

May 26, 1931.

J. ULLENDORFF
MECHANISM FOR SUPPLYING FLUIDS FROM ONE
AIRSHIP TO ANOTHER WHILE IN FLIGHT
Filed Jan. 10, 1929

1,806,833

4 Sheets-Sheet 1

Fig. 1

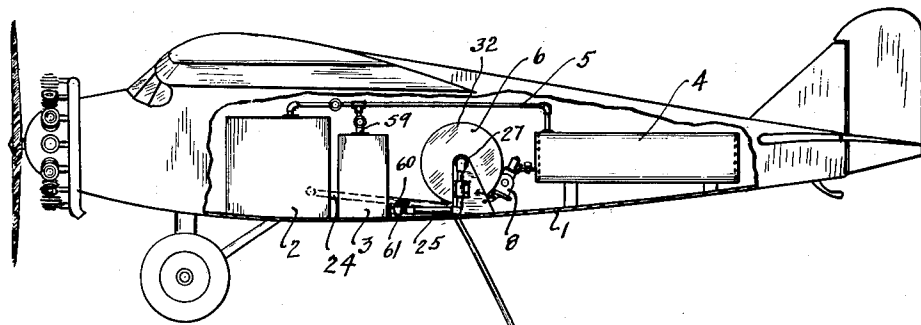
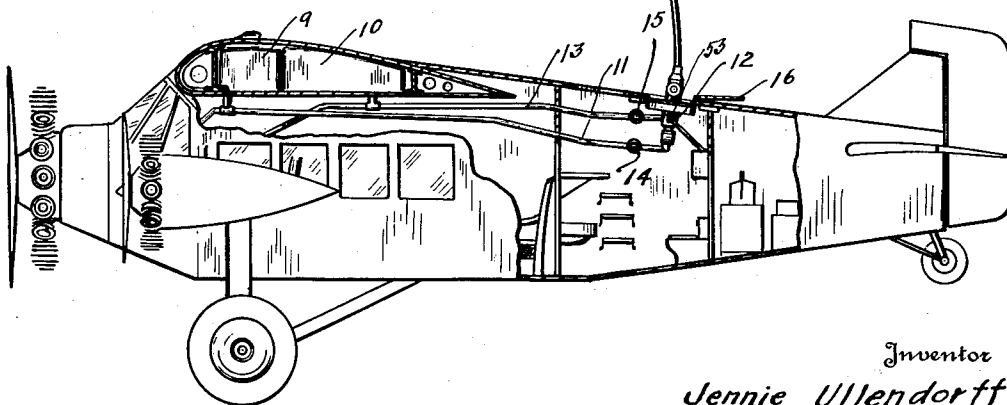


