No. 706,154.

Patented Aug. 5, 1902.

G. E. BLAKE.

PRESSURE GENERATOR.

(Application filed Mar. 31, 1902.)

(No Model.)

2 Sheets—Sheet 1.

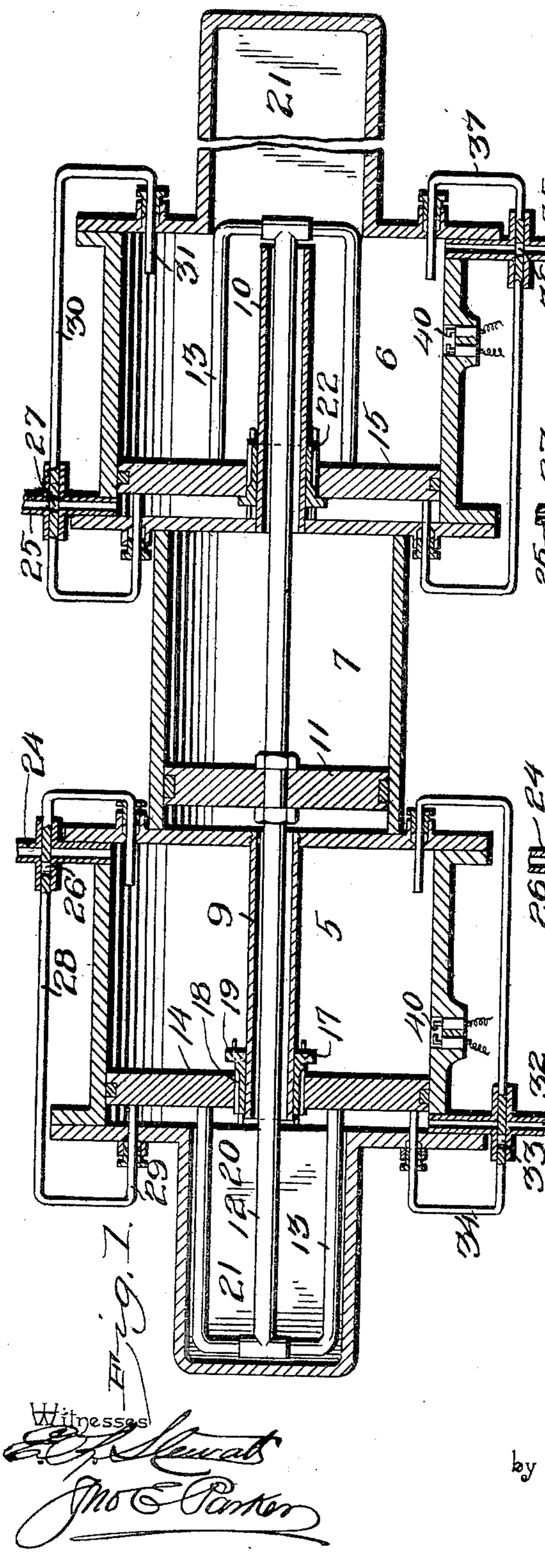

Fig. 1.

