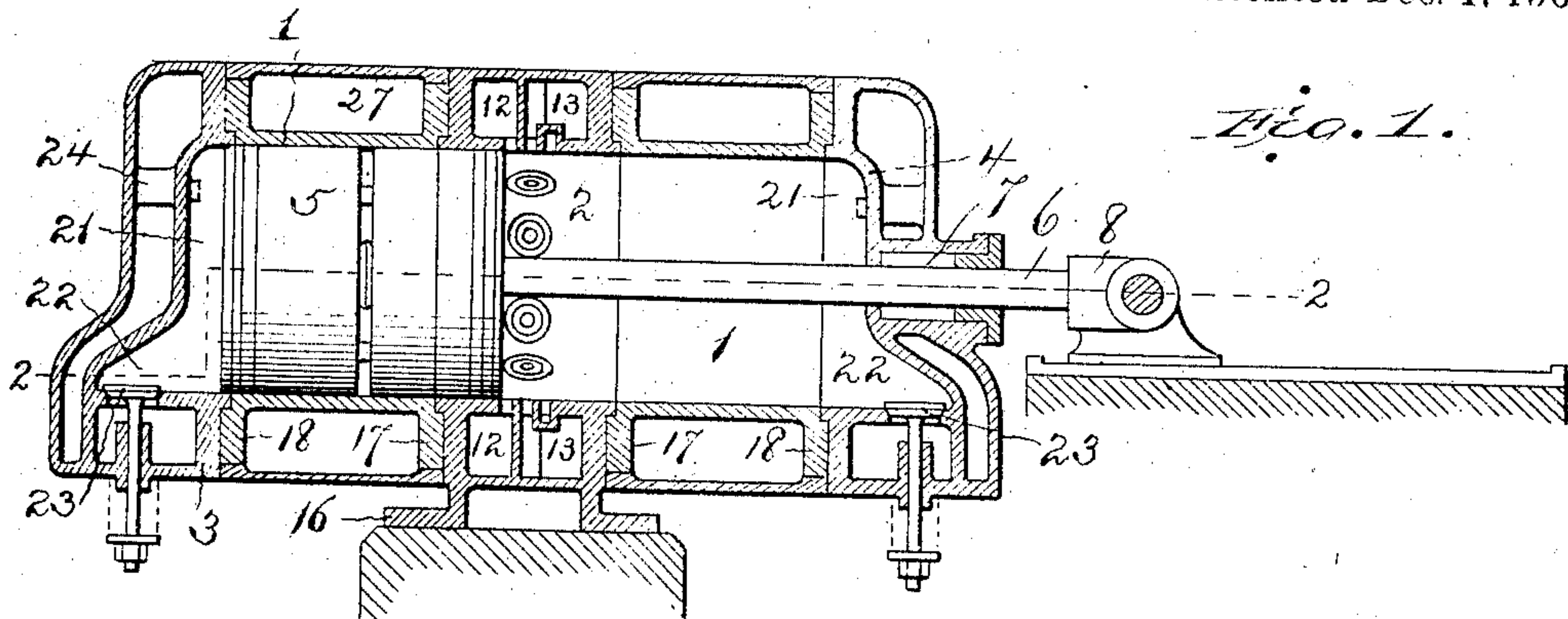


Fig. 1.

