W. A. & E. R. REEVES.

BALANCED PROPORTIONING VALVE FOR EXPLOSIVE ENGINES.

APPLICATION FILED FEB. 6, 1908.

907,879.

Patented Dec. 29, 1908.

3 SHEETS—SHEET 1.

Fig. 1.

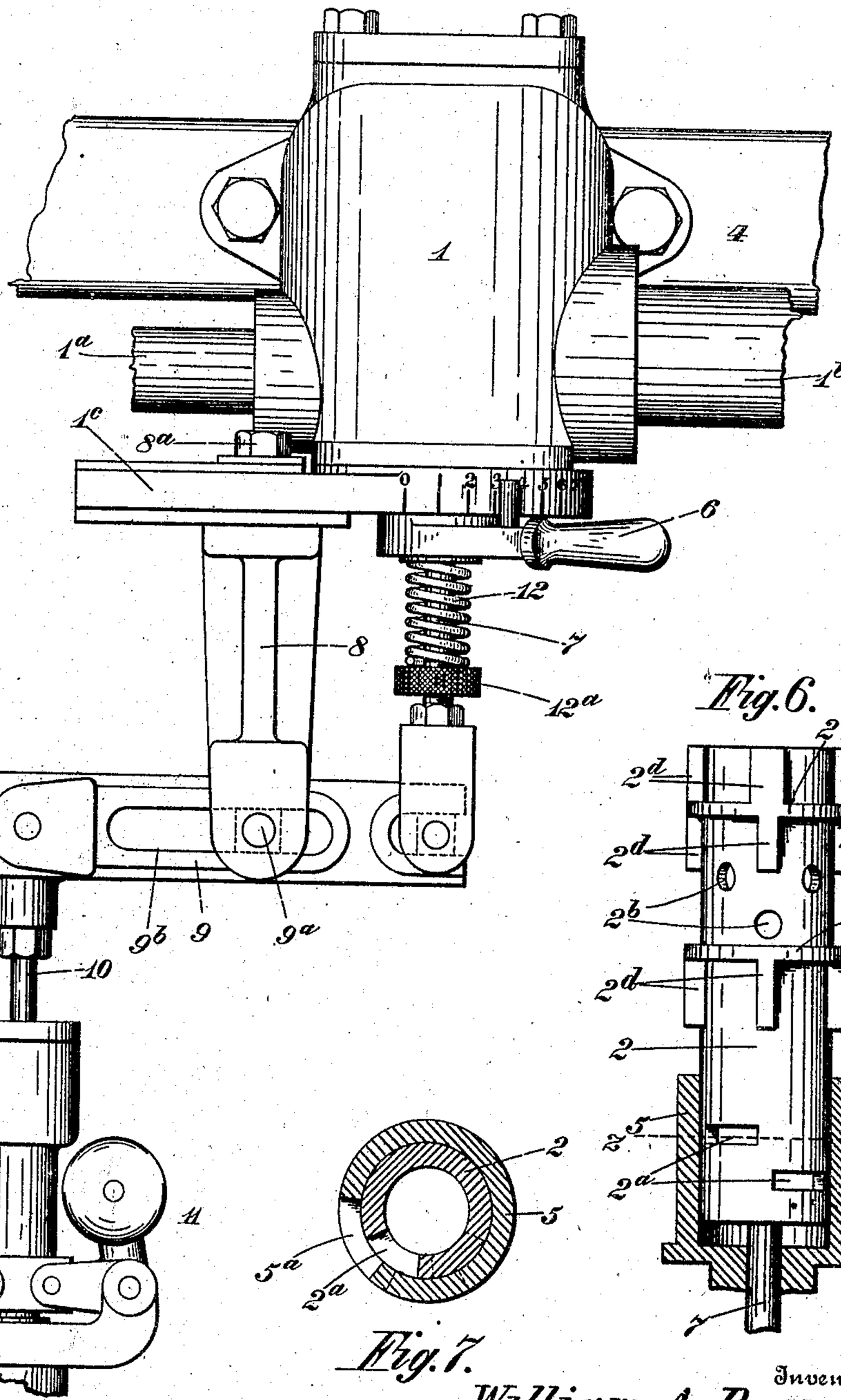

Fig. 6.

