

No. 876,497.

PATENTED JAN. 14, 1908.

J. F. SENTER.  
STEAM BOILER INDICATOR.  
APPLICATION FILED JULY 21, 1908.

2 SHEETS—SHEET 1.

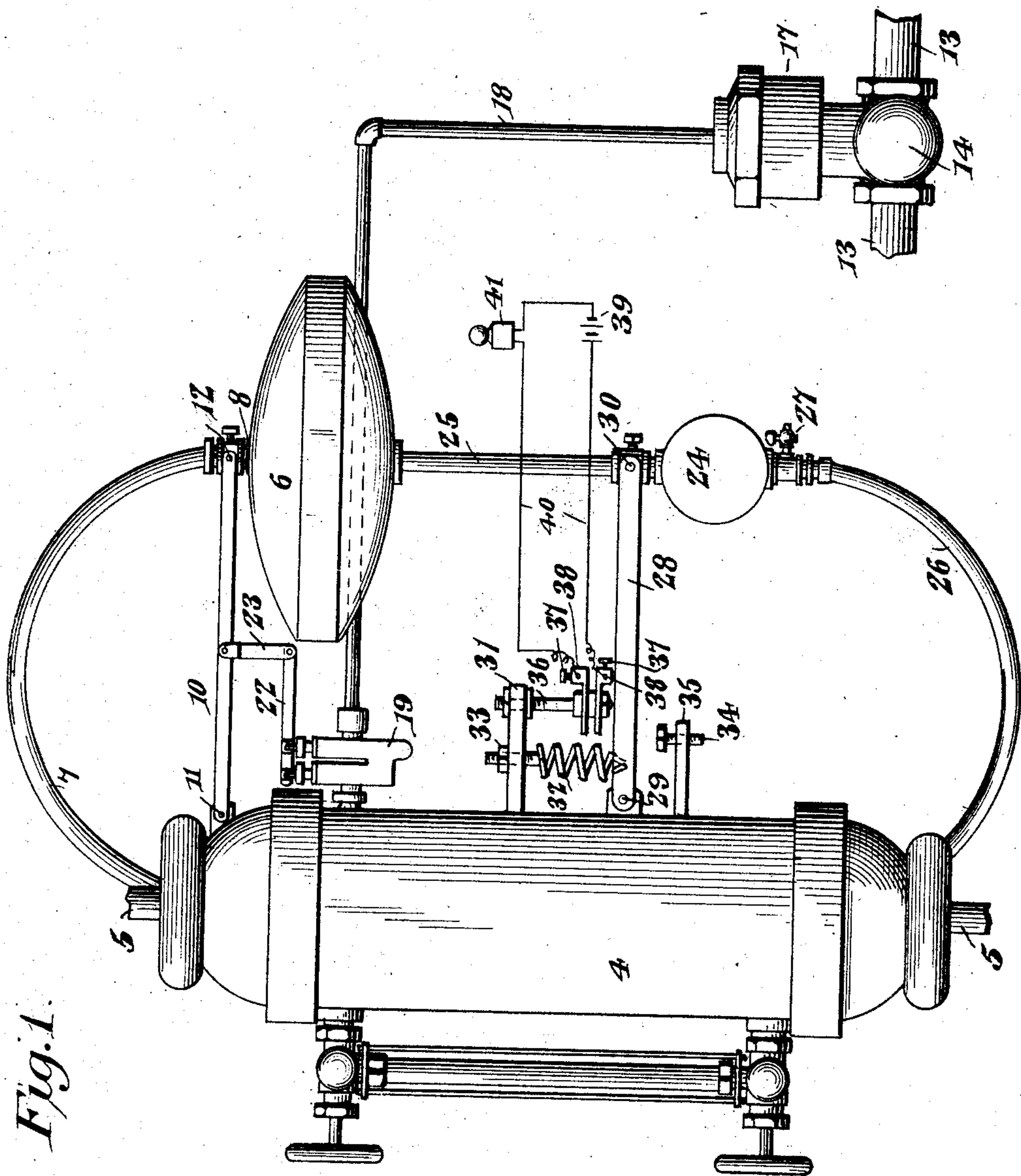


Fig. 1.

