978,867.

G. C. FAIN.

GASOLENE ENGINE.

APPLICATION FILED FEB. 18, 1908.

Patented Dec. 20, 1910.

4 SHEETS—SHEET 1.

Fig. 1.

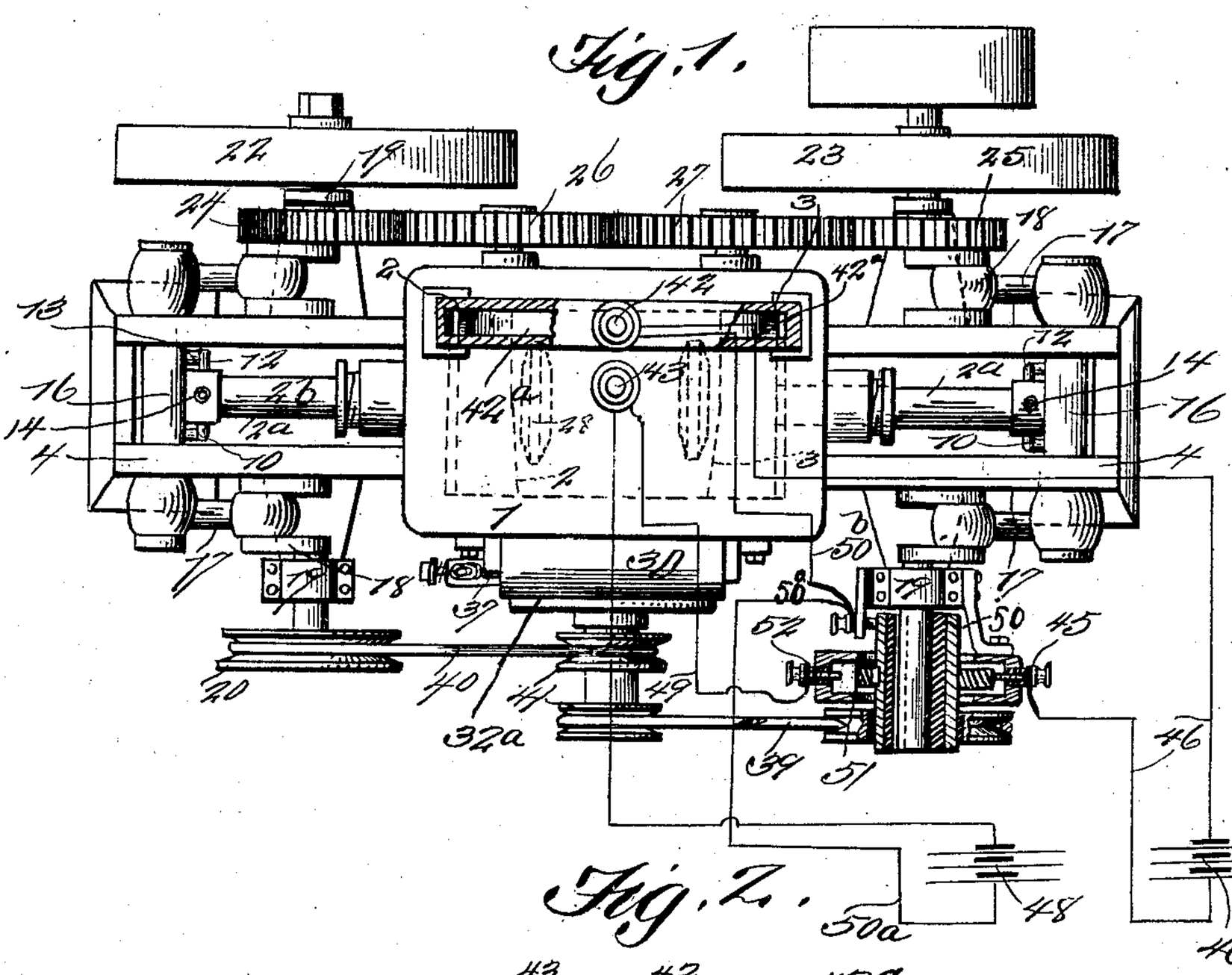
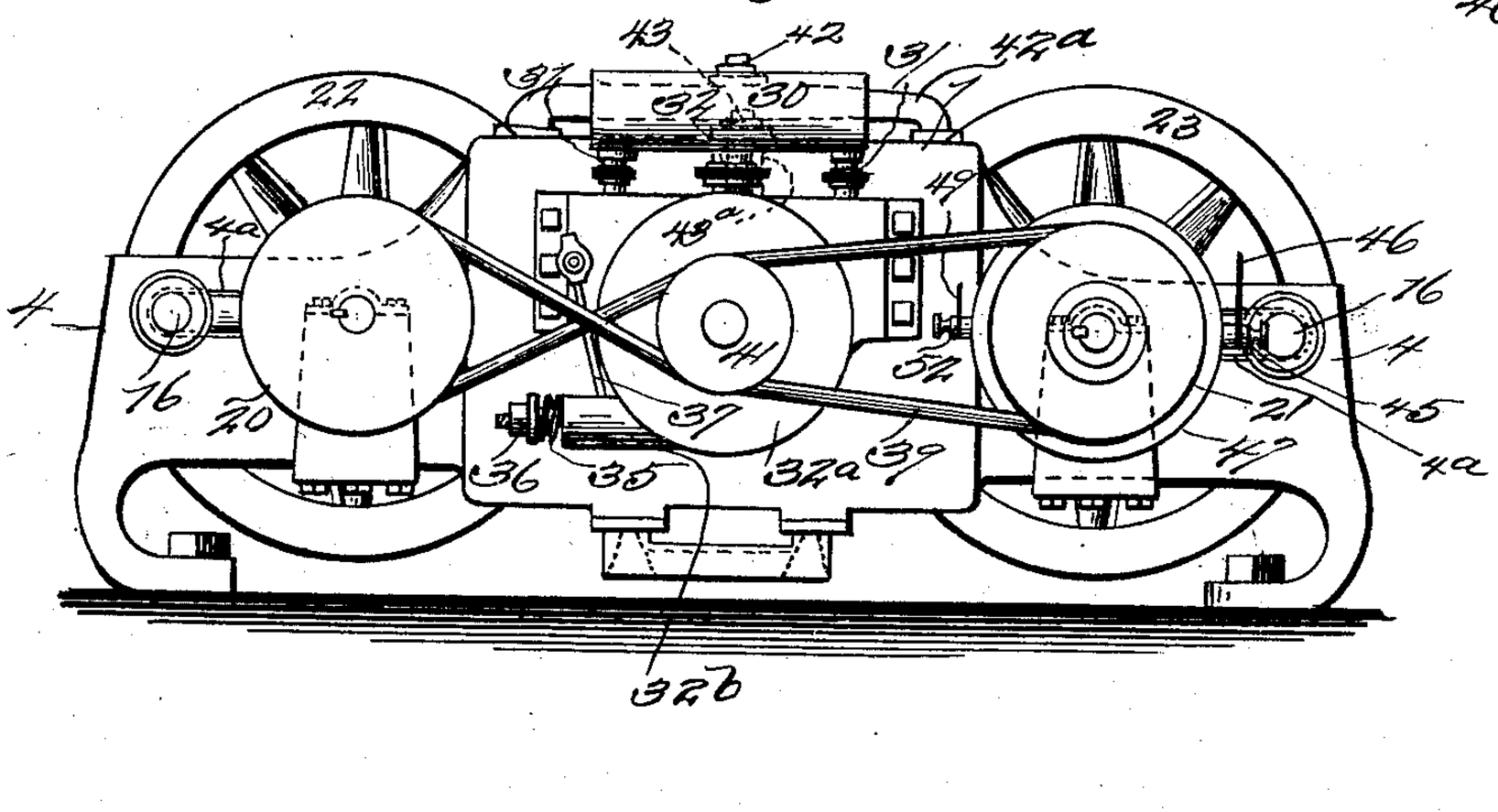