Fig. 7.

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3 SHEETS—SHEET 2.

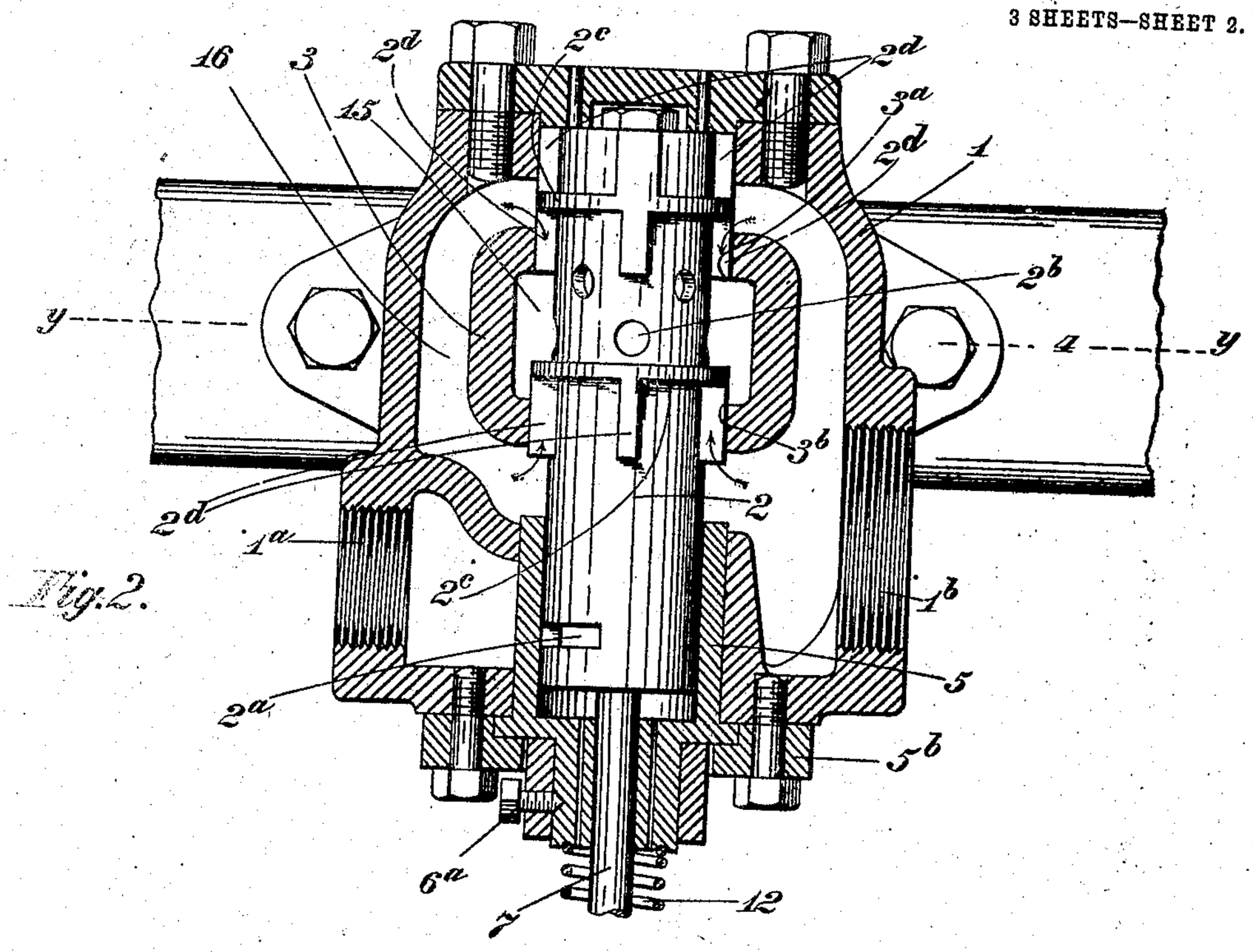

Fig. 2.

