(No Model.)

2 Sheets—Sheet 1.

W. B. BARY.

MOTOR.

No. 546,481. Patented Sept. 17, 1895.

Fig. 1.

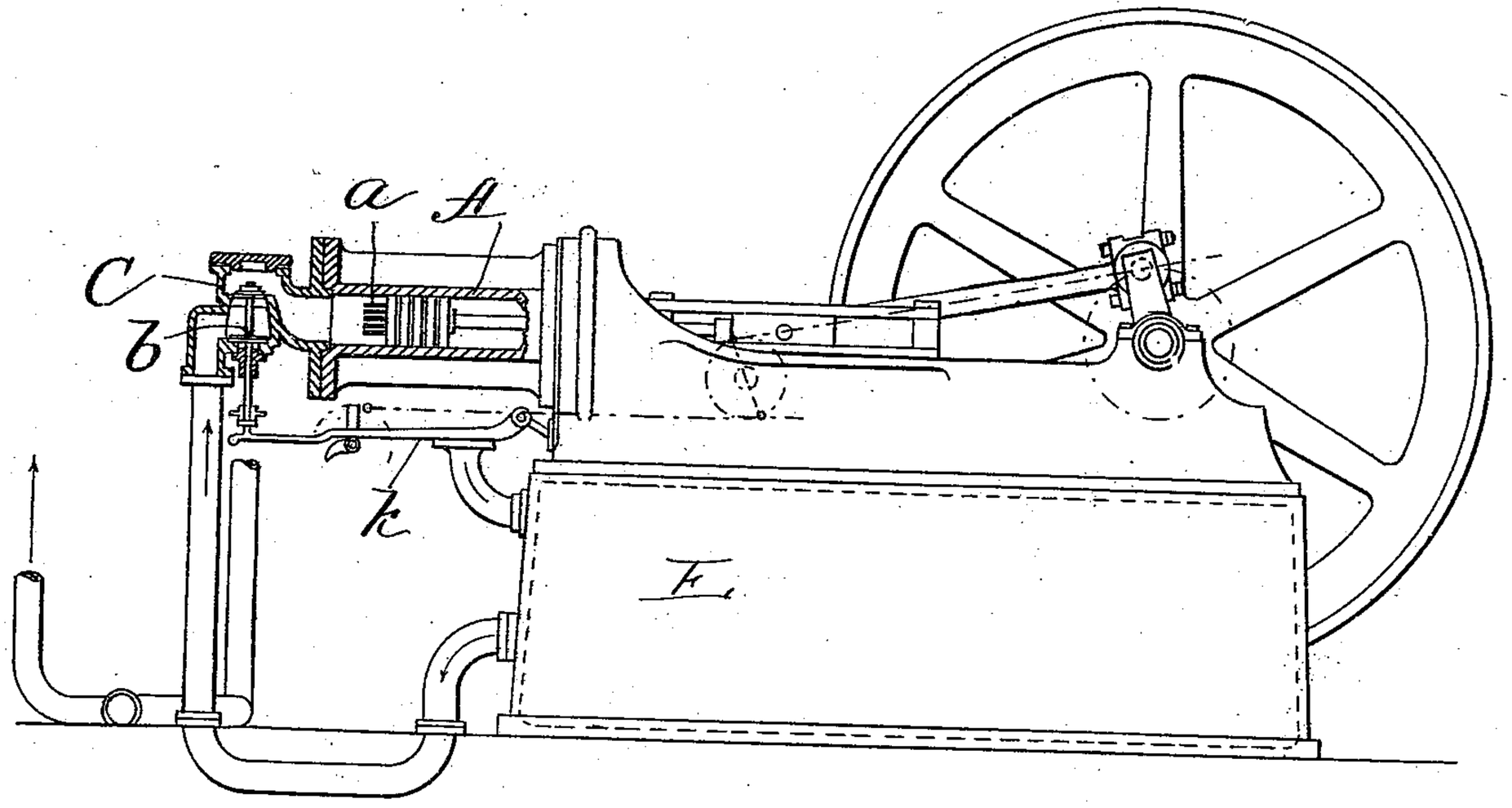
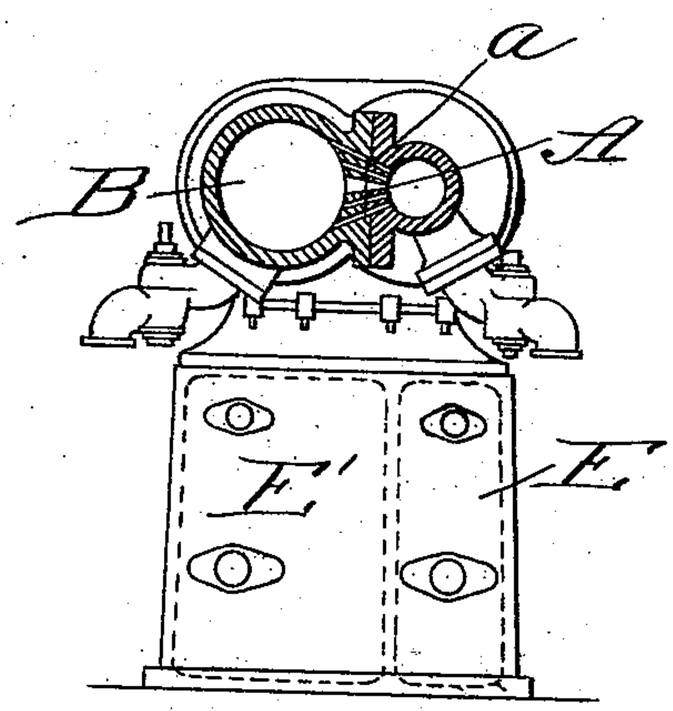