Fig. 2.



Witnesses

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4 SHEETS—SHEET 2.

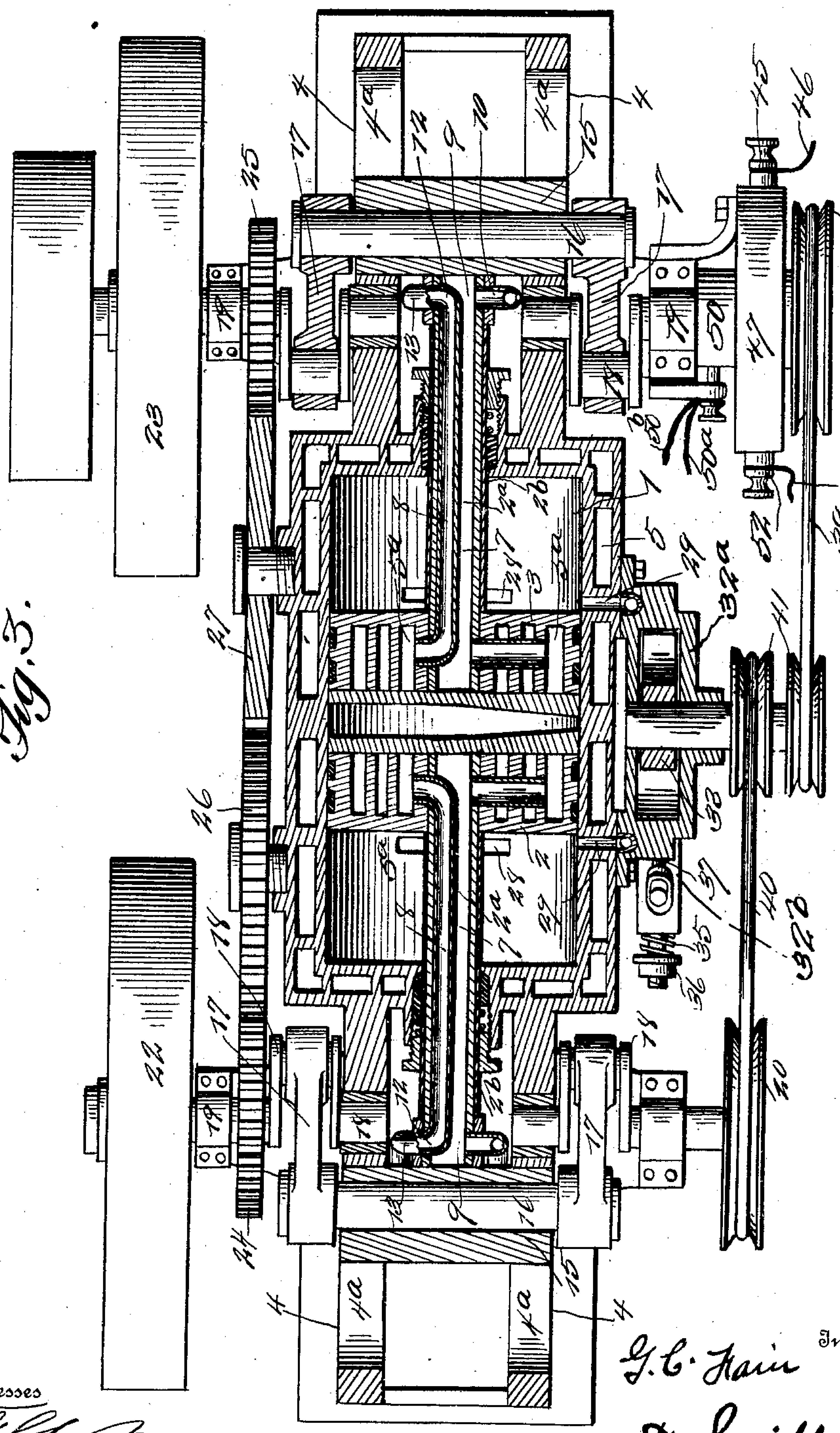

Fig. 3.

Witnesses

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4 SHEETS—SHEET 3.

Fig. 7.