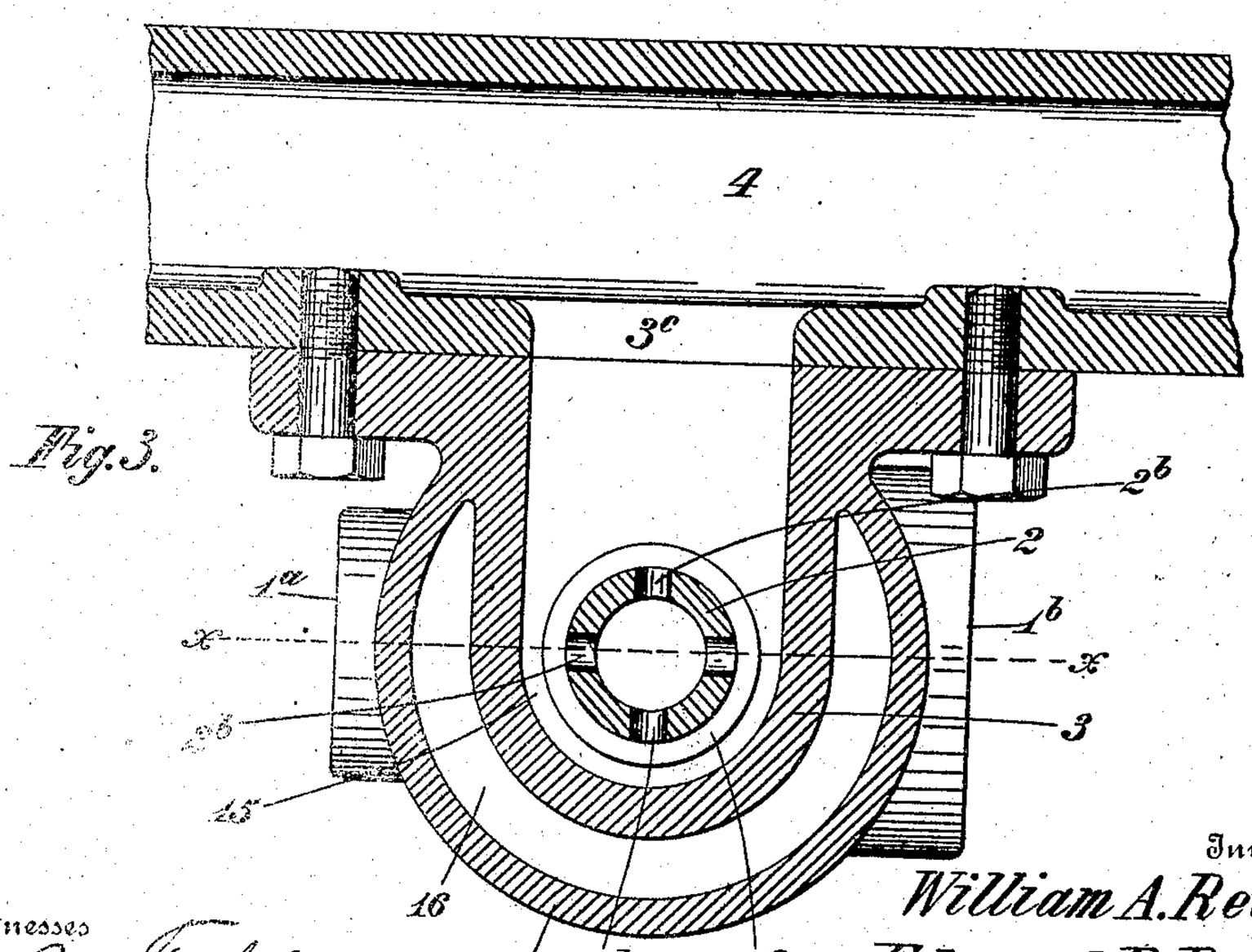

Fig. 3.

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3 SHEETS—SHEET 3.

Fig. 4.