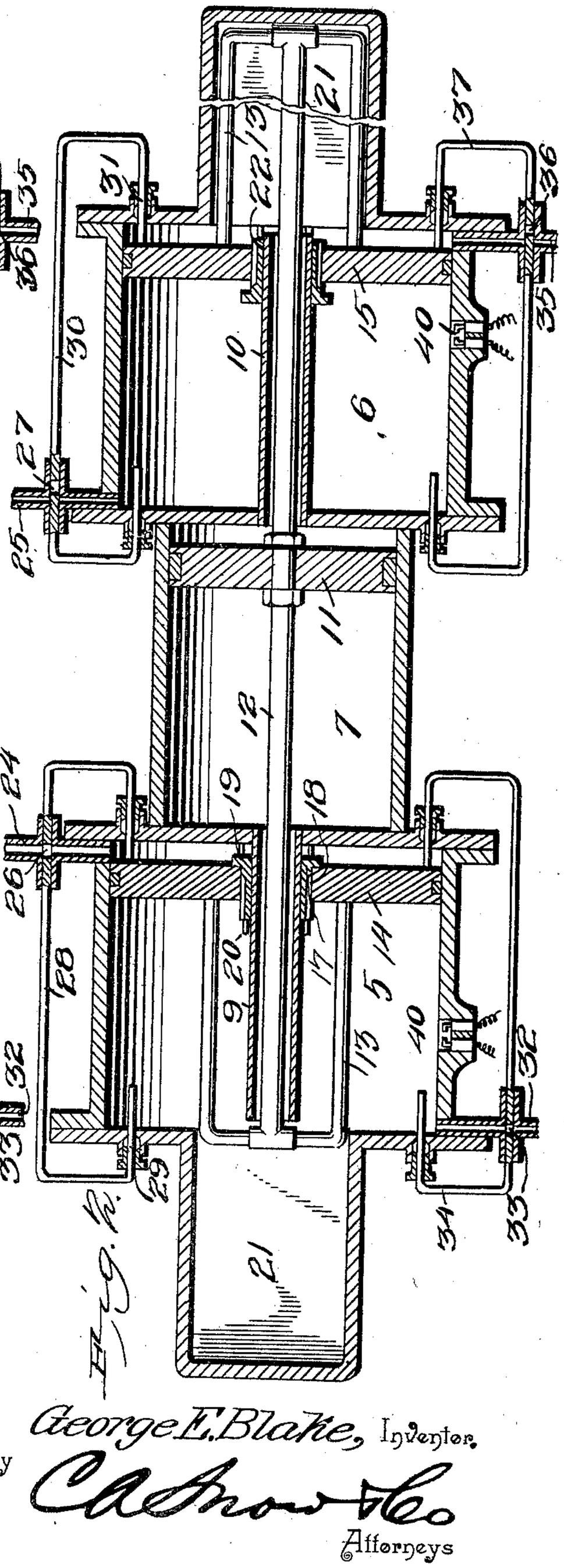

Fig. 2.

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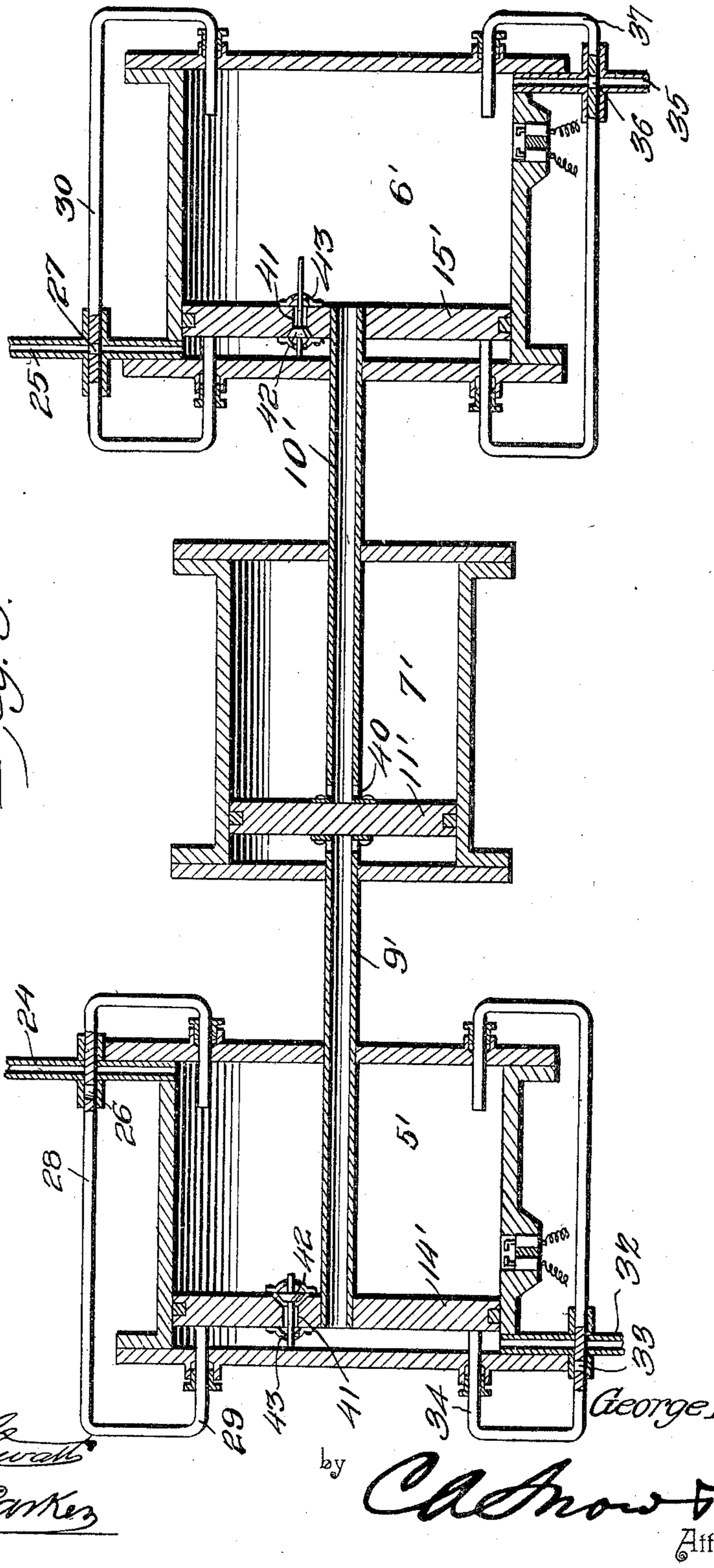

