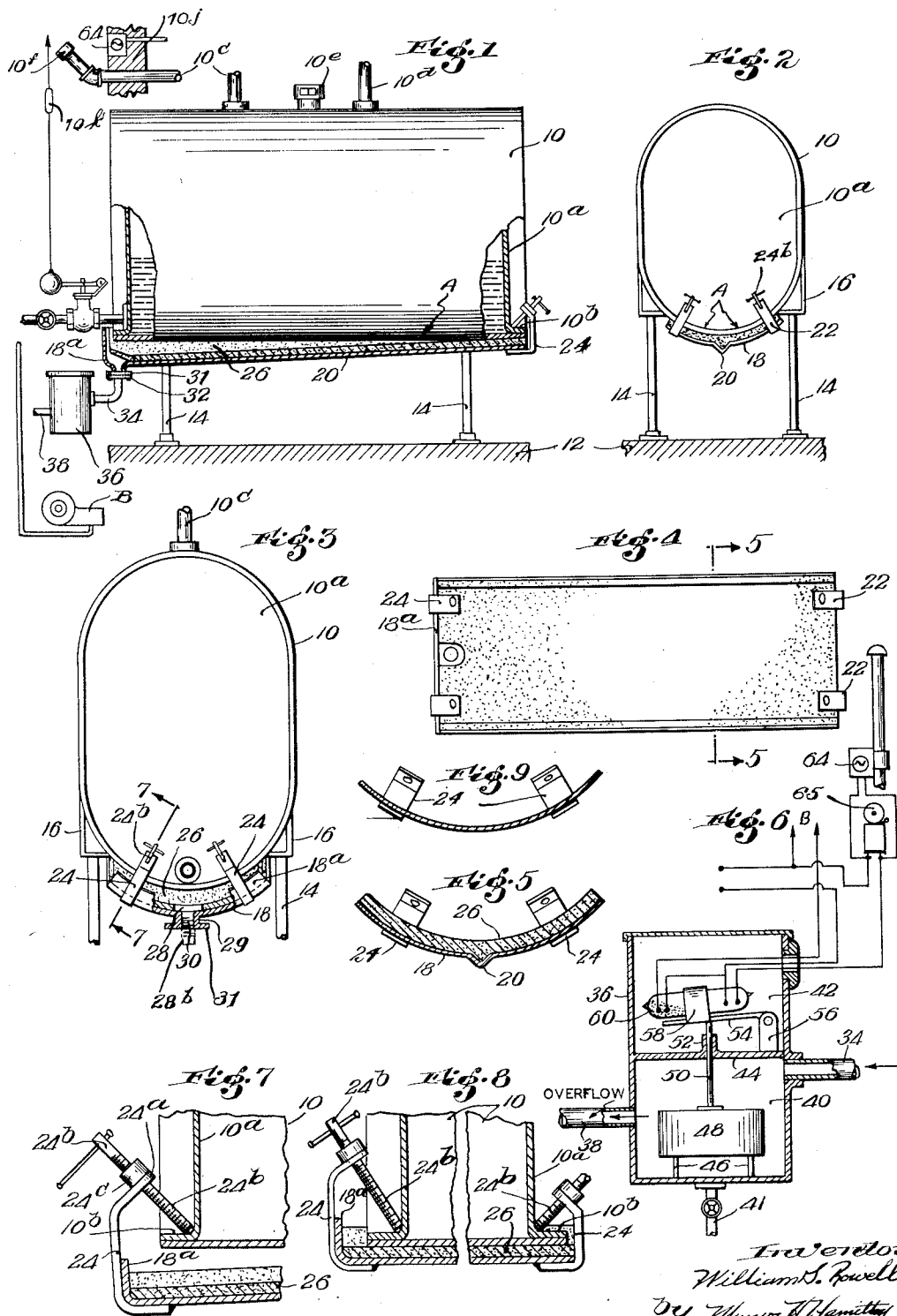


**Nov. 21, 1950**

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SYSTEM FOR BURNER CUTOFF AND SIGNALING  
MEANS UPON TANK LEAKAGE  
Filed April 15, 1948

**2,531,159**



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## UNITED STATES PATENT OFFICE

2,531,159

## SYSTEM FOR BURNER CUTOFF AND SIGNALING MEANS UPON TANK LEAKAGE

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Application April 15, 1948, Serial No. 21,274

11 Claims. (Cl. 158—42.3)

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This invention relates to a safety attachment for a fuel oil storage tank of the type commonly employed in supplying fuel oil to oil burner heating systems in homes, factories, and various other establishments.