Fig. 2



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Fig 6

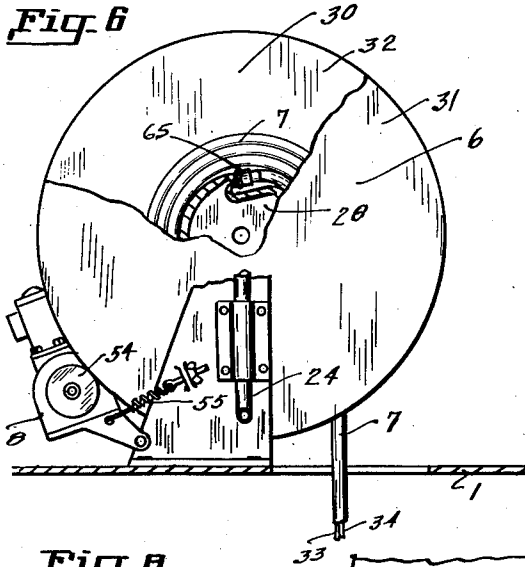


Fig 7

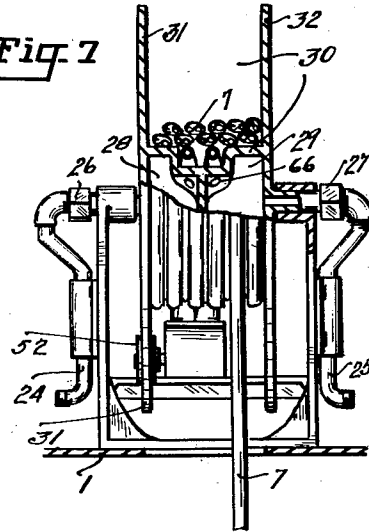


Fig 8

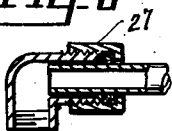


Fig 5

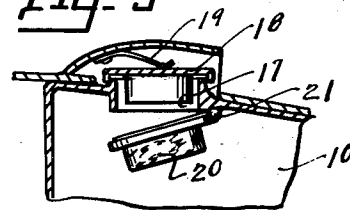


Fig III

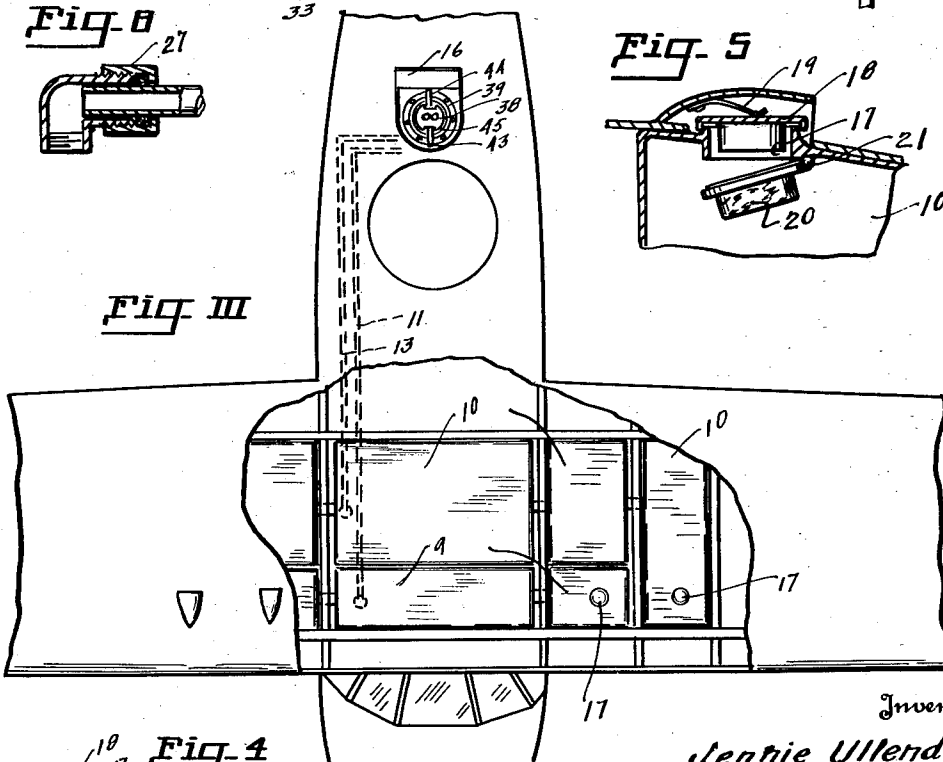
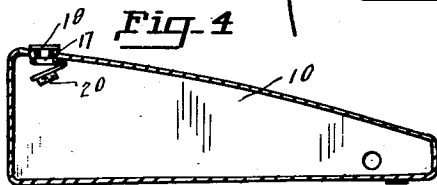