Fig. 3.



WITNESSES:

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

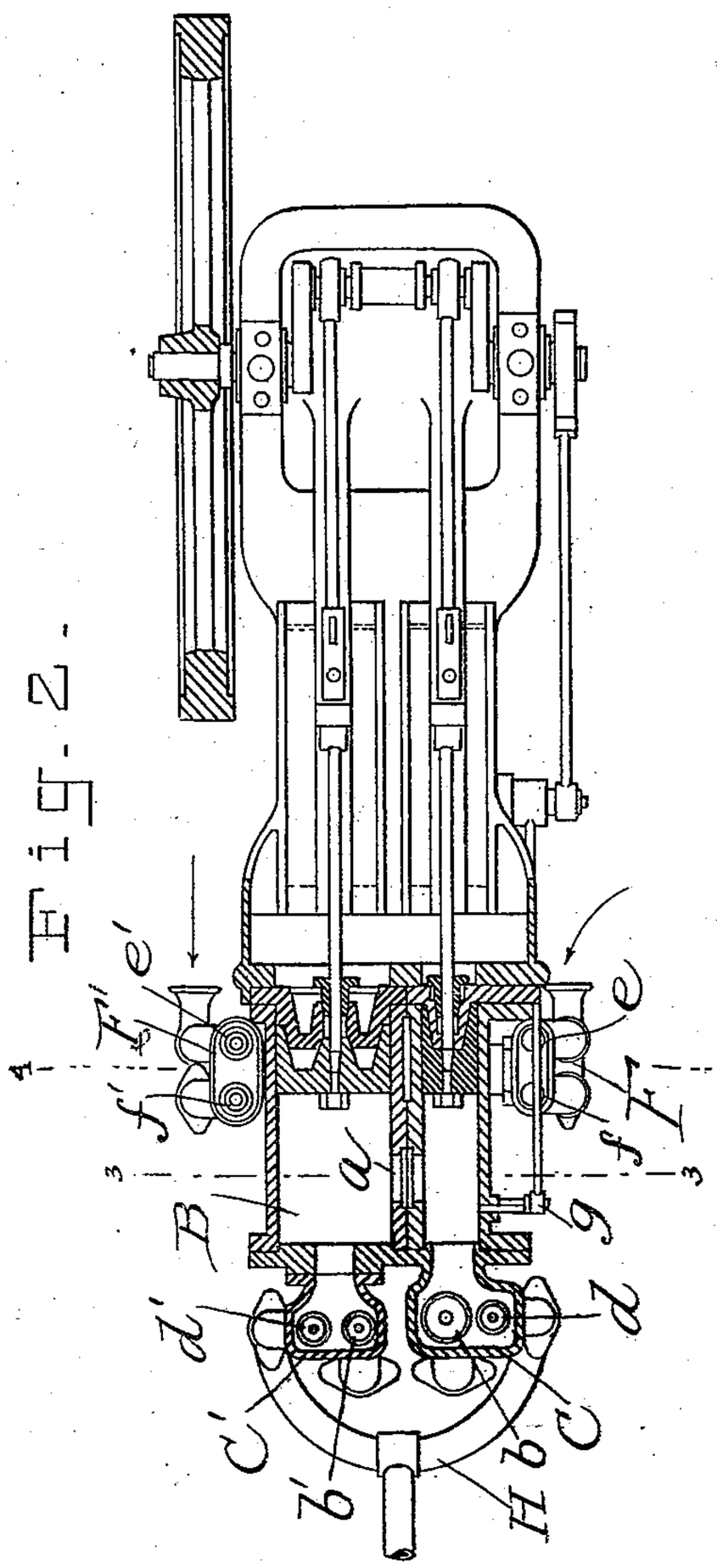
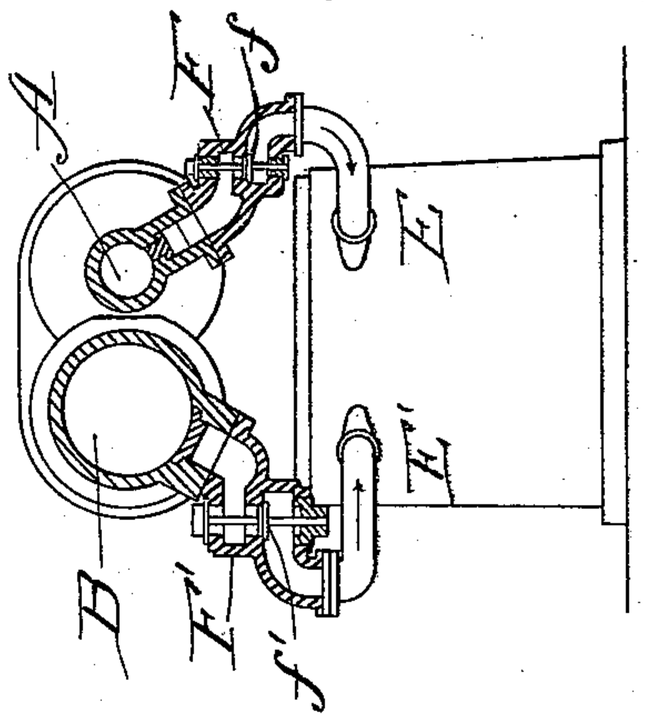


