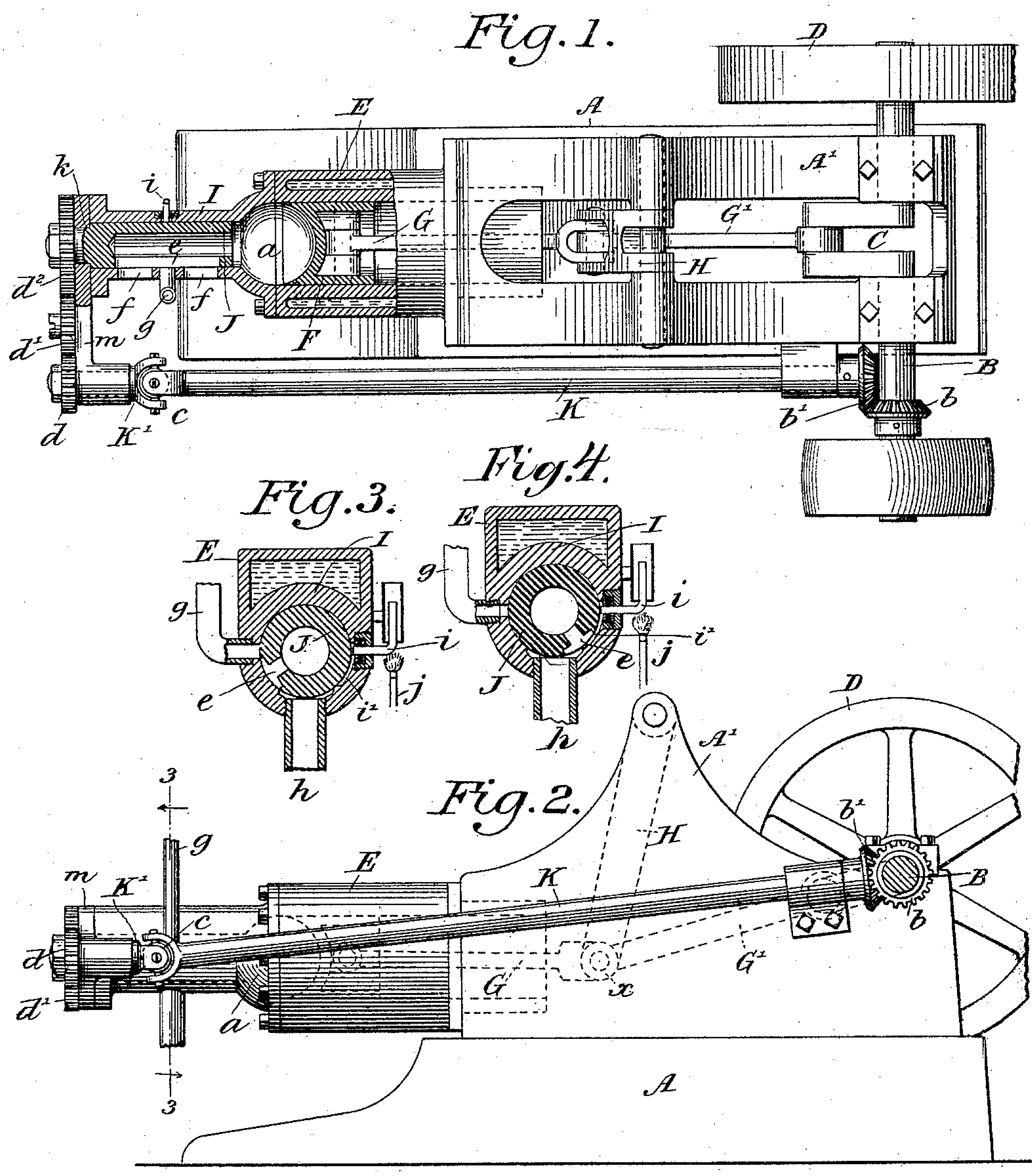
(No Model.)

C. W. WEISS.

GAS ENGINE.

No. 473,685. Patented Apr. 26, 1892.



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CARL W. WEISS, OF BROOKLYN, NEW YORK.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 473,685, dated April 26, 1892.

Application filed June 25, 1891. Serial No. 397,422. (No model.)

To all whom it may concern:

Be it known that I, CARL W. WEISS, a citizen of the United States, and a resident of Brooklyn, in the county of Kings and State of New York, have invented certain Improvements in Gas-Engines, of which the following is a specification.