Fig 4



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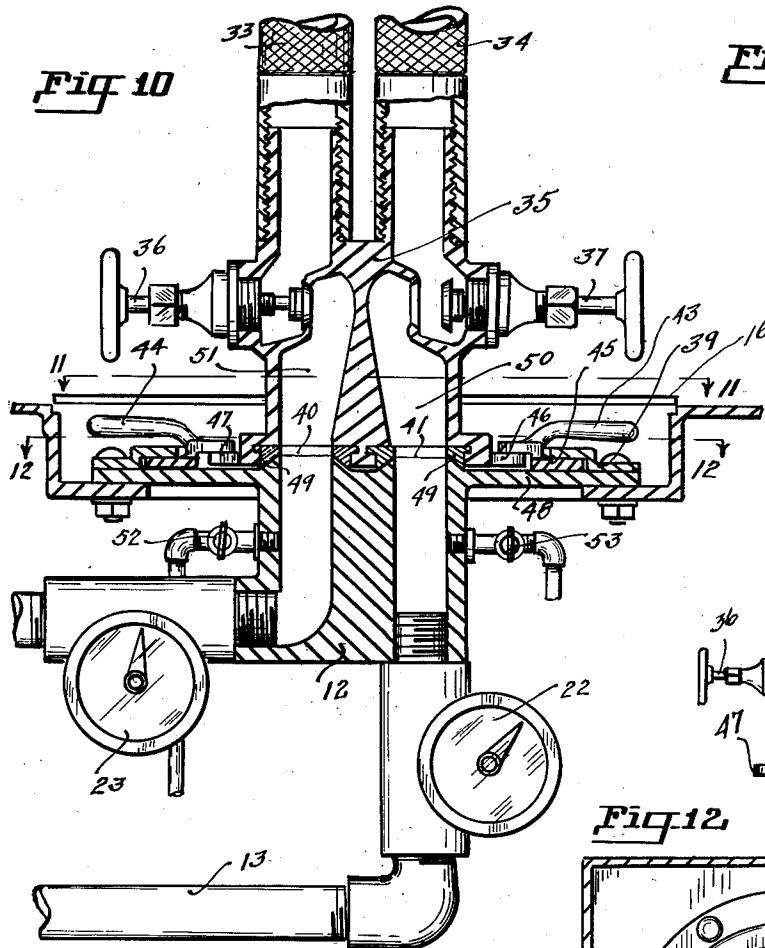


Fig 9

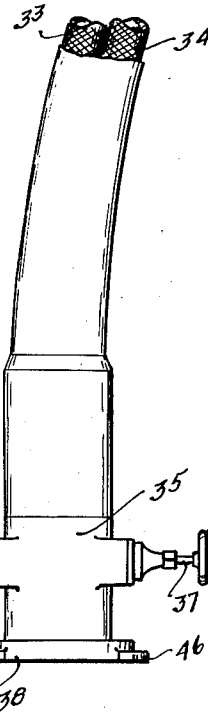


Fig 12

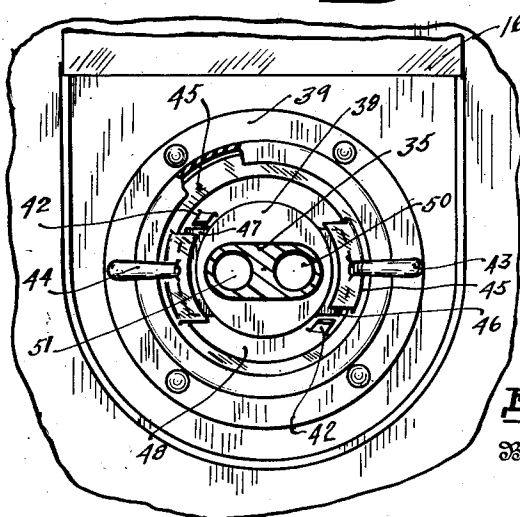
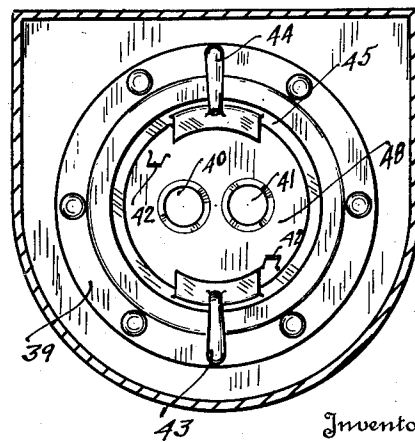