Fig. 4.



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UNITED STATES PATENT OFFICE.

WILLIAM BENJAMIN BARY, OF ST. PETERSBURG, RUSSIA.

MOTOR.

SPECIFICATION forming part of Letters Patent No. 546,481, dated September 17, 1895.

Application filed April 10, 1895. Serial No. 545,196. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM BENJAMIN BARY, a citizen of the United States of America, and a resident of St. Petersburg, Russia, have invented certain new and useful Improvements in Motors, of which the following is a specification.

The motor of my system is designed to perform work by explosions of a mixture of inflammable gases or hydrocarbon vapors with air, and its characteristic feature consists in the combination, whereby the explosion of the mixture takes place separately in a cylinder of smaller dimensions, allowing the products of explosion to pass immediately afterward through communicating ports into a larger cylinder, where they mix with compressed air contained therein, in consequence of which heat is being transmitted from the contents of the small cylinder to the contents of the large cylinder and thereby the temperature in the small cylinder is being readily reduced. Owing to the application of this combination the constant cooling of the cylinders by means of circulating water becomes unnecessary, and thus the heat, which is usually lost, being absorbed and carried away by the heated water, is in this manner utilized for the purpose of heating the compressed air in the larger cylinder and performing actual work. By varying the relative sizes of the cylinders and the rate of compression of gaseous mixtures, it is rendered possible to work the motor at any desired and practical temperature without necessitating the cylinders to be cooled by water.

In order that my invention might be more readily understood I have shown on the annexed drawings one mode of carrying it into practice.

Figure 1 represents a side view of the motor of my system, the smaller cylinder being represented in longitudinal section. Fig. 2 is a horizontal section of same. Figs. 3 and 4 are transverse sections, respectively, on the lines 3 3 and 4 4, Fig. 2.

A is a smaller cylinder.

B is a larger cylinder.

a represents communicating ports between the smaller and larger cylinders.

C is a valve-box with valves for the smaller cylinder.

C′ is a valve-box with valves for the larger cylinder.

b is a valve for the inlet of compressed mixture of air and gas into the smaller cylinder from the reservoir E.

b′ is a valve for the inlet of compressed air into the larger cylinder from the reservoir E′.

d is an exhaust-valve for the discharge of the products of explosion from the smaller cylinder into the pipe H.

d′ is an exhaust-valve for the discharge of the products of explosion from the larger cylinder into the pipe H.

F is a valve-box with suction-valve for the suction of a mixture of gas and air into the smaller cylinder for the purpose of their compression.

