

Aug. 14, 1928.

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J. O. LEWIS ET AL

TESTING DEVICE

Filed March 28, 1927

Fig. 1.

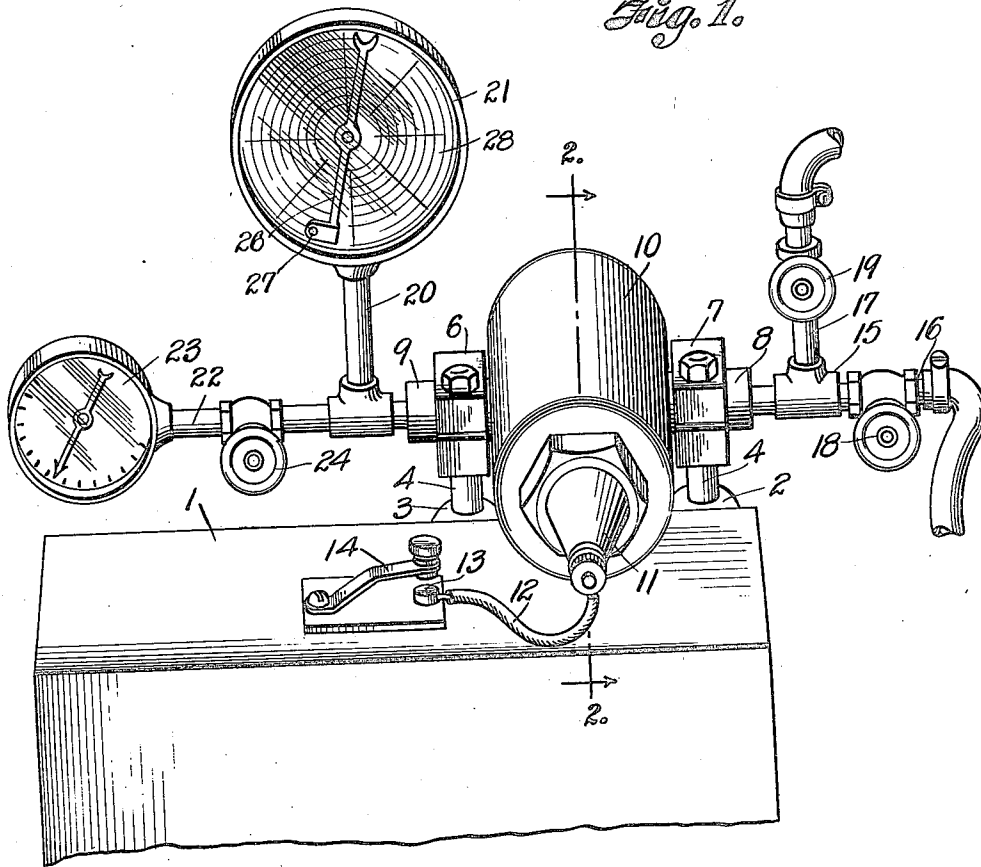


Fig. 2.

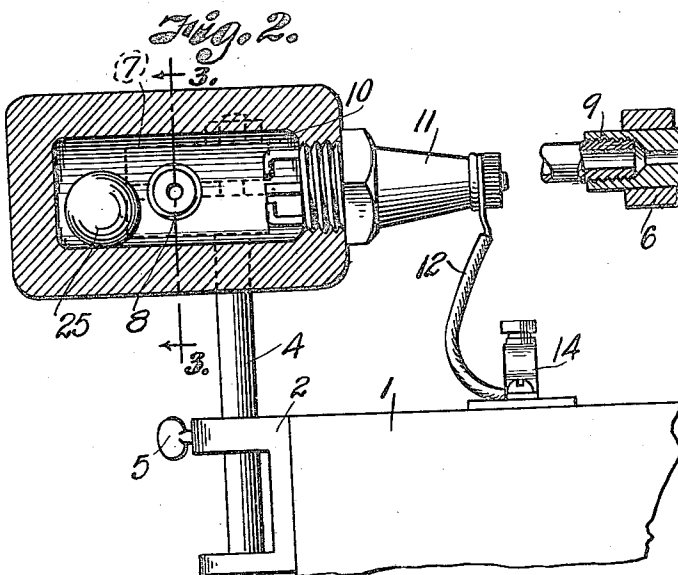
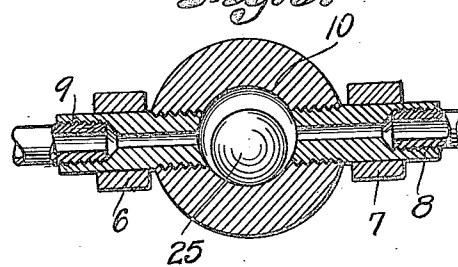


