

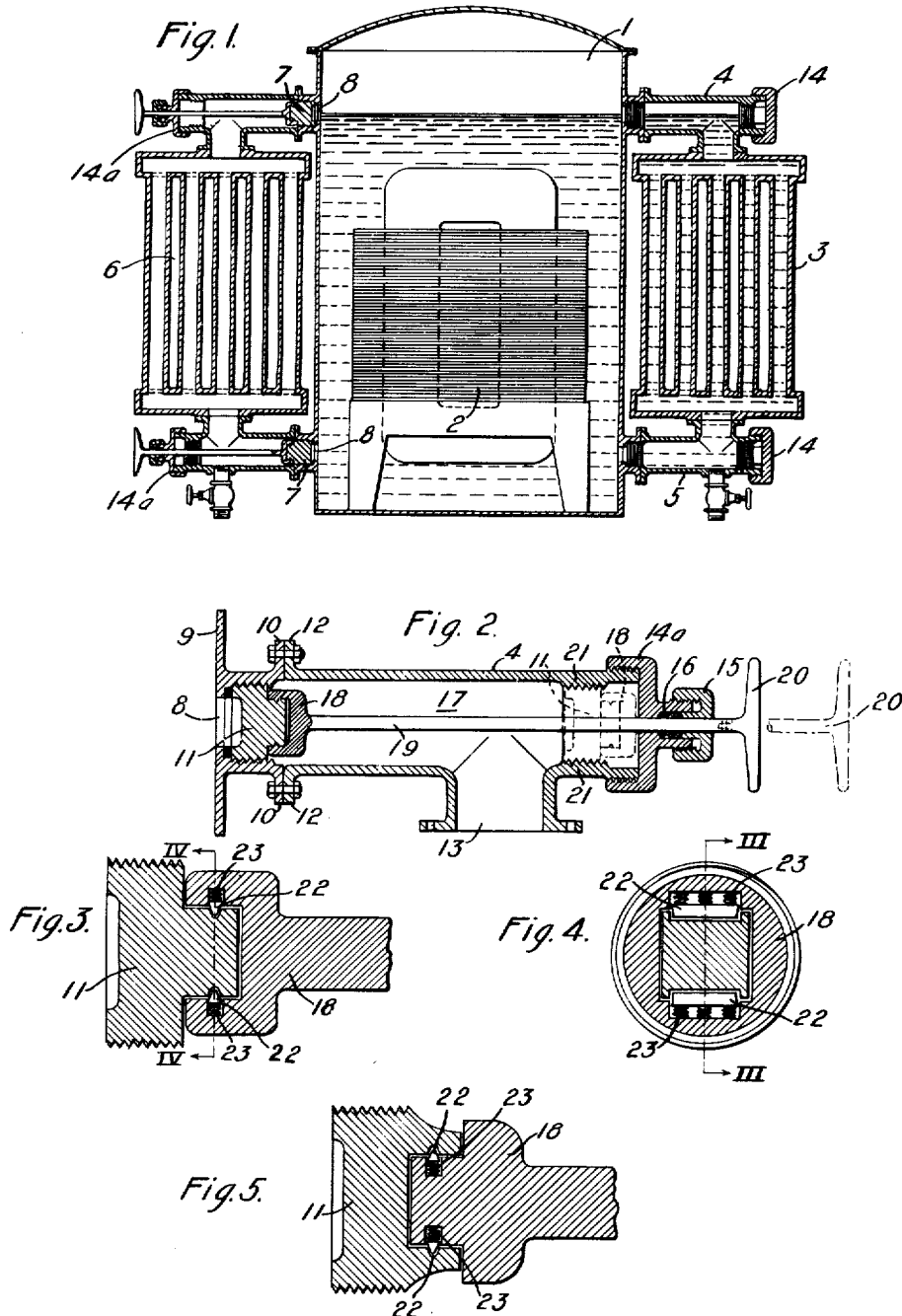
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C. G. JONES

DETACHABLE TRANSFORMER RADIATOR

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WITNESSES:
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Patented June 26, 1923.