It is a general object of the invention to deal with problems surrounding the flooding of a basement or cellar floor by fuel oil released from a leaky fuel oil storage tank whose under side has become corroded and worn away, and to devise a relatively cheap, easily installed safety attachment of simplified construction for minimizing the danger of fire from such oil flooding, for indicating the occurrence of the leak at its inception, and for providing a means of sealing the corroded portions of the tank.

In one aspect the invention is concerned with the potential fire hazard which as a result of tank corrosion is constantly present in many private dwellings. It is usually the case in such private dwellings that the storage oil tank is installed in the cellar or basement in relatively close proximity to the combustion chamber of the oil burning heater. Experience has shown that when corroded portions of the tank fall away, a sudden flood of oil may be discharged from the leaky tank. In many instances the oil rapidly rises up around the nearby fire box, producing an explosive surrounding atmosphere, and in some cases gaining access to the open flame of the burner, thus starting a fire. Even if no fire starts, there occurs property damage and great inconvenience from the unpleasant odor of fuel oil released in the basement of a building. Then too, the occupant when discovering the trouble, may find it difficult to successfully stop the leak or dispose of the flooding oil. The danger of tank failure is also increased by the fact that deliveries of oil must be made frequently and each time oil is pumped into the tank there is an increased strain on weakened bottom portions of a tank resulting from corrosion which may have taken place over a considerable period of time.

The safety attachment of the invention provides a novel means for eliminating the fire hazard described by combining a leak detecting apparatus for a storage tank of the character described with an electrical switch which is connected into the power supply line of the oil burner. In response to a leakage of oil from the tank, the power supply line to the burner is opened and the burner flame is extinguished. An important feature of the invention therefore is an auxiliary oil burner switch operatively connected to an oil collecting member arranged in spaced relation to

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the under side of a fuel oil storage tank. The oil collecting member presents an inclined surface along which oil leaking from the tank may be guided into a container. Passage of oil into the container serves through some suitable agency as a float member, an oil soluble link or other device, to actuate the auxiliary switch and thus discontinue operation of the burner.

Another desirable feature of the invention is a sealing member comprising for example a resilient or yieldable body which is preferably formed with a substantially curved shape to conform to the curvature of a conventional fuel oil storage tank member. Clamping means are included at separated points along the sealing member for attaching it in tightly sealed relation against the under side of the tank. The sealing member may conveniently constitute a part of the oil collecting member in the form of a liner of a rubber-like substance.

Another feature of the invention is the combination with the leak detecting mechanism and switch described of a warning light located externally of the dwelling in close proximity to the fill pipe of the storage tank, for indicating to a tank truck operator the possible occurrence of a leak precipitated by the act of filling the tank with fuel oil. In conjunction with the warning light there may be employed a bell or other audible signal for also indicating the occurrence of a leak to the occupant of the dwelling.

These and other objects and novel features will be more fully understood and appreciated from the following description of the several embodiments of the invention selected for purposes of illustration and shown in the accompanying drawings, in which

Fig. 1 is a view in side elevation illustrating a conventional fuel oil storage tank having the safety attachment of the invention secured thereto;

Fig. 2 is a rear elevational view of the tank and safety attachment;

Fig. 3 is a front elevational view;

Fig. 4 is a plan view of the safety attachment removed from the tank;

Fig. 5 is a cross-sectional view taken on the line 5—5 of Fig. 4;

Fig. 6 is a schematic view illustrating an electrical circuit for interrupting burner operation in response to movement of a float mechanism;

Fig. 7 is a detail cross section taken on the line 7—7 of Fig. 3;

Fig. 8 is a detail cross-sectional view illustrating the safety attachment engaged in sealed relation to the under side of the tank; and

Fig. 9 is a detail cross-sectional view of another type of oil collecting member.

