Sept. 16, 1947. N. J. DE SANDERS, JR 2,427,352

JETTISON TANK

Filed May 12, 1944 2 Sheets-Sheet 1

Fig. 1.

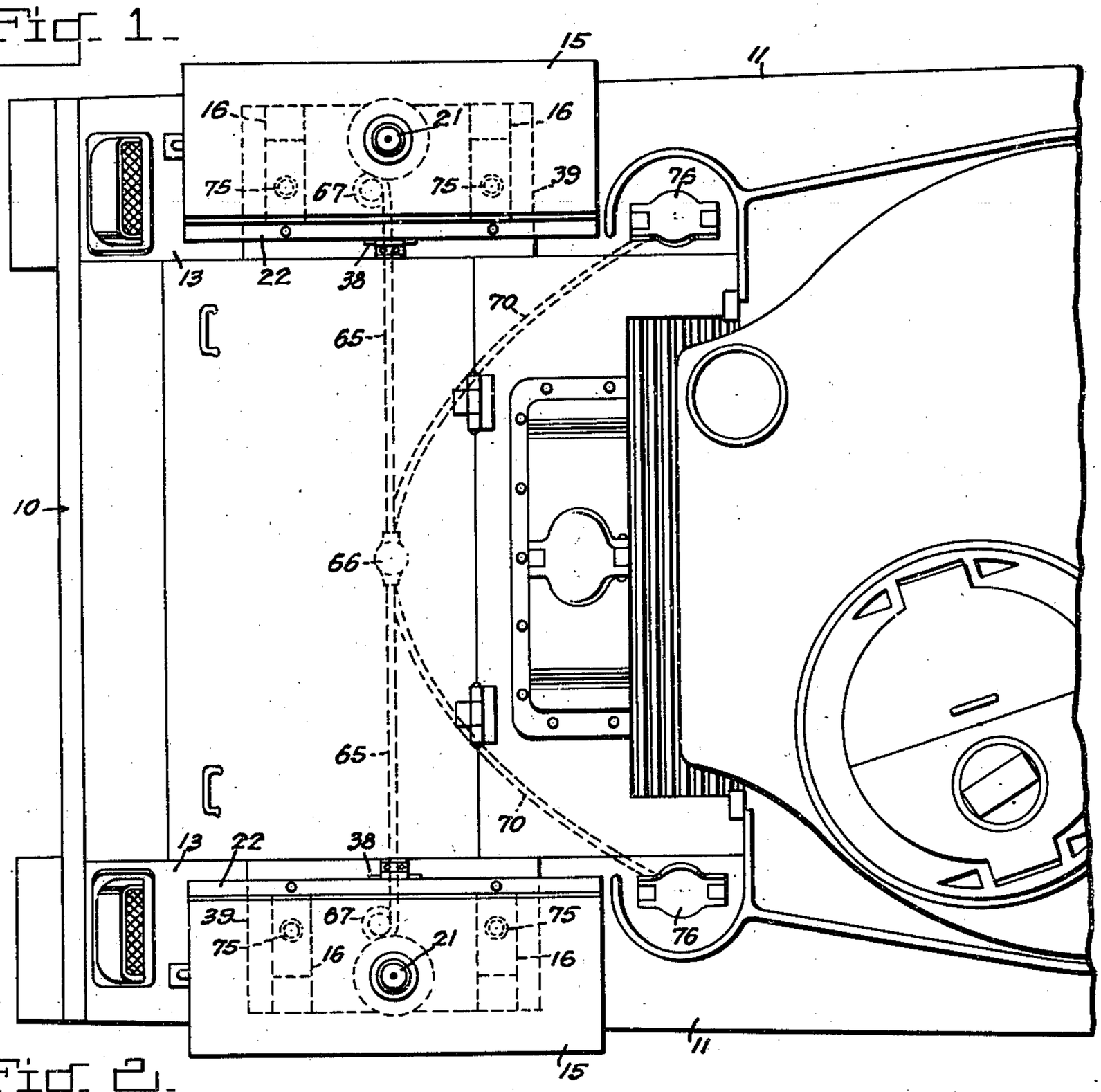

Fig. 2.