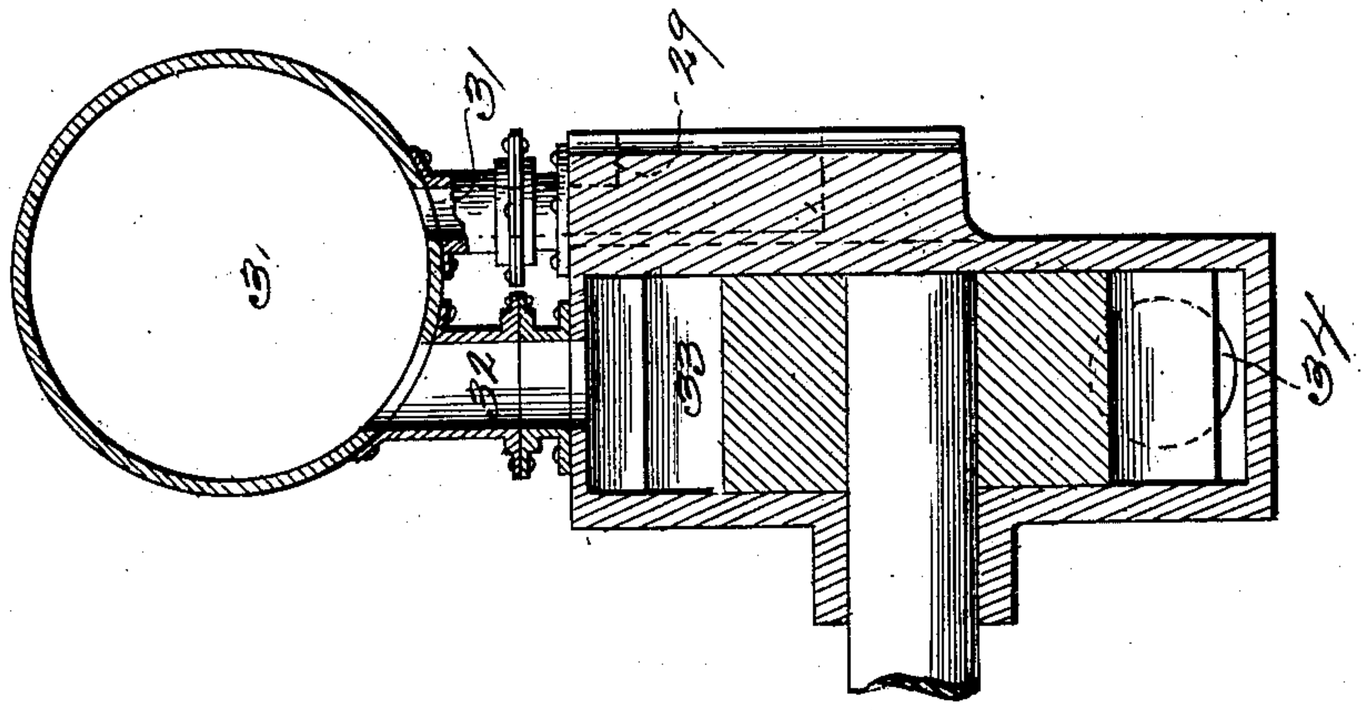

Fig. 8.