The general plan of the invention is indicated in Fig. 1 which discloses a fuel oil storage tank for an oil burner and the safety attachment of the invention comprising a longitudinally extending support member fastened at the under side of the tank. The invention is described with reference especially to the standard type of fuel oil tank commonly made and sold for use in private dwellings although it is not intended that the invention shall be limited to this or any other particular type of storage tank. The standard type of tank referred to has a capacity of from 250 up to 300 gallons, a volume of oil which appears to best adapt itself to consumer use and servicing operations. It has been found desirable to provide the tank capacity noted in the most compact manner possible and this has given rise to the universal practice of forming the tank with a so-called oval shape which has its smallest dimension extending in a horizontal direction, thus saving space. It is further the custom to support the tank in a raised position with respect to the basement floor by mounting it on legs which are bolted to brackets welded onto the under side of the tank.

Thus in the arrangement shown in Figs. 1 and 2, the tank member 10 is mounted in spaced relation to a basement floor or other supporting surface 12 by means of legs 14 which bear against spaced-apart brackets 16 welded to the under side of the tank as shown. A spacing of the tank from the floor of from twelve inches up to as much as twenty-four inches or more is usually provided in tank installations for dwelling houses. The portion of the tank bottom included between the brackets 16, as viewed in Fig. 2, is usually of a width of from twelve to fifteen inches or slightly more. It is, in most instances of tank failure, along this bottom portion of the tank referred to where corrosion is found to occur. The region described may conveniently be referred to as the area of corrosion and has been denoted by the letter A in the drawings.

The construction of these tanks is in almost all cases of one standard design and includes a steel body consisting of a plate bent around to form an oval-shaped member, the two ends of which are closed by end walls 18a. The edges of the end walls 18a are bent over onto the edges of the body portion of the tank which cause the end walls 18a to assume a slightly recessed position and to present projecting flanges 18b as is clearly shown at the right-hand side of Fig. 1. Numeral 10c denotes a fill pipe leading from a point outside the foundation 10j of a dwelling house into the tank 10 by means of which the tank is filled from conventional oil tank trucks. A vent pipe 10d is also located at the top of the tank and lying therebetween is a conventional gage member 10e. A standard fusible link 10k shuts off the flow of oil in event of fire.

In the normal use of the tank and storage system described, deliveries are frequently made by removing the cover 10f on fill pipe 10c and inserting the oil delivery hose nozzle into the fill pipe 10c. It is found that in connection with this operation moisture gains access to the tank either by transfer from the supply hose or by accidentally leaving off the cover during stormy weather, or by condensation, or in other ways,

and that this moisture collects in small amounts at the bottom of the tank. Over a period of time corrosive acidic reagents may be formed which eat into the metal, gradually forming porous portions comprising a multiplicity of small holes and in some cases forming relatively large weakened tank areas which under a suddenly increased weight may fall away from adjacent portions of the tank bottom, producing relatively large openings through which oil may escape.

It is generally recognized in the trade that these tanks are subject to failure from corrosion after they have been in use for periods of from nine to fifteen years and oil tank manufacturers in most cases refuse to furnish a guarantee even for a limited period of use.

In accordance with the invention I have devised a novel safety attachment which is especially well suited for use with the type of tank construction described. Advantage is taken of the spaced relation of the tank above its supporting surface to utilize a bowed support member preferably consisting of a metal plate 18 which can be installed from the under side of the tank 10. The bowed plate 18 has an arc of curvature substantially coinciding with that present at the rounded bottom portions of the tank designated as area of corrosion A. The length of plate 18 may slightly exceed the length of the tank 10 while the width of plate 18 is preferably limited to a dimension corresponding to or slightly less than the arcuate distance included along the area A between the knee brackets 16. Such a width allows the plate 18 to be passed longitudinally under the tank 10 and fastened in a raised position between the legs, and also allows the plate 18 to be moved into contact with the under surface of the tank when desired without interference by the knee brackets.

The central portion of the member 18 is preferably formed with a reinforced construction obtained for example by providing one or more corrugations such as the corrugation 20 which extends longitudinally along its under side. At either side of the corrugation and in spaced relation to it on two opposite ends of the plate are adjustable screw clamps 24. The opening for each clamp is chosen to slightly exceed the combined thickness of the tank flange 10b and the support member 18 as noted in Fig. 1.

Adjustment bolts 24b are threaded through the sides 24a of the clamps and secured by collars 24c (Fig. 7). The bolts 24b at the front end of the tank are adapted to be threaded into the sides 24a to an extent such as has been indicated in Fig. 7, in which position they engage against the flanges 10b in an angularly extending position and thus support the front end of the support member 18 in spaced relation to the bottom of the tank, while the opposite end of the support member is held firmly against the flanges 10b. The effect of thus spacing the front end of the plate 18 from the tank while securing the opposite end in contact with the tank is to support the plate in an inclined position, as is also shown in Fig. 7.

