

March 26, 1940.

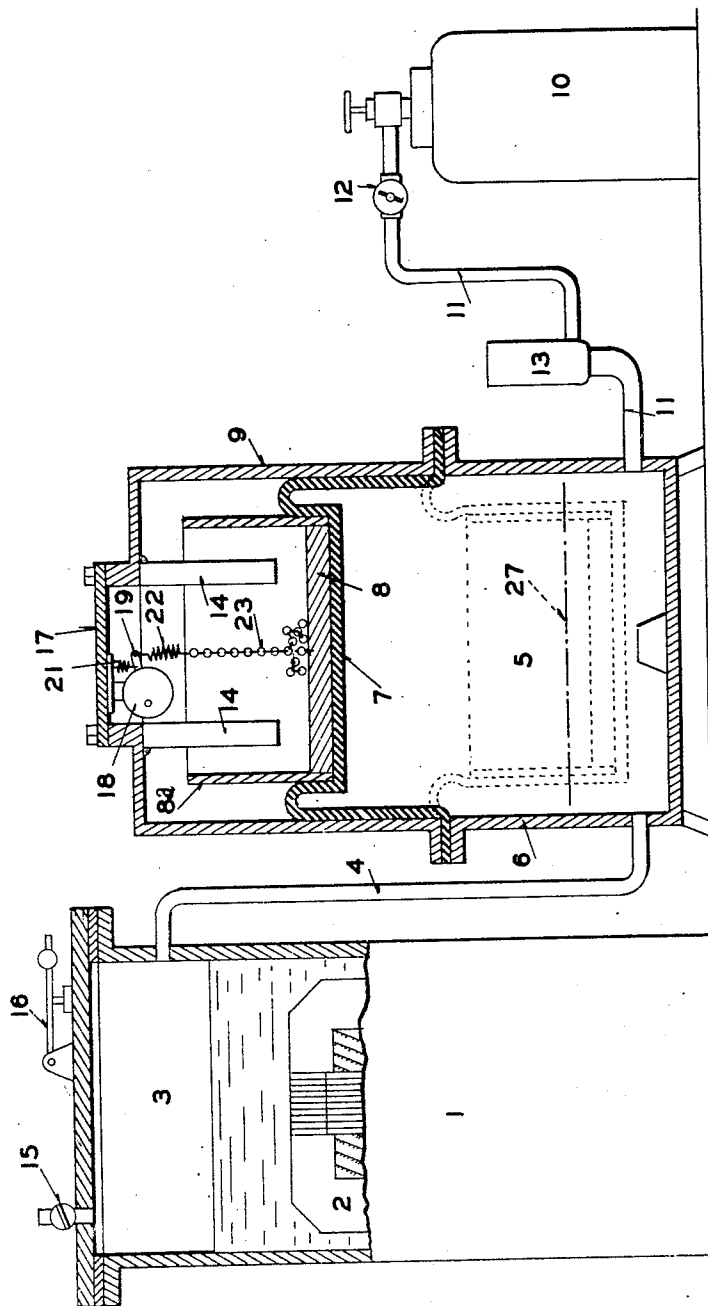
J. S. MALSARY
GASOMETER CONSTRUCTION

2,194,604

Filed June 1, 1937

2 Sheets-Sheet 1

FIG. 1.



INVENTOR.
JAMES S. MALSARY
BY *J. E. Huffman*
ATTORNEY.

March 26, 1940.

J. S. MALSARY
GASOMETER CONSTRUCTION

2,194,604

Filed June 1, 1937

2 Sheets-Sheet 2

FIG. 2.

