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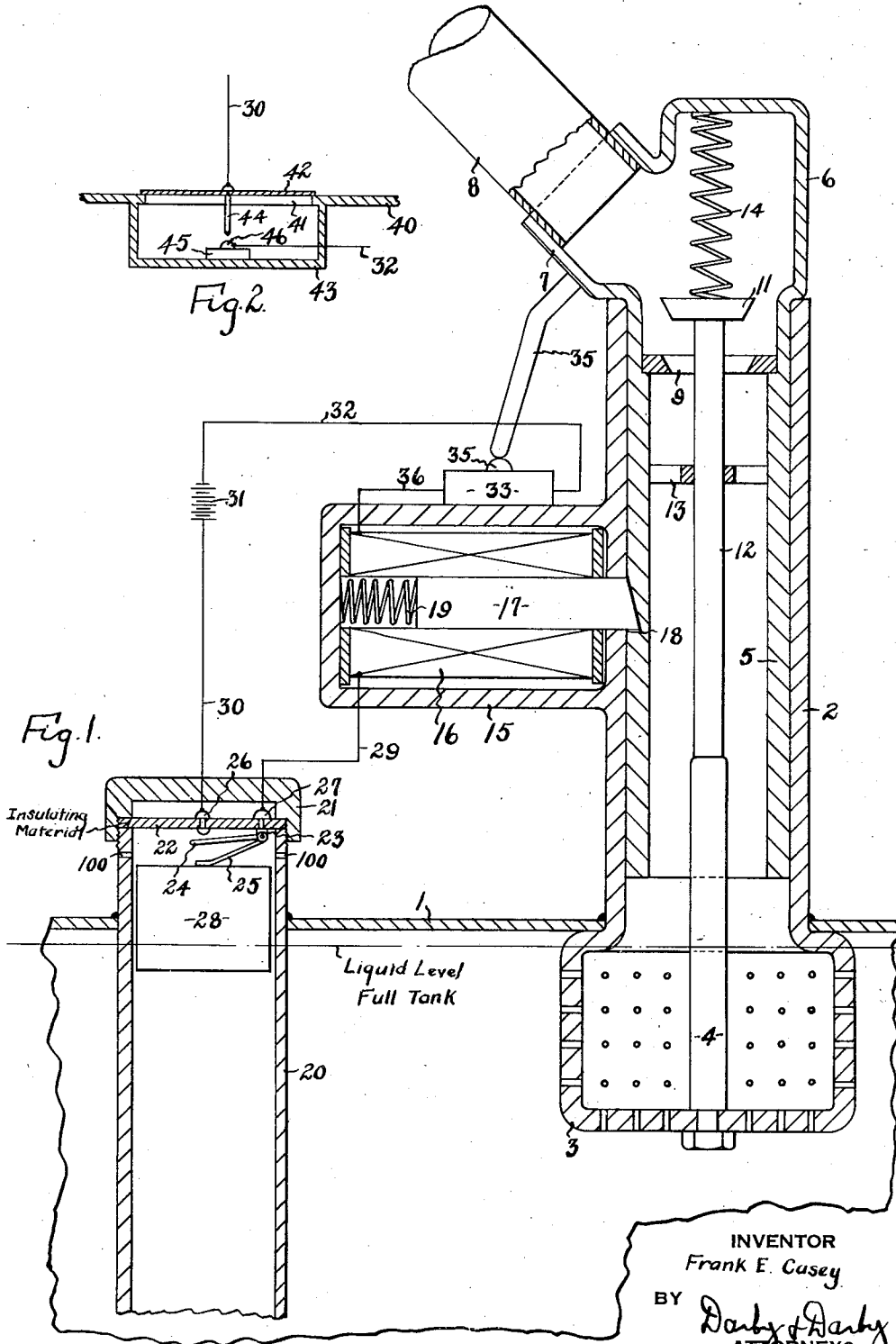
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FUEL TANK FILLING AND PROTECTING DEVICE

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FUEL TANK FILLING AND PROTECTING DEVICE

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This invention relates to improvements in the construction of fuel tanks by means of which the tank may be filled without overflowing it and stealing of fuel from the tank is prevented.

The invention also relates to improvements in discharge nozzles for fuel pumps by means of which the unauthorized withdrawal of fuel from the pump is prevented.