1,460,135

UNITED STATES PATENT OFFICE.

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DETACHABLE TRANSFORMER RADIATOR.

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To all whom it may concern:

Be it known that I, CARL G. JONES, a citizen of the United States, and a resident of Wilksburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Detachable Transformer Radiators, of which the following is a specification.

My invention relates to means for, and methods of, applying detachable radiators to tanks in which an electrical device is positioned and in which an insulating fluid circulates about the electrical device and through the radiators for the purpose of cooling the apparatus.

When the insulating fluid contained in a tank or reservoir becomes heated it tends to rise, and, by attaching to the tank or reservoir a radiator which has openings at the top and bottom, it is possible to cause the fluid to pass through the radiator from top to bottom and thereby become more effectively cooled than would be the case if the radiating surface of the tank alone were depended upon.

Therefore, it is the usual custom to supply all transformer tanks, in which apparatus of the oil-insulated type is to be positioned, with one or more radiators having a comparatively large radiating surface. Radiators of the character designated occupy a great deal of space in a transverse direction and, therefore, limit to a great degree the size of tank which may be shipped with the radiators in place. Therefore, when the tanks reach such size that the addition of the radiators thereto for shipping purposes would bring the total volume of the apparatus beyond the limits imposed by car sizes, bridge clearances and other shipping considerations, it is necessary to ship the radiators separately.

It is obvious that such separate shipping of the tank and its radiators precludes the possibility of the tank and radiators being filled with the insulating fluid before shipment. This is a distinct inconvenience, since the fluid must be shipped separately and, in transformer tanks of large sizes, and such separate shipment of the fluid requires considerable containing space.

An alternative method of shipping requires the filling of the tank with insulating fluid after caps have been placed over the openings to which the transformer ra-

diators are to be attached. By this method, approximately three-fourths of the insulating fluid may be shipped in the tank and the remainder be placed in barrels and shipped separately. However, when the point of installation is reached, it is obvious that, to attach the radiators to the transformer tank, it is necessary that all of the fluid contained therein be drained. This entails considerable expense since containing means to hold the fluid which normally fills the transformer tank must be of considerable size, and, moreover, means must be provided for draining the tank, placing the radiators in position and thereafter replacing the insulating fluid in the tank from the top, unless some more or less expensive method, such as siphoning, etc., be adopted.

If, at any time during the operation of the transformer, one or more of the radiators become faulty, that is, develops a leak, clogs, or otherwise, it is necessary to drain the entire apparatus before even one of the radiator structures may be detached and repaired. It is obvious that such considerations as given above limit, to a great extent, the flexibility of repair of transforming apparatus of the character described.

Moreover, it is very desirable to ship the transformer with the insulating fluid in place since there otherwise is great danger of the windings becoming saturated with moisture and subsequently developing serious faults.

One object of my invention is, therefore, to provide means whereby the transforming apparatus may be placed in its tank and shipped surrounded by oil, and, for this purpose, I provide novel closure means for closing the openings to which the radiators are to be attached.

When the point of installation is reached, my improved means of attachment further admit of the attachment of the radiators to the tank, the withdrawal of the closure means, and the subsequent filling of the radiators with the insulating fluid in the manner desired for operating conditions.

Again, my detaching means admit of the detachment of any radiator in which a fault may develop, even though the same be filled with fluid, that is, they provide means whereby any one radiator may be detached from the tank, and at the same time, the openings from which the radiator is sepa-

rated may be closed in the same manner that they were closed during the initial shipment of the tank filled with insulating fluid.

Other obvious advantages of my detaching means and the method of operating the same in connection with transformer radiators will appear to those skilled in the art, in the following description of the structure and the operation thereof.

