No. 668,514. Patented Feb. 19, 1901.

W. L. GARRELS & C. KIMBALL.

WATER GAGE.

(No Model.) (Application filed Mar. 16, 1900.)

Fig. 1.

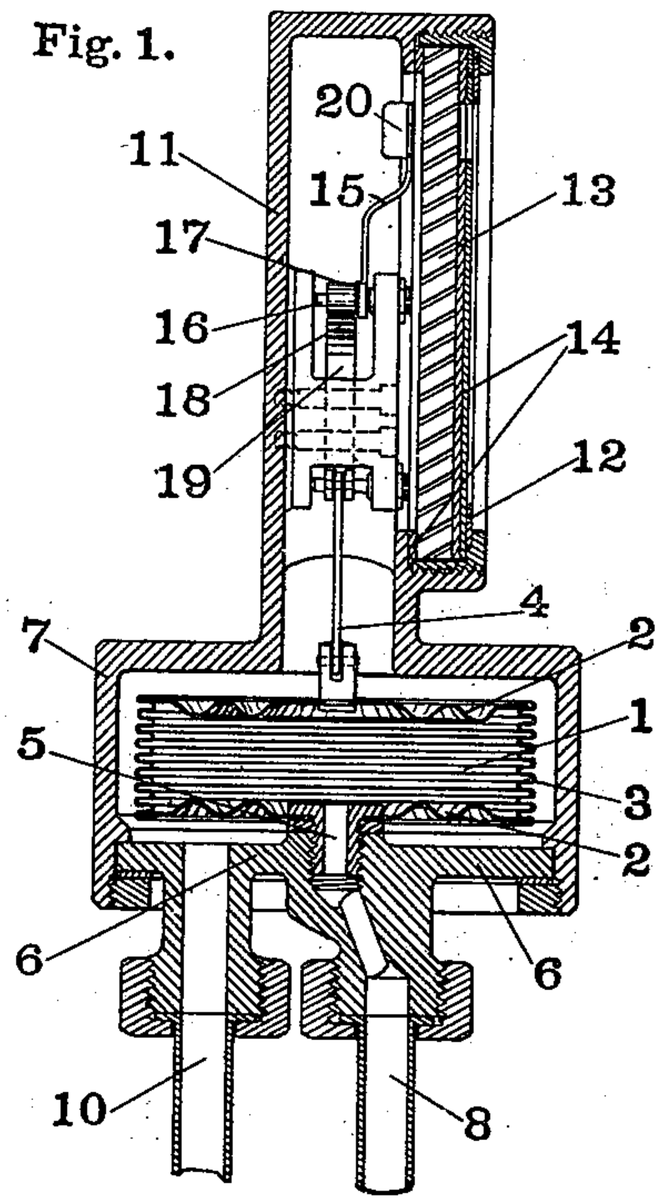


Fig. 2.