F′ is a valve-box with suction-valve for the suction of air into the larger cylinder for the purpose of its compression.

e is a suction-valve for the suction of a mixture of gas and air into the smaller cylinder for the purpose of their compression.

e′ is a suction-valve for the suction of air into the larger cylinder for the purpose of its compression.

f is a valve through which a compressed mixture of gas and air is passed into the reservoir E from the smaller cylinder.

f′ is a valve through which compressed air is passed into the reservoir E′ from the larger cylinder.

g is an ignition device. K represents levers which are moved by suitable eccentrics from the motor-shaft for the purpose of opening at intervals the valves *b b′*, *d* and *d′*.

H is an exhaust-pipe for the outlet of the products of the explosions.

E is a reservoir for the compressed mixture of gas and air.

E′ is a reservoir for the compressed air.

My motor performs its work in the following manner: To start the motor for the first time the pistons in the cylinders A and B are moved to and fro by means of the fly-wheel until a desired degree of compression is attained, whereby the inner part of the small cylinder serves to compress a mixture of gas and air by sucking them through the valve *e* and forcing the mixture into the reservoir E through the valve *f*. At the same time the inner part of the large cylinder serves to com-

press air alone by sucking it through the valve *e'* and forcing the same through the valve *f'* into the reservoir E'. After the desired pressure has been attained the levers *k* are set at work by the eccentric from the motor-shaft, and the valves *b*, *b'*, *d*, and *d'* commence to perform their duties. The compressed mixture is let into the outer part of the small cylinder and the compressed air into the outer part of the large cylinder from the respective reservoirs E and E'. By the action of the same levers *k* from the eccentric on the motor-shaft the valves *b* and *b'* are closed at a certain point. Thus the inlet of the compressed mixture and air into the two respective cylinders ceases. By expansion of the charges in the two cylinders the two pistons in the cylinders A and B advance and the piston in the small cylinder B passes the ignition device *g*, whereby the mixture being ignited explodes. The pistons in the cylinders A and B further advance and uncover the communicating ports *a* between the two cylinders. Owing to the difference in pressure at the moment just produced by the explosion of the contents in the outer part of the small cylinder the contents of both cylinders in their outer parts mix therein, whereby the temperature of the contents in the outer part of the small cylinder is being readily reduced and of the contents in the outer part of the large cylinder is being as readily increased. Thus the contents in the outer parts of both cylinders are equalized in temperature and pressure. The increased pressure caused by explosion and afterward equalized in both cylinders act upon both pistons in the cylinders A and B and force them to advance. During the advancement of the pistons in the inner parts of the cylinders the compression of the mixture of gas and air in the small cylinder and of air alone in the large cylinder takes place, and the mixture and the air are forced into the respective cylinders E and E'. The return stroke of the pistons is effected by the energy accumulated in the fly-wheel. By means of the return stroke into the inner part of the cylinders are sucked, for the purpose of compression—into the small gas and air and into the large air. By the same return stroke the products of explosion are driven out from the outer parts of the two cylinders and discharged through the valves *d* and *d'*, which are opened by the lever *k* from the eccentric on the motor-shaft. The products of explosion finally pass through the exhaust-pipe H. The working of my motor is continued in the manner above described. To start the motor again, after the same has been in operation and stopped, it requires merely to heat the ignition device and to allow the levers *k* to perform their duties—to open the respective valves, as compressed mixtures and air were stored in the respective reservoirs during the prior working of the motor.

The pressure in the reservoirs E E' is controlled by monometers and safety-valves (not shown on the drawings) or in any usual manner. Also the speed of the motor is regulated by an ordinary governor acting on the levers *k* or in any other convenient manner.

The motors of my system may have more than two cylinders and can be made of horizontal and vertical types. They can be constructed as mono or polycycle engines. Their cylinders may be set not only one alongside of the other, as described, but one under the other or one behind the other tandem.

I claim as my invention—

1. In combination, in a gas engine the two cylinders arranged side by side with a port between them, the two pistons moving in unison and in the same direction in said cylinders, a compressed air supply leading to one cylinder and controlled by a valve, an explosive mixture supply controlled by a valve and leading to the other cylinder and an igniting device in one cylinder arranged to act when the port between the two cylinders is closed, substantially as described.

2. A gas engine comprising the compressed air and explosive mixture reservoirs, the cylinders having valve connections therewith from the opposite ends of the cylinders, the port between the cylinders, the pistons moving in unison in the cylinders and arranged to cover and uncover the said port, substantially as described.

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

WILLIAM BENJAMIN BARY.

Witnesses:
N. TSCHEKALOFF,
E. WANSCHEIDT.