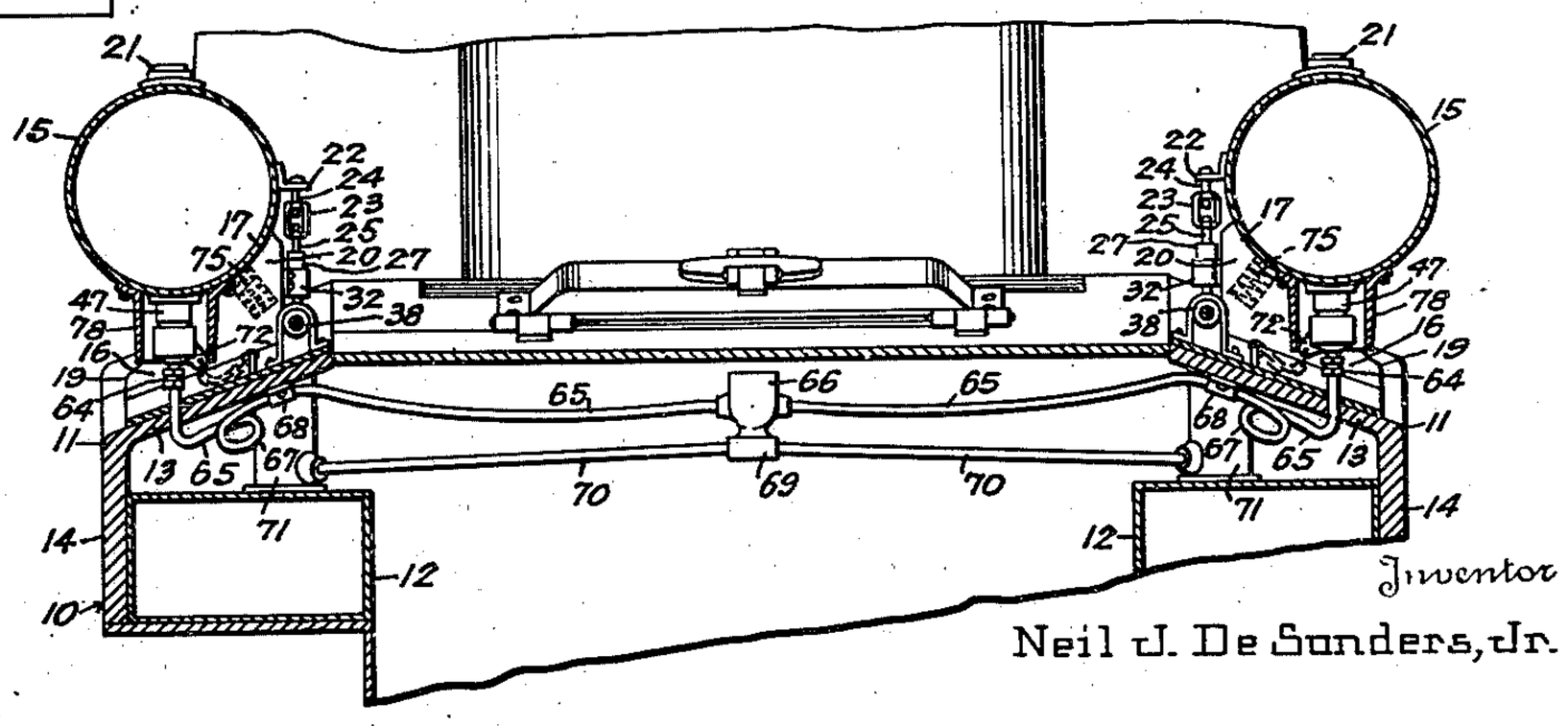

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Fig. 3.