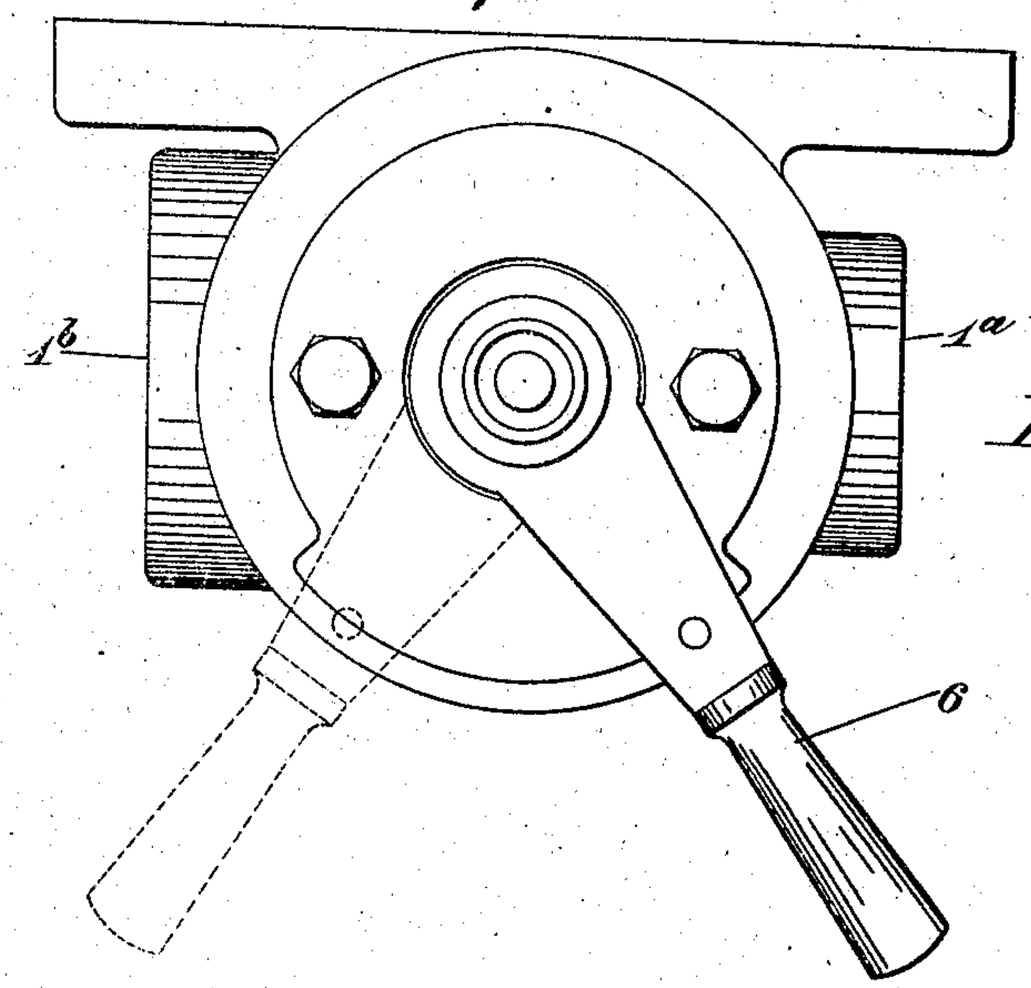

Fig. 5.

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UNITED STATES PATENT OFFICE.

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BALANCED PROPORTIONING-VALVE FOR EXPLOSIVE-ENGINES.

No. 907,879. Specification of Letters Patent. Patented Dec. 29, 1908.

Application filed February 6, 1908. Serial No. 414,537.

To all whom it may concern:

Be it known that we, WILLIAM A. REEVES and EDWARD R. REEVES, citizens of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented a certain new and useful Improvement in Balanced Proportioning-Valves for Explosive-Engines, of which the following is a specification.

It is well known that to obtain the greatest efficiency in explosive engines the explosive agent should contain its components, gas and air, in proper proportions. Because gas varies in quality—especially natural gas as compared with artificial—it is important that the engine be provided with means capable of nice and wide adjustment exactly adapting it for the use of the gas at hand. Such means have heretofore been proposed but they have been bulky, difficult of adaptation to required conditions, and troublesome to keep clean.