For a better understanding of my invention, reference may be had to the accompanying drawing in which:

Fig. 1 is a sectional elevational view of a transformer and a containing tank filled with insulating fluid and having auxiliary cooling means, such as radiators, attached thereto; Fig. 2 is a detail sectional view of the top header of one of the radiators embodying my detaching and attaching means, the operating means being shown in two extreme positions; Fig. 3 is a detail sectional view taken on line III—III of Fig. 4 and illustrating in detail, the engaging portion of my closure operating means; Fig. 4 is a sectional view of the structure shown in Fig. 3 and taken on the line IV—IV thereof; and Fig. 5 is a sectional view showing an alternative form of closure means and operating means.

Referring more particularly to Fig. 1, a tank 1 containing an electrical device 2 and filled with fluid for insulating and cooling said electrical device, is shown. To the right of the tank 1 is shown a radiator member 3 of usual construction, with the exception of a novel form of headers 4 and 5. It will be observed that the radiator 3 is shown as filled with insulating fluid; that is, it is in communication with the main tank 1.

At the left-hand side of the tank 1 is shown a radiator 6 but, in this latter case, the radiator is not filled with insulating fluid because the tank 1, while being mechanically connected with the radiator 6, is still closed by closure means 7 which are seated within the openings 8 registering with similar openings in the radiator structure.

The top header 4 of either of the radiators 3 and 6 is shown in detail in Fig. 2. A wall portion 9 of the tank 1 is shown as provided with the opening 8, the metal around this opening being flanged at 10 and provided with interior screw threads for the purpose of receiving a threaded member 11. The threaded member 11 comprises a closure member for the opening 8 and, when engaging properly, the screw thread with which the opening is provided forms a fluid-tight closure for the tank 1.

The header 4 is likewise provided with a flanged member 12 which is adapted to so engage the tank-wall flanged member 10 that registry is established between the openings in the tank and in the radiator. The flanged portion 13 of the header 4 provides a path

for the fluid to enter the radiating pipes of the radiator. At the opposite end of the header member 4 from the flanged member 12, threads are provided upon which a pipe-cap member 14 or an auxiliary perforated cap member 14a may be secured, and it will be observed that, by the positioning of the member 14, the header 4 is closed and made fluid-tight. It will be understood that all of the radiators are provided with the cap members 14, which are used at all times other than those during which the radiators are being attached to, and detached from, the tank; while the special cap member 14a, which is illustrated in Fig. 2, is used in conjunction with an auxiliary member 15 and a packing 16 for purposes to be hereinafter described.

It will be observed that both the cap member 14a and the auxiliary member 15 are apertured to permit the passage therethrough of a closure-operating means 17, comprising an engaging socket member 18, a longitudinally extending connecting rod 19 and a detachable operating handle 20, the handle 20 being made detachable in order that it may be removed from the members 18 and 19, whereby the closure operating means may be disengaged from the members 14a, 15 and 16. The interior portion of the header 4, which is adjacent to the opening over which the cap members 14 and 14a are placed, is threaded at 21 to receive the member 11.

The view shown in the full lines in this figure represents the condition obtaining in the transformer structure after the radiator member has been attached by means of the flanged members 10 and 12 to the tank, the tank 1 being filled with fluid, and after the closure-operating means 17 has been passed through the radiator header and has engaged the closure means 11, the operation of all of which will be described more in detail hereinafter. The broken lines, on the other hand, represent the positions of the various elements after the closure means 11 has been unscrewed, withdrawn to the opposite end of the radiator header 4 and there secured, the closure-operating means 17 having not as yet been withdrawn entirely from the associated structure of the radiator header.

Figs. 3 and 4 will be considered together as showing the detailed structure of what I now consider the preferred form of the engaging member 18 of the closure-operating means 17. It is desirable that the member 18 shall be of such size and shape that it may pass through a pipe having a diameter no greater than its own diameter and, while within said pipe, may engage the protruding portion of a member which it is desired to withdraw against pressure. It is obvious, therefore, that means must be provided, in conjunction with the member 18, which will admit of its passage through a pipe having a

diameter no greater than its own and, at the same time, allow it to pass over and engage a protruding member having a diameter commensurate with the diameter of socket existing in the member 18. To attain this end, I have provided the member 18 with resilient gripping means 22 which, in the form of device shown in Figs. 3 and 4, are actuated by spring members 23—23.