Fig. 3.

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UNITED STATES PATENT OFFICE.

GEORGE EDWARD BLAKE, OF GREENCASTLE, INDIANA.

PRESSURE-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 706,154, dated August 5, 1902.

Application filed March 31, 1902. Serial No. 100,840. (No model.)

To all whom it may concern:

Be it known that I, GEORGE EDWARD BLAKE, a citizen of the United States, residing at Greencastle, in the county of Putnam and State of Indiana, have invented a new and useful Pressure-Generator, of which the following is a specification.

My invention relates to certain improvements in apparatus for generating and storing power in the form of fluids under high pressure; and has for its principal object to construct a device of this character in which the action will be wholly automatic and in which a constant supply of fluid under pressure may be maintained for motive power or other purposes.

With these and other objects in view the invention consists in the novel construction and combination of parts hereinafter described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims.

In the drawings, Figure 1 is a longitudinal sectional elevation of a pressure-generator constructed in accordance with my invention. Fig. 2 is a similar view illustrating the parts in a different position. Fig. 3 is a view similar to Fig. 1, illustrating a modified structure.

Referring to the drawings, 5, 6, and 7 represent three cylinders arranged in tandem, all of substantially the same length, but the central cylinder 7 being preferably somewhat less in diameter than the remaining cylinders. In the cylinder 5 is a centrally-disposed tube 9, one end of which passes through the partition or cylinder-head which divides the cylinders 5 and 7, the opposite end of said tube being open and situated at a point near the opposite end of the cylinder, so as to place the central cylinder at all times in free communication with the outer end of the cylinder 5. In similar manner a tube 10 is arranged in the cylinder 6 and connects the opposite end of the central cylinder to the outer end of said cylinder 6. In the central cylinder 7 is a piston 11, carried by a piston-rod 12, which extends through both of the tubes 9 and 10 and is connected at its opposite ends by yokes 13 to a piston 14 in the cylinder 5 and a piston 15 in the cylinder 6, the construction being such that all three of the pistons must move simultaneously in the same direction.

On the tube 9 is a snugly-fitting sleeve 17, free to slide on said tube and fitting within a centrally-disposed opening in the piston 14. On the periphery of the sleeve 17 are formed passages 18, which when said sleeve is in the position illustrated in Fig. 1 places the ends of the cylinder on opposite sides of the piston in free communication with each other. At the inner end of the sleeve is an enlarged annular flange 19, which is seated against the inner face of the piston when the latter is moved to the position shown in Fig. 2, each end of the sleeve being provided with projecting pins 20, which make contact with the cylinder-heads in advance of the stopping of the piston. The outer heads of both of the cylinders 5 and 6 are enlarged to form recesses or slots 21 for the reception of the yokes 13, thus avoiding the formation of a plurality of openings in the cylinder-heads for the reception of the piston-rod and its connections.