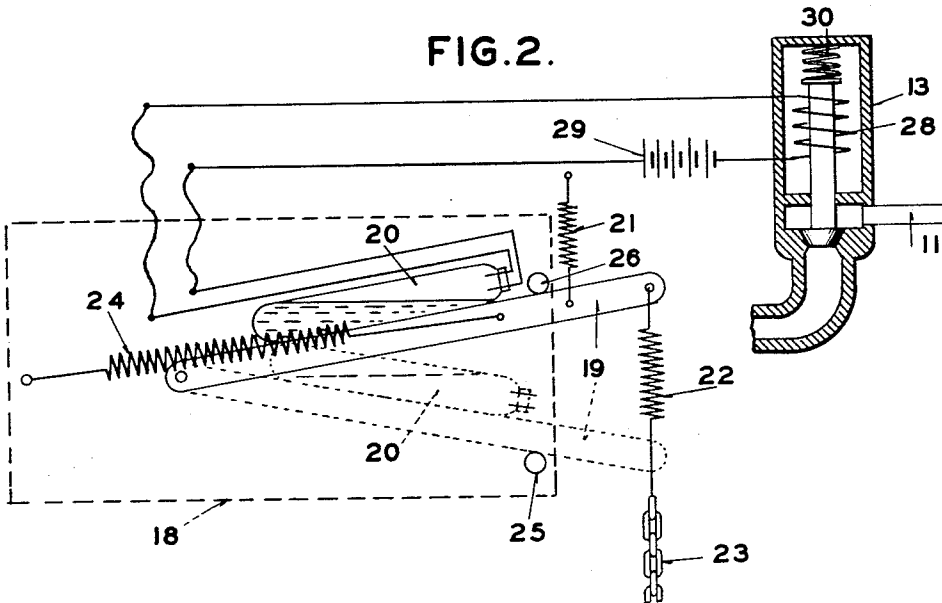
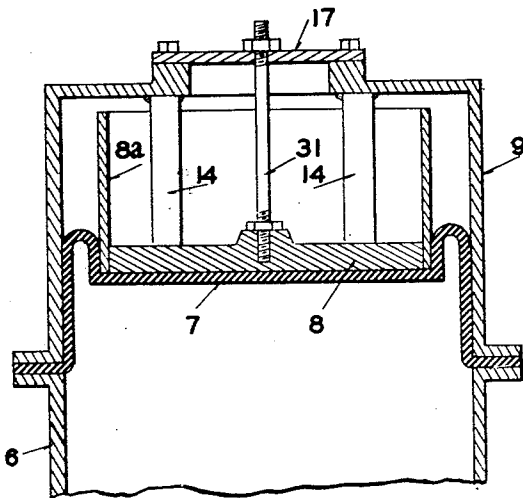


FIG. 3.



INVENTOR.
JAMES S. MALSARY
BY *E. G. Schuyler*
ATTORNEY.

UNITED STATES PATENT OFFICE

2,194,604

GASOMETER CONSTRUCTION

James S. Malsbary, Kirkwood, Mo., assignor to
Wagner Electric Corporation, St. Louis, Mo., a
corporation of Delaware

Application June 1, 1937, Serial No. 145,777

2 Claims. (Cl. 220—85)

My invention relates to apparatus for main-
taining a supply of inert gas in a gas containing
space above the fluid level in "oil-filled" trans-
former tanks and other liquid containing tanks
in which it is desirable that the space above the
liquid should be filled with inert gas (nitrogen
or carbon dioxide, for example) rather than with
air. As herein illustrated, my invention is applied
to a type of gasometer construction, for the pur-
pose indicated, which comprises a gas chamber
formed by a rigid casing portion and a flexible
inflatable bag portion, which bag carries a weight
determining the inert gas pressure which will be
maintained. Gasometers of this type are de-
scribed in the prior application of Hans Weichsel,
Serial No. 144,321, filed May 22, 1937 and it is one
of the special objects of this invention to provide
means which will reduce to a minimum the
amount of inert gas lost during the operation of
a transformer with which such apparatus is asso-
ciated. Other objects of the invention appear
from the following description.