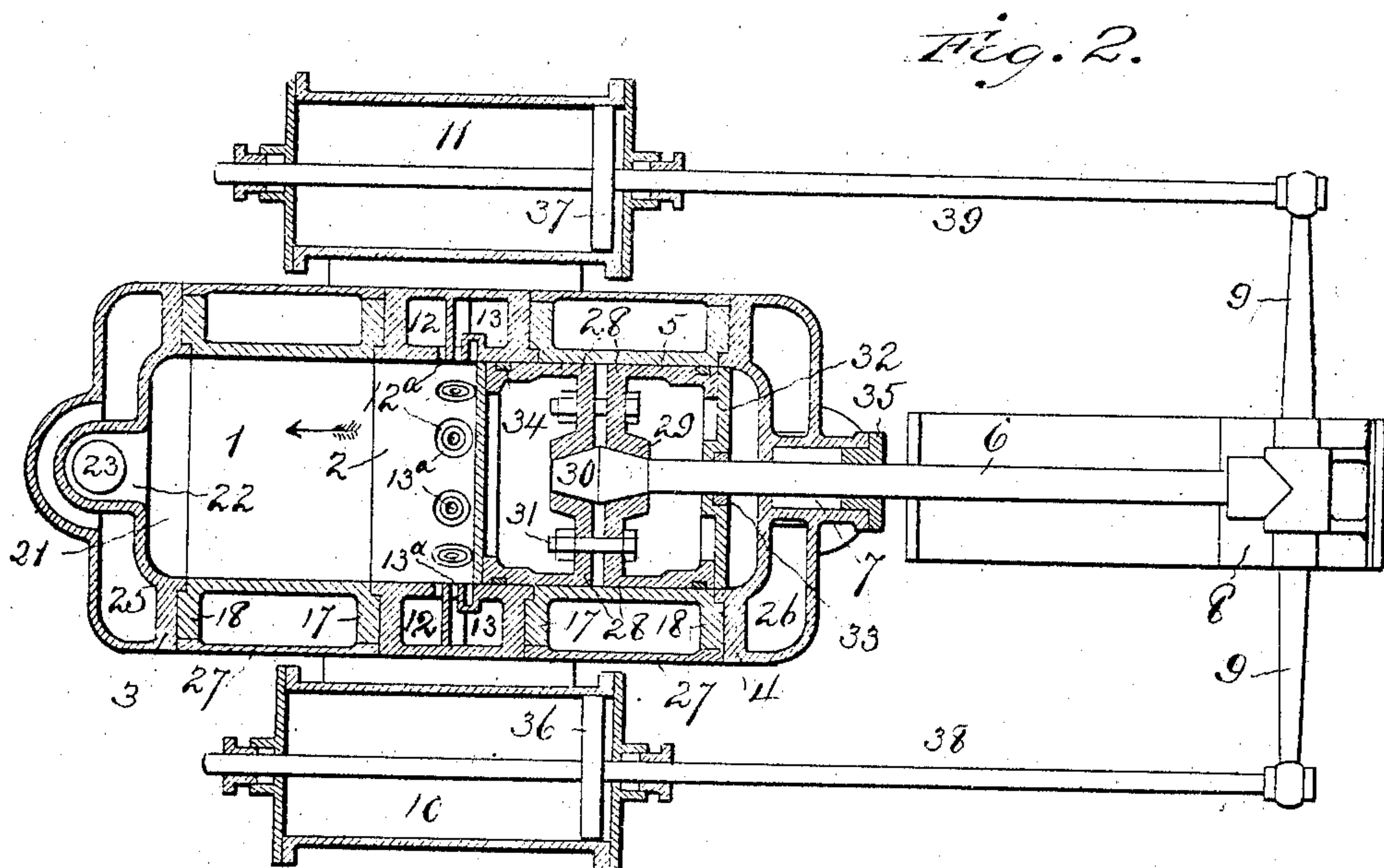


Fig. 2.