In Fig. 5 I have shown an alternative construction of the closure means which may be used, and have also shown closure-operating means adapted to co-act therewith to position, in the desired manner, a closure means of this type.

Having described a transformer and radiator tank connected in accordance with my invention, the manner of attaching the radiator member to, and detaching it from, the main tank will now be described.

Assume that the main transformer tank 1, containing the electrical device 2 and filled with the maximum quantity of insulating fluid, has been shipped to the point of installation separately from the required number of radiator elements. Moreover, it should be remembered that, in order to so convey the tank 1 filled with oil, it has been necessary to close each of the openings, which are adapted to register with the radiator openings, by the closure means 11.

The radiator element 3 is attached to the tank 1 by means of flanges 10 and 12 in a well known manner. For purposes of convenience, the cap member 14 is usually in position when the radiators are shipped, and this member, therefore is first removed. The auxiliary pipe cap 14a, as well as the packing members 15 and 16, are usually in place on the closure operating means 17, since only under special circumstances is it necessary to withdraw the rod 19 through the apertures in the members 14a, 15 and 16 by removing detachable handle 20. In other words, the entire operating mechanism which is used for removing the closure means may be readily carried from place to place and used in an integral form.

The standard cap piece 14 having been removed, the entire closure-operating mechanism is brought to juxtaposition with the header 4, the gripping member 18 is passed through the header, and, finally, the auxiliary cap piece 14a is screwed tightly into position upon the open end of the header, this last operation insuring the existence of a fluid-tight closure for the top header of the radiator. The engaging portion 18 is now pushed forward until the socket portion thereof engages the protruding portion of the member 11, as far as the resilient gripping means 22. A sharp blow will now drive the member 18 completely over the protruding portion of the member 11, and the resilient means will be seated in the re-

cesses provided for this purpose in the protruding portion of the member 11. The socket of the member 18 and the coacting protruding portion of the member 11 being polygonal in form, rotation of the handle member 20 will result in the member 11 being disengaged from the threaded portion of the opening 8 and immediately, the fluid which fills the tank 1 will flow into the header 4 and the remainder of the radiator structure 3. Therefore, the closure member 11 must be withdrawn from the opening 8 against fluid pressure. The member 17, which is now engaging the closure means 11, is drawn through the aperture in the cap 14 until the threads of the member 11 engage those at 21. By rotation of the member 17, the closure member 11 is then firmly secured at 21 to preclude the flow of fluid through the opening over which the member 14 is placed. Since the next step in the operation is to unscrew the member 14a and since the closure means 11 and the operating means 17 are now in the position indicated by the dotted lines, it will be a simple matter to disengage the member 18 from the protruding portion of the closure means 11. The auxiliary cap member 14a and the associated closure operating means is then removed and the permanent solid cap member 14 placed in position, as shown at the right-hand side of Fig. 1.

From the foregoing, it is obvious that I have provided means whereby the closure means 11 are withdrawn and, after fluid communication is established between the radiator and main transformer tank, are thereafter employed to close the opening at the right-hand end of the header of a radiator member. Since the closure-operating means 17 is applicable to the closure members in all of the openings, this device may be used to attach all of the radiators to the transformer tank, in the manner hereinbefore described in connection with the header illustrated.

As further set forth, my radiator-detaching means are also employed to detach any radiator in which a fault may develop from the transformer tank and, at the same time, allow the latter to operate under normal conditions. To do this without draining any of the fluid with which the tank and the associated radiators are filled, the following operation is pursued.

The fluid communication between the main tank and either the top or bottom of the radiator may be interrupted, if desired, and, for purposes of convenience, I will illustrate such interruption as being performed in the top header of the radiator illustrated in Fig. 2.