In the accompanying drawings Figure 1 is a
view, partly in section and partly in elevation,
illustrating a gasometer and associated apparatus
embodying my invention; Figure 2 is a diagram-
matic view illustrating my improved control
mechanism for the supply of gas to the gasome-
ter; and Figure 3 is a detail view illustrating
means for protecting the gasometer bag from in-
jury during shipment of the gasometer.

Referring to Figure 1, an oil-filled transformer
is shown which consists of a casing element 1,
a transformer 2 and a body of oil submerging the
transformer, the oil level indicated being as-
sumed to be that existing when the transformer is
in operation under temperature conditions lower
than the highest which may exist. The gas space
3 of the transformer is in communication through
pipe 4 with the gas chamber 5 of the gasometer.
This gas chamber is formed by the rigid casing
element 6 (preferably cylindrical) and a flexible
inflated bag element 7 which may be formed of
synthetic rubber composition such as marketed
under the trade-names "Duprene" and "Thiokol".
The outer upper surface of the bag element 7 car-
ries a weight element 8 having a cylindrical ex-
tension 8a forming a support for the inner sur-
face of the torus portion of the bag element which
lies between this extension and the inner wall of
the top protective casing element 9 throughout
a substantial part of the range of movement of
the weight contacting portion of the bag during
operation. Numeral 10 represents a gas supply
tank containing inert gas under high pressure

which communicates with the gasometer cham-
ber through pipe 11 under control of a known
form of pressure reducing valve 12 and a gas
shut-off valve 13.

The top of the transformer casing is provided
with a purge valve 15 and with a safety valve 16
which limits the pressure which could be devel-
oped in the gas space of the transformer under
any condition of operation. As will be later
brought out, however, the object of my invention
is to normally prevent weight element 8 from
reaching the upward limit of its movement and,
therefore, to prevent the development of any
greater pressure in the transformer gas space
than that determined by the value of the weight
in relation to its area. I do not claim as my in-
vention the construction thus far described, the
same being illustrated in the co-pending appli-
cation of Hans Weichsel heretofore identified.

The top portion of casing 9 is provided with
stop posts 14 welded through and preferably
spaced about 120 degrees apart. These stop posts
limit the upward movement of the bag element,
being in the path of movement of weight 8.

Before referring in detail to the gas supply con-
trol apparatus constituting my invention, refer-
ence may be made to the fact that in the opera-
tion of a transformer change in load or in sur-
rounding temperature conditions will cause a rise
or fall of the oil level in the transformer and,
therefore, a reduction or increase in the volume
of gas containing space 3. However, neither in-
crease nor decrease of this space will change the
gas pressure therein unless the weight element
of the gasometer bag is at the time at one end or
the other of its path of travel. Under other con-
ditions, the weighted portion of the gasometer
bag 8 will either rise or fall, depending upon
whether the gas space in the transformer has in-
creased or diminished or the temperature of the
inert gas has changed, and the pressure will re-
main the same.

The purpose of my control mechanism is to
provide means whereby the weight element of
the bag will not, under normal range of operat-
ing conditions, reach its upward limit of move-
ment and, therefore, whereby there will be no
waste of gas other than that resulting from joint
leaks in the gas space of the gasometer or trans-
former. If, when gas is introduced into the
gasometer from tank 10, it is permitted to
continue to flow in until the weight is brought
against posts 14 before being cut off, subse-
quent increase in transformer temperature might
result in sufficient increase in gas pressure

to open safety valve 16 and permit waste of gas. My improved control mechanism for avoiding this condition will now be described.

To the cover 17 or to the upper part of the top casing element of the gasometer, is attached a switch control mechanism indicated in outline at 18 in Figure 1, said switch mechanism being for the purpose of controlling the circuits by means of which gas supply valve 13 is operated. These circuits are illustrated in Figure 2.