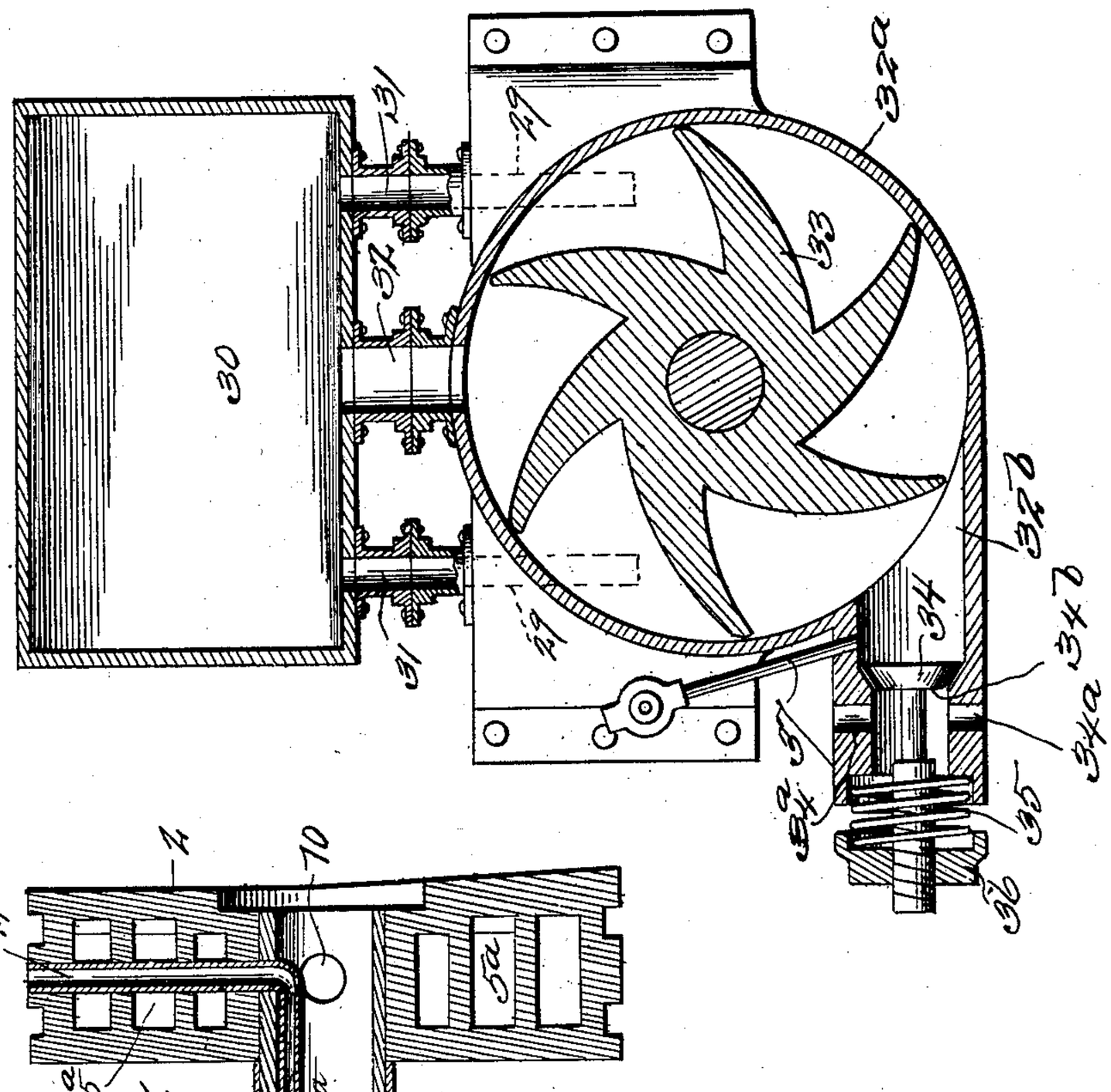

Fig. 9.

Witnesses

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4 SHEETS—SHEET 4.

Fig. 6.

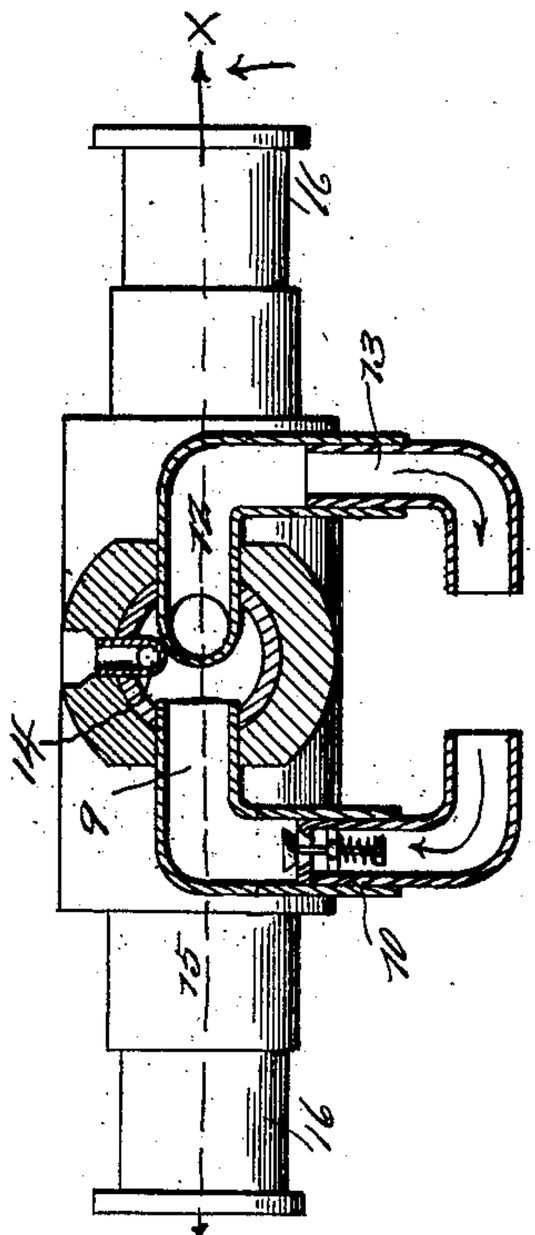


Fig. 7.