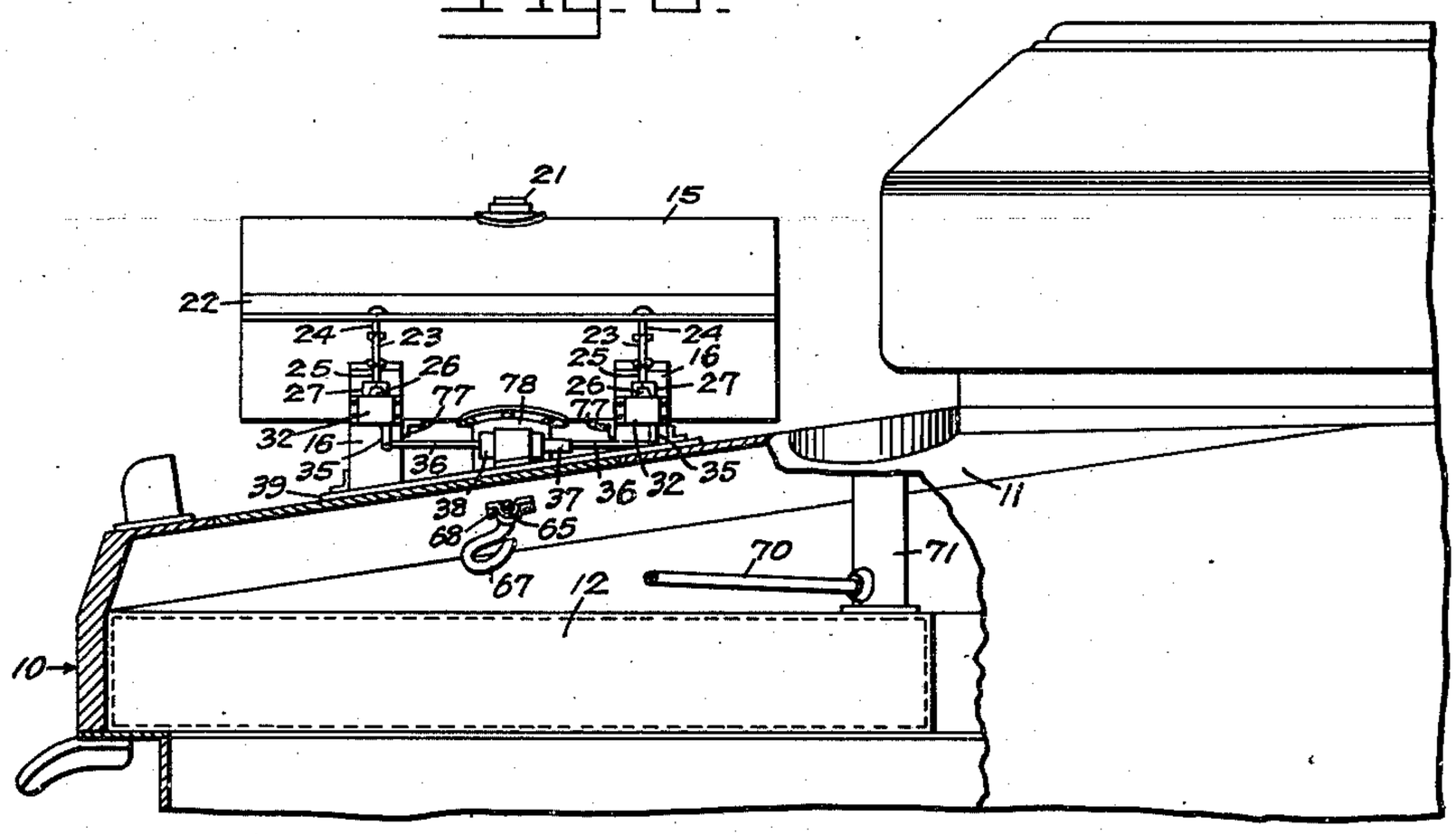

Fig. 4.

