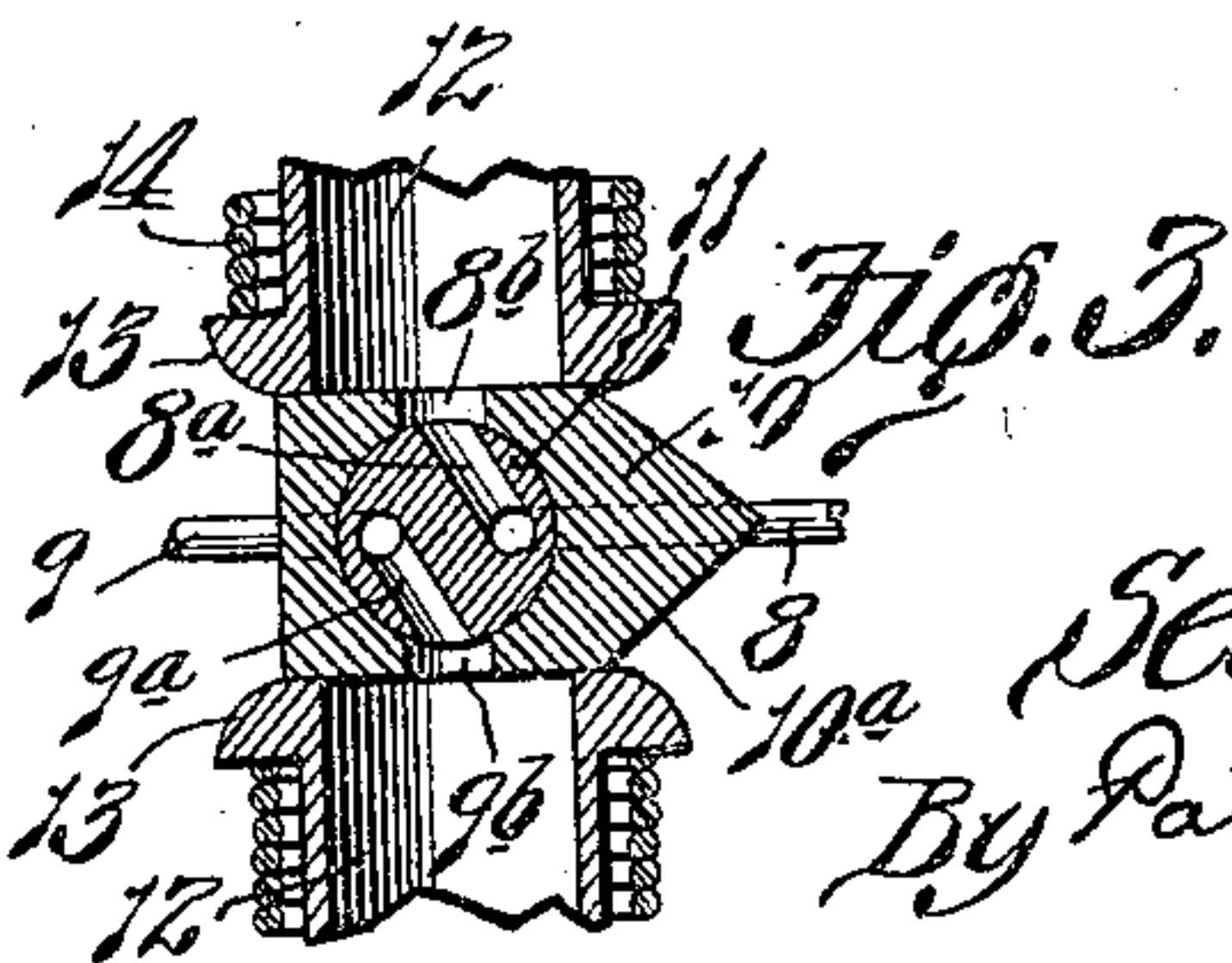