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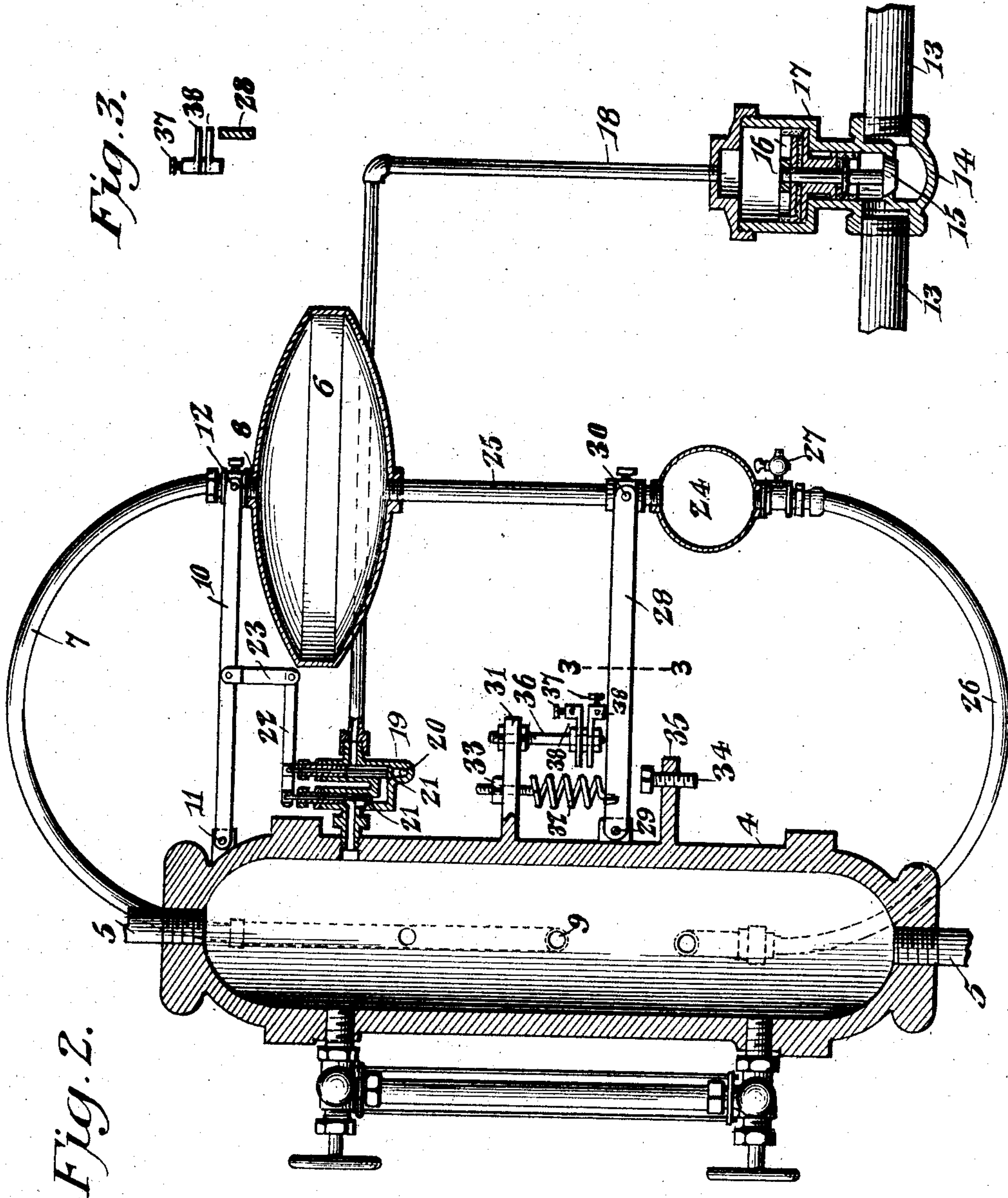
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Witnesses  
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# UNITED STATES PATENT OFFICE.

JOHN F. SENTER, OF CHATTANOOGA, TENNESSEE, ASSIGNOR OF ONE-HALF TO MORGAN LLEWELLYN, MICHAEL G. WEIDNER, AND J. HARRY STREET, OF CHATTANOOGA, TENNESSEE.

## STEAM-BOILER INDICATOR.

No. 876,497.

Specification of Letters Patent.

Patented Jan. 14, 1908.

Application filed July 21, 1906. Serial No. 327,216.

*To all whom it may concern:*

Be it known that I, JOHN F. SENTER, a citizen of the United States, residing at Chattanooga, in the county of Hamilton and State of Tennessee, have invented a new and useful Steam-Boiler Indicator, of which the following is a specification.

This invention relates in a specific sense to means for sounding an alarm, or operating a suitable indicator, when the water in a boiler reaches a predetermined level, said invention, however, being clearly useful in connection with substantially any apparatus when it is advantageous to know when the level of a liquid reaches a predetermined point.

The disclosed embodiment of the invention is a steam boiler indicator, and in the drawings, Figure 1 is a side elevation of the same. Fig. 2 is a vertical longitudinal sectional view therethrough. Fig. 3 is a detail section on the line 3—3 of Fig. 2.

Similar reference numerals designate corresponding parts in all the figures of the drawings.