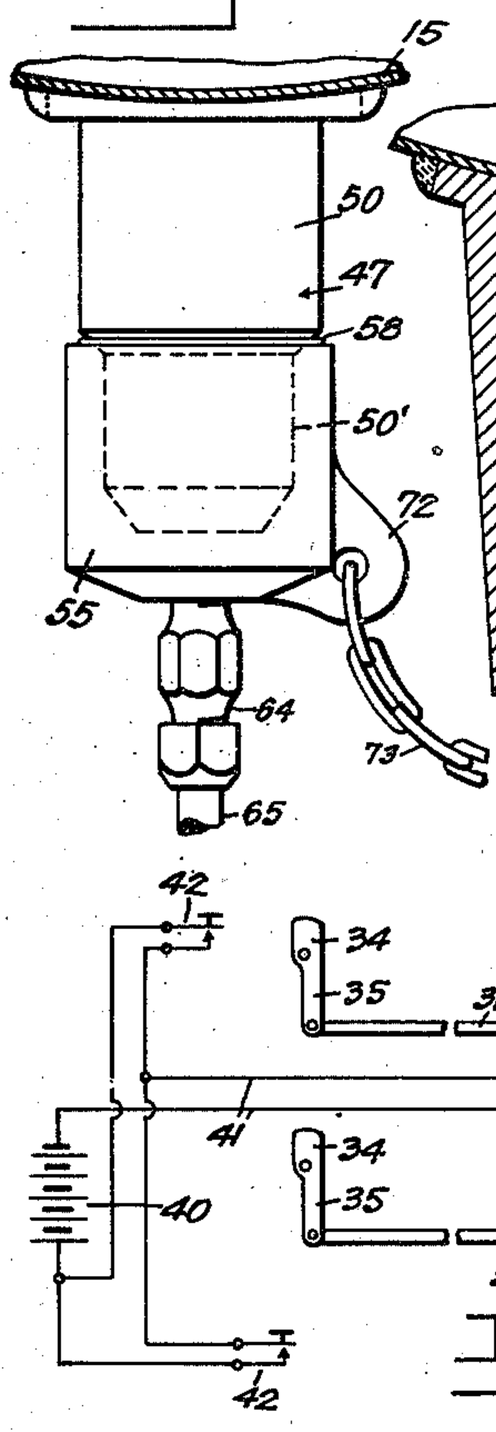

Fig. 5.

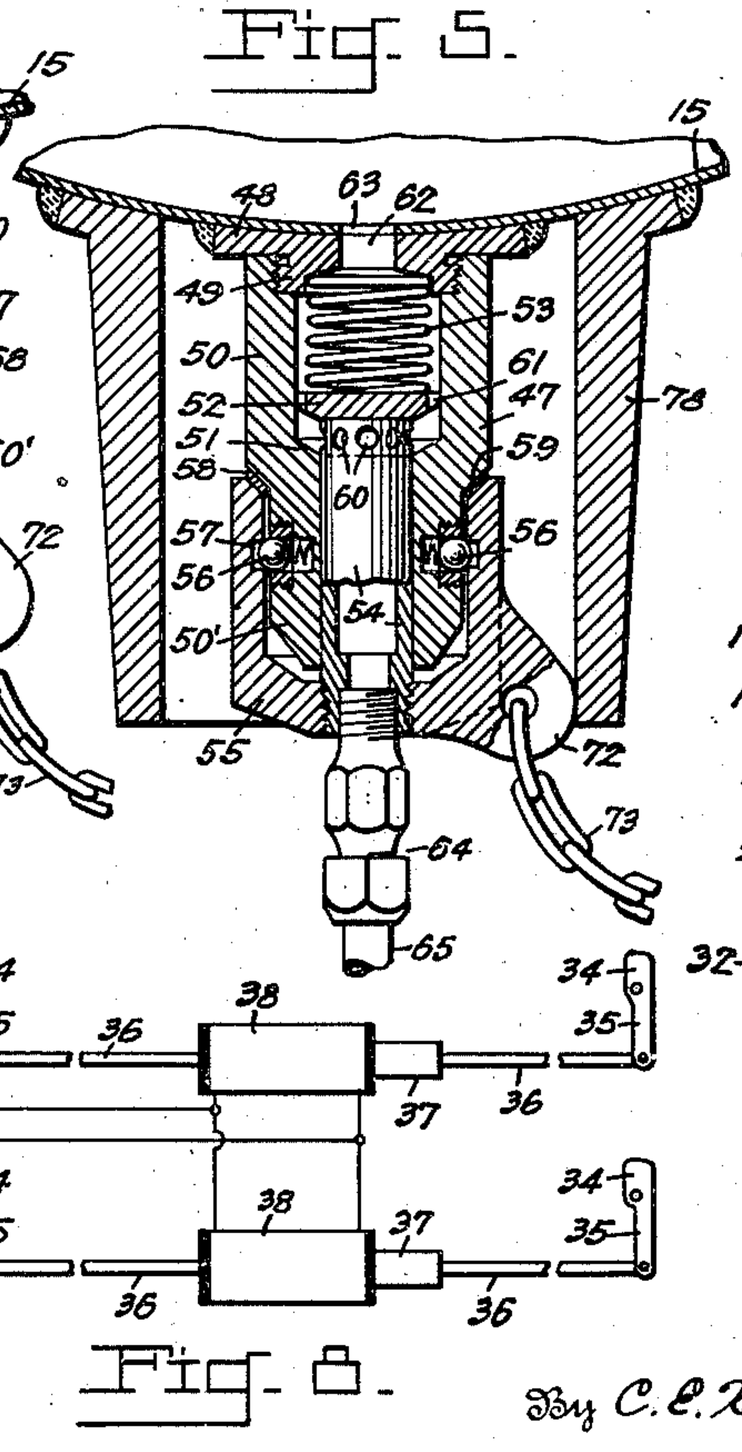

Fig. 6.