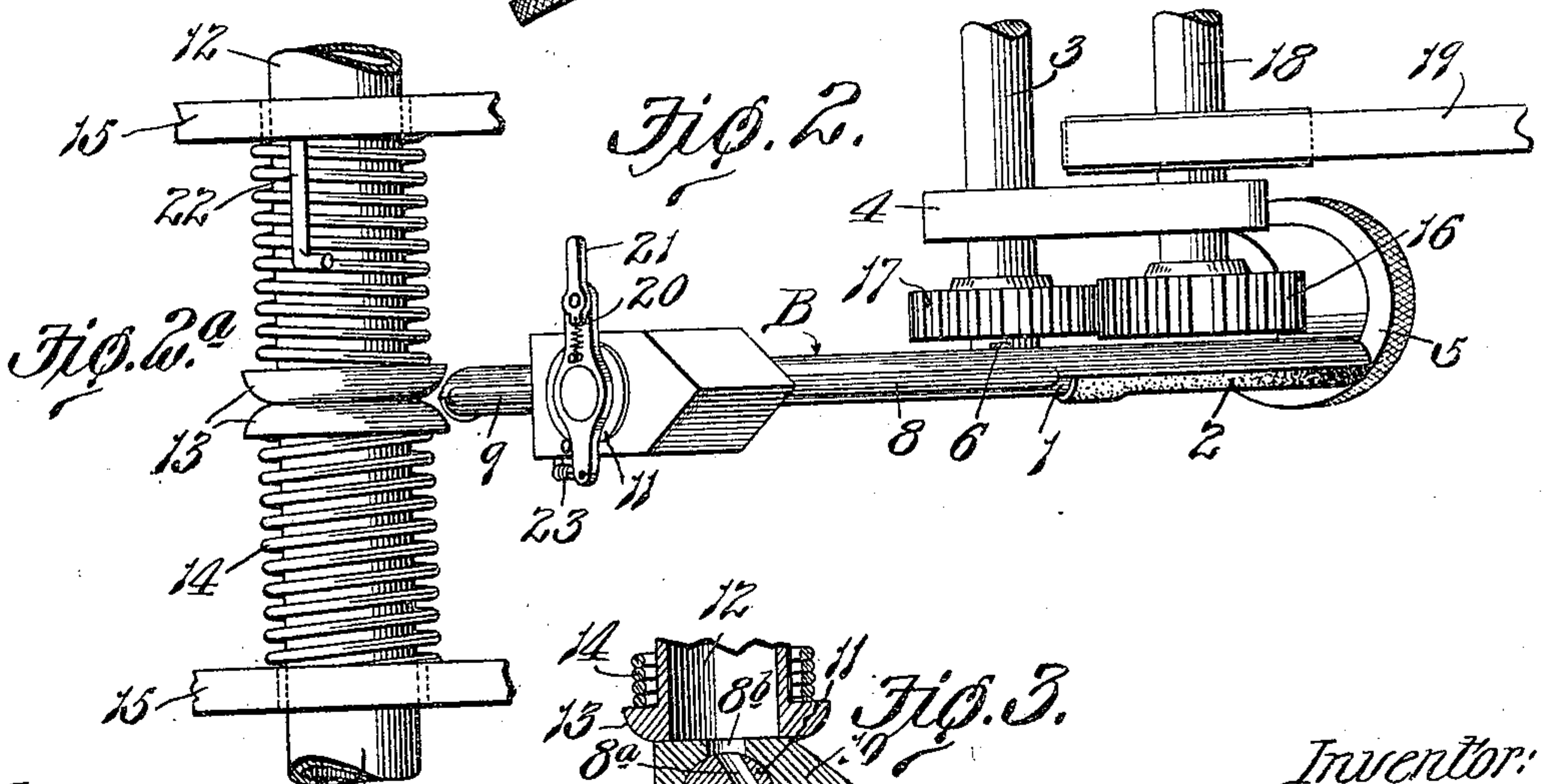
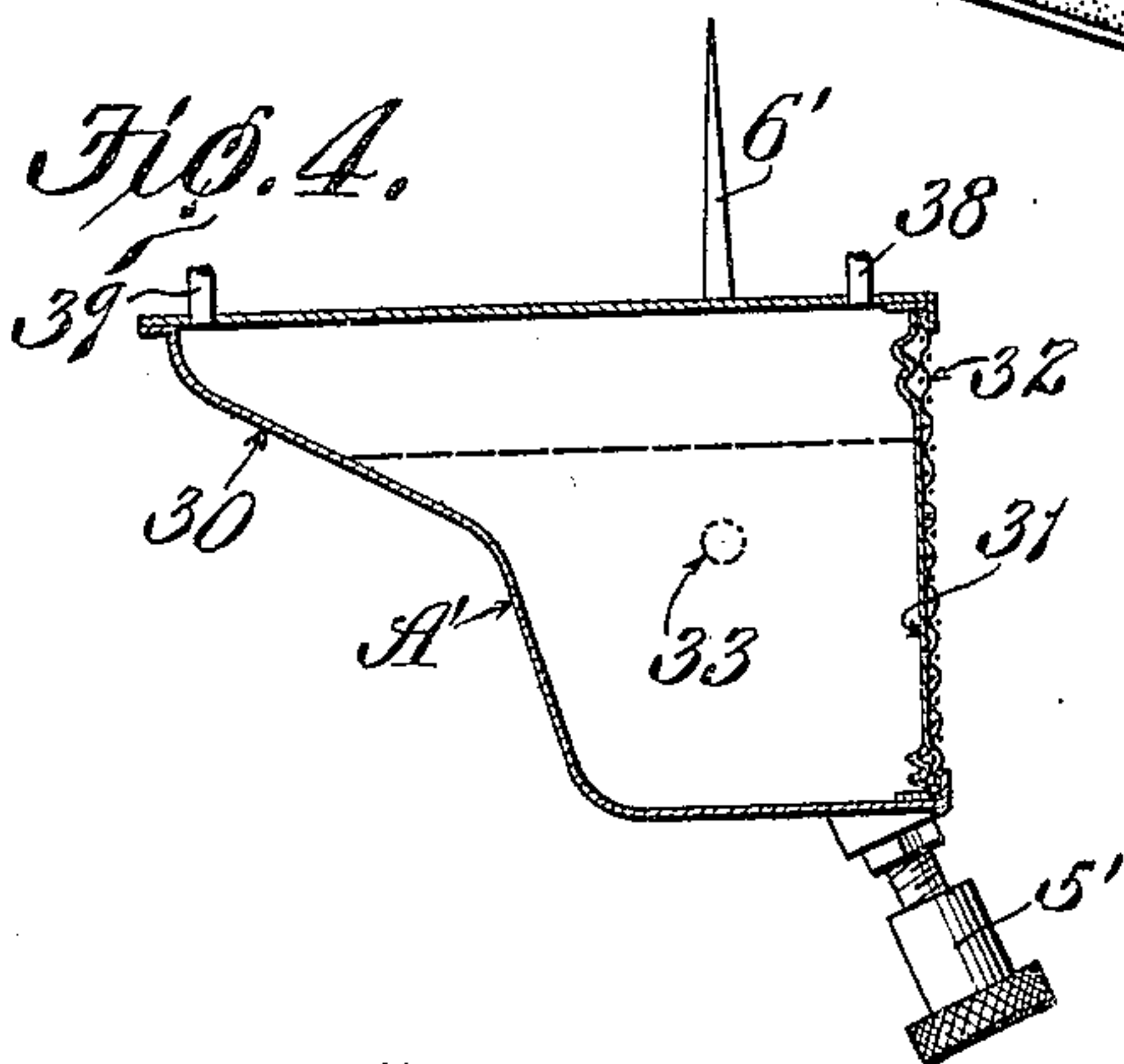