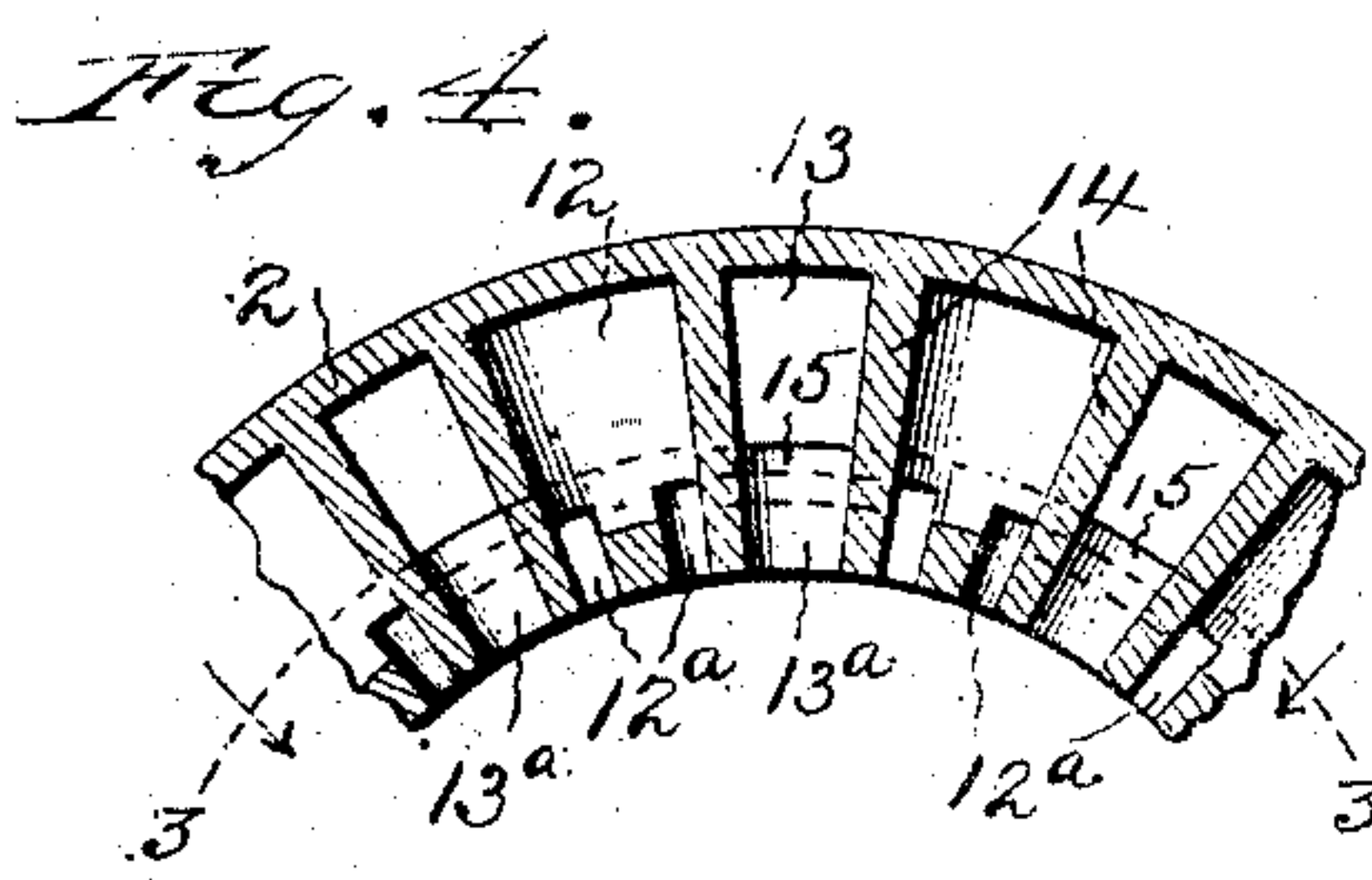


Fig. 4.