The switch mechanism referred to comprises an arm 19 carrying a mercury switch 20. Spring 21 tends to hold the arm in its top position against stop 26, as indicated in full lines in Figure 2. One end of spring 22 is attached to arm 19 and the other end to a chain 23 of suitable length which is connected to weight 8 of the gasometer. A spring 24 is also provided, one end of which is connected to arm 19 and the other to a fixed point so located, as indicated in Figure 2, that it tends to snap the switch arm 19 downward against stop 25 after the arm has been brought past horizontal position by tension on chain 23 and spring 22 under the conditions to be hereafter mentioned.

Referring to operation of the control apparatus just described, the length of chain 23 and spring 22 is so chosen that when, due to fall in temperature of the transformer or to leak of gas, the weight element 8 reaches a predetermined position, such for example, as indicated by the dotted line 27 in Figure 1, switch arm 19 will have been brought below horizontal whereupon spring 24 will snap the arm to the position shown in dotted lines in Figure 2. As shown in full lines in this figure, the mercury of switch 20 does not connect the contacts to close the circuit by means of which solenoid 28 is energized through a battery or other source of current 29, but when the switch arm is in the dotted line position, these contacts are connected by the mercury and the solenoid opens gas supply valve 13 permitting gas to flow into the gasometer chamber through pipe 11 from tank 10. When the gasometer weight has risen to a point where tension on spring 22 is sufficiently reduced, spring 21 returns the switch arm to the full line position whereupon solenoid 28 is deenergized and spring 30 closes valve 13. The relation is so chosen that the action just described occurs when the gasometer weight has risen to approximately the position indicated in full lines in Figure 1, and, consequently, even though there is considerable rise in temperature of the transformer above that existing at the time the gas supply valve is closed, the weight will not be brought to the upper limit of its movement against stops 14 and, therefore, no excess pressure will be built up which might result in opening safety valve 16 and discharging gas to the atmosphere.

It is to be observed that by the employment of my invention the gasometer apparatus can be designed to automatically admit gas from the gas storage tank if only a small loss has occurred and to supply only a small quantity at a time. Therefore, the apparatus can be extremely economical in operation since no inert gas would be lost except to the extent of gas leaks which may

be permitted to continue through neglect, and also the size of the gasometer can be much smaller than if gas is admitted and cut off only at limits of possible movement of the weight.

Since the inflatable bag employed in the apparatus of the character described is of light material which could be damaged by a heavy weight 8 during shipment of the apparatus if said weight were permitted to move, means must be provided to secure this weight in position at this time and this is facilitated by the provision of stop posts 14 whereby during shipment rod 31 can be applied which is threaded at one end into the weight, the upper end is secured to the top casing of the apparatus as shown in Figure 3, and the weight is clamped firmly against the ends of the stop posts.

Being aware of the possibility of modifications in the particular structure herein described without departing from the fundamental principles of my invention, I do not intend that its scope be limited except as set forth by the appended claims.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In gasometer apparatus comprising a gas chamber provided with a wall part movable to vary the volume of the chamber, a source of gas under pressure connected to said chamber and a gas shut-off valve in said connection, control means for said valve comprising an electric circuit and a switch element for opening and closing said circuit, said switch element being biased to open position by a spring and also connected by spring means to the movable part of the gas chamber, said second spring being proportioned to overcome the biasing spring and move the switch arm toward closed position upon movement of the chamber wall to a predetermined position, and means effective when the switch arm has been moved a predetermined distance from open position to cause said arm to snap to switch-closed position.

2. A gasometer apparatus for the purpose described comprising a gas-tight container having a portion of its wall formed of flexible material, a weight element supported by said wall, means limiting the upward movement of said weight element, a gas supply source connected to said container, a gas shut-off valve for said connection, a control element for said valve, a spring tending to maintain said control element in open position, a second spring stronger than said first mentioned spring and connected to said control element and to the weight for moving said element toward closed position when the weight by its downward movement applies sufficient force to said second mentioned spring to overcome the resistance of the first mentioned spring, and a third spring element acting in cooperation with the second spring and against the first spring when the control element has been moved to a predetermined position from open position and functioning to quickly bring the control element to closed position.

JAMES S. MALSBARY.