Fig 11

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Fig 13

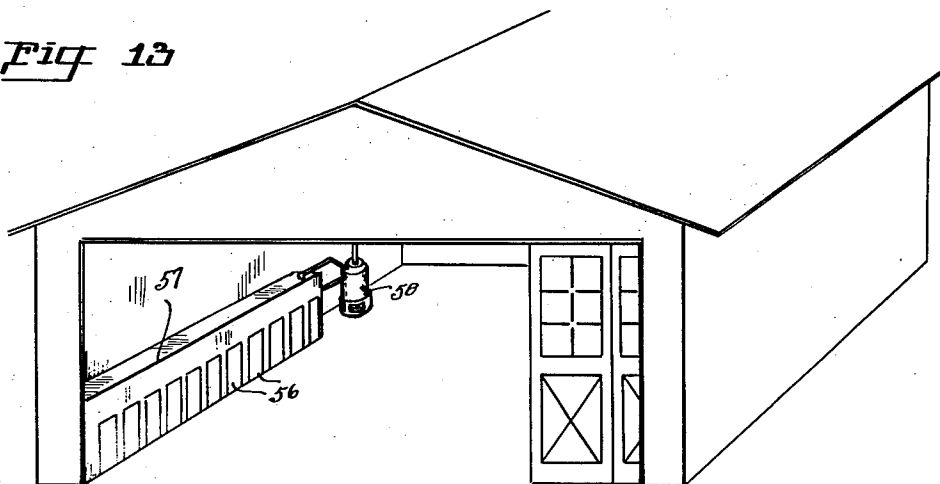


Fig 14

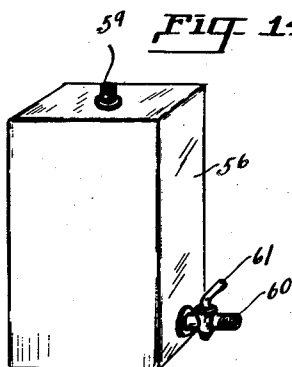


Fig 15

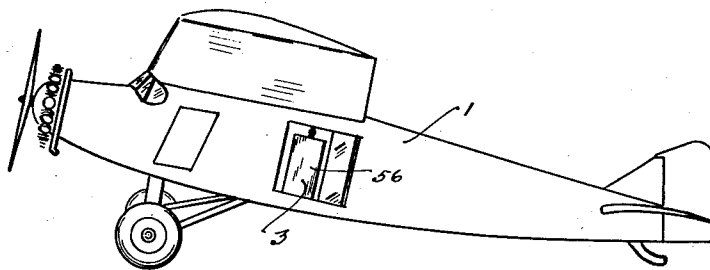
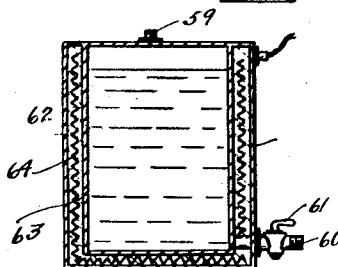


Fig 16

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UNITED STATES PATENT OFFICE

JENNIE ULLENDORFF, OF PORTLAND, OREGON

MECHANISM FOR SUPPLYING FLUIDS FROM ONE AIRSHIP TO ANOTHER
WHILE IN FLIGHT

Application filed January 10, 1929. Serial No. 331,680.

The primary object of my invention is for the supplying of fluid fuel and oil from one aeroplane to another while in flight.

The tendency in aeronautics at the present time is for longer sustained flights which require heavier fuel loads and one of the difficulties is for the aeroplane that contemplates the flight to leave the ground with the heavy fuel load required.

One of the purposes of my new and improved devices is to refuel the ship with a maximum fuel load in the early stages of its flight thereby enabling the aeroplane to carry a heavier load once substantial speed is attained than it is possible for it to carry on leaving the ground.

Another object of my device is to resupply the aeroplane with fuel and oil while in flight.

A further object of my new and improved invention is to reduce to a minimum, the time of contact between the two aeroplanes required for refuelling and augmenting its oil supply.

A further object of my invention is to reduce the hazards entailed during the period of contact between the two aeroplanes and to reduce the hazard to a minimum before and after contact is made between the air ships.

Still further objects of my new and improved devices reside in simplified construction and in means for increasing the viscosity of the oil in order that the time of delivery of the oil from contacting vessels may be reduced to a minimum.

And still further objects of my invention is to provide simple and efficient means whereby the air ship to be supplied with oil may receive the kind and quality of oil required by delivering the same from a source of supply of known quality and of the desired viscosity.

Still further objects of my invention reside in a mechanism wherein it is possible to supply both fluid fuel and oil simultaneously by requiring but one connection to be made between the fuel and oil supply and the tanks to receive the same.

In methods and means now in use to accomplish the refuelling and the furnishing of additional oils from one aeroplane to an-

other, while in flight, long contact is required between the two ships to accomplish the result and great hazard exists during such period. In my new and improved mechanisms, I supply fluid fuel and oil simultaneously through one conductor, having dual passages disposed therein, but wherein it is required to make but one contact in order that the dual purpose may be accomplished simultaneously and with a minimum of time of contact being required.