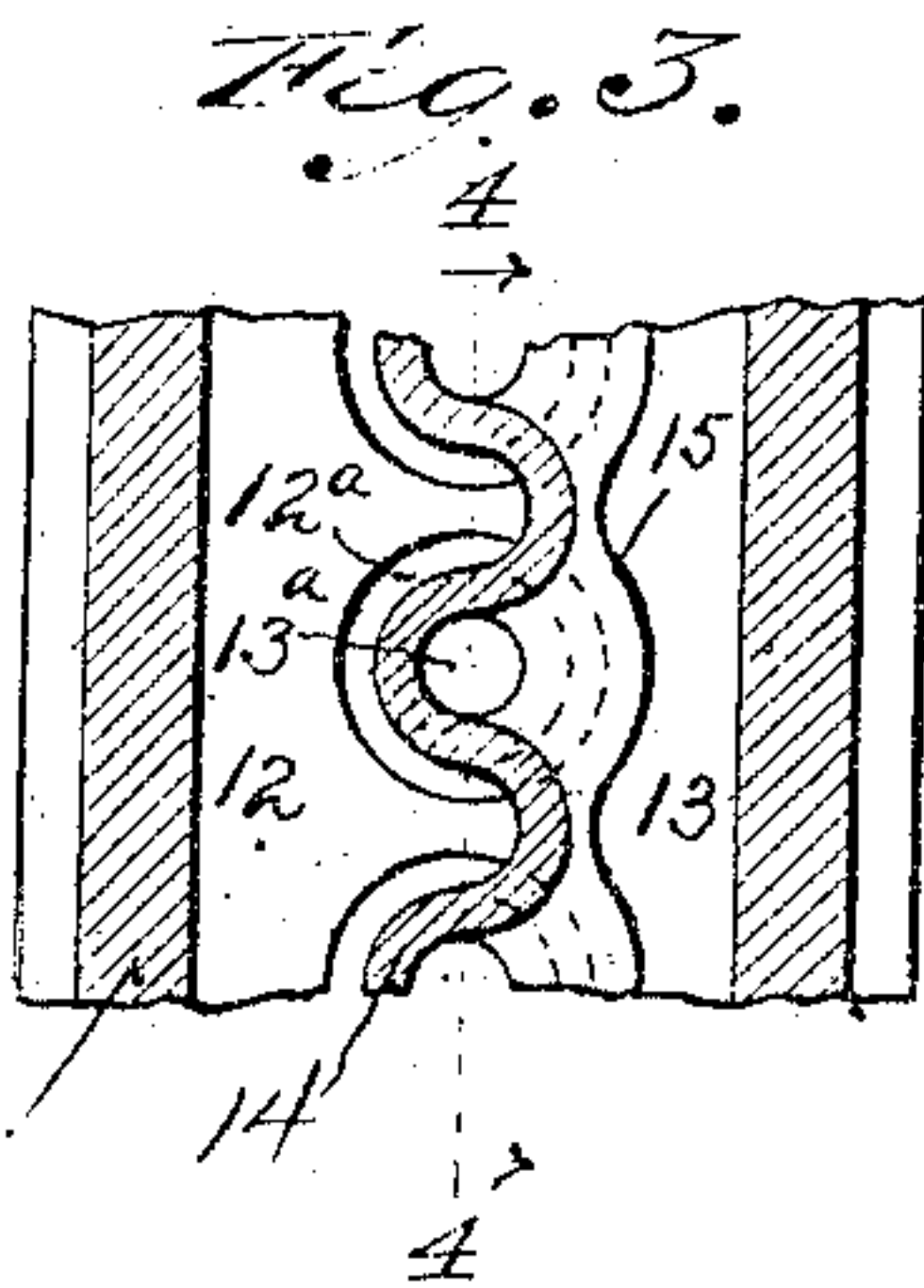


Fig. 5.