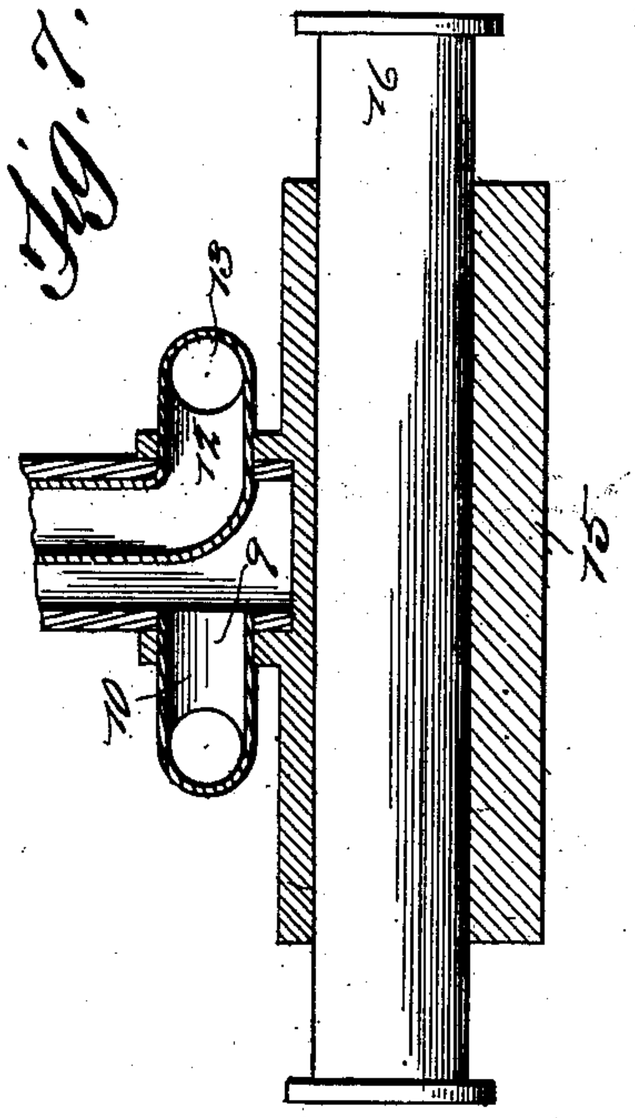
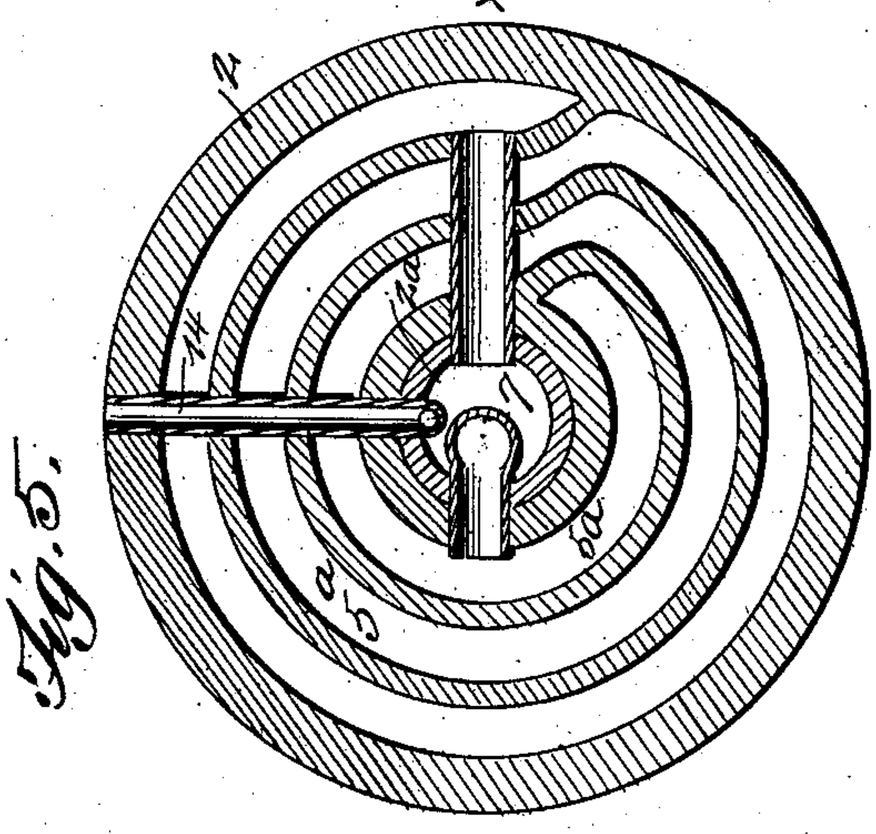


Fig. 5.



Witnesses

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UNITED STATES PATENT OFFICE.

GEORGE C. FAIN, OF BAKERSFIELD, CALIFORNIA.

GASOLENE-ENGINE.

978,867. Specification of Letters Patent. **Patented Dec. 20, 1910.**

Application filed February 18, 1908. Serial No. 416,440.

To all whom it may concern:

Be it known that I, GEORGE C. FAIN, a citizen of the United States, residing at Bakersfield, in the county of Kern and State of California, have invented a new and useful Gasolene-Engine; 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.

The invention about to be set forth pertains to a new and useful gasolene engine, especially of that type of engine, characterized by having one explosion for each stroke of the pistons, or two explosions for one revolution of the crank shafts, which are actuated by said pistons.

