No. 677,397. Patented July 2, 1901.

W. BRUENING.

HYDROCARBON MOTOR.

(Application filed Sept. 14, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. I,

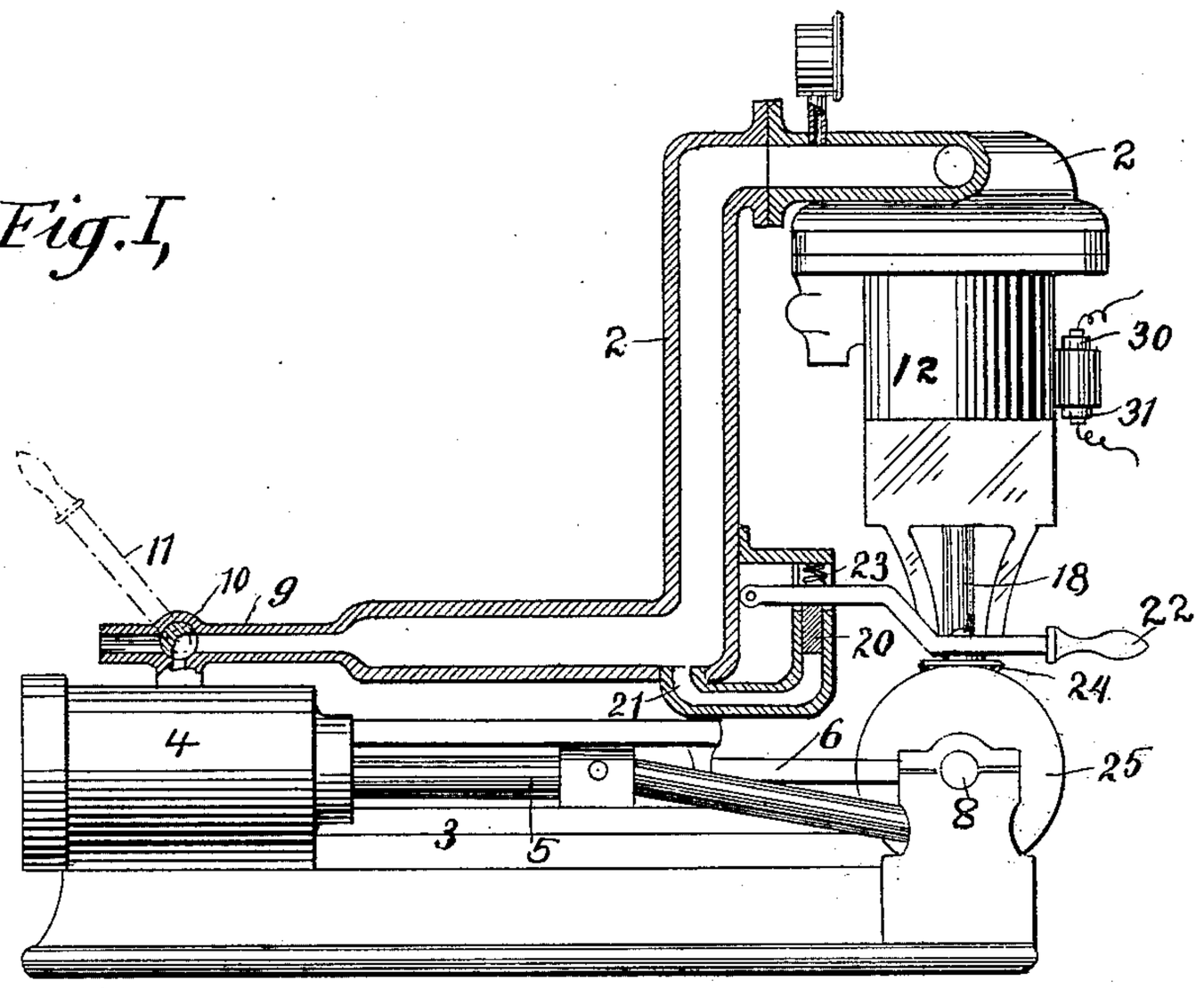

Fig. V,

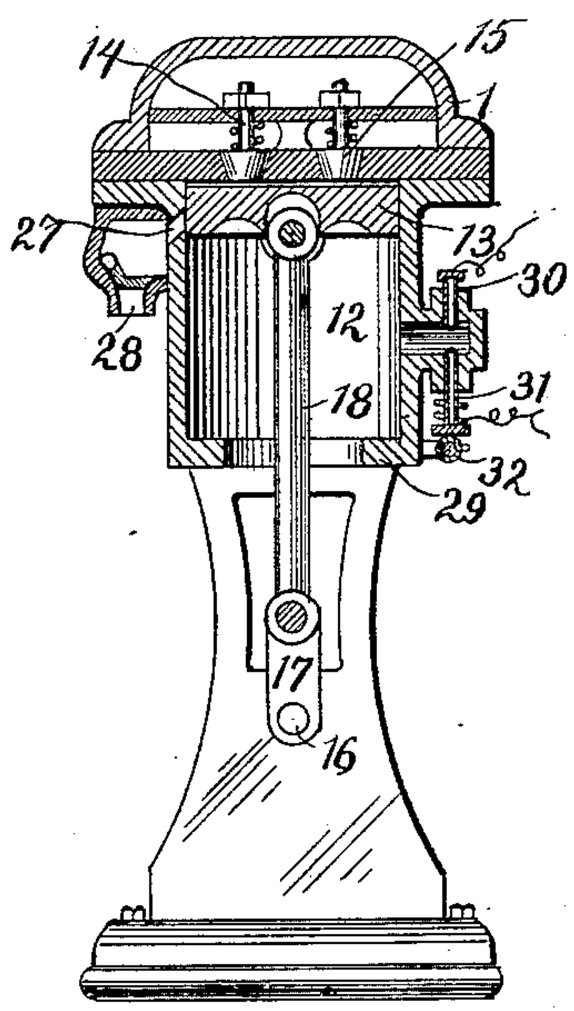

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Fig. IV

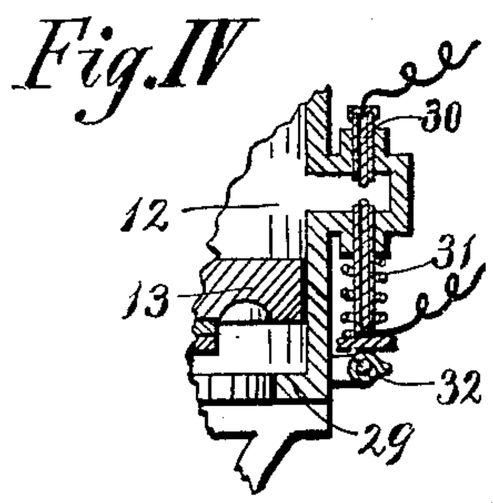


Fig. III

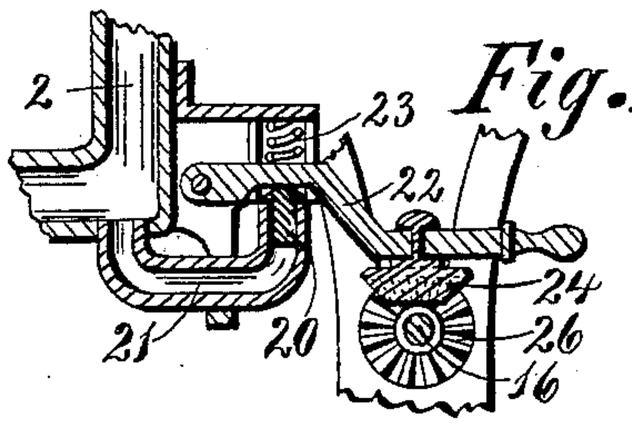
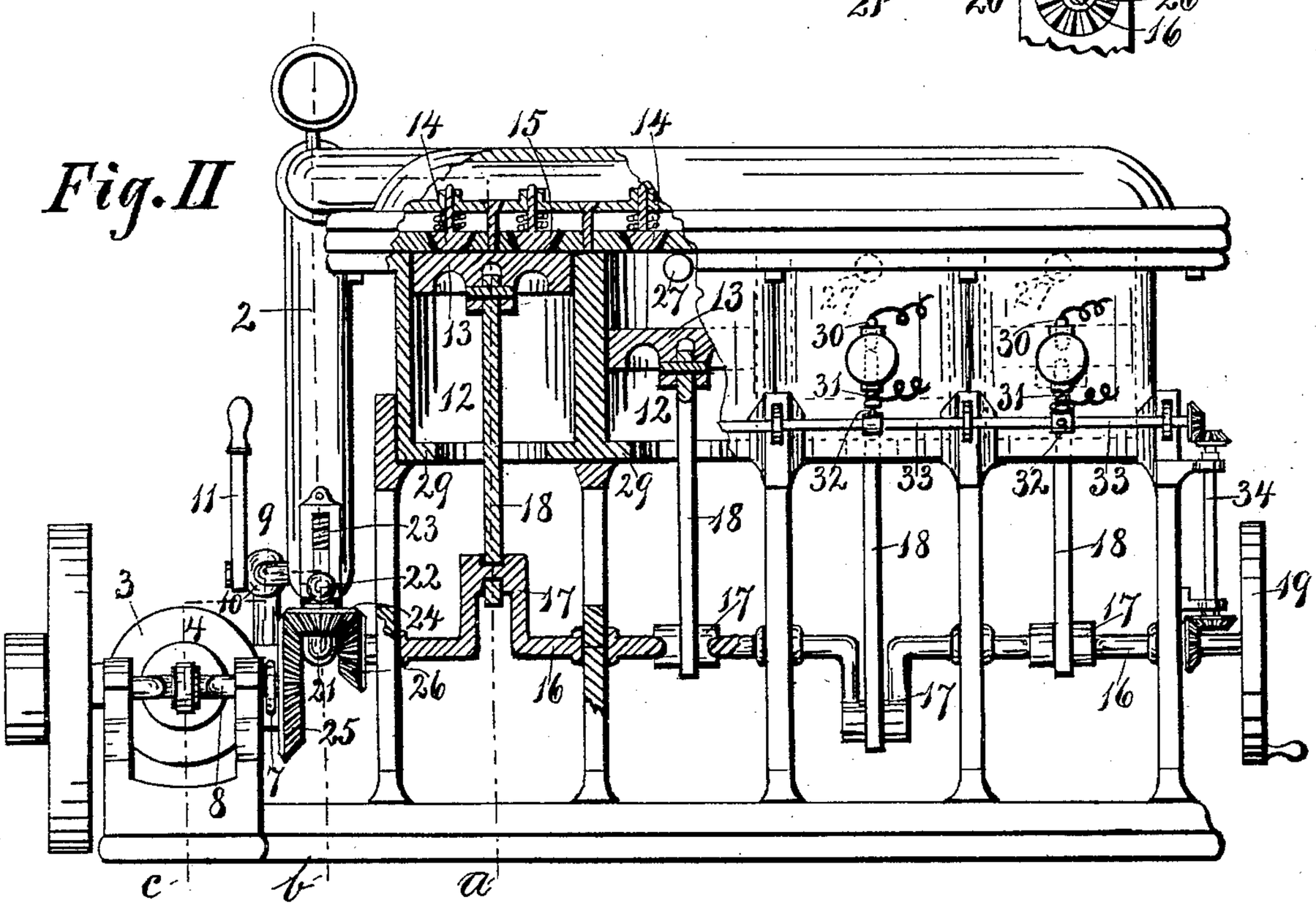


Fig. II



WITNESSES:

Albert W. Venino

Carl M. Bruening

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William Bruening

UNITED STATES PATENT OFFICE.

WILLIAM BRUENING, OF NEW YORK, N. Y.

HYDROCARBON-MOTOR.

SPECIFICATION forming part of Letters Patent No. 677,397, dated July 2, 1901.

Application filed September 14, 1899. Serial No. 730,459. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM BRUENING, a citizen of the United States, residing in the borough of Manhattan, city and State of New York, have invented certain new and useful Improvements in Motors, of which the following is a specification.

My invention relates to power-generators operating by the expansion of gases resulting from the explosion of inflammable fluids, such as gas or vapor mixed with air, and to the connection of such generator with a power shaft or motor whereby the power of the generator is applied in a peculiar manner.

The invention consists of the various features and combinations of features hereinafter set forth.

In the accompanying drawings, forming part of this specification, and in which like reference characters designate corresponding parts in the several views, I have shown one embodiment of the invention.