My invention relates to the class of gas-engines which are operated by what is known as a "four-stroke" cycle—that is to say, when the charge is exploded the piston makes its outstroke, then returns and expels the products of combustion, then makes a second outstroke, drawing in the charge, and then on the next instroke compressing said charge.

The object of my invention is in the main to improve the means for admitting the gas and air forming the explosive charge and for igniting the same.

My invention will be fully described hereinafter, and its novel features carefully defined in the claims.

In the accompanying drawings, wherein my improvements are represented as embodied in a gas-engine, Figure 1 is a plan of the engine, a portion of the cylinder, piston, and valve being in axial section; and Fig. 2 is a side elevation of the engine. Fig. 3 is a transverse section through the valve and valve-chamber, taken in the plane indicated by the line 3 3 in Fig. 2, but drawn to a scale about double that of Fig. 2. Fig. 4 is a view similar to that of Fig. 3, but showing the valve in a different position.

Let A represent the bed-plate of the engine, B the main shaft mounted in bearings therein and provided with a crank C, and D is the fly-wheel on said shaft.

E is the engine-cylinder; F, the piston; G, the piston-rod coupled at one end to the piston and at the other end to a connecting-rod G', which is itself coupled at its other end to the crank C in the main shaft. At the point where the piston-rod and connecting-rod are coupled together they are also coupled to the lower pendent end of a suspended link H, which is pivoted at its upper end in a frame A' on the bed-plate A.

It will be seen that the crank-shaft B has its axis above a horizontal plane passing through the axis of the engine-cylinder, and, as herein shown, the shaft is set above the plane of the cylinder-axis a distance equal to the length of the crank. Consequently the rod G' and the crank will stand at an incline with axis of the cylinder when the crank is on its center, as seen in Fig. 2. The pendent link H causes the piston-rod G to maintain very nearly its alignment with the cylinder-axis, the swing of said link causing the coupling-point x to move a little below the axial line of the cylinder as the piston moves to and fro. The result of this construction is that when the explosion takes place and the piston is driven forward it will travel through a greater distance in proportion to the travel of the crank during the same period than in constructions where the shaft is in line with the cylinder-axis, and as the crank will be moving at the normal speed the piston will thus be able to travel with an increased speed, especially during the first half of its outstroke. I employ the link H in preference to cross-head guides, in order to reduce the friction arising from the use of such guides. This mode of constructing the engine—namely, with its crank-shaft placed laterally out of line with the cylinder-axis—is not new with me, but I prefer to employ it.

I will now describe the construction of the explosion-chamber and the valve. At the back of the cylinder is a valve-casing I, which is bolted firmly to the cylinder and comprises a tubular cylindrical portion, in which is mounted a tubular cylindrical valve J, and a portion adjacent to the cylinder having a spherical concavity which forms one-half of the explosion-chamber a. A corresponding spherical concavity in the piston F forms the other half or part of said chamber. The spherical form thus given to the explosion-chamber is clearly illustrated in Fig. 1, the diameter of the chamber being equal to that of the cylinder. The axis of the valve J is aligned with the axis of the cylinder E, and said valve is mounted in a bearing at its outer end, where it is closed, and rotation is imparted to it through the medium of the mechanism I will now describe.

On the main shaft B is a miter-wheel b, which gears with a corresponding miter-wheel b' on an inclined shaft K, mounted rotatively in a bearing on the frame A′ and coupled by a universal joint c to a short shaft K′ at the rear of the engine. On this shaft K′ is a toothed wheel d, which gears with an intermediate wheel d', which latter gears with the toothed wheel d^2 on the projecting journal of the valve J. Consequently when the main shaft is driven the valve will be rotated at the proper speed through the medium of said gearing. In the valve is a single port e, which opens in turn as the valve rotates to the gas and air inlets, the ignition-point, and finally to the exhaust-outlet. This port e is elongated, as seen in Fig. 1, whereby it is adapted to receive air at two air-inlets f and simultaneously at a gas-inlet g, arranged between said air-inlets.

h is the exhaust-outlet, and i is the igniting-tube, which is heated by the burner j, as seen in Fig. 3.