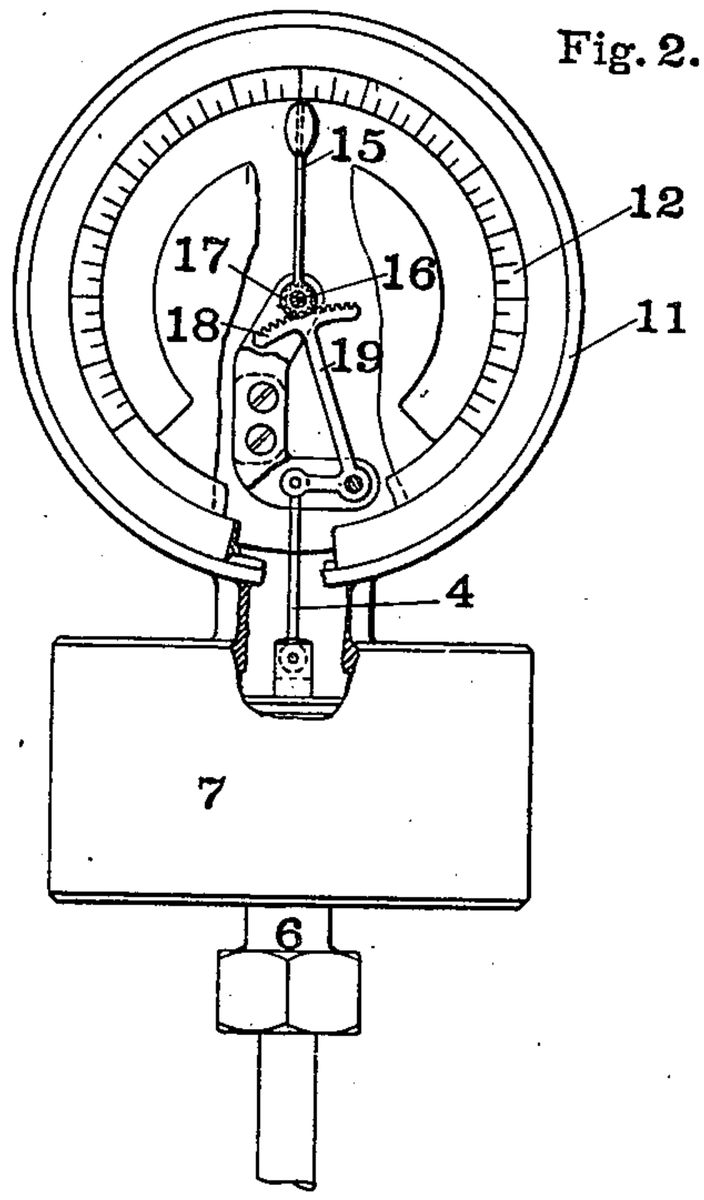
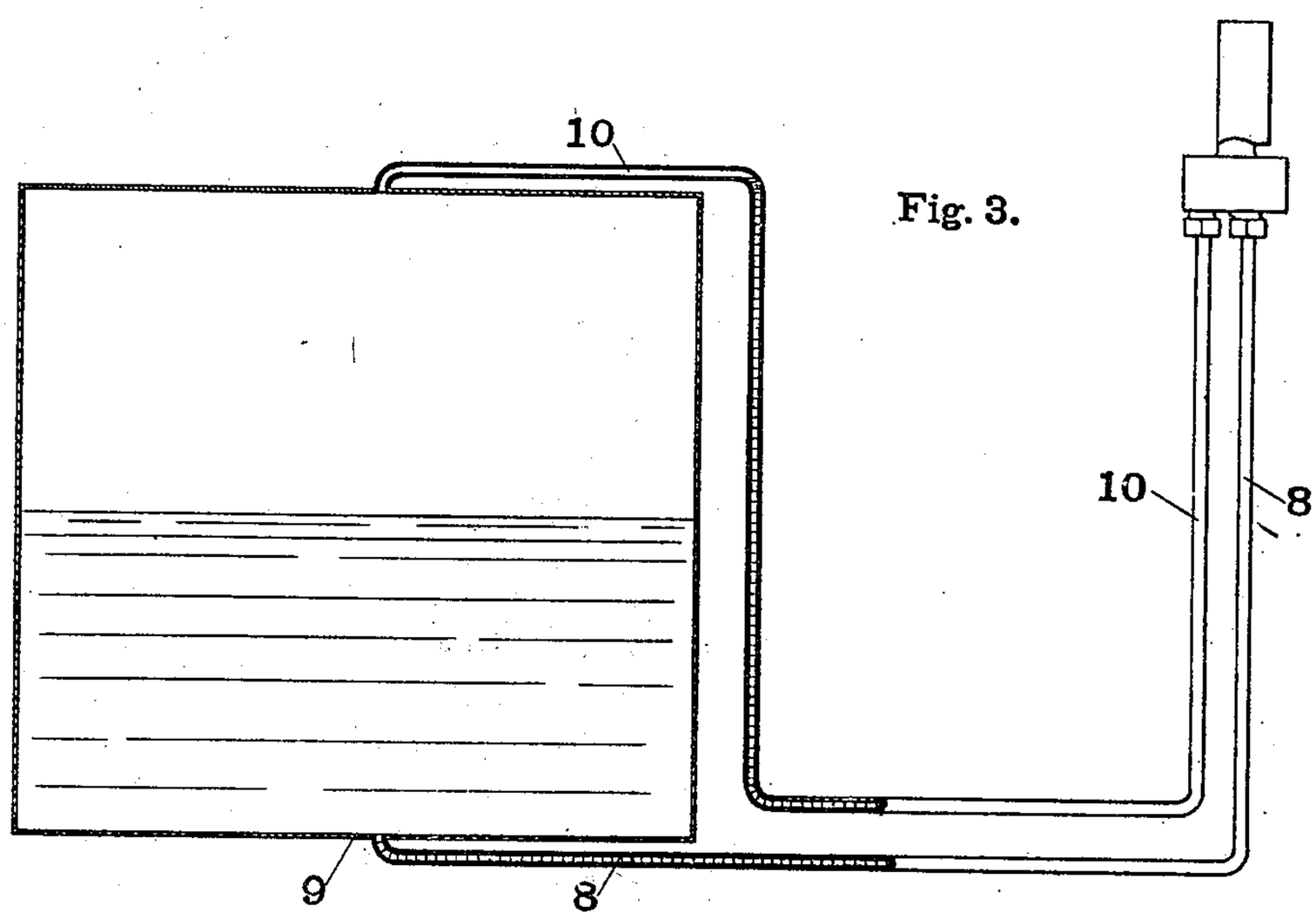