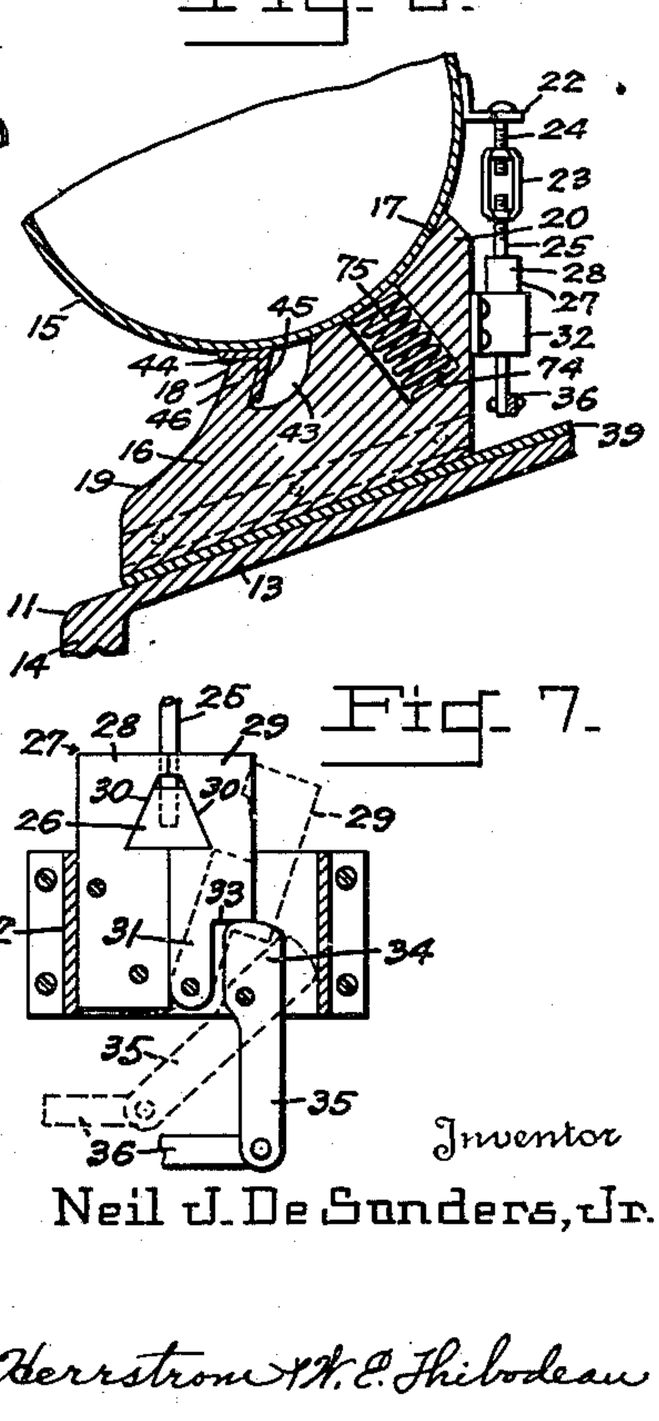

Fig. 7.

Fig. 8.

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Patented Sept. 16, 1947 2,427,352

UNITED STATES PATENT OFFICE

2,427,352

JETTISON TANK

Neil J. De Sanders, Jr., Dallas, Tex.

Application May 12, 1944, Serial No. 535,379

9 Claims. (Cl. 280—5)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment to me of any royalty thereon.

The invention relates to improvements in auxiliary tanks and the mounting thereof for discarding, as is practised with fuel tanks on motorized artillery and particularly such as are technically known as "tanks" where extra fuel tanks are carried to supplement the supply carried in the regular tanks of the vehicle, and are discarded when emptied or before, when in battle.