The pipe-cap member 14 is first removed and a fluid tight closure is still present on account of the member 11 being seated in

the threads 21. The engaging portion 18 of the device 17 is then pressed over the protruding portion of the closure means 11 which, when the radiator is filled with oil and operating under normal conditions, is secured in the threads at the right-hand end of the header, as shown. The member 14a and the packing-gland sections 15 and 16 are then screwed into place, whereby a fluid-tight cap is placed over the opening at the right-hand of the header. By rotation of the handle 20, the member 11 is now unscrewed from the threads at 21, pushed through the header and screwed into position in the opening 8. In like manner, the bottom header of the particular radiator which is being detached is separated from fluid communication with the tank.

At this point in the detaching operation, the radiator has no fluid communication with the main tank, although it is mechanically attached thereto. The drains in the bottom of the radiator may now be opened and the small quantity of oil contained in the radiator be withdrawn. It is apparent, therefore, that I have been able to detach an affected radiator from the tank for purposes of repair without having the radiator or the tank in any way supplied with gate valves or other expensive auxiliary apparatus. The association of valves and other projecting attaching apparatus is especially undesirable if it is desired to ship a transformer tank filled with oil a long distance, for the reason that such valves will be easily broken off in transit or bent in such way that they will not register correctly with the radiators intended for the tank.

The foregoing description has been directed principally to fluid-containing vessels in which electrical devices are positioned and to which auxiliary fluid-containing vessels, such as radiators, are attached. It is obvious, however, that my invention is broad enough to cover the attachment and detachment of any two fluid-containing vessels, wherein it is desired to attach or detach one vessel to or from another while the one or the other is filled, or while both vessels are filled with liquid. Such flexibility of attachment and detachment may prove especially desirable when it is necessary to ship a large vessel filled with fluid and thereafter attach it to another vessel without emptying, and when this operation must be performed without the interposition of valves, etc.

While I have described one embodiment of my invention, it is obvious that other detaching and attaching means may occur to those skilled in the art to be used in a manner analagous to those above described and, therefore, I desire that my invention be construed as broadly as is permitted by the prior art. Moreover, I believe that the de-

vice with which I operate the closure means is novel in its arrangement of the resilient engaging members, and I desire this device also to be construed as broadly as possible.

I claim as my invention:

1. A transformer tank and a detachable radiator therefor, said radiator having a plurality of openings in alinement with an opening in said tank, closure means for the opening in said tank and means operable when said tank and said radiator are operatively connected to remove said closure into said radiator for closing one of the openings therein.

2. A transformer tank having an opening therein, a radiator adapted to be attached thereto and having an opening adapted to register with the opening in the tank and to be in fluid communication therewith, closure means for said openings, and means whereby said closure means may be removed and fluid communication established between said tank and radiator after a fluid-tight connection has been made therebetween.

3. A main fluid-containing vessel having threaded openings therein, an auxiliary vessel adapted to be attached thereto and to be in fluid communication therewith, closure means adapted to engage with said threaded openings, and means whereby said closure means may be removed and fluid communication established between said vessels after a fluid-tight connection has been made therebetween.

4. A main fluid-containing vessel having threaded openings therein, an auxiliary vessel with openings therein adapted to be attached thereto and to be in fluid communication therewith, closure means between said vessels, the openings in said auxiliary vessel being adapted to register with said main vessel openings, means for removing said closure means and withdrawing the same through said auxiliary vessel openings whereby fluid communication is established between said vessels, and means disposed in said auxiliary vessel whereby said closure means may be secured after its withdrawal from said main vessel.

5. A main fluid-containing vessel having openings therein, an auxiliary vessel with openings therein which are adapted to register with said main vessel openings and which is adapted to be attached thereto, and to be in fluid communication therewith, closure means for said main vessel openings, means for removing said closure means, and means associated with said auxiliary vessel whereby said closure means may be secured after their removal from said main vessel openings.

6. A main fluid-containing vessel having openings therein, an auxiliary vessel with openings therein adapted to register with

said main vessel openings, and which is adapted to be attached thereto, and to be in fluid communication therewith, closure means for said main vessel openings, means for removing said closure means, fluid-tight means permitting the passage of said closure removing means into said auxiliary vessel while the same contains fluid, and means associated with said auxiliary vessel whereby said closure means may be secured after their removal from said main vessel openings.