Figure I is a vertical sectional elevation of the generator on the line *b* of Fig. II. Fig. II is an enlarged front elevation, partly in section. Figs. III and IV are enlarged sectional elevations showing details. Fig. V is a transverse vertical section on the line *a* of Fig. II.

3 is an engine such as is ordinarily used with steam, which may be provided with appliances usually attached thereto, of which 4 is the cylinder and 5 the piston. The slide-valve (not shown) is moved by the rod 6 and controlled by the eccentric 7 on the power-shaft 8, which is provided with the gear 25. The power-shaft 8 is arranged in operative connection with a generator, which in the present embodiment of the invention comprises a plurality of explosion-chambers communicating with a reservoir. The reservoir communicates with the cylinder 4, and thus the generator is in operative connection with the power-shaft 8. In the generator the reservoir 2 is shown as a bent pipe or tube, but may be a vessel of any other desired form, and communicates with the valve-chest of the engine 3 by a conduit 9, in which is located a valve 10, controlled by the lever 11, and with the explosion-chamber 12 of the generator. The explosion-chamber 12 is shown as a cylinder provided with a piston 13.

14 and 15 are valves controlling the communication between the explosion-chamber and the reservoir and are normally held in their seats by springs.

The shaft 16 is provided with a crank 17, which, if desired, may be substituted by an eccentric, to which the piston-rod 18 is attached and by which the piston 13 is operated. One end of the shaft 16 is provided with a hand-wheel 19 and the other end with a gear 26, by means of which the shaft is rotated.

The plug 20 is movably fitted in and closes the opening of the tube 21, which is inserted in the reservoir 2, and a lever 22 bears on the plug 20 and is held in position by a spring 23, which has a resistance corresponding to the desired pressure in the reservoir. A gear 24 is held movably by the lever 22 and is normally in operative contact with the gears 25 and 26. The orifice 27 in the explosion-chamber is controlled by an inwardly-opening valve 28, through which the mixture of gas or vapor and air is drawn by suction when the piston 13 is moved outwardly. When the piston has arrived at the end of its outward stroke and touches the annular flange 29, the mixture is ignited by any usual means, here shown as an insulated electrical terminal 30, inserted in a recess of the generator, and a movable insulated electrical terminal 31, normally held out of contact by a spring and moved into contact with the terminal 30 and released therefrom by the movement of a cam or projection 32 on the shaft 33, which is provided with a gear and operatively connected with a gear on the shaft 16 by means of gearing on the counter-shaft 34, whereby a spark is generated within the chamber 12.

To start the motor, the lever 22 is lifted and the intermediate gear 24 is thereby disengaged from operative contact with the gears 25 and 26, and the hand-wheel 19 is turned to rotate the shaft 16, when the piston 13 will draw into the chamber 12 by suction through the orifice 27 the mixture of air and gas or vapor, and when the piston has arrived at the end of its stroke the ignition of the contents of the chamber will cause the excess of the resulting expanding gases to escape through the openings controlled by the valves 14 and 15 into the reservoir 2.

When a desired pressure is indicated in the reservoir, the lever 22 is released, which brings the gear 24 into operative contact with the gears 25 and 26, and the valve 10 is opened, and the compressed gases act by expansion alternately on either side of the engine-piston 5 by any ordinary arrangement of valves and valve-gear, (not shown,) causing the shaft 8 to rotate, which in turn will cause the rotation of the shaft 16 until the pressure in the reservoir on the plug 20 exceeds the resistance of the spring 23, when by the movement of the plug the lever 22 is lifted, and the intermediate gear 24 is thereby thrown out of operative contact with the gears 25 and 26, and the action of the generator ceases until the pressure in the reservoir is reduced and the spring 23 forces the gear 24 back into its normal position, when the action of the generator is resumed.