The front end of the support member 18 is formed with an upturned edge 18a which lies in contact with the clamps 24 as shown in Fig. 7. Secured along the inner peripheral surface of the plate in abutting relation to the edge 18a is a sealing member 26 which may consist for example of a layer of rubber or a rubber-like

substance or a pressure-sensitive adhesive material such as a chlorinated rubber material, or other cementitious substances. The member 26 when maintained by supporting member 18 in the inclined position above described functions as an oil collecting and guiding surface and when tightly clamped against the under side of the tank is adapted to form a sealing member. Numeral 28 denotes an opening formed in member 26 (Fig. 3) at a point near the front end of the tank and communicating with this opening is a passageway provided by a tubular extension 29 formed in the member 18 and terminating in a flange 31. The inside of tubular extension 29 is formed with threads 30. Connected to flange 31 through a pipe 34 and corresponding flange 32 is an oil container 36 having an overflow 38 located at a level below the inlet 23, as shown in Fig. 1, and connected into the fuel supply line.

The container 36 is illustrated in greater detail in Fig. 6 and includes a lower fluid chamber 40 having a drain 41 and an upper switch receptacle 42 separated by a dividing wall 44. Mounted in the fluid chamber 40 on pins 46 is a float 48 from which extends upwardly a stem 50 slidably received in a bearing 52. Resting on the upper extremity of the stem 50 is a lever 54 pivoted on an upright 56. The lever carries a supporting band 58 in which is secured an electrical switch 60 of the mercoid type. In the tilted position of switch 60 as shown in Fig. 6, a circuit is closed through the power supply circuit of an oil burner B which is receiving oil from tank 10, as diagrammatically illustrated at the left-hand side of Fig. 1.

In operation, oil discharged from a leak in the tank 10 is collected by the member 26 and caused to run into chamber 40 through pipe 34, raising the float 48 and tilting the mercury switch 60 into an alternate position. This opens the circuit through burner B illustrated in Fig. 6 and burner B is shut down in response to the rising of liquid level in float 48. Also, the power supply line which controls the burner circuit energizes the blower apparatus which may operate independently of the electrical igniting system for the burner. This main supply line is also interrupted by the operation of the mercury switch in accordance with the invention. The electrical wiring for the arrangement referred to is well known in the art and is thought to require no further illustration or description in the specification. Simultaneously movement of the mercury switch is utilized to close a circuit through a warning light 64 located at a point in the foundation wall of the dwelling and in close proximity to the outer opening of the fill pipe 10, as illustrated in Fig. 1. Thus in the event of a leak developing in the tank during delivery of oil, the truck operator may be given a warning, or if a slow leak has been in effect the light may already have been energized, thus preventing start of an oil delivery. If desired, there may be included in the warning light circuit an alarm bell 65 or other audible signalling device for indicating the presence of a leak to the occupant.

The device operating as above described provides a positive reliable means of preventing oil from coming into close proximity to an oil burner while in operation and thus danger of fire is reduced and substantially eliminated especially at those times when the occupant may be absent or possibly during the sleeping hours.

However, when the occupant is apprised of the fact that a leak has occurred either due to interruption in oil burner service or by one of the warning devices noted above, he is also concerned with the problem of stopping the leak as quickly as possible. The device of the invention is designed to place at his disposal a convenient, ever ready means of sealing the tank and preventing at least temporarily further passage of oil out of the tank. This is achieved by means of the member 26. All that need be done is for the occupant to adjust the bolts 24b and move the curved surface of member 26 into contact with the bottom of the tank. The curved surface of the member 26 is preferably chosen to coincide with the curvature of the tank bottom and this allows the member 26 to be tightly clamped in sealed relation and to effectively bar further passage of leaking oil. When this is done the opening formed by the tubular extension may be closed by securing therein a plug member 28b as illustrated in broken lines in Fig. 3, with the container and its connecting tube being removed. The sealing member may in some cases be employed to prevent the occurrence of a leak taking place or at least prolonging such an occurrence for a considerable period. This may be done by installing the plate and its liner in tightly clamped relation on the tank at the outset and eliminating the safety control altogether. In this connection the form of sealing member may vary with the liner or yieldable material being supported by other types of backing elements than the steel plate described. Likewise there may be substituted for the clamps other types of fastening means such as bands encircling the tank or adjustment braces wedged between the tank and the floor, or other arrangements.