7. A main fluid-containing vessel having openings therein, an auxiliary vessel having openings therein adapted to register with said main vessel openings, and which is adapted to be attached thereto, and to be in fluid communication therewith, closure means for said main vessel openings, means for removing said closure means, removable fluid-tight means permitting the passage of said closure removing means into said auxiliary vessel while the same contains fluid, said closure removing means passing through said fluid-tight means whereby said closure means may be removed from said main vessel while said auxiliary vessel is filled with fluid and whereby said closure removing means is thereafter withdrawn without any of the fluid in said vessel being lost, and means associated with said auxiliary vessel whereby said closure means may be secured after their removal from said main vessel openings.

8. A main fluid-containing vessel having openings therein, an auxiliary vessel having openings therein adapted to register with said main vessel openings, and which is adapted to be attached thereto, and to be in fluid communication therewith, closure means for said main vessel openings, means for removing said closure means, removable fluid-tight means permitting the passage of said closure removing means into said auxiliary vessel while the same contains fluid, said closure removing means passing through said fluid-tight means whereby said closure means may be removed from said main vessel while said auxiliary vessel is filled with fluid, and whereby said closure removing means is thereafter withdrawn without any of the fluid in said vessel being lost.

9. A main fluid-containing vessel having openings therein, an auxiliary vessel having openings therein adapted to register with said first openings, and which is adapted to be attached thereto, and to be in fluid communication therewith, closure means for said main vessel openings, means for removing said closure means, means comprising a removable cap having a fluid-tight opening therein through which said closure-removing means may operate while both vessels contain fluid, said closure-removing means passing through said fluid-tight means whereby

said closure means may be removed from said main vessel, while said auxiliary vessel is filled with fluid, and whereby said closure-removing means is thereafter withdrawn without any of the fluid in said vessel being lost, and means associated with said auxiliary vessel whereby said closure means may be secured after their removal from said main vessel openings.

10. A main fluid-containing vessel having openings therein, an auxiliary vessel having openings therein adapted to register with said first openings, and adapted to be attached thereto, and to be in fluid communication therewith, closure means for said main vessel openings secured in said auxiliary vessel, and closure operating means whereby said closure means may close said main vessel openings while both of said vessels are filled with fluid.

11. A main fluid-containing vessel having openings therein, an auxiliary vessel having openings therein adapted to register with said main vessel openings, which is adapted to be attached thereto, and to be in fluid communication therewith, closure means for said main vessel openings secured in said auxiliary vessel, closure operating means, and means whereby said closure operating means may engage said closure means and thereafter position the same in said main vessel openings while both of said vessels are filled with fluid.

12. A main fluid-containing vessel having openings therein, an auxiliary vessel having openings therein adapted to register with said first openings, which is adapted to be attached thereto, and to be in fluid communication therewith, openings in said main vessel, closure means for said main vessel openings secured in said auxiliary vessel, closure operating means, means permitting said closure operating means to engage said closure means and thereafter position the same in said main vessel openings while both of said vessels are filled with fluid, and means whereby said closure operating means may be entirely dissociated from said last named means.

13. A main fluid-containing vessel having openings therein, an auxiliary vessel having openings therein adapted to register with said main vessel openings, which is adapted to be attached thereto, and in fluid communication therewith, openings in said main vessel, closure means for said main vessel openings, means in said auxiliary vessel adapted to receive said closure means, and means adapted to engage said closure means, remove them from said main vessel, and thereafter secure them in said closure receiving means in said auxiliary vessel whereby fluid communication is established between said vessels after they have been mechanically connected and are fluid-tight.

14. A main fluid-containing vessel having openings therein, an auxiliary vessel having openings therein adapted to register with said first openings, which is adapted to be attached thereto, and in fluid communication therewith, openings in said main vessel, closure means for said main vessel openings, means in said auxiliary vessel adapted to receive said closure means, and means adapted to engage said closure means, remove them from their seat in said auxiliary vessel, and thereafter effect a closure of the openings in said first vessel, all while both of said vessels are filled with fluid.