The object of the present invention is to remedy these defects and to provide a compact and simplified construction adapted to all the ordinary varieties of gas and in which the size and cost of the device are reduced, and in which the parts are not so subject to the accumulation of oils, tar and dust—called gum—and to have the efficiency of their operation affected thereby, and in which the apparatus is nicely and promptly adjustable for the use of any given quality or kind of gas, and after adjustment, is automatically maintained.

The invention consists in the construction hereinafter described and claimed, the invention not being confined in its practical embodiment to precisely the forms of the parts shown.

In the accompanying drawings—Figure 1 is a view in front elevation; Fig. 2 is a vertical section on the line *x—x* Fig. 3; Fig. 3 is a horizontal section on the line *y—y* Fig. 2; Fig. 4 is an end view looking at the right hand side of the valve chamber as seen in Fig. 1; Fig. 5 is a plan view of the lower end of the valve chamber. Fig. 6 is a detail in side view and section of the valve and port-controlling sleeve or bushing at its lower end; and Fig. 7 is a horizontal section on the line *z—z* Fig. 6.

In the several views 1 designates the main or outer inclosing shell or casing. This casing has a gas inlet 1^a and an air inlet 1^b. Formed within the chamber 1 is a wall 3 forming within itself a mixing chamber 15, and forming at its outer side in conjunction with the casing 1 an air chamber 16. The wall 3 is formed with ports 3^a and 3^b and the chamber 15 communicates through a port 3^c with the manifold 4 that leads to the cylinder or cylinders of the engine. Within the casing 1 is a tubular valve device 2 generally of cylindrical form and provided at its lower end with gas ports 2^a and at its upper end with gas ports 2^b, and annular ribs 2^c constituting the valves operating as hereinafter described. The tubular valve device 2 is vertically movable in ports 3^a and 3^b of the upper and lower portions of the wall 3, said valve being adapted to close said ports and to coöperate therewith to vary the capacity of the passage from the air chamber 16 to the mixing chamber 15. The longitudinal ribs 2^d serve to aid in guiding the tubular valve device in its movements, but these ribs can be dispensed with.

Encircling the lower end of the tubular valve is a rotatable bushing or sleeve 5 provided with ports 5^a. This bushing is secured in place by a ring 5^b bolted to the main casing and is furnished with a suitable handle 6 secured thereto with a set screw 6^a by means of which handle the ports 5^a in the bushing or sleeve can be turned into and out of coincidence with the ports 2^a in the lower end of the tubular valve, see Fig. 7.

The character 7 designates a stem connected with the lower end of the tubular valve, said stem projecting downward through a suitable opening in the lower end of the sleeve to the exterior of the casing.

8 designates a fulcrum bracket that is adjustably attached to a projecting arm 1^c on the outer casing 1, a bolt 8^a being provided for securing the bracket in adjusted position on said projection.

9 designates a lever fulcrumed by means of a pin 9^a on a square block, shown in broken lines, sliding in a slot 9^b on said lever. One end of said lever is connected by a suitable connection with the lower end of the valve stem 7, while the other end of the lever is connected by a suitable connection with the upper end of a sliding rod 10. The sliding rod 10 is connected to an ordinary centrifugal governor device, as seen at 11, so that when said governor device is operated by the operation of the engine the tubular valve device is drawn down to bring the valves thereon to the desired given posi-

tion with reference to the ports 3^a and 3^b to the mixing chamber, thereby affording the proper openings for the passage of air to the mixing chamber 15. By adjusting the fulcrum bracket 8 to the right or to the left on the projection 1^e the length of the two arms of the lever on each side of the fulcrum pin 9^a is varied, consequently varying the position of the valves on the tubular valve device with reference to the ports 3^a and 3^b when the governor device is in operation, and the area of the air passage to the mixing chamber is correspondingly varied. By shifting the handle 6 of the sleeve or bushing 5 the area of the opening formed by the coöperating gas ports 2^a and 5^a is increased, and reversely by shifting said handle to the left the area of such passage is diminished (or entirely closed.) It will thus be observed that a very exact proportioning of the area of both the air and gas passages can be had. The outer casing can be provided with a scale indicating the position of the handle 6 for a given quality of gas.

12 designates a spring arranged on the stem 7 at the exterior of the casing and pressing on an adjustable nut 12^a to tend to draw the tubular valve down.