On the tube 10 within the cylinder 6 is mounted a grooved sleeve 22 of precisely the same construction as the sleeve 17 and operated in a similar manner.

At the adjacent ends of the cylinders 5 and 6 are arranged inlet-pipes 24 and 25, respectively, to supply the cylinders with an explosive mixture, preferably in the form of carbureted air mixed with water or steam and air, the water serving in a measure to lower the temperature of the cylinders, but being converted into steam at or before the time of explosion. In the pipe 24 is a ported valve 26, which may take the form of the slide-valve, as illustrated in the drawings, and in the pipe 25 is arranged a similar valve 27. The valve 26 is connected by a rod 28 to arms 29, extending through suitable stuffing-boxes in the interior of the cylinder 5, said arms being arranged at opposite ends of the cylinder and adapted for contact with the opposite faces of the piston as the latter nears the limit of its movement in either direction. Thus, for instance, on the outstroke, immediately before the piston has reached the position illustrated in Fig. 1, the outer face of the piston comes into contact with one of the arms 29 and moves the valve to closed posi-

tion, cutting off the supply of explosive compound, and in the opposite position, or that indicated in Fig. 2, the valve is opened as the piston nears the limit of its instroke. The valve 27 is connected by a rod 30 to arms 31, which extend through stuffing-boxes in the ends of the cylinder 6 and are operated upon by the piston 15.

At the outer end of the cylinder 5 is an escape-pipe 32, having a ported valve 33, connected to arms 34, which extend through stuffing-boxes at the opposite ends of the cylinder 5 and are operated upon by the piston to effect the opening and closing of the said valve. In similar manner the cylinder 6 is provided with an escape-pipe 35, having a valve 36, connected to arms 37, extending into the cylinder 6 and operated upon by the piston 15. In each cylinder at a point a short distance from the outer end thereof are arranged two sparking terminals 40, which may be of any ordinary construction and connected in a suitable circuit provided with devices for making and breaking the circuit and creating a spark to ignite the explosive mixture. These sparking terminals are preferably arranged at such a point as to ignite the gas in the cylinders immediately before the pistons reach the limit of outward movement.

In the operation of the device, the parts being in the position shown in Fig. 1, an explosion has occurred in the cylinder 5 and the exploded gas under high pressure is flowing through the ports or passages 18 in the sleeve 17 to the outer side of the piston and thence through the tube 9 and acting upon the piston 11 to force the latter from the position shown in Fig. 1 to that illustrated in Fig. 2. The valve 27 of the cylinder 6 is open and the explosive mixture is entering through the pipe 25 under sufficient pressure to assist in the movement of the piston 15 to the position shown in Fig. 2, it being understood that all three of the pistons are rigidly connected and must move together. The outer end of the cylinder 6 and the right-hand end of the central cylinder 7 are filled with exploded gas resulting from a previous explosion in the cylinder 6, and this gas is flowing through the outlet-pipe 35 to an engine or other point, where its pressure is to be utilized. As the three pistons approach the position shown in Fig. 2 the piston 15 closes the outlet-valve 36 and opens communication between the two sides of the piston by bringing the end of its sleeve 22 into contact with the end wall of the cylinder. Immediately previous to this operation the valve 27 in the inlet-pipe has been closed and an explosion takes place immediately after the piston passes the sparking terminals 40. As the piston 14 travels from the position shown in Fig. 1 to that shown in Fig. 2 its sleeve 17 will remain in the position shown in Fig. 1, permitting the free passage of exploded gas from one side of the piston to the other. As the limit of movement is reached the valve 26 of the inlet-pipe 24 is open to admit a fresh supply and the pins 20 of sleeve 17 have made contact with the inner wall of the cylinder 5, moving said sleeve to the position shown in Fig. 2 and cutting off communication between the opposite sides of the piston. The outlet-pipe 32 is then opened and the exploded gases from the outer end of cylinder 5 and the left-hand end of cylinder 7 are allowed to escape to the point of consumption. The sleeves 17 and 22 are comparatively loose on their supporting-pipes, so as to slide freely thereon, while there is sufficient frictional contact between the peripheries of the sleeve and the openings in the central portions of the pistons to compel the movement of the sleeves with said pistons.