I accomplish these results by having in the mother ship removable oil supply tanks that may be admitted into the mother ship in a warmed condition to increase the viscosity of the oil and to maintain, where necessary, the oil in the warmed condition until the same is delivered to the air ship requiring the same; means being further provided for the maintaining of the hose or supply conduit, between the two air ships in a relatively taut condition and free from slack; but one conduit being required through which the fuel and the oil is forced under pressure to reduce the time of delivery from the mother ship to the receiving ship to a minimum.

With these and incidental objects in view, the invention consists in certain novel features of construction and combination of parts, the essential elements of which are set forth in the appended claims, and a preferred form of embodiment of which is hereinafter shown with reference to the drawings which accompany and form a part of this specification.

In the drawings:

Fig. 1 is a side view, partially in section of the mother ship.

Fig. 2 is a side view, partially in section of the air ship to which fuel and oil is to be supplied.

In Fig. 1 and Fig. 2 the air ships are shown in flight and in connection with the conduit for supplying the fuel and oil in engagement for delivery.

Fig. 3 is a fragmentary, sectional, top plan view of the air ship to which fuel and oil is to be supplied.

Fig. 4 is a sectional, end view of one of the

receiving tanks to which fuel or oil is to be supplied.

Fig. 5 is a sectional, side view of the escapement valve disposed within the receiving tank.

Fig. 6 is a side view, partially in section of the hose reel about which the hose is wound and through which the fuel and oil flows from the mother ship to the receiving ship.

Fig. 7 is another view partially in section of the hose reel about which the hose is wound.

Fig. 8 is a fragmentary, sectional, side view of the connection leading from the fuel supply and conducting the same into the central portion of the hose reel.

Fig. 9 is a side view of the discharge head of the hose.

Fig. 10 is a cross sectional, side elevation of the valves and attaching mechanism.

Fig. 11 is a sectional, end view, taken on line 11-11 of Fig. 10, looking in the direction indicated.

Fig. 12 is a sectional, end view, taken on line 12-12 of Fig. 10 looking in the direction indicated.

Fig. 13 is a perspective, end view of a hanger illustrating means for maintaining the oil tanks in a warmed condition to maintain the oil in the tanks in the warmed condition to increase the viscosity of the same.

Fig. 14 is a perspective, side view of one of the tanks that is adapted for being placed within the mother ship to which may be attached the hose or conduits that leads the oil directly into the tanks of the ship to receive the same.

Fig. 15 is a cross sectional view of a tank adapted for being warmed by electrical means.

Fig. 16 is a side view of the mother ship illustrating the same in position for receiving an oil tank filled with oil.

Like reference characters refer to like parts throughout the several views.

1 is the mother ship having an auxiliary fuel tank 2 disposed therein and having an auxiliary oil tank 3 disposed therein. An air tank 4 is disposed within the mother ship, the purpose and object of which is to supply air under pressure through the conduit 5 that leads into the tanks 2 and 3 to force the delivery of the fuel and oil from the mother ship to the receiving ship. A hose reel 6 is also disposed within the mother ship, the purpose of which is to control the hose 7 leading therefrom and to maintain the same in a relatively taut condition after the connection has been completed between the two ships. A suitable prime mover for rotating the reel 6 as an air motor, is illustrated at 8. The air motor is driven by air from the tank 4. The receiving ship is illustrated partially in section in Fig. 2, in which the fuel tanks 9

and 10 are illustrated in the wing structure of the receiving ship. For the purpose of illustration, the oil tank is illustrated at 9 with the supply pipe 11 running from the distributor head 12 to the oil tank and the supply pipe 13 leads from the distributor head 12 to the gasoline tank 10. Suitable valves 14 and 15 are disposed within the pipes for shutting off the pipes after the fuel supply has been received. A hatch 16A is disposed within the upper portion of the ship and about the receiving end of the distributor head. A hatch cover 16 is hingedly secured to the upper portion of the ship and covers the hatch and distributor head 12 when it is not in use. An escapement valve 17 is provided in each receiving tank due to the high velocity with which the fluids are delivered therein. The escapement valve 17 has a lidded closure 18 that is normally maintained in a closed position through the action of the spring 19. The pressure of the spring should be sufficient to maintain the cap closure 18 normally closed. A float valve 20 is hingedly disposed upon the inner side of the tank by any suitable hinging means 21 and as the tank fills, the valve will automatically close and therefore indicate upon the pressure indicators 22 and 23 that the respective tanks have been filled. I believe that the tanks for oil and gas disposed within the receiving ship should be arranged in series so that but one escapement valve will be required so that the tanks will progressively fill until all have been filled.