More specifically, the invention consists of apparatus preferably formed as a unitary structure with a fuel tank by means of which it is possible to fill the tank to a predetermined level without overflowing the tank and automatically cutting off the supply of fuel to the tank when it is filled to the predetermined level.

This apparatus is so constructed that it prevents stealing of fuel from a tank.

In conjunction with the invention a novel form of filling spout is employed connected to the delivery hose of the fuel source constructed so that, except when used in conjunction with the improved tank structure, it is practically impossible to discharge fuel through the spout.

These and many other objects, as will appear from the following disclosure, are secured by means of this invention.

This invention resides substantially in the combination, construction, arrangement, and relative location of parts, all as will be described in greater detail in the following specification and set forth in the appended claims.

Referring to the drawings—

Figure 1 is a cross-sectional view through the entire apparatus of this invention showing the spout in position to fill the tank and showing the circuit connections involved;

Figure 2 is an enlarged cross-sectional view through a modified portion of the apparatus.

Fig. 3 is a vertical cross-sectional view through a modified form of device showing the locking means mounted on the filling spout; and

Fig. 4 is a vertical cross-sectional view

through a modified form of float operated switch.

In the operation of vehicles driven by internal combustion engines which are operated by liquid fuel, such as gasoline, there are several sources of loss and wastage of fuel due to carelessness and pilfering. These losses are incident to the operation of all automobiles, but are particularly prevalent in connection with the operation of motor coaches where one of the biggest items of operating expense is that absorbed by the fuel.

In connection with all automobiles, one source, of loss of fuel due to carelessness is that arising from the fact that in filling the fuel tank it is often overflowed so that a sizable quantity of fuel is lost. Another source of loss is that due to the unauthorized withdrawal of fuel from the tank by siphoning it out. In addition, a further source of loss is encountered, particularly in connection with the operation of motor coaches and buses by large companies, where the employees of the company often fill their private cars at the expense of the company from the company's fuel pumps.

The general object of this invention is to prevent and completely eliminate loss of fuel from all of these sources. It is, of course, apparent that this invention is not limited to the automobile industry, or to use with fuel tanks since it is applicable, either in part or in whole, to the filling of all tanks with liquid.

The nature of the invention will be more readily understood by detail reference to the drawings. A portion of the fuel tank is shown at 1, which tank may of course be of any suitable size and construction which does not form by itself any part of this invention. The top of the tank is indicated in cross-section and is provided with an opening in which a vertically extending tube 2 is secured in accordance with the known practice. This tube takes the place of the usual filling opening of such a tank and, as will be apparent, the vertical extent thereof and its relative position with respect to the tank is of little importance in accom-

plishing the invention. The lower end of the tube 2 is formed integral with a perforated gauge or basket 3 which projects into the tank and has a minimum extent in a vertical direction for a reason which will become apparent. Mounted on the bottom of the basket at the center thereof and projecting up into the tube is a stop rod 4. At 5 is the filling spout which is closed at the top portion 6, as shown, and formed integral with a tubular extension 7 to which a flexible or other hose 8 is permanently secured. This tube or hose 8 connects with the source of fuel, usually a pump in the case of automobiles. Mounted within the tube is a valve seat 9 upon which a valve 11 may seat to close off the upper portion of the tube and the hose 8 from the lower end of the spout. At 13 is a guide or spider, of which several may be employed if desired, to slidably support the vertical stem 12 of the valve 11. At 14 is a heavy spring lying between the valve 11 and the top of the head 6 of the tube so as to normally hold the valve 11 on its seat. Preferably formed integral with the tube 2 is a small casing 15 within which a solenoid 16 is mounted. The plunger 17 of the solenoid is formed to provide a latch member which may engage with a notch 18 on the outside surface of the spout 5. A spring 19 normally holds the plunger 17 in the position shown in the drawings so that the end thereof will project into the tube 2. As will be apparent to one skilled in the art, the latch 17 may be formed with a shoulder to prevent it from protruding into tube 2 no further than sufficient to perform its locking function.