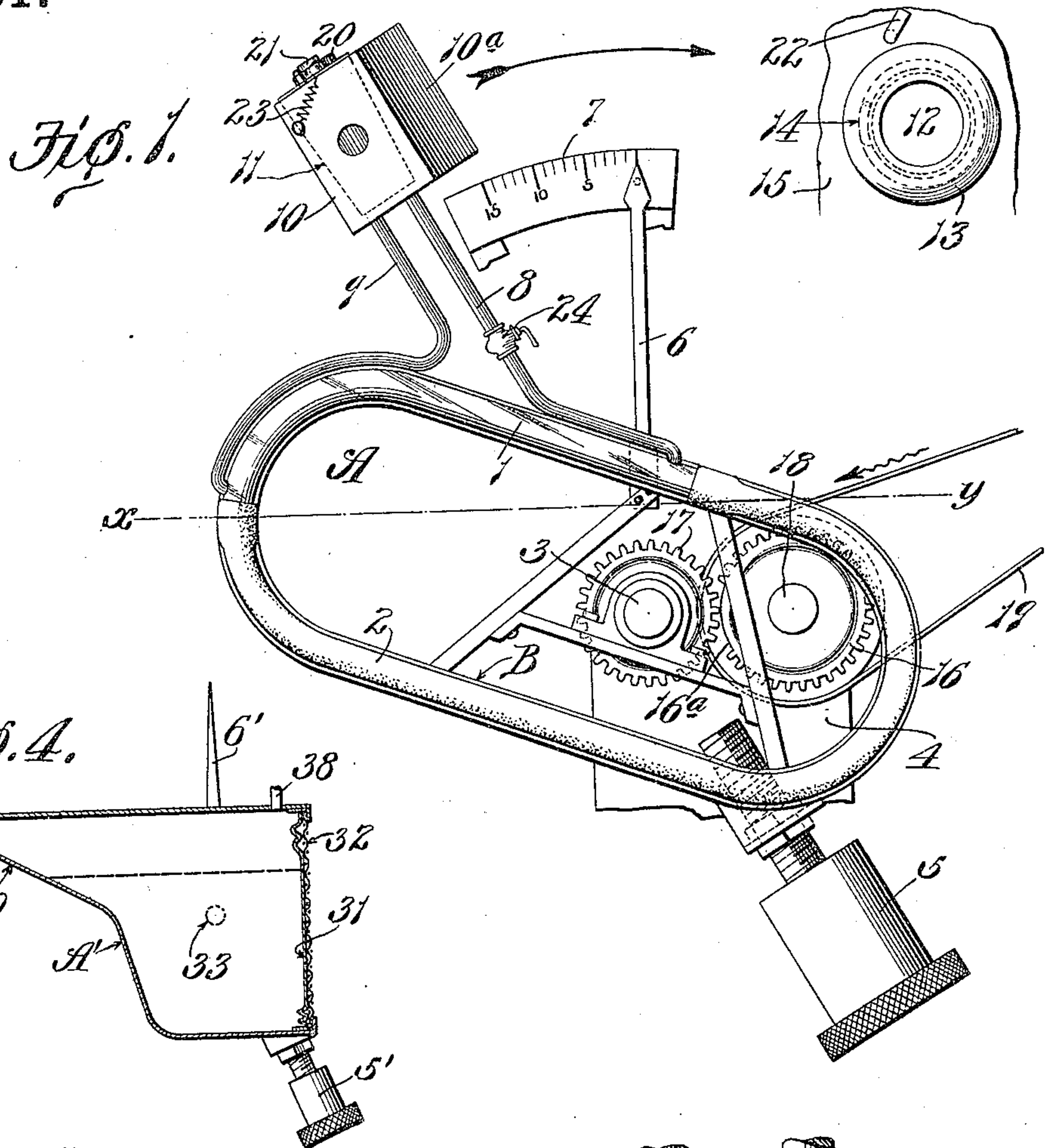


