No. 864,412. PATENTED AUG. 27, 1907.

H. C. ESTEP.

DEVICE FOR TESTING EXPLOSIVE ENGINES.

APPLICATION FILED AUG. 20, 1906.

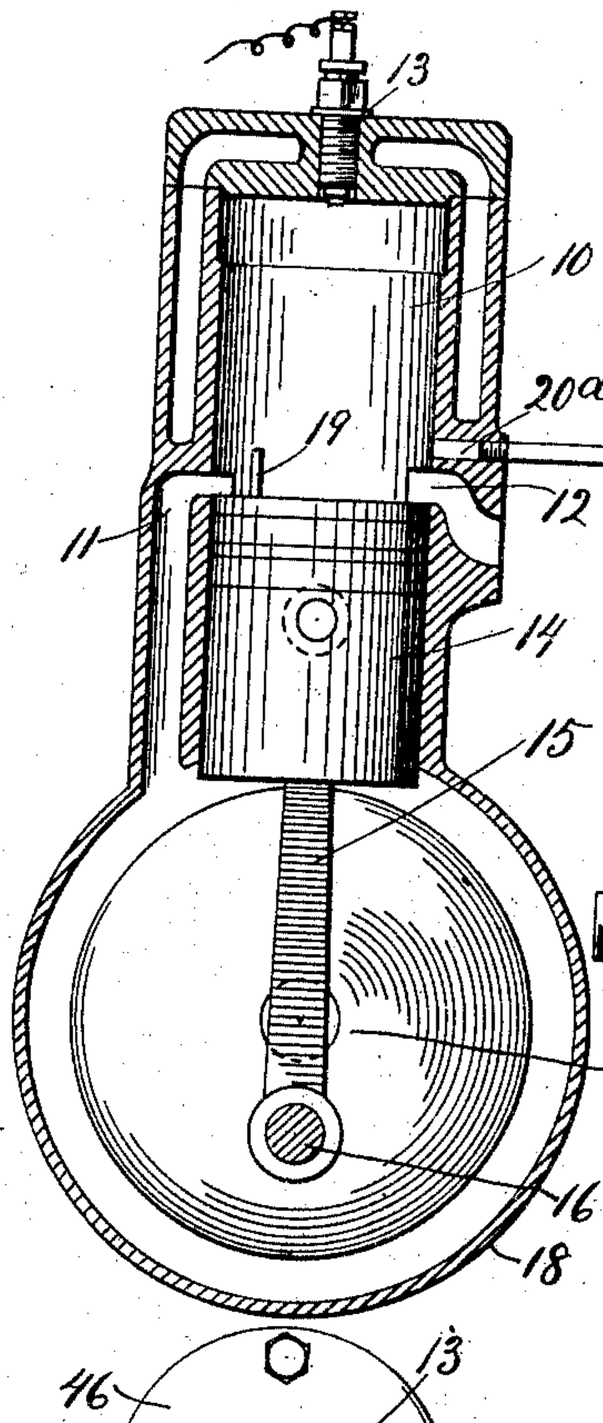

Fig. 1

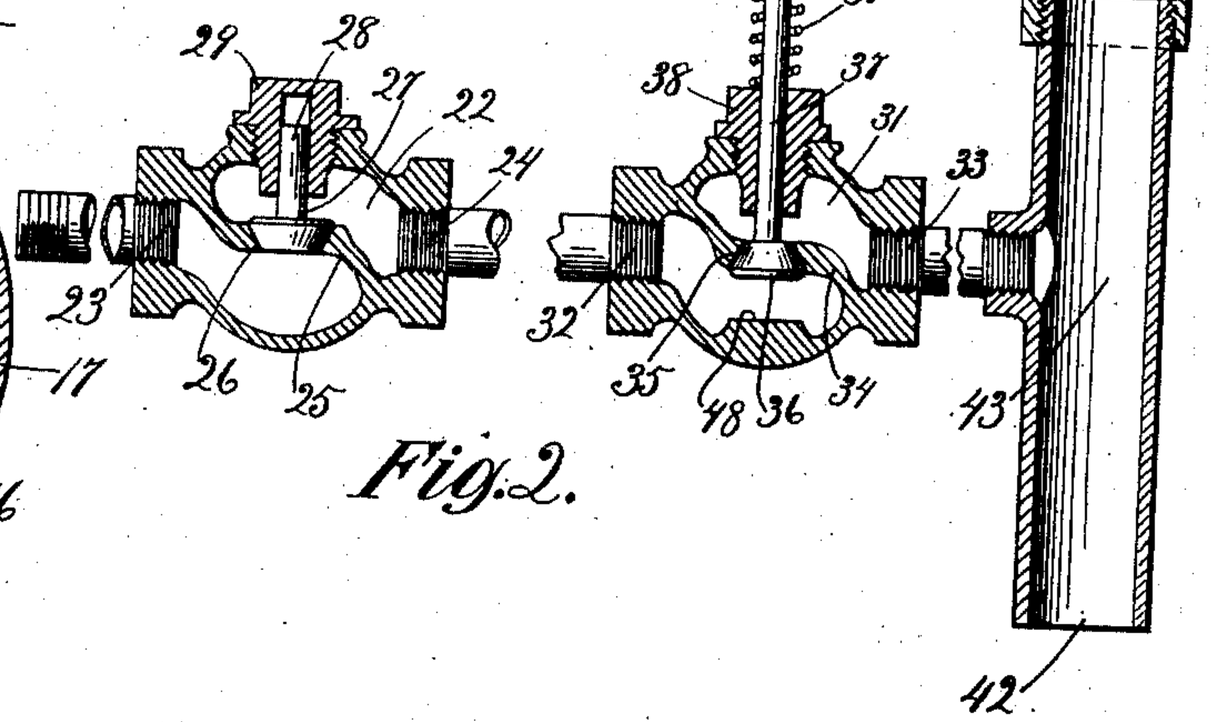

Fig. 2.