Likewise secured in the tank 1 through an opening is a tube 20 which projects down into the tank and is open at the bottom. This tube opens exteriorly of the tank and is provided with a cover 21 which, when in place, secures a disc 22 of insulating material between it and the tube. Pivotaly mounted at 23 on the disc 22 is a bell crank lever having the contact arm 24 and a lower frame 25 to be engaged by a float 28 within the tube 20. The float may be made of any suitable material, such as cork, aluminum, or the like. The tube 20 is provided with breather openings 100 for an obvious purpose. Mounted on the disc 22 is a contact 26 and at 27 is another terminal electrically connected to the contact arm 24. As shown, terminal 27 may be a portion of the means for securing the pivotal support 23 to the disc.

Terminal 27 is connected by wire 29 to one terminal of the solenoid 16. Contact 26 is connected by wire 30 to one terminal of a suitable current source 31 which may be, for example, a storage battery on an automobile. The other terminal of the current source 31 is connected by wire 32 to one ter-

minal of an enclosed switch 33 by means of a wire 32. A switch 33 is mounted on the casing 15 and is preferably of an enclosed construction so that it will not be a fire hazard as an open switch would be because of sparking. The other terminal of this switch is connected by wire 36 to the other terminal of the solenoid 16. Switch 33 is provided with an operating button or arm 34 which is engaged by an extension or arm 35 which is integral with the spout, as shown.

In the operation of this device the cap (not shown) is removed from the tube 2 and the spout 5 is telescoped with the tube to the position shown in the drawings so that the spring pressed latch of the plate 17 engages the notch 18 in the wall thereof and locks the spout in place. As the spout moves into place arm 35 engages the operating member 34 of switch 33 and partially completes the circuit to the solenoid. As the spout moves into place the valve stem 12 engages the fixed stop 4 so as to raise valve 11 off its seat and compress spring 14.

The attendant may then fill the tank by operating the pump until the liquid in the tank reaches a predetermined liquid level line, at which time float 28 will have engaged arm 25 and move the contact arm 24 into engagement with contact 26. The float will, of course, travel upwardly with the liquid level because tube 20 is open to the interior of the tank. Upon engagement of contact arm 24 with contact 26 the circuit to solenoid 16 will be completed so that current will flow through wire 32, closed switch 33, wire 36, solenoid 16, wire 29, terminal 27, contact arm 24, contact 26, wire 30, back to the current source. This will energize the solenoid causing it to withdraw plunger 17 out of the notch 18. Spring 14, which is compressed, will then kick the spout upwardly to a point where valve 11 is on its seat 9 and notch 18 is above the latch 17. The upward kicking movement of the spout will notify the attendant that the tank is full. The supply of gasoline will, of course, be automatically cut off. The spout is then removed and the cap replaced on the tube 2. When the spout is kicked upwardly arm 35 disengages the operating member 34 of switch 33 so that the solenoid is deenergized. Switch 33 is desirable because, by means of it, the solenoid is cut out of circuit even though contact member 24 remains in engagement with contact 26 until the liquid level has fallen somewhat. It will be seen, therefore, that the tank is always filled to a predetermined level, the supply of gasoline being cut off when that level is reached, and as a result the tank cannot be overflowed.

Another feature of this construction is that since the basket 3 only projects below the liquid level a short distance when the tank is full it is impossible for an unau-

thorized person to abstract any substantial quantity of gasoline from the filled tank. Withdrawal of gasoline is rendered difficult also because of the construction of the tube and the presence of the rod 4 projecting up into it. These parts may be proportioned so that it is practically impossible to get a siphoning tube into the gasoline. Even when this is done gasoline can only be extracted until the level falls to the bottom of the basket.

Another feature and advantage of the invention is that the spout 5 is closed by valve 11 which is held on its seat by the spring 14, which can be made very strong. In an actual device valve stem 11 will terminate much closer to the guiding spider 13 so that it will be practically impossible to hold the valve open manually and at the same time discharge gasoline from the spout. Thus, by this construction, unauthorized persons will find considerable difficulty in filling tanks which are not equipped with the remainder of the apparatus. The efficiency of such a device will be increased when used by large bus companies if only busses and the like are equipped with the complete invention.

It will be apparent that the float switch may be operated in many other ways. For example, a modified arrangement is shown in Fig. 2 where the bottom of the tank is shown at 40. It is provided with a sufficiently large opening which is closed and sealed by means of a flexible disc 42. The opening is surrounded by a closed casing 43 in which is mounted an insulating support 45 for a contact 46. The flexible plate 42 is provided with a cooperating contact 44. As before, the wires 30 and 32 are connected to the contacts 44 and 46 so that when the tank is filled to a predetermined level the weight of the gasoline on the flexible plate 42 will have curved it downwardly to a point where contact 44 engages contact 46 to complete the circuit to the solenoid. Many other equivalent arrangements may be employed for completing the circuit to the solenoid, as will be apparent to those skilled in the art.