S. D. MERTON.
COMBUSTION RECORDER OR INDICATOR.
APPLICATION FILED MAY 3, 1909.

Patented Mar. 29, 1910.

953,481.



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SETH D. MERTON, OF ST. LOUIS, MISSOURI.

COMBUSTION RECORDER OR INDICATOR.

953,481.

Specification of Letters Patent. Patented Mar. 29, 1910.

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To all whom it may concern:

Be it known that I, SETH D. MERTON, a citizen of the United States, residing at St. Louis, Missouri, have invented a certain new and useful Improvement in Combustion Recorders or Indicators, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to combustion recorders or indicators; namely, devices that are used for determining the percentage of carbon dioxid (CO_2) in gases that escape from boilers and furnaces.

The main object of my invention is to provide a combustion recorder or indicator of simple construction that can be manufactured at a low cost.

Another object is to provide a CO_2 recorder or indicator which is so constructed that the receptacle or member which contains the absorbing solution or substance will automatically change its position after the carbon dioxid has been extracted from the sample of gas being tested, and thus actuate a recording or indicating mechanism which will show the percentage of CO_2 that has been extracted from the gas. And still another object of my invention is to provide a CO_2 recorder or indicator comprising a balanced receptacle or hollow member that is adapted to hold an absorbing solution or substance and a sample of gas that is to be tested, and means whereby the difference in pressure on the inside and outside of the receptacle causes its equilibrium to be destroyed so that it will move automatically from its normal position, the degree of movement of said receptacle from its balanced position varying according to the percentage of CO_2 that the absorbing solution extracts from the gas, and thus showing, by calibration, the percentage of carbon dioxid that the gas contains.

Other objects and desirable features of my invention will be hereinafter pointed out.