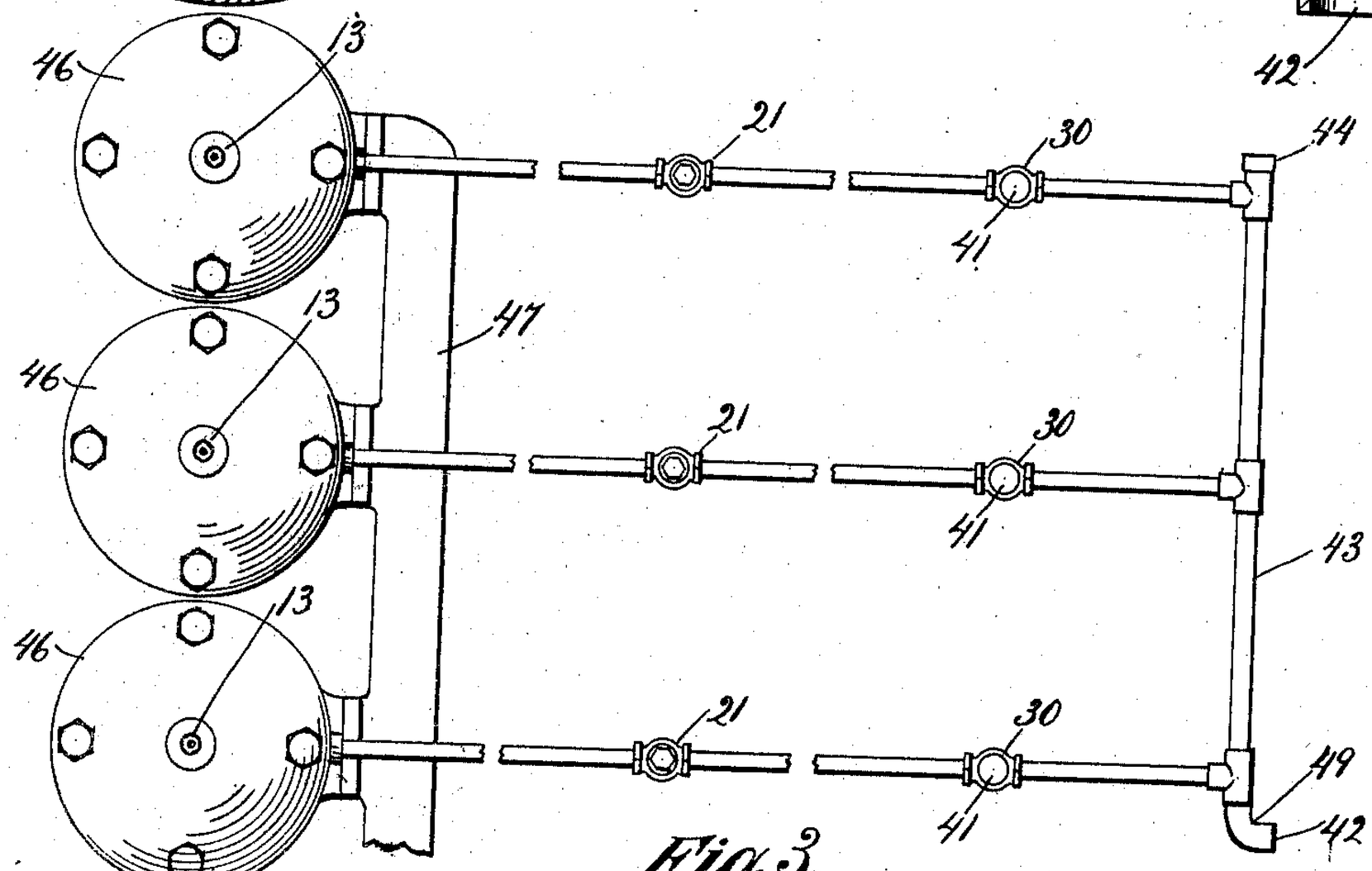

Fig. 3.

Witnesses:
W H Cotton
Charles B. Gillson.

Inventor:
Harvey C. Estep.
By Louis A. Gillespy
Atty.

UNITED STATES PATENT OFFICE.

HARVEY C. ESTEP, OF ABERDEEN, SOUTH DAKOTA.

DEVICE FOR TESTING EXPLOSIVE-ENGINES.

No. 864,412. Specification of Letters Patent. Patented Aug. 27, 1907.

Application filed August 20, 1906. Serial No. 331,342.

To all whom it may concern:

Be it known that I, HARVEY C. ESTEP, a citizen of the United States, and a resident of Aberdeen, in the county of Brown and State of South Dakota, have invented certain new and useful Improvements in Devices for Testing Explosive-Engines, of which the following is a specification.

This invention relates to explosive engines, and has for its object to provide means for determining the nature of the combustion within the power chamber of such engines by permitting the escape of a small portion of the power fluid at a point within the range of observation of the operator.

The condition of working of explosive engines having but a single cylinder or power chamber may usually be determined by noting the noise produced by the exhaust of spent gases from the engine. The odor of those gases, however, is commonly so obnoxious that it is frequently desirable to have them discharged from the engine at a point where they cannot be readily observed, and in explosive engines having a plurality of power chambers and a common exhaust flue, no indication can be had from the exhaust as to which one, if any, of the chambers is working poorly or has failed entirely.

The invention contemplates means communicating with the interior of the power chamber of explosive engines whereby a portion of the power fluid from within the chamber may be caused to exhaust within the view of the observer and is exemplified in the structure to be hereinafter described and illustrated in the accompanying drawings, in which—