In the embodiment illustrated, a liquid container is illustrated in the form of a water column casing 4, having the usual upper and lower connections 5, with the steam boiler (not shown). A comparatively large gravity tank 6 is arranged on a level with the upper portion of the casing 4, and a flexible hose 7 has a connection 8 with the top of this tank. The other end of the hose is connected, as shown at 9, with an intermediate portion of the casing 4. An actuating lever 10 is pivoted at one end, as shown at 11, to the upper portion of the casing 4. Its other end is pivoted as shown at 12 to the connection 8.

A portion of a boiler feed pipe is shown at 13, and located in it is a valve casing 14 having a valve 15 therein. This valve is operated by a piston 16 arranged within a cylinder 17 connected to the casing 14. A motive fluid supply pipe 18, connected to the cylinder 17, has its inlet end communicating with the upper portion of the water column 4, and arranged in the pipe 18 contiguous to its inlet end is a valve casing 19, provided with an exhaust 20. Valves 21 controlling the inlet and exhaust are connected to a lever 22, which, in turn, has a link connection 23 with the supporting lever 10. With this construction, when the gravity tank 6

is lowered, the valve 21 controlling the supply of motive fluid is opened while the other valve, controlling the exhaust, will be closed. Thus motive fluid will be admitted to the pipe 18, and, passing through the same, will enter the cylinder 17. As a result, the piston will be forced downwardly, closing the valve 15, and cutting off the supply of water to the boiler. No claims are made to this specific valve actuating mechanism *per se* in the present application, inasmuch as the same constitutes the subject-matter of a co-pending application, Serial No. 327,217.

Arranged below the gravity tank 6 is a smaller and correspondingly movable gravity tank 24, the top of which communicates with the bottom of the tank 6 through an upright conduit 25. The lower portion of the tank 24 has a flexible hose connection 26 with the lower portion of the water column casing 4, and a blow-off cock 27 is preferably located in the connection just beneath the tank 24. A lever 28 is pivoted at one end, as shown at 29, to one side of the casing 4, and its other end has a pivotal connection 30 with the pipe 25, between the tanks 6 and 24. An outstanding arm 31 is arranged over the lever 28, and a spring 32, connected to said lever, has an adjustable connection 33 with the arm. A stop abutment, in the form of a screw 34, is disposed beneath the lever 28, and is carried by another arm 35, projecting from one side of the casing.

Depending from the outer end of the arm 31 is a stem 36, the lower end of which supports a circuit closer, the same comprising suitable yielding arms 37, insulated from each other, and having portions disposed in the path of movement, and above the lever 28. The arms 37 are provided with suitable binding posts 38. A suitable source of electric power 39 has a circuit that includes the arms 37, said circuit also including a suitable indicator, shown in Fig. 1 in the form of a bell 41; but the character of this indicator may be altered as desired.

The operation of the structure under normal conditions is as follows: The lower and smaller tank 24 is disposed below the ordinary level of the water in the boiler, and consequently in the water column 4, so that said tank 24 will be filled with water.



The upper tank 6 is, however, preferably disposed above the normal level of water. As long as this level is below the inlet end 9 of the flexible conduit 7, steam can pass  
 5 freely through said conduit 7, and therefore the tank 6 will be empty. The spring 32 is sufficient to hold the tanks 6 and 24 elevated when the former is empty. Therefore the exhaust 20 of the valve casing 19 will be  
 10 opened, the valve 15 will be opened, and water will be supplied through the pipe 13 to the boiler. As soon as the level rises above the inlet 9 of the flexible conduit 7, the supply of steam to said conduit 7 will  
 15 be cut off, and immediately the steam contained in the tank 6 will condense, causing a partial vacuum, which will be destroyed by the flow of water into said tank. The weight of the water within the tank causes  
 20 the same to overbalance the spring 32, and, as a consequence, the tanks 6 and 24 will be lowered. The result is that the valve 21, controlling the supply of motive fluid to the cylinder 17, will be opened, and the exhaust  
 25 closed, so that steam will force the piston 16 downwardly and close the valve 15, cutting off the feed water. As soon as the level of the water, due to the evaporation in the boiler, falls below the inlet 9, steam will  
 30 again enter the conduit 7, and the water contained in the tank 6 will flow therefrom, causing the opening movement of the valve 15, and turning on the supply of feed water to the boiler. If, however, through  
 35 any cause, the feed mechanism should fail to operate, it will be evident that the evaporation in the boiler will still continue and the level of said water will also continue to lower. In time, therefore, this level will  
 40 be below the horizontal plane of the tank 24, and the water contained therein will gravitate therefrom into the casing 4. A further lightening of the tanks 6 and 24 will result in the further upward movement of the  
 45 same, and this movement beyond the ordinary predetermined movements of the tanks, effects an elevation of the lever 28 sufficient to cause an engagement of the contacts 37, thereby closing the circuit 40, and  
 50 actuating the indicator 41. The operator is thus notified of the approaching dangerous condition of the boiler.