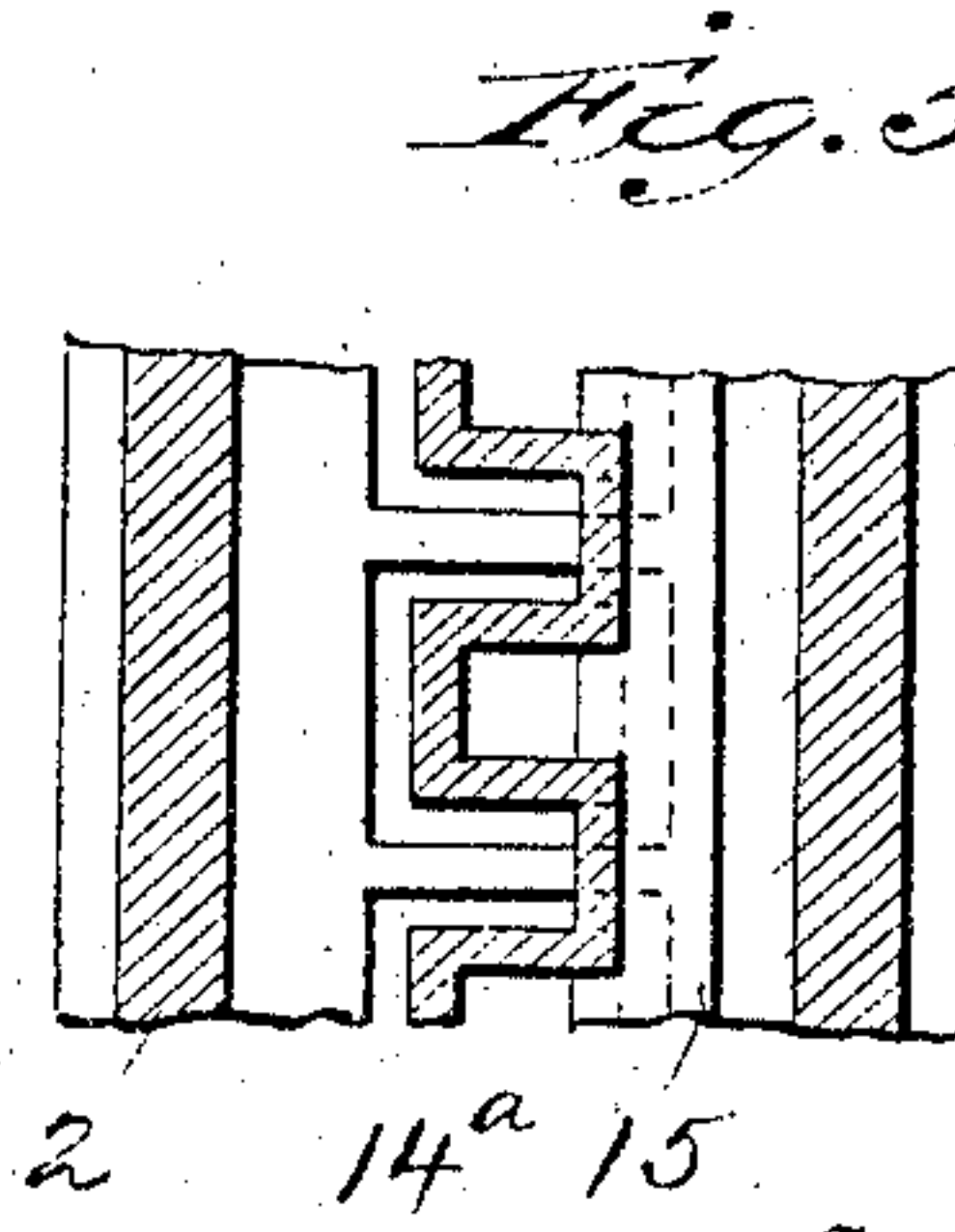


Fig. 6.

Witnesses
Edwin L. Jewell
B. Kommers

Inventor
Heinrich Söhnlein

By Henry Orthofer
Attorney

UNITED STATES PATENT OFFICE.

HEINRICH SÖHNLEIN, OF WIESBADEN, GERMANY.

GAS-ENGINE.