Figure 1 of the drawings is a side elevational view of a device embodying my invention; Fig. 2 is a top plan view of said device, the gas conduit being removed to more clearly show the construction of the device; Fig. 2^a is a top plan view of the movable sections of the gas conduit; Fig. 3 is a detail sectional view showing the

valve casing interposed between the movable sections of the gas conduit and the valve arranged in position for establishing communication between said gas conduit and the receptacle which contains the absorbing solution; and Fig. 4 is a vertical sectional view of another form of device embodying my invention.

Referring to Fig. 1 of the drawings which illustrates one form of my invention, A designates a hollow member or receptacle that is adapted to contain an absorbing solution or substance and a sample of gas which it is desired to test to determine the percentage of CO_2 therein, said receptacle consisting of a glass tube 1 and a piece of rubber tubing 2 that is detachably connected to said glass tube, thus forming an endless tube which is preferably bent into approximately oblong shape. The tube or receptacle A is carried by a frame B which is connected by some suitable means to a horizontally disposed shaft 3 that is journaled in a stationary bearing 4. The frame B, or the means that connects said frame to the shaft 3, carries an adjustable weight 5 which is employed for balancing the frame or holding it in a certain position. A pointer 6, which is connected to the frame B, coöperates with a stationary calibrated scale 7 for visually indicating the percentage of CO_2 in the gas. The weight 5 is adjusted in such a position that the pointer 6 will stand at zero on the scale when the pressure on the inside of the tube A is the same as the atmospheric pressure on the outside of said tube, but when the pressure on the inside of the tube is reduced, as hereinafter described, the frame B will shift or move from its normal position and thus carry the pointer 6 to a different position on the scale 7. The tube or receptacle A contains some suitable absorbing solution such, for example, as caustic potash, and means is provided for trapping a sample of gas in said tube so that the absorbing solution can extract the CO_2 from the gas.

In the construction shown in Fig. 1, pipes 8 and 9, that lead from a valve casing 10, are tapped into the glass tube 1 which forms part of the receptacle A, and the controlling valve 11, which is mounted in the casing 10, is provided with ports 8^a and 9^a that establish communication between the pipes 8 and 9 and ports 8^b and 9^b in the sides of the valve casing 10. The gas which is to be tested flows through a gas conduit that com-

prises two movable sections 12 provided at their meeting ends with flanges 13 that are normally held in intimate engagement with each other, as shown in Fig. 2^a, by means of
 5 coiled expansion springs 14 interposed between said flanges and stationary supports 15 through which the movable sections 12 of the gas conduit pass. This gas conduit is arranged in such a position that the valve casing 10 can pass between the movable sections 12 and thus establish communication between the gas conduit and the interior of the receptacle A when the frame which carries said receptacle is moved in a certain
 10 direction.

It is preferable to rock or vibrate the receptacle A after the gas has been introduced into same so as to bring the gas into intimate contact with the absorbing solution or with
 20 the wetted surfaces on the interior of said receptacle so as to cause the CO₂ in the gas to be absorbed quickly, and while I have herein shown means for imparting nearly a complete rotation to the frame B and receptacle A, I do not wish it to be understood that my
 25 broad idea is limited to such a construction for the member that contains the absorbing solution and gas could be merely rocked or vibrated manually or by any suitable mechanism.

The means that I have shown in Fig. 1 for imparting a slow rotary movement to the frame B and receptacle A comprises a mutilated gear 16 that meshes with a gear
 35 17 on the shaft 3 to which the frame B is connected, the gear 16 being secured to a shaft 18 which is driven continuously, preferably at a slow speed, by means of a belt 19 which passes over a pulley on said shaft.
 40 The valve casing 10 is provided with a substantially wedge-shaped portion 10^a, and when the frame B is rotated in the direction indicated by the arrow in Fig. 1 the wedge-shaped portion 10^a of said valve casing will
 45 pass between the flanges 13 on the movable sections of the gas conduit and thus force said sections apart sufficiently to permit the valve casing to pass between same. The gas-controlling valve 11 is provided at its
 50 upper end with an arm 20 having a pivotally mounted yielding extension 21 that coöperates with a stationary tripping device 22 to turn the valve 11 into the position shown in Fig. 3 so as to establish communication between the gas conduit and the interior of the receptacle A, said valve being restored to its normal closed position so as to close the pipes 8 and 9 by means of a spring 23 connected to the arm 20 and to the valve casing, as shown clearly in Fig. 2.