A suitable piping connection 24 leads from the gasoline supply tank 2 of the mother ship, and a suitable piping connection 25 leads from the oil tank 3 disposed within the mother ship. Each of these supply lines are connected through stuffing boxes 26 and 27 and lead directly into the interior of the hose reel 6. The hose reel 6 on its inside is divided into two compartments 28 and 29 which normally maintains two reservoirs filled with oil and gas. A hose is wound about the drum 30 of the hose reel and connected to each reservoir at the openings 66 shown in Fig. 7 by any connecting means, as a hose union 65 shown in Fig. 6. The drum 30 being disposed between the side walls 31 and 32 of the hose reel. The hose 7 has a dual passageway disposed therein composed of at least two independent conduits 33 and 34 terminating in a head 35 disposed upon its lower end. Each of the conduits 33 and 34 have manually operable valves 36 and 37 terminating the outlet. A flange head 38 terminating the free end of the hose 7. Disposed within the distributor head 12 of the receiving ship is a hatch cover 39 having entrance ways 40 and 41 disposed central thereof and having stop lugs 42 disposed in its upper surface. Rotatably disposed within the hatch cover is a ring having a pair of locking

handles 43 and 44 secured to a slip ring 45 mounted within a suitable guideway disposed within the hatch cover. The flange 38 terminating the hose 7 has lips 46 and 47 outwardly extending from the central portion and are adapted to engage within the circular depression 48 disposed in the upper surface of the receiving hatch. The stops 42 positioning and limiting the rotation of the terminal end of the hose after the same has been positioned within the hatch. When so positioned the openings 33 and 34 of the hose are then disposed in registerable alignment with the lead holes 40 and 41 disposed within the hatch. When the hose head is in position the locking handles 43 and 44 are rotated so that a tight connection is formed between the hatch and the lips, outwardly extending from the flange 38. A compressible gasket 49 is carried between the flange and the surface of the hatch to prevent leakage. When the indicators 22 and 23 indicate that the tanks have been filled the valves 36 and 37 are manually closed, thus leaving a minimum amount of fluid trapped within the passageways 50 and 51 disposed between the valves 36 and 37 and the lowest point in the passageways 50 and 51. To prevent this material overflowing or being wasted by, pass drains 52 and 53 conducts the material trapped within the entrances 50 and 51 into their respective passageways. In order that the hose 7 after the connection has been completed is maintained in a relatively taut condition, a prime mover, as an air motor 8 drives, a friction disk 54 illustrated in Fig. 6. The friction disk engages one of the faces of the side wall of the hose reel and rotates the same, to prevent slack in the hose line. The amount of rotating energy being imparted to the hose reel being determined by a tension spring 55 which maintains the friction wheel in intimate contact with the hose reel frame member.

It is highly desirable that the oil be maintained in a warmed condition to increase the viscosity of the oil so that it will be easier to deliver. Satisfactory results may be obtained by maintaining a battery of tanks, as illustrated in Fig. 13 wherein the tanks 56 are maintained within a warmed chest 57; the chest being maintained in a warmed condition by any suitable means, as by a steam boiler 58. Each of the tanks has an inlet 59 disposed through one of its side walls and a discharge outlet 60, with a valve 61, disposed within the discharge outlet. Each of the tanks may be filled with the oil required by the plane to be refuelled and as the plane is about ready for more oil, the tank, containing the warm oil as illustrated in Fig. 14, is placed within the mother ship and connected with the proper pipes and the oil is ready to be dispensed in the warm condition. The tank may be surrounded by a jacket 62 and

the tank 63 may be heated, by electric heating elements 64, disposed within the space between the jacket and the tank.

While the form of mechanism herein shown and described is admirably adapted to fulfill the objects primarily stated, it is to be understood that it is not intended to confine the invention to be one form of mechanism herein shown and described, as it is susceptible of embodiment in various forms all coming within the scope of the claims which follow.

What I claim is:

1. In a device of the class described, the combination of a mother ship having fuel and oil reservoirs disposed therein and a receiving ship having fuel and oil reservoirs disposed therein, discharge outlets leading from the reservoirs disposed within the mother ship and inlet pipes leading from a common point to the reservoirs disposed within the receiving ship, a dual passage hose leading from the reservoir outlets from the mother ship, means for detachably attaching the free end of the hose to the common inlet disposed upon the receiving ship and means for maintaining the hose in a relatively taut condition when attached and for automatically reeling the hose when detached from the receiving ship.