In the accompanying drawings, illustrating the preferred embodiment of my invention, Figure 1 is a plan view of the same, partly in section. Fig. 2 is a side elevation thereof, partly in section. Fig. 3 is a horizontal section of the engine. Fig. 4 is a part section and part side view, more especially of one of the pistons and its tubular or hollow carrying rod. Fig. 5 is a section produced through said piston in a plane at a right angle to that upon which the section of Fig. 4, is taken. Fig. 6 is a detached partly side view and partly sectional view, disclosing more fully, one of the piston-rod cross-heads and adjunctive parts including the ported water inlet valve equipped pipe-section and the waste-water outlet or exhaust valveless pipe-section. Fig. 7 is a detail sectional view taken on the line *x*—*x* of Fig. 6. Figs. 8 and 9 are vertical sectional views produced, one at a right angle to the other, of the explosive mixture delivery or feeding contrivance of the piston-cylinder.

In carrying out my invention I provide a suitable cylinder 1 mounted or secured in position upon a suitable base or support and having preferably end-extensions 4, the purpose of which, will presently appear. Said cylinder has the usual water-jacket 5, for aiding the lowering of the temperature of the cylinder, from the action of the combustion of the gases, as well understood. Pistons 2 and 3 are arranged in the cylinder 1, each having a tubular or hollow-carrying rod 2^a, a spiral passage 5^a, winding therethrough, the receiving end of which passage connects with a longitudinal passage 7, extending through the tubular or hollow piston rod 2^a and having connection at 9, with a ported valve-equipped pipe-section 10 in turn connected with a force pump (not shown) of any ordinary or approved type for passing cooling fluid through the spiral passage 5 in each piston for preventing overheating the latter, from the combustion action of the explosive mixture, as will be readily appreciated. The exhaust or discharge end of said spiral passage 5, also connects with a like passage 8, also extending through the tubular piston-rod 2^a and having connection at 12 with a ported valveless pipe-section 13, in turn connected with an exhaust pump (not shown) for aiding the withdrawal of the cooling fluid after passing the piston and which has become warm or heated. The piston-rods 2^a are incased in preferably thin cast-iron sleeves 2^b to exclude the former from the combustion action of the exploding gases in the cylinder, the cast-iron sleeves not being so readily assailable or pitted by the same as it is found, steel is, from which the piston rods are formed. The oil or lubricant for the pistons is designed to circulate through suitable tubes 14, which are positioned in the pistons 2 and 3, as shown in Fig. 4.

Suitable cross-heads 15 are arranged to slide in guides 4^a of the cylinder extensions 4; passing through the cross-heads are wrist-pins 16, the ends of which project beyond the cross-heads, and between which ends and the crank arms of the crank shafts 18, link connections 17 are loosely connected. The inner arms of the crank shafts 18, are suitably journaled in the cylinder-extensions 4, while their outer arms are journaled in suitable supports 19. The outer arms of the shafts 18, upon one side of the cylinder-extensions 4, are provided with pulleys 20, and 21 respectively, while the corresponding arms of said shafts, upon the opposite sides of said cylinder-extensions are equipped with fly or balance wheels 22 and 23 respectively; also with gear wheels 24 and 25, respectively. Intermediate the gear wheels 24 and 25, and gearing therewith, are arranged intergeared wheels 26 and 27 the whole, thus forming a train of gear, and gear wheels 26 and 27 are suitably journaled upon stub-axles supported in suitable offset or outstanding portions of the piston cylinder 1. By means of this arrangement of

parts friction therebetween and between the pistons and the cylinder is reduced to the minimum.

It will be noted that the fly or balance wheels have their flat spokes set at an angle in order to deliver, when they are in motion, a blast upon the piston cylinder and thus aid to also reduce the temperature of the latter.

Suitable exhaust ports 28 are arranged in the piston-cylinder 1, to provide for the escape of the burned gases of the explosive mixture. The ports 28 are flared outwardly at their discharge ends to allow of the expansion of the burned gases as they escape therefrom into the atmosphere, for reducing or entirely avoiding the noise, which would otherwise attend the escape of such burned gases. A tank or chamber 30 is suitably provided for vaporizing and compressing the mixture of gasolene and air, said tank having suitable tank connections 31, with the inlet ports 29 of the duplicate chambers of said cylinder, and a central pipe-connection 32 with the casing 32^a of a rotary suction fan 33, which supplies said tank with the air and gasolene mixture.