Fig. 3.



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UNITED STATES PATENT OFFICE.

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WATER-GAGE.

SPECIFICATION forming part of Letters Patent No. 668,514, dated February 19, 1901.

Application filed March 16, 1900. Serial No. 8,882. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM L. GARRELS, a resident of the city of St. Louis, and CLINTON KIMBALL, a resident of the city of Kirkwood, St. Louis county, State of Missouri, citizens of the United States, have invented certain new and useful Improvements in Water-Gages, of which the following is a specification.

Our invention relates to water-gages for boilers, and has for its principal object to provide a gage for indicating the level of the water in the boiler at any point where it may be desired to locate said gage, be it above or below or on a level with said boiler.

Our invention consists in an incased diaphragm provided with indicating mechanism and having the space opposite its respective sides connected to the top and to the bottom of the boiler.

It also consists in incasing all of the indicating mechanism in a space exposed to boiler-pressure.

It also consists in a pressure-diaphragm having a double connection to the top and to the bottom of the boiler.

It also consists in improvements in the construction of the pressure-diaphragm and in divers arrangements and combinations of parts, as hereinafter described and claimed.

In the accompanying drawings, which form part of this specification, and wherein like symbols refer to like parts wherever they occur, Figure 1 is a vertical sectional view of the diaphragm and the casing therefor. Fig. 2 is a front view of said casing, parts being broken away to expose the working mechanism. Fig. 3 is a diagrammatic view showing the connections to the boiler.

The diaphragm 1 of our device consists of a pair of concentrically-corrugated disks 2, connected by a circumferentially-corrugated tube 3, of thin sheet metal. The diaphragm thus constructed constitutes a hollow expansible cylinder, one end 2 of which carries a link or stem 4 for operating the indicator mechanism. Through the center of the other end extends a hollow nipple 5, which is screwed into a threaded hole in the end plate 6 of the diaphragm-casing 7. This hole communicates through an ordinary pipe 8 with the lower portion of the boiler 9. A second hole in said end plate 6 communicates through another pipe 10 with the upper portion of the boiler.

The case 7 for the diaphragm has an upward extension 11, which incases all of the indicating mechanism. The indicating mechanism may be of any desired form—such, for instance, as that illustrated in Figs. 1 and 2. In this construction there is a graduated ring or dial 12, adjustably mounted in said casing, and a heavy glass front plate 13 therefor made to fit water and air tight by means of suitable packing 14. An indicator-hand 15, arranged concentrically with the dial, is mounted on a shaft 16, which is journaled in the framework and is provided with a pinion 17. This pinion meshes with a curved rack 18 on the end of a bell-crank lever 19, likewise journaled in the framework and pivotally connected with a link or stem 4, which is connected to the diaphragm. The indicator-hand or pointer has a fin or web 20 on its back, which tends to deaden the movement through the water in the casing.