No. 905,598.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, HEINRICH SÖHNLEIN, a subject of the German Emperor, and a resident of Wiesbaden, Germany, have invented certain new and useful Improvements in Gas-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

The invention relates to improvements in explosive gas engines particularly to that type of engine in which the explosions occur on each side of the working piston alternately, so that there will be two impulses for each revolution.

The object of my improvement is to provide an engine which combines simplicity with a high efficiency and consists principally in the novel arrangement of inlet ports, the cylinder and the cooperating piston.

In the drawing accompanying and forming a part of this specification I have shown in detail certain advantageous forms of embodiment of the invention which will be set forth in detail in the following description while the novelty of the invention will be included in the claims succeeding said description.

Referring to said drawing:—Figure 1 is a longitudinal vertical section of an engine embodying the novel features of my invention. Fig. 2 a horizontal section on line 2—2 of Fig. 1. Fig. 3 an enlarged detail partial longitudinal section of the air and gas chambers taken on lines 3—3 Fig. 4 looking in the direction of the arrows. Fig. 4 a vertical section on line 4—4 of Fig. 3. Fig. 5 a view similar to Fig. 3 of a modification.

Corresponding and like parts are referred to in the following description and indicated in the several views of the drawing by the same reference characters.

The engine consists in general of a working cylinder composed of end sections 1 1 and a central section 2: two cylinder covers 3 and 4, a power piston 5, a piston rod 6, passing substantially gas tight through a

stuffing box 7, a cross-head 8 having two lateral extensions 9, a gas-pump 10, an air pump 11, the pistons of said pumps being connected to extensions 9 of the cross-head and the necessary parts to govern and transmit the power of the piston. These last mentioned parts may be of any desired and well known construction and as they form no part of my invention, they have not been illustrated.

The section 2 is divided into two longitudinal passages 12, 13 by means of a sinuous partition 14 as shown in Figs. 3 and 4 or by a zig-zag partition 14^a shown in Fig. 5.

On the gas side 13 of the partition is formed a bridge 15 having a channel connecting the adjacent turns of the sinuous partition and opening into and being fed from the air side 12 of the partition so as to form continuous ports 12^a for the air which surround gas ports 13^a on the gas side of the partition whereby gas can pass from the gas chamber 13 under bridge 15 and up through the central gas ports 13^a into the cylinder.

The central portion 2 of the cylinder is provided with a suitable foot or flange 16 that serves to support the working cylinder and the parts connected thereto and capable of being bolted to a suitable bed plate or foundation.

The end sections 1, 1, are provided with flanges 17 by means of which they are fastened to the central portion 2 and also with flanges 18 to which the cylinder ends 3 and 4 are secured.

The parts 1, 2, 3 and 4 are each provided with tongues and grooves to form an abutting and alining joint, whereby the parts can be accurately centered. The cylinder heads or covers 3 and 4 are similar in construction, except that the one 4 is provided with a stuffing box 7. The spaces 21, at the ends of the cylinders, serve as the so-called explosion or compression chambers. In each cylinder-head is a suitably shaped pocket 22, in which is located an exhaust valve 23 and if necessary, more than one exhaust valve may be used at each cylinder end. These exhaust valves may be of any suitable construction and are here shown as the common puppet valves that are mechanically operated by any suitable mechanism, not shown.

The heads 3 and 4 contain a suitable ignition device, electric igniters 24 being preferred, though any other suitable igniter may be used. The cylinder heads are provided with water chambers 25 and 26 for the circulation of cooling water and the sections 1, 1 are each provided with a casing 27 that also forms space for the circulation of cooling water. Since the central portion 2 of the cylinder is only exposed to a fraction of the heat of explosion it need not necessarily be provided with a water jacket.

The cylinder may be formed in one piece, but the composite structure described is preferable, the chief advantage of which is that the unequal expansion of the cylinder is avoided; a perfect alinement of the cylinder is maintained and the cylinder ends 1, 1, that are exposed to the greatest heat of explosion may expand freely to either side of the part 2, without affecting the relative positions of the inlet ports and the working piston.