What we claim and desire to secure by Letters Patent is:

1. A mixing and governing device for explosive engines comprising a main shell having a gas inlet and an air inlet, a wall within said shell forming a mixing chamber and also forming an air chamber between it and the main shell, said wall containing a valve port to establish communication between said chambers, a tubular valve working in said port to open and close communication between said chambers and constructed to cause the delivery of the air and gas separately to the mixing chamber, said valve provided with a gas inlet port and also with a gas outlet port into said mixing chamber.

2. A mixing and governing device for explosive engines comprising a main shell having a gas inlet and an air inlet, a wall within said shell forming a mixing chamber and also forming, in conjunction with the main shell, an air chamber, said wall containing a valve port, a tubular valve working in said port to open and close the passage from said air chamber to the mixing chamber and constructed to cause the delivery of the air and gas separately to said mixing chamber, said tubular valve provided with a gas inlet port and also with a gas outlet port into said mixing chamber, combined with a governor device operated by the engine for maintaining said tubular valve in definite relation to said valve port.

3. A mixing and governing device for explosive engines comprising a main shell having a gas inlet and an air inlet, a wall within said shell forming a mixing chamber and also forming, in conjunction with the main shell, an air chamber, said wall containing a valve port, a tubular valve working in said port to open and close communication between the air and mixing chambers and constructed to cause the delivery of the air and gas separately to the mixing chamber, said tubular valve provided with a gas inlet port and also with a gas outlet port into said mixing chamber, combined with a governor device operated by the engine for maintaining said tubular valve in definite relation to said valve port, and adjustable means for determining said relation.

4. A mixing and governing device for explosive engines comprising a main shell having a gas inlet and an air inlet, a wall within said shell forming a mixing chamber and also, in conjunction with the main shell, forming an air chamber, said wall containing a valve port, a tubular valve working in said port to open and close commun.cation between the air chamber and the mixing chamber, said tubular valve provided with a gas inlet port and with a gas outlet port into said mixing chamber, combined with a governor device operated by the engine for maintaining said tubular valve in definite relation to said valve port, and adjustable means for determining said relation comprising a lever operatively connected with said tubular valve, an adjustable fulcrum for said lever, and a governor device also operatively connected with said lever.

5. A mixing and governing device for explosive engines, comprising a main shell having a gas inlet and an air inlet, a wall within said shell forming a mixing chamber and, in conjunction with the main shell, an air chamber, said wall containing a valve port, a tubular valve working in said port to open and close communication between the air chamber and the mixing chamber, said tubular valve provided with a gas inlet port and with a gas outlet port, and a ported bushing or sleeve coöperating with the gas inlet of the outer shell and tubular valve, said bushing adapted to be adjusted to control the quantity of gas admitted to the tubular valve.

6. A mixing and governing device for explosive engines comprising a main shell having a gas inlet and an air inlet, a wall within said shell forming a mixing chamber and also, in conjunction with the main shell, forming an air chamber, said wall containing a valve port, a tubular valve working in said port to open and close communication between the air chamber and the mixing chamber, said tubular valve provided with a gas inlet port and a gas outlet port, and a ported bushing or sleeve coöperating with the gas inlet of the main shell and the tubular valve, said bushing adapted to be adjusted to control the quantity of gas admitted to the tubular valve, combined with a governor device

operated by the engine for maintaining said tubular valve in definite relation to its valve port and adjustable means for determining said relation.

7. A mixing and governing device for explosive engines comprising a main shell having a gas inlet and an air inlet, a wall within said shell forming a mixing chamber and also forming, in conjunction with the main shell, an air chamber, said wall containing a valve port, a tubular valve working in said port to open and close communication between the air chamber and the mixing chamber, said tubular valve provided with a gas inlet port and a gas outlet port, a ported bushing or sleeve coöperating with the gas inlets of the main shell and the tubular valve, said bushing adapted to be adjusted to control the quantity of gas admitted to the tubular valve, combined with a governor device operated by the engine for maintaining said tubular valve in definite relation to its valve port and means for determining said relation comprising a lever operatively connected with said tubular valve, and a governor device also operatively connected with said lever.

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