The absorbing solution or substance does not completely fill the tube A but said solution fills only a portion of said tube, the approximate level of said solution being indicated by the dot-and-dash line *x-y* in
 65

Fig. 1. During the time the mutilated portion or untoothed portion 16^a of the gear 16 is traveling past the gear 17 the frame B and receptacle A will remain at rest and in the position shown in Fig. 1 provided the pressure on the inside of the tube A is the same as the atmospheric pressure on the outside of same. When the teeth of gear 16 mesh with the teeth of gear 17 the frame B and the various members thereon will rotate in the direction indicated by the arrow in Fig. 1, the wedge-shaped portion 10^a of the valve casing 10 passing between the movable sections 12 of the gas conduit, and the tripping device 22 coöperating with the yielding extension 21 on the arm of the valve 11 to open said valve and permit the gas which is flowing through the gas conduit to pass through the pipe 8 into the tube A, the valve 11 moving automatically into its normal position to close the pipes 8 and 9 and thus trap the sample of gas in the tube A when the yielding extension on the valve arm passes out of engagement with the tripping device 22. The rotary movement of the receptacle A causes the gas to come into intimate contact with the absorbing solution in said receptacle or into engagement with the wetted surfaces on the interior of said receptacle, thus causing the CO₂ to be extracted from the gas by the time the receptacle has made practically a complete rotation, the frame B and receptacle A thereon coming to rest when the mutilated portion 16^a of the gear 16 comes into alignment with the gear 17. The absorption of the CO₂ by the solution in the receptacle A reduces the density of the gas and thus creates a partial vacuum in the receptacle A. Consequently, the rubber tube 2 or flexible portion of the receptacle A will contract because the atmospheric pressure on the exterior of said receptacle is greater than the pressure on the interior thereof, and this contraction of the tube 2 will cause the absorbing solution to rise or seek a higher level and thus throw the frame B and receptacle A out of balance. In other words, after the absorbing solution has extracted the CO₂ from the gas the pressure inside of the receptacle A will be so much less than the atmospheric pressure on the outside of same that said atmospheric pressure will force the tube inwardly and thus reduce the size of the chamber which contains the absorbing solution to such a degree that the level of said solution is raised. It is obvious that this will destroy the equilibrium of the frame B and the receptacle A for the weight 5 had been previously adjusted in such a position that the pointer 6 on the frame stood at zero on the scale when the pressure on the interior of the tube was the same as the atmospheric pressure and the level of the absorbing solution was lower. The pointer 6 coöperates

with the scale 7 to indicate the degree of movement of the frame from its normal balanced position, thus clearly indicating the percentage of CO_2 that has been extracted from the gas. The greater the percentage of CO_2 in the gas the greater will be the movement of the receptacle A from its normal balanced position.

I have previously stated that it is immaterial so far as my broad idea is concerned what kind of mechanism is employed for actuating the receptacle A and it is also immaterial what kind of means is employed for introducing the gas into the receptacle and permitting it to escape therefrom.

In case the apparatus is provided with a recording mechanism in addition to the pointer 6 and scale 7, it is preferable to provide the pipe 8 with a valve 24 that can be tripped automatically by some suitable means so as to admit a sufficient quantity of air into the receptacle A after the record has been taken to equalize the pressure in said receptacle and thus cause it to swing back to its normal position, so as to cause the gear 17 to mesh with the gear 16 at the proper time in the cycle of operations of said gear.

While I have herein shown a receptacle A consisting of an endless tube bent into approximately oblong shape, I wish it to be understood that the particular construction and shape of the receptacle is immaterial so far as my broad idea is concerned, and in Fig. 4 I have shown a slightly modified form of my invention wherein the receptacle A' is approximately rectangular-shaped, said receptacle having a laterally projecting portion or offset portion 30. One wall of said receptacle consists of a piece of rubber or other suitable flexible material 31 that is prevented from expanding outwardly by means of a wire netting 32 or a suitable rack that will permit the atmospheric pressure to force said flexible wall inwardly after the pressure on the inside of the receptacle has been reduced by the absorption of the CO_2 in the gas. The receptacle A' is provided with an adjustable weight 5' that holds the pointer or indicator 6' on said receptacle in a certain position, and pipes 38 and 39 are tapped into said receptacle for conducting the gas into same and conveying it away therefrom. Said receptacle A' is provided with trunnions 33 that pivotally connect it to a suitable stationary support, and any suitable means can be employed for oscillating said receptacle or imparting rotary movement thereto so as to bring the gas into intimate contact with the absorbing substance and thus reduce the pressure in said receptacle, the reduction of pressure therein causing the flexible wall 31 to expand inwardly and thus bodily shift the absorbing solution so as to destroy the equilibrium of the receptacle.