Fig. 3.



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UNITED STATES PATENT OFFICE.

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TESTING DEVICE.

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Our invention relates to testing devices and particularly to devices of this character which are designed to test the combustibility of explosive gases.

One of the prime objects of the invention is the provision of a device embodying a construction which is particularly useful in oil and gas fields for testing the gas emanating from a well which is sometimes employed as fuel for an internal combustion engine for driving a compressor located at the property, the compressor being employed to provide air pressure to supplement the natural pressure of the well and thus force oil from adjoining connected wells. The compressed air fed to the wells in its passage therethrough becomes mixed with gases and gasoline and gasoline vapors contained in the well and is transmitted to the compressor and passed back into the well. The resultant mixture varies at different locations and also varies from time to time on the same property; thus it is evident that the air supplied by the compressor and forced into the air well might become combined with the gases emanating from the oils therein and connected wells and might result in a mixture of high combustibility which would thus increase the explosive hazard.

The device forming the basis of this application is designed to provide a means whereby the mixture of air and gas which results by forcing air into the oil well by the compressor, may be tested as to its combustibility and have either air or gas added thereto so that the mixture which is returned to the well by the compressor may have added thereto air or gas corresponding in quantity to that shown by the test and thus produce a mixture in the line and well which is either too lean or rich to support combustion.

The device may be also employed to test any gas fuel used for actuating engines or for burning to determine whether the mixture fed thereto is either too rich or lean for proper combustion.

The device may also be employed to test spark plugs or ignition systems for any predetermined condition of pressure, temperature and mixture.

The invention has as an object the provision of a construction whereby a part of the gas employed for actuating the engine or that resulting from the mixture of air and

gases contained in the line and well may be drawn off and introduced to a combustion chamber having gauges connected therewith for the purpose of permitting a test to be made of any mixture as to its combustibility at any predetermined pressure, temperature and means of ignition. The invention also contemplates the use of a means whereby the gas may be ignited and the explosive force thereof measured, provided the mixture is of an explosive character.

It is an added object to provide means whereby either the air or gas content introduced to the combustion chamber may be varied to thereby determine the quantity of air or gas which will have to be added to that drawn from the well before the latter will support or prevent combustion and to determine the nature of and calorific value of the gas or its mixture.

It is an additional object of the invention to provide a means for agitating the mixture contained in the combustion chamber to mix the fluid contents of the combustion chamber.

The invention has these and other objects, all of which will be explained in detail and more readily understood when read in conjunction with the accompanying drawings which illustrate one embodiment of which the invention is susceptible, it being obvious, however, that changes and modifications may be resorted to without departing from the spirit of the appended claims forming a part hereof.

In the drawings:

Fig. 1 is a perspective view showing a construction whereby the above mentioned objects may be accomplished.

Fig. 2 is a section taken on the line 2—2 of Fig. 1, looking in the direction of the arrows, the coil box and switch being in elevation, and

Fig. 3 is a section taken on the line 3—3 of Fig. 2.