Figure 1 is a central vertical section of an internal combustion motor having a testing appliance constructed in accordance with the invention applied thereto; Fig. 2 is a detail longitudinal section of the testing appliance shown in Fig. 1; and Fig. 3 is a plan view of a motor of the form illustrated in Fig. 1, but having a plurality of power cylinders.

A motor of the type adapted to be actuated by explosive fluids and having a reciprocating piston is illustrated in Figs. 1 and 2 of the drawings. As shown it comprises a power cylinder 10, having an admission port 11, an exhaust port 12, and an ignition device 13. The piston is designated 14 and is connected by a pitman 15 to the crank 16 of a power shaft 17 journaled in the walls of a crank chamber 18. Preferably the piston 14 serves as a valve for the admission and exhaust ports 11 and 12, uncovering them as it approaches the end of its out stroke, and, in order to prevent the power fluid entering through the admission port 11 from sweeping across the interior of the power cylinder to the exhaust port 12, there is formed on the top of the piston a baffle 19.

A duct 20, which will usually be of small diameter, as compared with the exhaust port 12, leads out of the wall of the power cylinder preferably near its lower end, the port opening 20^a, through which it communicates with the interior of the cylinder, being then only uncovered by the piston when the latter is near the end of its outstroke. As shown, a check-valve 21 is provided in the duct 20 for preventing the entrance of air through the duct to the interior of the power cylinder. It comprises a housing 22 having a threaded connection with the walls of the duct at 23 and 24, and having its interior crosed by a diaphragm 25 which is apertured, as indicated at 26, to provide a passage through the valve and a tapered valve seat. A valve plunger 27 normally rests on this seat to close the passage through the valve, but may be opened by pressure in the duct in front of the valve, its stem 28 being guided to insure registration with the aperture 26 by a threaded nipple 29 in the wall of the housing 22.