When the generator comprises a plurality of explosion-chambers, as shown in Fig. II, the cranks on shaft 16 are arranged so that the charges may be successively ignited, and the quantity of fuel necessary to produce one rotation of the shaft 8 is divided into as many parts as there are explosion-chambers, each of said parts being subdivided by the number of times the shaft 16 rotates during the time of one rotation of the shaft 8, (due to the relative difference in the size of the gears 25 and 26,) whereby the size and capacity of each explosion-chamber may be correspondingly reduced. By dividing each charge of fuel necessary for the production of one rotation of the power-shaft 8 into a number of fractional parts, igniting the same successively, and compressing the gas in a reservoir intermediate the explosion-chamber or chambers and the power-shaft, I avoid the shock and strain usual in the working of gas-engines and obtain a production of energy upon the power-shaft extending over the time the shaft takes to complete each rotation, and this permits the generator to be made comparatively small and light, from which the heat consequent to its working is readily radiated, thereby dispensing with cooling devices and reducing the weight, which for some purposes, such as the propulsion of vehicles, is of importance.

It will be noted that a plurality of explosions may take place in one explosion-chamber during one rotation of the power-shaft. This will be evident from an inspection of the drawings, which show that from the relative sizes of the gears 25 and 26 the gear 26 makes more than two rotations during one rotation of the gear 25.

Instead of an engine provided with a reciprocating piston, as shown, the generator may be attached to a rotary engine or to one of any other construction that may be operated by the energy of compressed gases; nor do I limit myself to the construction and arrangement of parts shown and described, as it is obvious that various changes may be made therein without departing from the spirit or scope of my invention and some features thereof used without others.

What I claim as new, and desire to secure by Letters Patent, is—

1. A power-shaft in operative connection with a motive-fluid generator, said generator including in combination one or more explosion-chambers having a suitable source of fuel-supply communicating therewith, devices operated by the power-shaft for effecting a plurality of explosions of fuel in said chamber or chambers during a single rotation of the power-shaft, and means for automatically disconnecting said devices from the power-shaft and thereby interrupting the explosions upon the attainment of a predetermined gas-pressure.

2. A power-shaft in operative connection with a motive-fluid generator, said generator including in combination one or more explosion-chambers having a suitable source of fuel-supply communicating therewith, a reservoir communicating with the explosion chamber or chambers, devices operated by the power-shaft for effecting a plurality of explosions of fuel in said chamber or chambers during a single rotation of the power-shaft, and means for automatically disconnecting said devices from the power-shaft and thereby interrupting the explosions upon the attainment of a predetermined gas-pressure in the reservoir.

3. A power-shaft in operative connection with a motive-fluid generator, said generator including in combination an explosion-chamber having a suitable source of fuel-supply communicating therewith, a reservoir communicating with the explosion-chamber, a piston working in said explosion-chamber, means for applying the pressure in the reservoir to drive the power-shaft, the power-shaft being in operating connection with said piston, whereby the piston is operated by said shaft, and means for disconnecting said shaft and piston upon the attainment of a predetermined pressure in the reservoir.

4. A power-shaft in operative connection with a motive-fluid generator, said generator including in combination an explosion-chamber having a suitable source of fuel-supply communicating therewith, a reservoir communicating with the explosion-chamber, a piston working in said explosion-chamber, means for applying the pressure in the reservoir to drive the power-shaft, the power-shaft being in operating connection with said piston, whereby the piston is operated by said shaft, and means for disconnecting said shaft and piston upon the attainment of a predetermined pressure in the reservoir, and means for effecting a plurality of explosions of fuel in said chamber during a single rotation of the power-shaft.

5. A power-shaft in operative connection with a motive-fluid generator, said generator including in combination a series of explo-

sion-chambers having a source of fuel-supply communicating therewith, devices operated by the power-shaft for effecting a plurality of explosions in said chambers during a single rotation of the power-shaft, said explosions taking place in sequence in the several chambers, and means for automatically disconnecting said devices from the power-shaft, and thereby interrupting the explosions upon the attainment of a predetermined gas-pressure.

6. A power-shaft in operative connection with a motive-fluid generator, said generator including in combination a series of explosion-chambers having a source of fuel-supply communicating therewith, a reservoir communicating with said chambers, devices operated by the power-shaft for effecting a plurality of explosions in said chambers during a single rotation of the power-shaft, said explosions taking place in sequence in the several chambers, and means for automatically disconnecting said devices from the power-shaft and thereby interrupting the explosions upon the attainment of a predetermined gas-pressure in the reservoir.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 12th day of September, 1899.

WILLIAM BRUENING.

Witnesses:

ALBERT W. VENINO,

CAROL M. BRUENING.