Fig. 3 shows a modified form of structure in which the locking mechanism is mounted directly on the filling spout and in which the tank tube is provided with a spring operated valve to further aid in preventing siphoning of the fuel from the tank. As before the tank is shown at 1 provided with a filling tube 2 projecting into the tank and enclosed at the end. The closed end of the filling tube is provided with openings as before through which the fuel passes into the tank. Instead of a fixed stop rod 4 a vertically slidable rod 4' is employed and mounted in a spider 13 for slidably supporting it. This rod is provided with a valve disc 4^a upon which a spring 4^c presses to normally hold it

on a valve seat member 4^b. Thus the rod 4' becomes a valve stem and acts as a stop rod as before after it has moved downwardly to the position shown in Fig. 3. The filling spout 5 as before fits into the tube 2 and is provided with a top casing 6 to which is attached the integral tubular extension 7 which, in turn, is to be attached to the pump delivery pipe or hose. A vertically slidable stem 12 mounted in a spider 13 and provided with a valve disc 11 is employed as before. A valve seat ring 9 is likewise mounted in the filling spout and the spring 14 is employed to normally hold the valve disc 11 on its seat. The locking mechanism instead of being mounted on the tank and filling tube is in this form of the device constructed integrally with the filling spout. The filling spout is provided with a casing 50 within which is mounted the solenoid 16 provided with a slidable plunger core 17 normally held in the position shown by means of a spring 19. Pivotaly mounted in the casing 50 on the pivot pin 52 is a latch arm 54 which is pivotally secured at 53 to the plunger 17. The filling tube is provided with notches 51, as shown, to be engaged by the latch arm 54. Formed integral with the filling tube 2 is a second casing 55 in which the contact prong receiving sockets 56 are mounted and insulated from each other. The lower end of the casing 50 is formed into a right angle portion, as shown, and has slidably mounted therein an electric connecting plug 57 made of suitable insulating material. Projecting from the lower end of the plug are the contact prongs 60 arranged to fit into the contact receptacles 56. A spring 50 is interposed between the plug and supporting flange so as to permit the upward movement of the filling spout and attached parts for a sufficient distance to free the latch arm from the notches before the contact prongs are removed from the contact receptacles thus maintaining the circuit to the solenoid 16. To fill a tank with this device the filling spout is inserted in the filling tube to the position shown in Fig. 3 so that valve disc 4^a is unseated and its stem 4' moved down to contact with the end wall of the filling tube so that spring 4^c is compressed. Further movement of the filling spout into the tube causes valve disc 11 to unseat and compress spring 14. When the filling spout is fully inserted latch arm 54 engages one of the notches 51 of the filling tube so as to hold the parts in the position shown. At the same time the contact prongs 60 pass into the contact receptacles 56. Wire 62, for example, is connected to the current source and wire 61 is connected as before to the float switch which is open since the tank is not full. Fuel may then be pumped into the tank until the float

valve closes at which time solenoid 16 becomes energized pulling its plunger upwardly and withdrawing the latch lever 54 out of contact with the notches 51. Spring 14 then kicks the filling spout and connected parts upwardly so that valve discs 4* and 11 seat and the latch lever is moved up beyond the notches. The circuit to the solenoid 16 remains closed and spring 59 is compressed as plug 57 remains stationary. The filling spout may then be removed and contact prongs 60 break the circuit after both valves are closed. The circuit to the solenoid is completed to the contact prongs through the wires 63 and 64. With this construction an unauthorized siphoning of fuel from the tank is further prevented by the valve in the filling tube.

An additional feature of this invention is that most of the mechanism is mounted on the filling spout and the modification of the tank of each vehicle involves a relatively simple structural change or addition. Thus relatively fewer specially constructed filling spouts are necessary to handle a large number of vehicles.