The device may be employed for the production of fluid under pressure to be used as a motive power for an engine of any desired construction, or the piston-rod 12 is connected directly to a crank or other machine element to be operated.

In the modified construction illustrated in Fig. 3 the cylinders 5′, 6′, and 7′ are shown as separated, although they may be arranged closely together, as in Fig. 1. The connecting or piston rod 12 is dispensed with in the modified construction, and the tubes 9′ and 10′ are secured directly to the three pistons 11′, 14′, and 15′, thus avoiding the necessity of forming the chambers for the reception of the bars or yokes 13. The connecting-tubes are open at the outer ends of the cylinders 5′ and 6′, and at points near the piston 11′ each tube is provided with one or more openings 40 for the passage of gas to and from the cylinder 7′. In this construction the inlet and escape ports may be of the same character as that shown and described, and similar numerals of reference have been applied to corresponding parts of the structure. As the ends of the tubes are rigidly secured to the pistons provision is made for the passage of the gases through the two pistons 14′ and 15′ by providing a port or passage 41, which may be closed by a valve 42, having a suitable stem adapted to guideways 43, the action being precisely the same as that of the piston-valves shown in Figs. 1 and 2.

Owing to the fact that the fresh charge is always kept from mingling with the exploded charge, much better results are obtained than is possible where a quantity of the exploded charge remains in the chamber, and the arrangement of cylinders is such as to store a constant supply of gas under pressure which may be utilized for the propulsion of any ordinary form of engine.

While the construction herein described and illustrated in the accompanying drawings is the preferred form of the device, it is obvious that various changes in the form, proportions, size, and minor details of the

structure may be made without departing from the spirit or sacrificing any of the advantages of my invention.

Having thus described my invention, what I claim is—

1. In a device of the class specified, the combination with a plurality of alining cylinders, of a piston disposed in each cylinder, a piston-rod connected to all of the pistons, the central cylinder being in constant communication with the outer ends of the outer cylinders, valved openings arranged in the pistons of the outer cylinders, valved inlet and outlet pipes connected to opposite ends of the outer cylinder, and means for operating said valves.

2. In a device of the class specified, the combination of the end cylinders, a central cylinder in constant communication with the outer ends of said end cylinders, valved pistons arranged in the end cylinders, a piston disposed in the central cylinder, a piston-rod connecting all three of the pistons for simultaneous movement, inlet and outlet pipes connected to the end cylinders, controlling-valves in said pipes, and means for operating said valves.

3. In a device of the class specified, the combination of the end cylinders having valved pistons, a centrally-disposed cylinder of a diameter less than that of the end cylinders, a piston arranged in the central cylinder, a piston-rod connecting all of the pistons for simultaneous movement, connecting-tubes extending through the end pistons and serving to keep the central cylinder in constant communication with the ends of the end cylinder, and piston-operated valves for governing the supply of explosive mixture to said end cylinders and the escape of exploded gases from all of the cylinders.

4. In a device of the class specified, the combination of the three alining cylinders, of which the centrally-disposed cylinder is of less diameter than the end cylinders, a piston in said central cylinder, tubes extending from the ends of the central cylinder to the end portions of the end cylinders, sliding sleeves loosely mounted on said tubes and having ports or passages for controlling the flow of gas from one end of the cylinder to the other, pistons mounted on said sleeves, a piston-rod extending from the central piston through both of the tubes, yokes connecting the ends of the piston-rods to the end pistons, cylinder-heads having slots for the reception of the yokes, inlet-pipes for the admission of an explosive mixture to the end cylinders, outlet-pipes for the escape of gas under pressure from all of the cylinders, valves in all of said pipes, and arms connected to said valves, and extending through the end walls of the cylinders into the path of movement of the end pistons.

5. In a device of the class specified, the combination with the three alining cylinders, of pistons in said cylinders, means for alternately supplying the end cylinders with an explosive mixture, means for permitting the escape of gas alternately from said cylinders, means for exploding the explosive mixture in said end cylinders, and means for alternately admitting portions of an exploded charge from the end cylinders to the central cylinder, thereby to assist in the movement of the pistons in the several cylinders.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

GEORGE EDWARD BLAKE.

Witnesses:
MYRTLE BROOKS,
JENNIE C. MCCULLOUGH.