The piston 5 may be designed and fixed to the piston rod 6 in any suitable manner and the length of the piston must be slightly less than the stroke in order to clear the inlet ports when the piston is at the inner and outer dead points, whereby both ends of the cylinder are charged by a single series of ports.

The piston consists of two parts 28, having flanges 29, in the center of which are turned-out recesses to receive the thickened portion 30 of the piston rod 6. The enlarged portion 30 is preferably in the form of a double cone. The two parts 28 are bolted together by bolts 31 that pass between the flanges 29, the double coned end of the piston rod being held securely within the recesses in the flanges. The ends of the piston are closed by plates or caps 32 and the opening in one of them for the piston rod is made gas tight by a ring 33. The piston itself is provided with packing rings 34 as is customary.

The piston rod 6 is fastened to the cross-head 8 and passes through a stuffing box 7 in the cylinder-head 4, said box being filled with a suitable packing material held in place by a gland 35.

The engine is provided with two pumps 10 and 11 of the same construction. These pumps, which are double acting, are arranged on both sides of the power cylinder and parallel thereto, and their piston rods 38 and 39 are connected to the arms 9 on the cross-head 8, so that the three pistons 36, 5 and 37 have equal strokes and move in unison in the same direction.

The operation is as follows:—Let it be supposed that the compression chamber 21, near cylinder-head 4 in Fig. 2, is filled with

a compressed explosive charge and this charge is ignited by the device 24. At this time the left side of the gas pump 10 is filled with gas, and the left end of the air pump 11 with air. The working piston 5 is then driven in the direction of the arrow, both pump pistons traveling in the same direction in unison. Consequently gas and air are compressed in their respective pumps. After the piston 5 has passed about 80 per cent. of its stroke the exhaust valve 23 in the head 4 is opened and the high-pressure gases escape, shortly after which the end of the piston 5 uncovers the air ports 12^a to admit air compressed in the pump 11. As these air ports surround the gas ports they begin to be uncovered by the piston first to admit air that rushes into the cylinder in a number of single streams from the inner periphery of the cylinder, that impinge upon each other and thereby destroy the momentum of the rush of air. The air thus fills the whole cross-sectional area of the cylinder and advances as a solid column to force out any remnants of the products of combustion and thoroughly scavenge the cylinder. A further progress of the piston 5 will also open the gas ports 13^a and on account of the peculiar arrangement of the ports the air and gas is thoroughly mixed to form an explosive charge, and the uniformity of the mixture is insured, whatever the amount of the gas admitted.

At about the dead center the exhaust valve 23 is closed and the piston starts on its compression stroke (on the same side of the piston) first closing a part of the air ports and then the gas ports. Simultaneously the pumps draw a fresh supply of air and gas on one side of their pistons, while that on the other side is being compressed, the piston 5 again coming to the position shown in Fig. 2, when the cycle is completed. The same operations take place on the opposite side, thereby making the engine double acting with an explosion taking place alternately on opposite sides of the piston, or two explosions for every revolution.

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

1. In a gas engine, a cylinder having internal gas and air ports between its ends, the air ports surrounding the gas ports and a double acting power piston controlling said ports simultaneously, whereby during the travel of the piston the air ports will first be partially opened to admit air and then admit gas behind the stream of incoming air and finally surround the incoming gas by a mantle of air.

2. In a gas engine, a cylinder having a movable central cylinder section provided

with concentric internal air and gas ports,
air and gas chambers surrounding the sec-
tion and communicating respectively with
said concentric internal air and gas ports
5 formed within the section and a power pis-
ton in the cylinder simultaneously control-
ling all the ports.

In testimony that I claim the foregoing as
my invention, I have signed my name in
presence of two subscribing witnesses.

HEINRICH SÖHNLEIN.

Witnesses:

O. ERNST,
HENRY HOLLMANN.