A spring-closed manually-opened valve 30 controls the passage of gases outwardly through the duct 20 and is preferably placed beyond the check-valve 21. As shown it comprises a valve housing 31, having a threaded connection with the walls of the duct at 32 and 33, and having its interior crossed by a diaphragm 34 which is apertured, as indicated at 35, to provide a valve seat. A valve plunger 36, preferably having a tapered head to fit the aperture 35, provides a closure for the valve, its stem 37 extending upwardly through a threaded nipple 38 in the wall of the valve housing 31. It is normally held to its seat by a spring 39 coiled about its stem and reacting between the face of the nipple 38 and a shoulder 40 formed on the stem, this housing being, in the particular form of construction illustrated in the drawings, the under face of a grip-piece 41.

The end of the duct 20 is open to the atmosphere, as indicated at 42, in order to permit the escape of a portion of the power fluid from the cylinder 10 when the valve 30 is opened, and preferably the end of the duct takes the form of a **T** 43 having one of its ends closed by a nipple 44, the opening 42 being at the opposite end of the **T**.

In Fig. 3 of the drawings there is shown an explosive engine having a plurality of power cylinders 46, all of which exhaust into a common flue 47. For an engine of this form an independent duct 20, having valves 21 and 30, is preferably provided for each of the cylinders 46, the **T** 43 being, as shown, common to all of the ducts 20 and having a downwardly-turned end 49.

The device will ordinarily be used in connection with motor carriages, the power cylinders 10 or 46 being placed in the customary position on the carriage frame, not shown. Each of the ducts 20 will then preferably lead to a convenient position in front of the driver's seat in order that the grip 41 of each of the

valves 30 may be readily accessible and the discharge opening 42 may be within the driver's observation. Any one of the power cylinders 10 or 46 of the engine may be tested by opening the valve 30 of the corresponding duct 20, a small portion of the explosive charge within the cylinder being thus allowed to escape through the opening 42 and the violence of the explosive within the cylinder being ascertained from the noise of the discharge. The check-valve 21 prevents the power cylinder from taking a portion of its charge through the duct 20 when the valve 30 is open.

In order that pressure within the power cylinder and the duct 20 in front of the valve 30 may not tend to close this valve when it has been opened for use, a flat seat 48 is preferably formed on the interior of the wall of the valve casing 31 immediately below the valve plunger 36. By pressure applied to the valve stem 37 the valve plunger 36 may be easily removed from its seat in the diaphragm 34 whenever the pressure within the power cylinder 10 is released by the opening of the exhaust port 12, and if the valve plunger 36 is then forced completely down against the seat 48, there will be no danger of its being accidentally closed by the next increase of pressure in the power cylinder.

I claim—

1. In combination, a cylinder for explosive engines having admission and exhaust ports, an ignition device adjacent one end of the cylinder, a piston within the cylinder movable toward and away from the ignition device, a duct leading out of the cylinder, the mouth of the duct being uncovered by the piston adjacent the end of its outstroke, and a manually controlled valve in the duct.

2. In combination, a cylinder for explosive engines having admission and exhaust ports, an ignition device adjacent one end of the cylinder, a piston within the cylinder movable toward and away from the ignition device, a duct leading out of the cylinder, the mouth of the duct being uncovered by the piston adjacent the end of its outstroke, a check-valve yielding to pressure within the cylinder closing the duct, and a spring-closed manually opened valve in the duct beyond the check valve.

3. In combination, a cylinder for explosive engines having admission and exhaust ports, an ignition device adjacent one end of the cylinder, a piston within the cylinder movable toward and away from the ignition device, the exhaust port of the cylinder being uncovered by the piston adjacent the end of its outstroke, and a duct leading out of the cylinder, the mouth of the duct being in the wall of the cylinder remote from the ignition device and being uncovered by the piston during its outstroke before the uncovering of the exhaust port.

4. In an internal combustion engine, in combination, a power cylinder, a vent leading therefrom, an automatic outwardly-opening valve and a manually-controlled inwardly-opening valve in the vent passage, for the purpose specified.

HARVEY C. ESTEP.

Witnesses:
H. S. DODGE,
W. H. FULLER.