The operation of the foregoing device is as follows: The diaphragm-casing and the pipes connecting the same to the boiler being filled with water, both the interior and the exterior of the diaphragm are submitted to boiler-pressure, which holds the water regardless of the elevation of the indicator. The boiler-pressure on both sides of the diaphragm is thus equalized. The level of the water in the pipe connected to the top of the boiler, due to the steam condensing in said pipe, remains permanently at the highest turn in said pipe. The level of the water in the boiler varies from time to time, and the difference between the height of the water in the pipe connected at the top of the boiler and the level of the water in the boiler varies accordingly. This difference in levels results in an excess of pressure upon one side of the diaphragm equal to the weight of a column of water of the same height as the difference between these levels. A change of this excess pressure causes a movement of the diaphragm, which

movement is transmitted through the indicating mechanism to effect a rotary movement of the pointer on the dial.

The operation of our device depends upon the difference between the permanent level of water in one connecting-pipe and the varying level of the water in the boiler, so that the elevation of the indicator with reference to the boiler is immaterial. Said indicator may therefore be placed at any elevation with respect to the water-level and at any distance therefrom. Another principal advantage of our device is that by mounting the indicator mechanism inside of the pressure-chamber it minimizes the friction, which is a serious objection to the use of an ordinary stuffing-box. So, too, the oscillation of the pointer is deadened by the fin, so that while the device responds accurately to the pressure it is comparatively free from outside disturbing influences, such as the jarring of the framework on which it is mounted. For these reasons our device is specially adapted for a water-gage for motor-vehicles; but obviously it is of general application for measuring differences in pressure—as, for instance, the difference in pressure on two sides of a valve in a pipe.

Obviously our device admits of considerable modification without departing from our invention, and we do not desire to be restricted to the particular construction hereinbefore described. For instance, instead of using an extensible cylinder for the diaphragm said diaphragm may consist of a resilient distendible disk, plain or corrugated. In either of these cases the edge of the disk is fastened water-tight in the casing and the pressure-pipes are connected to the casing on opposite sides of said disk. So, too, instead of using a hollow cylinder of the form above described the indicating mechanism may be actuated by a curved flattened tube of spring metal closed at the end (or a tube corrugated on one side) and mounted on the end of one of the pressure-pipes, the other pressure-pipe opening into the casing, as hereinbefore described.

What we claim is—

1. A gage comprising a casing, a resilient distensible diaphragm arranged therein and free in movement from friction therewith, indicating mechanism operatively connected to said diaphragm and connections on opposite sides of said diaphragm to the upper and lower portions respectively of a source of pressure, substantially as described.

2. A gage comprising a casing, a hollow extensible device inside thereof and free from friction therewith, indicating mechanism operatively connected to said device, and separate connections for the inside of said device and for said casing to a source or sources of pressure, substantially as described.

3. A gage comprising a casing, a resilient distensible diaphragm arranged therein and free in movement from friction therewith, indicating mechanism inside of said casing and operatively connected to said diaphragm, and pipes connecting the space on opposite sides of said diaphragm to the top and bottom portions of a source of pressure, whereby the indicating mechanism and connections are immersed in the pressure medium and free from friction with the casing, substantially as described.

4. A gage comprising a resilient distensible diaphragm, indicating mechanism operatively connected thereto, a casing for inclosing said diaphragm and said mechanism, said diaphragm being free in movement from friction with said casing, and pipes connecting the space on opposite sides of said diaphragm to the top and bottom portions of the boiler respectively, substantially as described.

5. A gage comprising a casing, a diaphragm therein consisting of a cylindrical sheet of thin metal fluted peripherally and disks at the ends of said cylinder, and indicating mechanism operatively connected to one of said disks, the other disk having a hole adapted for connection to a pipe, and pipes connecting the interior of said casing and the interior of said diaphragm respectively to the upper and lower portions of the sources of pressure, substantially as described.

6. A gage comprising an extensible device having its opposite sides exposed to pressure from different sources, indicating mechanism and connecting devices for connecting said indicating mechanism to said extensible device, said indicating mechanism and connecting devices being immersed in the pressure medium, and the indicator-hand being provided with a fin for deadening its movement, substantially as described.

7. A gage for boilers comprising a hollow closed cylinder of thin metal corrugated peripherally, indicating mechanism operatively connected to one end of said cylinder, the other end of said cylinder having an open communication to a pipe, a casing inclosing said cylinder and indicating mechanism, and a pipe opening into said casing, said pipes being connected to the top and bottom portions of the boiler respectively, substantially as described.

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