The main advantage of a recorder or indicator of the character above described is that it is of such simple construction that it can be manufactured at a low cost and it does not comprise any complicated parts that are apt to become broken or get out of operation.

While I have herein stated that the device is used for recording or indicating the CO_2 in fuel gases, it will, of course, be understood that it could be used for various other purposes by substituting an absorbing solution that will extract some other constituent than carbon dioxide from the gas.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A device of the character described, comprising a movable receptacle that is adapted to contain a sample of gas and a medium that will absorb one of the constituents of said gas, said receptacle being provided with means whereby the atmospheric pressure on the exterior thereof causes said receptacle to shift from its normal position after one of the constituents of the gas has been extracted by said absorbing medium.

2. A device of the character described, comprising a movable member that is adapted to contain a sample of gas and a solution that will absorb one of the constituents of said gas, said receptacle being provided with means whereby the atmospheric pressure on the exterior thereof causes said receptacle to shift from its normal position after one of the constituents of the gas has been extracted by said absorbing solution, and means showing the degree of movement of said member to determine the percentage of the constituent that has been extracted from the gas.

3. A device of the character described, comprising a movable receptacle that is adapted to contain a sample of gas and a substance that will absorb one of the constituents of said gas, said receptacle being provided with means whereby the atmospheric pressure on the exterior thereof causes said receptacle to shift from its normal position after one of the constituents of the gas has been extracted by said absorbing substance, means for actuating said receptacle so as to bring the gas into intimate contact with the absorbing substance, and means for showing the degree of movement of said receptacle from its normal position so as to determine the percentage of the constituent that has been removed from the gas.

4. A device of the character described, comprising a receptacle that is mounted in such a manner that it can oscillate or rotate, said receptacle being adapted to receive an absorbing medium and a sample of gas and

being so constructed that it assumes a certain position when the pressure in the interior thereof is approximately the same as the atmospheric pressure, means whereby the
5 atmospheric pressure on the exterior of said receptacle causes said receptacle to shift from its normal position after one of the constituents of the gas has been extracted by said absorbing solution, and means for
10 indicating the degree of movement of said receptacle from its normal position so as to determine the percentage of the constituent that has been removed from the gas.

5. A device for the purpose described,
15 comprising a hollow member that is mounted in such a manner that it can rock or rotate, said receptacle being adapted to contain an absorbing medium and a sample of gas, and a piece of flexible material forming
20 a portion of one wall of said member so as to cause the absorbing medium to change its level or position when the pressure on the interior of the hollow member is less than atmospheric pressure.

25 6. A device for the purpose described, comprising a pivotally mounted receptacle provided in some portion of its surface with a piece of flexible material, said receptacle being adapted to hold a sample of gas and
30 an absorbing substance that will extract the CO_2 from said gas, means for causing said receptacle to stand in a certain position when the pressure inside of same is equal to atmospheric pressure, and means for indi-
35 cating the degree of movement of said re-

ceptacle from its normal position after the equilibrium of said receptacle has been destroyed by the reduction of pressure on the inside of same.

7. A device for the purpose described, 40 comprising a receptacle that is adapted to contain an absorbing solution, means for introducing a sample of gas into said receptacle and trapping it therein, a fulcrum for said receptacle, means for balancing said 45 receptacle in a certain position when the pressure on the interior and exterior thereof is equalized, and an indicating mechanism for showing the degree of movement of said receptacle from its normal balanced position. 50

8. A device of the character described, comprising a receptacle that consists of an endless tube bent into approximately oblong shape, a portion of said tube being formed of yielding material, an oscillating or 55 swinging support for said receptacle, means for holding said support in a certain position, an absorbing medium in said receptacle, means for trapping a sample of gas in said receptacle, means for rocking said 60 receptacle, and mechanism for showing the degree of movement of said receptacle from its normal position.

In testimony whereof I hereunto affix my signature in the presence of two witnesses, 65 this twenty sixth day of April 1909.

SETH D. MERTON.

Witnesses:

WELLS L. CHURCH,
GEORGE BAKEWELL.