2. In a device of the class described, the combination of a mother ship and a receiving ship, fuel and oil tanks disposed upon the respective ships, a dual passaged hose disposed upon one of the ships, means for detachably attaching the hose disposed upon one of the ships to the other to conduct fuel and oil simultaneously therethrough from one ship to the other and means for maintaining the hose in a relatively taut condition during the fuel and oil transfer and for automatically reeling the hose in when detached from one of the ships.

3. In a device of the class described, the combination in a mother ship, of auxiliary fluid holding tanks disposed therein, one of said tanks having a compressible fluid therein, intercommunicating passageways connecting the compressible fluid holding tank and each of the other of said fluid holding tanks, a hose reel having liquid holding compartments disposed therein, disposed within the mother ship, inter-connecting passageways disposed between the noncompressible liquid tanks and the compartments of the hose reel, and a multi-tubular hose disposed about the hose reel and adapted for being wound and unwound therefrom, and means for connecting each of the tubular compartments of the hose with a different compartment within the hose reel.

4. In a device of the class described, in combination with refuelling apparatus disposed within a receiving ship, of a distributor head divided into a plurality of compartments directly aligned to a hose having a number of tubes disposed therein, said head hav-

ing a latch cover with a plurality of openings disposed centrally thereof, stop lugs disposed on its upper surface, locking means rotatably disposed within the latch cover, receiving tanks, and conduits leading from the head to the receiving tanks.

5 5. In a device of the class described, in combination with refuelling apparatus disposed in a mother ship, of a hose reel comprising
10 side walls, a drum having a plurality of compartments disposed between the side walls, brackets for holding the reel in an upright position, a hollow axle leading into the interior of the compartments of the drum, said
15 axle connected with stuffing boxes disposed on either side of the hose reel, inter-connecting conduits attached on their one end to the fluid reservoirs disposed within the mother ship and on their other end attached to the stuffing
20 boxes disposed on either side of the hose reel, a multi-tubular hose disposed about the hose reel and adapted for being wound and unwound therefrom, means for connecting a multi-tubular hose to the several compart-
25 ments of the drum, and means for controlling the movement of the hose reel.

6. In a device of the class described, in combination with refuelling apparatus, a hose having a plurality of conduits connected to a
30 hollow drum on its one end and terminating in a head at its free end, said head having a plurality of valves, each valve registerably aligned with a conduit of the hose, and means for detachably attaching the free end of the
35 hose to a common inlet disposed within the receiving ship.

7. In a device of the class described, in combination, a multi-tubular hose terminating in a head having as many valves as there
40 are conduits and having means for connecting the hose to a distributor head having a hatch cover with a plurality of openings disposed centrally thereof and in registerable alignment with the conduits in the hose, locking
45 means disposed on the upper surface of the distributor head, by pass drains connected with the distributor head, receiving tanks disposed within the receiving ship, and supply pipes running from the distributor head to
50 the receiving tanks.

8. In a device of the class described, in combination with refuelling apparatus disposed within a receiving ship, receiving tanks having disposed therein an escapement valve having
55 a lid closure held in intimate contact with a valve opening disposed through valve, and a floating valve hingedly secured to the inner side of a receiving tank and registerably aligned with the opening in the escapement valve that automatically closes as the receiving tank disposed within the receiving ship
60 is filled.

9. In a device of the class described, refueling apparatus, in combination, a distributor
65 head having a plurality of compartments, a

multi-tubular hose attachably detachable to the distributor head, a hatch disposed about the receiving end of the distributor head, a cover hingedly secured to the refueling ship, locking means rotatably disposed within the
70 hatch cover, lugging means disposed upon the hatch, receiving tanks, and conduits leading from the distributor head to the receiving tanks.

10. In a device of the class described, refueling apparatus, in combination, distributing tanks, a compressible fluid holding tank, intercommunicating passageways connecting the distributing tanks with the compressible
75 fluid holding tank, a hose reel, a plurality of compartments disposed within the hub of its drum, intercommunicating passageways connecting the compartments with the distributing tanks, a multi-tubular hose detachably
80 attachable to the compartments, and means for making the attachment.

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