At the ported intake-end of the casing, 32^a, is a spring controlled inwardly opening valve 34, whose spring 35 serves to close it, when the air, which enters the extension 32^b of the casing 32^a, through the openings 34^a, is withdrawn, from acting upon the face 34^b of the valve; the spring 35 being compressed when the valve is seated or closed, a suitable cap or nut 36 is threaded to the outer end of the valve stem, and is provided for the purpose of regulating the tension of said spring. A suitable tube 37 is designed for the purpose of connecting to a suitable supply tank of gasolene (not shown) for the purpose of delivering gasolene into the intake-end of the casing 32^a, in advance of the incoming air which is drawn through the openings 34^a by means of the fan 33 which causes a suction or drawing action in the extension 32^b, as the fan rotates. At the same time air is drawn through the extension 32^b, gasolene is also fed through the tube 37. The valve 34 is opened through a suction action caused by the rotary fan 33 (which also draws air by the valve). The incoming air mixes with the gasolene, as it leaves the tube 37, and partially vaporizes the same. The fan 33 has a tendency to also vaporize the gasolene, and conveys or delivers the combined vapor or gas and air, through the passageway 32, into the casing 30, as a suitable charge for the engine. From the casing 30 charges are forced into the combustion chamber of the engine, by way of the passageways 31 and through the inlet ports 29.

The suction or rotary fan 33 is suitably driven from and controlled in its action by the pulleys 20 and 21, having belt-connections 39 and 40 with the grooved peripheries of pulleys 41 secured to the shaft of said rotary fan, one belt being crossed for the driving of said fan equally with the driving thereof by the other belt, as the pulleys 20 and 21 are actuated from the crank shafts 18 of the engine.

The cylinder of the engine is provided with the usual sparking plugs 42 and 43. The sparking plug 42 is electrically connected to the pin 45 by the conductor 46 leading to a battery 46^a, which pin is arranged in a casing 47 wherein rotates a crank shaft 18. The pin 52 is connected electrically to the sparking plug 43 by a conductor 49. The battery 48 is electrically connected at 50^a to a sleeve 50 which in turn is electrically connected at 50^b to the plug 42, which sleeve rotates with the cam 51 which alternately completes the circuit for operating the sparking plugs 42 and 43; said sleeve being suitably insulated from the shaft 18 and the pulley carried by said shaft. The wiring for these plugs provides for the circuiting of said sparking plugs, the operation of which it is apparent will be readily understood from the foregoing.

It is readily manifest that the feeding of the charges is alternately effected to the rear of the pistons and between them. While a charge is being fed in the rear of the pistons, a charge is compressed and fired between them, and as the pistons separate, the charges which were admitted to the rear of the pistons are compressed, and after being compressed, they are fired. The above is evident upon examining Fig. 3 of the drawings, in which figure, it will be seen that the charges are being admitted to the rear of the pistons, and while being admitted, a charge is being compressed and fired between the pistons. Upon examining Fig. 1 of the drawings (in which figure the pistons are shown in dotted lines), it will be seen that charges are being admitted between the pistons, and while this is taking place, the charges that were admitted to the rear of the pistons are being compressed and fired. It will be observed upon reference to Fig. 1 that a circuit is completed so as to operate the sparking plug 42, the effects of which are being transmitted or carried through the passageways 42^a, and to the rear of the pistons, and so as to ignite the charges which are being compressed. When the pistons are forced toward one another, the cam 51 will close the circuit on the screw plug 52 so as to operate the sparking plug 43, the effects from which will ignite the charges which are being compressed between the pistons, as will be clearly apparent. The sparking of the plugs 42 and 43 is alternately effected

through the medium of the cam 51 as the same rotates, therefore the charges admitted to the rear and between the pistons are alternately ignited.

It will be observed that the aforesaid combination and arrangement of parts form a very simple, inexpensive and effective engine for securing the maximum amount of horse-power in a given time, with the minimum outlay of expense.

I claim,

1. In a device as set forth, a casing having an explosion chamber, opposing pistons operable in the chamber and provided with rods, said rods having cross-heads carried by their outer ends, wrist pins penetrating the cross heads and having their ends projecting beyond the cross heads said casing having guides in which said cross heads and wrist pins reciprocate, crank shafts mounted in bearings adjacent the guides having link connections with the projecting ends of said wrist pins, and connections between the crank shafts for permitting the pistons to operate in unison.

2. An explosive engine, including a casing having upstanding side portions spaced apart, and provided with registering guide slots; the engine embodying opposing pistons, including rods having cross-heads carried by their outer ends, and adapted to fit the guide slots, so as to be guided thereby; wrist pins penetrating the cross-heads and having their ends projecting beyond the cross-heads and the guide slots upon each side of the upstanding side portions, the cross-heads with the wrist pins having reciprocating motions in the registering guide slots; crank shafts mounted in bearings adjacent one of the ends of the guide slots, and including link connections with the projecting ends of said wrist pins; and connections between the crank shafts for permitting the pistons to operate in unison.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GEORGE C. FAIN.

Witnesses:
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FRED C. RHODES.