In the embodiment of the invention illustrated in the drawings, a coil box 1 is employed in which high tension coils are located, it being understood that these coils are connected to a source of electrical energy. Brackets 2 and 3 are secured to a face of the coil box and provide a means by which certain other elements are supported in unitary relation to the coil box. Rods 4 are mounted in the brackets so that said rods and associated devices may be held in any adjusted

position by means of the thumb screws 5. The upper ends of the rods 4 are each formed to provide bearings 6 and 7 in which nipples 8 and 9 are rotatably mounted, the latter 5 having one end thereof threaded into an opening provided in the combustion chamber 10 which is located between the bearings 6 and 7.

The combustion chamber 10 has a spark 10 plug 11 connected thereto, the terminal thereof being connected by means of a conductor 12 to a terminal 13 of a switch 14, which is connected in circuit with the coils provided in the coil box. It is manifest that 15 upon operation of the switch 14, any combustible charge contained in the combustion chamber 10 will be ignited through the means just referred to if all conditions are suitable.

The trunnion 8 has pipe fittings 15 secured to it to provide separate air and gas branches 16 and 17, which are respectively controlled by valves 18 and 19, said valves being provided to control the passage of gas 25 and air to the interior of the combustion chamber 10.

The trunnion 9 is also provided with pipe fittings, one of which, such as 20, is connected with a registering gauge 21 and the 30 other, such as 22, being connected to a pressure gauge 23. A valve 24 is arranged between the combustion chamber 10 and the pressure gauge 23. The pressure gauge 23 is employed to measure the pressure of the 35 fluid content in the combustion chamber 10 and the registering gauge 21 is employed to measure the explosive force of the fluid contents of the combustion chamber 10 when the fluid is ignited through the medium of the 40 spark plug 11 and connections therewith, the valve 24 being shut during the explosion in order to protect the measuring gauge 23 which is of more sensitive and less rugged construction than the gauge 21.

The combustion chamber 10 is supplied 45 with a means for agitating the mixture contained in the combustion chamber 10 so as to thoroughly mix the contents of the chamber. The means herein shown for accomplishing this last-mentioned function includes a ball 25 which is freely movable 50 within the interior of the combustion chamber, it being actuated upon oscillation or rotation of the combustion chamber in the bearings 6 and 7 in which it is mounted.

The recording gauge 21 preferably comprises a rotatable arm 26 carrying a wick or pencil 27 adapted for recording on a disk 28 and slidable on the arm so that it may be 60 reset after recording each of the explosions of a test and provide a graph of the pressures of the series of explosions. A number of disks 28 may be removably mounted in the gauge housing, one upon the other so 65 that the outer one may record impressions

from the wick or pencil and be removed for association with a chart of the air and gas supply to form a record.

The structure described provides a means whereby the fluid pressure introduced to the 70 combustion chamber 10 may be measured so as to determine whether or not the fluid contents of the chamber is of an explosive or non-explosive character, it being understood that the connection 17 of the pipe fittings 15 75 is connected to a source of gas supply, such as, for instance, a pipe or line leading from a compressor employed to force air into a well to cause oil in an adjacent well to flow therefrom. 80

It is thus evident that when the valve 19 controlling the connection 17 is opened and the valve 18 controlling the air connection 16 is closed, gas will be permitted to flow into the combustion chamber through the nipple 8, and from the combustion chamber through 85 the nipple 9 to the pressure gauge 23, upon which a reading of the pressure may be had. When a test is to be made, the valves 18, 19 and 24 are closed and the switch 14 operated, 90 which will cause a spark to occur within the combustion chamber 10, and if the gas or mixture is of a character which will support combustion it will naturally be ignited and the explosive force thereof will be denoted 95 upon the recording gauge 21. If the gaseous content of the chamber is such that it ignites and it is desired to determine the quantity of air or gas necessary to be mixed with the gas so as to provide a mixture which is too 100 rich or too lean to support combustion, then air under pressure or gas is fed separately in quantities, which can be determined by the indication of the pressure gauge, through the pipe connection 16 to the combustion chamber where it is mixed and the 105 precedingly described operation will be resorted to until a mixture results which is non-combustible, the explosive force of each mixture being recorded on the recording 110 gauge which, together with the chart of mixtures employed may provide a record of the tests. In this manner the quantity of air or gas necessary to be added to the mixture fed to a well which is non-combustible can 115 be ascertained.