It will be evident from the foregoing description that I have provided a simple but effective safety attachment which is capable of materially reducing fire hazard and providing a security factor not heretofore available to property owners. It is also pointed out that the use of oil burners and oil storage tanks has greatly increased in the past few years so that there is to be expected from time to time a considerable increase in fires from tanks gradually wearing out. Many of these potential fires may be avoided by the device of the invention either by the aid of the leak detecting equipment or the sealing member or both.

Having thus disclosed my invention and described in detail illustrative embodiments thereof, I claim as new and desire to secure by Letters Patent:

1. A device for preventing fire due to leakage of fuel oil from storage tanks comprising, in combination, an oil burner having an electrical igniting system, a fuel supply apparatus, a fuel oil storage tank of the oval cross-section type having an elongated rounded bottom surface, a conduit connecting said tank to said burner, an elongated oil collecting trough mounted in spaced relation to the bottom surface in a position to receive oil leaking from lowermost portions of the tank surface, and means operating in response to flow of oil along the oil collecting trough for opening the power supply line for the said electrical igniting system and the fuel supply apparatus.

2. A device for preventing fire due to leakage of fuel oil from storage tanks comprising, in combination, an oil burner having an electrical

igniting system, a fuel supply apparatus, a fuel oil storage tank of the oval cross-section type having an elongated rounded bottom surface, a conduit connecting said tank to said burner, a relatively narrow elongated oil collecting trough mounted in spaced relation to the bottom surface in a position to receive oil leaking from lowermost portions of the tank surface, said oil collecting trough extending below the tank from end to end thereof and being supported in an inclined position to cause collected oil to flow to one extremity of the trough, an oil receptacle arranged at the lower end of the trough for collecting oil as it flows from the trough, a float member adjustably supported in the oil receptacle, an electrical switch member operating in response to the flow of oil into the receptacle, and said switch member being adapted to open the electrical igniting circuit for the oil burner and the fuel supply apparatus when a leak occurs in the rounded bottom surface of the tank.

3. In combination, an oil burner having an electrical igniting system, a fuel supply apparatus, a fuel oil storage tank of the oval cross-section type for the burner, said storage tank having an elongated rounded bottom surface, a conduit connecting said tank to said burner, an elongated oil collecting trough mounted in spaced relation to the rounded bottom surface in a position to receive oil dropping from any point along lowermost portions of the tank surface, said oil collecting trough extending below the tank from end to end thereof and being supported in an inclined position, an oil receptacle communicating with one end of the trough, a float in the receptacle, and a switch member operating in response to movement of the float to prevent operation of the electrical igniting system and the fuel supply apparatus.

4. A device as described in claim 2, in which the oil collecting trough is supported on upright members located below the tank at either end thereof.

5. A device as described in claim 2, in which the storage tank presents outwardly projecting flanges at its front and rear ends, the said oil collecting trough being adjustably secured by means of clamps which engage against the flanged portions of the tank.

6. A device as described in claim 2, in which the trough includes at its lowermost end a trans-

versely disposed partition cooperating with the adjacent portions of the trough to form an oil reservoir.

7. A device as described in claim 2, in which the lowermost end of the trough is constructed with a partition transversely secured to adjacent portions of the trough to form an oil reservoir, and the bottom of the trough at points adjacent to the partition being formed with an opening communicating with the reservoir, and means for connecting the oil receptacle to the trough at the point of said opening.

8. A device as described in claim 2, in which the oil receptacle includes dual chambers separated by a partition, the said float member being located in one of the chambers, and means operatively connecting the float to the electrical switch member in the other of the said chambers.

9. A device as described in claim 8, in which the lower chamber is formed with oil inlet and oil outlet members, the said oil outlet member occurring at a level substantially below that of the oil inlet member.

10. A device as described in claim 2, in which the trough at its lowermost end is formed with a tubular outlet, the said oil receptacle being connected to the tubular outlet and supported from this member.

11. A device as described in claim 2, including means for simultaneously indicating the occurrence of a leak.

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