It will be evident that this structure is very simple, and that the alarm or indi-  
 55 cating means is combined in a novel manner with the valve controlling mechanism, so that while dependent to a certain extent thereon, said indicating means is not operated upon the normal movement of the  
 60 valve controlling mechanism, but is operated upon an abnormal movement thereof, the abnormal movement being in turn controlled by the condition of the lower tank 24.

From the foregoing, it is thought that the  
 65 construction, operation, and many advan-

tages of the herein described invention will be apparent to those skilled in the art, without further description, and it will be understood that various changes in the size, shape, proportion, and minor details  
 70 of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

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

1. In mechanism of the class set forth, the combination with a container, of a plurality of movable separate gravity tanks connected to the container, a conduit con-  
 80 necting the tanks separately from their connections with the container, an indicator associated with the tanks, and operating means for the indicator controlled by the movement of said tanks. 85

2. In mechanism of the class set forth, the combination with a container, of a plurality of movable separate gravity tanks of different sizes connected to the container, a conduit connecting the tanks separately  
 90 from their connections with the container, an indicator associated with the tanks, and operating means for the indicator controlled by the movement of said tanks.

3. In mechanism of the class described, 95 the combination with an upper gravity tank, of a lower gravity tank of less size than the upper tank, a conduit connecting the lower portion of the upper tank with the upper portion of the lower tank, means for  
 100 admitting liquid to and discharging it from the tanks, and a signal associated with the tanks and operated upon their movement to a predetermined position.

4. In mechanism of the class set forth, 105 the combination with a fluid container, of a movable gravity tank, flexible hose connections between the upper and lower portions of the tank and the container, a lever pivoted at one end on the container and  
 110 pivotally connected at its other end to the tank, a spring for urging the lever against its downward movement by the tank, and alarm mechanism having portions disposed in the path of movement of the lever. 115

5. In mechanism of the class set forth, the combination with movable gravity tanks disposed at different elevations, of a conduit directly connecting the tanks, and  
 120 an alarm actuated by the tanks on a predetermined movement of the same.

6. In mechanism of the class set forth, the combination with a liquid container, of upper and lower gravity tanks, a connection between them, a connection between the  
 125 upper tank and the container, a connection between the lower tank and the container, an alarm, and an indicator actuated by the tanks on a predetermined movement of the same. 130



7. In mechanism of the class set forth, the combination with a movable gravity tank, of liquid supply controlling means operated upon a predetermined movement of the same, another movable gravity tank movable with the first mentioned tank, a conduit directly connecting the upper portion of one tank with the lower portion of the other, and an indicator associated with the latter tank and operated upon a predetermined movement of the same.

8. In mechanism of the class set forth, the combination with a liquid container, of a movable gravity tank, liquid supply controlling means operated upon a predetermined movement by the tank, another movable gravity tank movable with the first mentioned tank, a connection between the tanks, a flexible connection between each tank and the container, and an indicator associated with the tanks and operated upon a movement of the same beyond said predetermined movement.

9. In mechanism of the class set forth, the combination with a water column casing, of movable gravity tanks disposed one above the other and having connections with the casing, means for circulating liquid from one tank to the other independently of the column casing connections, liquid controlling means associated with the tanks and operated on the discharge of liquid from one, and an indicator associated with the tanks and operated on the discharge of liquid from the other.

10. In mechanism of the class set forth, the combination with a liquid container, of movable gravity tanks disposed one above the other, a conduit connecting the top of

the lower tank to the bottom of the upper tank, a flexible conduit between the top of the upper tank and the container, a flexible conduit between the bottom of the lower tank and the container, and indicating means associated with the tanks and operated upon a predetermined movement of the same.

11. In mechanism of the class set forth, the combination with a water column casing, of an upper gravity tank having a flexible conduit connection with the same, a lower gravity tank having a flexible conduit connection with the column, a conduit connecting the tanks, valve controlling mechanism operated by the tanks upon a predetermined movement thereof, a lever connected to the tank, and an indicating mechanism having a portion disposed in the path of movement of the lever and operated upon the movement of said tanks beyond said predetermined movement.

12. In mechanism of the class described, the combination with a liquid container, of a plurality of connected gravity tanks having connections with such container and movable simultaneously in corresponding directions, valve mechanism associated with the tanks and operated on the discharge of liquid from one, and an indicator associated with the tanks and operated on the discharge of liquid from both.

In testimony, that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

JOHN F. SENTER.

Witnesses:

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F. P. LLEWELLYN.