If it is desired to employ the device to determine the combustibility at the operating pressure of a gas to be employed for actuating the engine whereby the compressor is 120 operated, the above described operation will again be employed and thus the exact proportion of gas and air which is necessary to be added to that in the line or well to support combustion at the greatest generation 12 of pressure may be determined by noting the pressures recorded on the gauge 21 for the tests of various mixtures.

From the foregoing description, it is manifest that a structure is disclosed where- 13

by the combustibility or non-combustibility of a gas may be determined and whereby said gas may be rendered combustible or non-combustible as desired to thereby either reduce fire hazard resulting from an explosion or increase its combustibility depending upon the circumstances or desires.

It is further manifest that after determining by the test the quantity of air or gas necessary to be added to prevent combustion, gas or air in similar proportions may be introduced to the well and line and thus prevent conflagration and explosion.

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

1. In a testing device of the character described, the combination of a combustion chamber, air and gas inlets leading to said chamber, gauges communicating with said chamber, means arranged within said chamber for mixing the fluid introduced to said chamber, and means for causing combustion in said chamber.

2. In a testing device of the character described, the combination of a combustion chamber, air and gas inlets leading to said chamber, gauges communicating with said combustion chamber, means for controlling the actuation of one of said gauges, and means for causing combustion in said combustion chamber.

3. In a testing device of the character described, the combination of a movably mounted combustion chamber, means arranged within said chamber for mixing fluid introduced to said chamber, said means being operable upon movement of said chamber, a fluid inlet leading to said combustion chamber, and a gauge in communication with said combustion chamber.

4. In a testing device of the character described, the combination of a movably mounted combustion chamber, means arranged within said chamber for mixing fluid introduced to said chamber, said means being operable upon movement of said chamber, a fluid inlet leading to said combustion chamber, gauges in communication with said combustion chamber, and means for controlling the passage of pressure to one of said gauges.

5. In a testing device of the character described, the combination of a rotatable combustion chamber, a fluid inlet and outlet leading to and from said chamber, valves controlling said fluid inlet, gauges connected with said outlet, said fluid inlet and outlet

to and from the chamber providing means upon which the combustion chamber is journaled.

6. In a testing device of the character described, the combination of a rotatable combustion chamber, a fluid inlet and outlet leading to and from said chamber, valves controlling said fluid inlet, gauges connected with said outlet, and a valve located in said fluid outlet, said fluid inlet and outlet to and from the chamber providing means upon which the combustion chamber is journaled.

7. In a testing device of the character described, a coil box, a chamber mounted on the box comprising an ignition device, means for connecting the ignition device with the coil within the box, means for controlling supply of elements of a fuel mixture to the chamber, and a recording gauge having communication with the chamber.

8. In a testing device of the character described, a coil box, an explosion chamber mounted on the box and comprising an ignition device, a switch controlling electrical connection between the ignition device and coils within the box, means controlling delivery of elements of a fuel mixture separately to the explosion chamber, and gauges in communication with said chamber.

9. In a testing device of the character described, an explosion chamber, means controlling flow of elements of a fuel mixture to said chamber, means for igniting the fuel mixture in said chamber, and a recording gauge in communication with the chamber, the recording gauge comprising an arm movable under impulse of pressure from the explosion chamber and a marking member adjustable on said arm.

10. In a testing device of the character described, an explosion chamber, means controlling separate flow of elements of a fuel mixture to the chamber, a pressure gauge connected with the chamber and a recording gauge connected with the chamber, and means for shutting off flow of fluid medium from the chamber to the pressure gauge, the recording gauge comprising an arm rotatable under impulses emanating from the explosion chamber and a marking member adjustable on said arm.

In testimony whereof we affix our signatures.

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