In the modified arrangement shown in Fig. 4 a mercury switch is employed in the float tube instead of an open switch as is shown in Fig. 1 in order to prevent the danger of fire and explosion by reason of sparking at the switch. In this case an arm 66 is pivotally mounted on a standard 65 and provided with a saddle within which the mercury switch 67 is mounted. As before, the terminals 26 and 27 are provided and are connected to the terminals of the mercury switch by the pigtails 68 and 69. When the float 28 reaches a predetermined level or full tank position mercury switch 67 is tipped to complete the circuit to the solenoid 16 for either form of device.

From the above description it will be seen that this invention resides in certain principles of construction and operation which may be carried out in many other physical forms and I do not, therefore, desire to be strictly limited to the disclosure, as given for purposes of illustration, but rather to the scope of the appended claims.

What I seek to secure by United States Letters Patent is:

1. An apparatus as described comprising a liquid tank having a filling opening, a perforated casing enclosing said opening and having a spout receiving portion, an electric lock mounted on the spout receiving portion to engage and lock a filling spout therein, and means operated by the liquid when a predetermined quantity has been filled into the tank for operating the electric lock to release the filling spout.

2. An apparatus as described comprising a liquid tank having a filling opening, a perforated casing mounted in said opening and

opening exteriorly of the tank, said casing being formed to receive a filling spout, a filling spout having a valve therein, means for opening the valve when the filling spout is in place, means for locking the filling spout in place, and means operated when a predetermined quantity of liquid is filled into the tank for releasing the locking means.

3. An apparatus as described comprising a liquid tank having a filling opening, a perforated casing mounted in said opening and opening exteriorly of the tank, said casing being formed to receive a filling spout, a filling spout having a valve therein, means for opening the valve when the filling spout is in place, means for locking the filling spout in place, means operated when a predetermined quantity of liquid is filled into the tank for releasing the locking means, and means for simultaneously closing the valve in the spout and partially ejecting the spout when the locking means is operated.

4. In an apparatus as described the combination comprising a liquid tank, a perforated filling tube mounted on said tank and opening to the interior thereof through its perforations, said tube being adapted to receive a filling spout, a liquid filling spout, a valve in said spout, means in said filling tube for engaging said valve and opening it when the spout is in place, an electrically operated lock engaging said filling spout so as to hold it in place during the filling operation, and means operated when a predetermined quantity of liquid is filled into the tank for operating the lock to release the spout.

5. In an apparatus as described the combination comprising a liquid tank, a perforated filling tube mounted on said tank and opening to the interior thereof through its perforations, said tube being adapted to receive a filling spout, a liquid filling spout, a valve in said spout, means in said filling tube for engaging said valve and opening it when the spout is in place, an electrically operated lock engaging said filling spout so as to hold it in place during the filling operation, and a float operated switch and circuit connections between the electric lock and said switch whereby the lock is operated to release the filling spout when the liquid in the tank has reached a predetermined level.

6. In an apparatus as described the combination comprising a liquid tank, a spout receiving filling tube for said tank, a filling spout, an electric lock mounted on said tube and engaging the spout to lock it in place in the tube, a float operated switch, a second switch, circuits including both of said switches and said electric lock, and means on said spout for closing the second switch when the spout is locked in the fill-

ing tube, the circuit to the electric lock being finally completed by the float operated switch when the liquid in the tank has reached a predetermined level.

5 7. In an apparatus as described the combination comprising a liquid tank, a filling tube passing through the wall of the tank and closed at the end projecting into the tank, said closed end being perforated, an
10 end projecting exteriorly of the tank being formed to receive a filling spout, a filling spout, a valve in said filling spout, resilient means for normally holding the valve closed, a lock mounted on the filling tube
15 for engaging the filling spout and locking it in filling position, means for opening the valve when the spout is in filling position, and means operated when the tank is filled with a predetermined quantity of liquid for
20 operating the lock to release the spout.

8. In an apparatus as described the combination comprising a liquid tank, a filling tube passing through the wall of the tank and closed at the end projecting into the
25 tank, said closed end being perforated, an end projecting exteriorly of the tank, being formed to receive a filling spout, a filling spout, a valve in said filling spout, resilient means for normally holding the valve
30 closed, an electric lock mounted on the filling tube for engaging the filling spout and locking it in filling position, means for opening the valve when the spout is in filling position, means operated when the tank
35 is filled with a predetermined quantity of liquid for operating the lock to release the spout, a float operated switch on said tank arranged to be closed when the liquid in the tank has reached a predetermined level,
40 a current source and circuits including said switch and electric lock whereby the lock is operated when the liquid in the tank has reached a predetermined level.