15. A main fluid-containing vessel having openings therein, an auxiliary vessel having openings therein adapted to register with said first openings, which is adapted to be attached thereto, and in fluid communication therewith, openings in said main vessel, closure means for said main vessel openings, means in said auxiliary vessel adapted to receive said closure means, means adapted to engage said closure means, remove them from their seat in said auxiliary vessel, and thereafter effect a closure of the openings in said first vessel, and means permitting said engagement, removal, and first-opening closure while both of said vessels are filled with fluid.

16. A main fluid-containing vessel having openings therein, an auxiliary vessel having openings therein adapted to register with said main vessel openings, which is adapted to be attached thereto, and to be in fluid communication therewith, closure means for said main vessel openings, operating means for said closure means comprising a socket member, and means associated with said socket member whereby said closure means may be withdrawn longitudinally against fluid pressure.

17. A main fluid-containing vessel having openings therein, an auxiliary vessel having openings therein said auxiliary vessel adapted to register with said main vessel openings, which is adapted to be attached thereto, and to be in fluid communication therewith, closure means for said main vessel openings, operating means for said closure means comprising a socket member, and resilient means associated with said socket member whereby said closure means may be withdrawn longitudinally against fluid pressure.

18. A main fluid-containing vessel, an auxiliary vessel having openings therein, adapted to register with said main vessel openings, which is adapted to be attached thereto, and to be in fluid communication therewith, means associated with said auxiliary vessel permitting the operation of said closure operating means while said auxiliary vessel is filled with fluid, said closure operating means comprising a socket member, resilient means associated with said

socket member whereby said closure means may be withdrawn against fluid pressure, and an operating member extending through said operation-permitting means, whereby said closure means may be operated from the exterior of said vessels while the same are filled with fluid.

19. A main fluid-containing vessel having openings therein, an auxiliary vessel having openings therein adapted to register with said first openings, which is adapted to be attached thereto, and to be in fluid communication therewith, means associated with said auxiliary vessel permitting the operation of said closure operating means while said auxiliary vessel is filled with fluid, said closure operating means comprising a socket member, resilient means associated with said socket member whereby said closure means may be withdrawn against fluid pressure and an operating member extending through said operation-permitting means, whereby said closure means may be operated from the exterior of said vessels while the same are filled with fluid, and whereby said operating means may be withdrawn from said auxiliary vessel and thereafter caused to operate another closure means in a separate set of liquid-containing vessels.

20. A main fluid-containing vessel having openings therein, an auxiliary vessel having threaded openings therein adapted to register with said main vessel openings, which is adapted to be attached thereto, and to be in fluid communication therewith, threaded closure means for said main vessel openings adapted for socket engagement and operation, closure operating means comprising a complementary member for said socket arrangement and being provided with resilient means whereby said closure means may be engaged and, after disengagement from said threaded openings, withdrawn against fluid pressure.

21. A main fluid-containing vessel, an auxiliary vessel adapted to receive said therein adapted to register with said first openings, which is adapted to be attached thereto, and to be in fluid communication therewith, threaded closure means for said first openings adapted for socket engagement and operation, threaded means in said auxiliary vessel adapted to receive said closure means, closure operating means comprising a complementary member for said socket arrangement and being provided with resilient means whereby said closure means may be engaged and, after disengagement from said threaded openings, withdrawn against fluid pressure, and secured in said threaded means in said auxiliary vessel.

In testimony whereof, I have hereunto subscribed my name this 31st day of Dec., 1918.

CARL G. JONES.

Certificate of Correction.

It is hereby certified that in Letters Patent No. 1,460,135, granted June 26, 1923, upon the application of Carl G. Jones, of Wilkinsburg, Pennsylvania, for an improvement in "Detachable Transformer Radiators," an error appears in the printed specification requiring correction as follows: Page 6, line 111, claim 21, strike out the words "adapted to receive said" and insert instead *having threaded openings*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 23d day of October, A. D., 1923.

[SEAL.]

WM. A. KINNAN,
Acting Commissioner of Patents.