Having described the construction of the engine in a general way, I will now explain its operation, premising that, as represented in Fig. 1, the piston is at the inner end of its stroke and the valve is in position to admit a charge of gas and air. On the next outstroke of the piston the air entering at the inlets f and f and the gas entering at the inlet g between them are mixed thoroughly together on their way to the cylinder. On the next return stroke of the piston the charge of gas and air will be compressed in the globular or spherical chamber a, as well as in the elongated bore or chamber of the valve. At this moment the port e in the valve will open to the igniting-tube i and the compressed charge will expand into said tube and be ignited, thus igniting the portion of the charge within the valve. This valve having the axis of its bore or chamber directed toward the center of the charge in the spherical chamber a, the flame and heat from the explosion will be shot or fired, like the charge from a gun, into the center of and through said charge, thereby igniting the whole instantaneously. This produces the maximum effect due to the explosion. The piston now makes its next outstroke with great rapidity and force, owing to the construction described, whereby it is coupled to the crank. On the next return stroke the port e in the valve will be opened to the exhaust h and the burned gases or products of combustion will be expelled. As the burned gases will be compressed at the moment of the explosion in the igniting-tube i, which is closed at its outer end, and as these gases will be incarcerated in said tube by the movement of the valve I prefer to provide the means illustrated most clearly in Fig. 4, whereby these gases are allowed to exhaust into the exhaust-outlet. These consist in cutting away the inner wall of the valve-chamber to form a recess i' just below or beyond the point where the igniting-tube i enters said chamber, said recess extending down nearly to the recess about the exhaust-outlet h, whereby when the valve J has opened port e to the exhaust it will also open communication between the igniting-tube and the exhaust-outlet.

In Fig. 4 I have shown the port e of the valve in position to exhaust the gases from the igniting-tube.

As represented in Figs. 3 and 4, the valve J turns to the right and the port e is enlarged at its receiving end to such an extent that it opens to the air and gas inlets a moment after it closes to the exhaust. As the bore of the valve is elongated and the gas is taken in at a lateral port arranged between two air inlets or ports, one of which is necessarily farther from the chamber a than the other, it follows that the currents of gas and air, when deflected in the chamber of the valve, must commingle before reaching the chamber a. The valve-chamber is similar in form to the bore of a gun-barrel, and when the charge is ignited therein the flame is projected, as stated, directly into the center of the compressed spherical charge, which latter has the best form as to volume and surface for uniform and instantaneous ignition. The valve has a shoulder at k on its journal, which shoulder abuts against the bearing-piece m, secured to the valve-casing, and this bearing-piece resists the strain tending to force the valve back when the explosion occurs.

The cylinder and valve-casing may be provided with water-jackets, as shown.

The spherical construction of the chamber containing the charge is not of itself new; but I prefer this form of chamber for use in connection with my elongated tubular valve for the reason that the globular charge may be ignited with better effect, as I think, than a cylindrical charge.

Having thus described my invention, I claim—

1. A gas-engine having an elongated rotating tubular valve aligned axially the cylinder and always open thereto at its forward end, said valve being provided with a single port in its side, and a valve-casing having air and gas inlets, an exhaust-outlet, and an igniting-aperture, said port in the valve being brought successively to the receiving-ports, the igniting-point, and the exhaust-outlet, as set forth.

2. In a gas-engine, the combination, with the cylinder, the piston, and the valve-casing I, secured to the cylinder and provided with air-inlets, a gas-inlet, an exhaust-outlet, and an aperture to receive the igniting-tube, of the said igniting-tube and the elongated tubular rotating valve J, mounted in said casing and provided with a single port e, the air and gas inlets being arranged in line, whereby they open to the valve-port simultaneously, as set forth.

3. In a gas-engine, the combination, with the cylinder, the piston, and the valve-casing secured to the cylinder and aligned axially therewith, said casing having in it an exhaust-outlet, an aperture for the reception of the

igniting-tube, a gas-inlet *g*, and two air-inlets *f f*, one at each side of the gas-inlet, of the igniting-tube and the rotating valve mounted in said casing and provided with a port *e*, substantially as set forth.

4. In a gas-engine, the combination, with a cylinder and piston, of the valve-casing I, provided with gas and air inlets, an exhaust-outlet, an aperture to receive the igniting-tube, and a recess *i'*, connecting with the latter aperture, the igniting-tube, and the valve J, mounted in said casing and having a port *e*, which opens simultaneously to the exhaust-outlet, and the recess *i'*, whereby the burned gases in the igniting-tube are exhausted.

5. In a gas-engine, the combination, with the valve-casing provided with an exhaust-outlet, an aperture to receive the igniting-tube, and a recess *i'*, extending from the said aperture nearly to the exhaust-outlet, of a rotating cylindrical valve mounted in said casing and provided with a port *e*, adapted to open the said recess to the exhaust-outlet, as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

CARL W. WEISS.

Witnesses:
HENRY CONNETT,
CHAS. A. WALSH.