9. In an apparatus as described the combination comprising a liquid tank, a filling tube passing through the wall of the tank and closed at the end projecting into the
45 tank, said closed end being perforated, an end projecting exteriorly of the tank being formed to receive a filling spout, a filling spout, a valve in said filling spout, resilient means for normally holding the valve closed, an electric lock mounted on the filling
50 tube for engaging the filling spout and locking it in filling position, means for opening the valve when the spout is in filling position, means operated when the tank is filled with a predetermined quantity of liquid for
55 operating the lock to release the spout, a float operated switch on said tank arranged to be closed when the liquid in the tank has reached a predetermined level, a current source and circuits including said switch
60 and electric lock whereby the lock is operated when the liquid in the tank has reached

a predetermined level, a second switch in said circuit, and means for closing said switch when the spout is locked in filling position, the second switch partially completing the circuit to the electric lock. 70

10. An apparatus as described comprising a liquid tank, a tube extending through the wall of said tank and forming at its exterior end a spout receiving portion, and
75 having a perforated wall closing the end within the tank, a spout to fit in said tube, a valve in said spout, a spring for normally holding the valve seated, means in said tube for opening the valve when the spout is placed in the tube, an electric lock for engaging the spout and locking it in position in the tube when the valve is open, said
80 spring being compressed, and means for operating the lock for releasing the spout when the tank is full, said spring partially ejecting the spout indicating that the tank is full. 85

11. An apparatus as described comprising a liquid tank, a tube extending through the wall of said tank and forming at its exterior end a spout receiving portion and
90 having a perforated wall closing the end within the tank, a spout to fit in said tube, a valve in said spout, a spring for normally holding the valve seated, means in said tube for opening the valve when the spout is placed in the tube, an electric lock for engaging the spout and locking it in position in the tube when the valve is open, said
95 spring being compressed, means for operating the lock for releasing the spout when the tank is full, said spring partially ejecting the spout indicating that the tank is full, and means operated by the liquid in the tank when operating the lock when the
100 tank is full. 105

12. In an apparatus as described the combination comprising a liquid tank, a filling tube mounted on said tank so as to project into the interior thereof and provided with
110 a perforated end wall, a liquid filling spout, a valve in said spout, means in said filling tube for engaging said valve to open it when the spout is in place, an electrically operated lock cooperating with said filling tube
115 to lock the spout in place during the filling operation, and a float operated mercury switch mounted on said tank and connected to said electric lock for energizing it to release the filling spout when the liquid in
120 the tank has reached a predetermined level.

13. The combination with a liquid tank, a filling tube mounted thereon so as to project into the interior thereof and having a perforated end wall and a spring operated
125 valve in said filling tube normally held in closed position, of a filling spout adapted to engage said filling tube, a spring operated valve in said filling spout and adapted to be opened when the filling spout is in fill- 130

ing relation with the filling tube, an electric lock mounted on said filling spout so as to engage the filling tube and hold the parts in filling position, an electric circuit socket
5 mounted on said tank and a circuit plug mounted on said filling spout so as to engage the socket when the filling spout is in place, said plug being connected to the electric lock.

10 14. The combination with a liquid tank, a filling tube mounted thereon so as to project into the interior thereof and having a perforated end wall and a spring operated valve in said filling tube normally held in
15 closed position, of a filling spout adapted to engage said filling tube, a spring operated valve in said filling spout and adapted to be opened when the filling spout is in filling relation with the filling tube, an electric lock
20 mounted on said filling spout so as to engage the filling tube and socket mounted on said tank, a circuit plug mounted on said filling spout so as to engage the socket when the filling spout is in place, said plug being connected to the electric lock, a current source
25 and a float operated switch connected to said socket whereby the electric lock is energized to release the filling spout when the liquid in the tank has reached a predetermined
30 level.

15. An apparatus as described comprising a liquid tank having a filling opening, a filling tube in said opening having a closed but perforated inner end projecting into the
35 tank, the outer end forming a spout receiving portion, locking means associated with the tube for locking a filling spout therein, and means controlled by the level of the liquid in the tank for operating the
40 lock to release the spout when a predetermined quantity of liquid has been filled into the tank.

In testimony whereof I have hereunto set my hand on this 9th day of June A. D.,
45 1932.

FRANK E. CASEY.

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