It is necessary, in such equipment, to safeguard personnel in the vehicle from injury by fire in case the auxiliary is disrupted, and an instantaneous response of discharging means must occur when the tank captain or other of the crew operate the necessary release or discharge device.

Also, in case it is found necessary to jettison a tank containing fuel, as may occur when the auxiliary is apt to interfere with traverse of the main armament piece, or as a precaution on entering an encounter, it is desirable to avoid waste of the fuel, because the tank may be recovered and also avoid undesired incendiary effects.

Therefore salient objects of the invention are to satisfy the above mentioned requirements and needs.

Incident to these objects it is sought to present a novel and effective fuel duct coupling which will be automatically uncoupled when the tank is jettisoned, and to coordinate therewith a closure for the tank whereby fuel will be retained therein.

A most urgent object is to insure the prompt removal of the auxiliary tank when desired without possibility of fouling of the fastenings or fuel connection; and to effect this by a novel, inexpensive, and rugged means, liable in a minimum degree to impairment by wear, weather or severe usage.

It is also an attainment of the invention that the procedure and manipulations involved in the emplacement, and securing of the auxiliary ready for effective release, are extremely simple and can be carried out by relatively unskilled personnel with small chance for mistakes.

Among other objects are these: to insure prompt initiation of movement of the auxiliary from place by mere release of an anchor device; to enable push button control of the discharge of the tank; to minimize delay in action of an anchor releasing device; to safeguard flexible fuel conduit from strain; to enable use of my invention without material change in equipment already in use.

Additional objects, advantages and features of invention reside in the construction arrangement and combination of parts involved in the embodiment of the invention, as will appear from the

following description and accompanying drawings, wherein:

Figure 1 is a top view of the rear part of a tank equipped with my invention;

Figure 2 is a schematic section showing: sponsons of a tank formally in section, the regular fuel tanks and two jettison tanks and mountings embodying my invention, together with fuel connections therefrom;

Figure 3 is a detail end elevation of one of my auxiliary tanks and mounting, with part of the mounting removed to disclose the discharge spring and fuel connection;

Figure 4 is a detail elevation of a fuel coupling;

Figure 5 is an enlarged vertical section of the fuel coupling;

Figure 6 is a detail cross section of the jettison tank and its mounting;

Figure 7 is a detail of one of the anchor release devices;

Figure 8 is a diagram of the electrical control circuits.

There is illustrated a portion of a motorized vehicle 10, and in this instance corresponding to what is known as a tank, a heavily armored vehicle carrying a large caliber gun mounted in a rotating turret by which traverse of the gun is effected through 360 degrees. This vehicle usually has a rear sloping deck behind the turret, and at each side of this rear deck fixed sponsons 11, here shown formally, each lying over an endless track traction device (not shown) and affording a space for the fuel tanks 12 permanently installed and conventionally connected to the carbureters of the power plant, these connections and plant not being shown.

The sponsons include a laterally sloping top armor deck part 13 and a depending thicker armor 14 at the outer side.

On each of the sloping tops 13 of the sponsons auxiliary cylindrical fuel tanks 15 are mounted and connected to the fuel system of the vehicle power plant, although they may be mounted elsewhere if desired, conveniently for dropping from the vehicle to the ground at need.

As the mounting of both tanks is identical, and also the immediate fuel connections therewith, one only will be described. The support for the tank 15 includes the deck 13 and at least two saddles 16, which may be termed a base support. They may be fixed permanently to the deck by bolting or welding. These saddles are arranged in parallel relation at right angles to the side 14 of the sponson, and suitably spaced longitudinally of the vehicle and tank 15. They are shaped arcuately concave on the upper side to fit the periphery of the tank 15, but contrary to ordinary practice with barrel cradles, in the normal or travel position of the tank 15, the outer side of the saddle does not extend to a level substantially

above that of the lowermost part of the recess. The recess 17 in the saddle terminates at the outer side immediately adjacent, if not inwardly of, the vertical diameter of the tank 15, and the saddle is rounded therefrom, forming a terminal support heel 18 which constitutes a fulcrum, on which the tank may pivot and is tiltable, when unsecured, from position snugly in the saddles, and is extended vertically downward from the heel, the lower or foot part of the saddle continuing slopingly downward, and outward, forming a ramp 19 or foot on which the tank may roll. The saddles are preferably located with said diameter a distance from the side 14 of the sponson less than one half the circumference of the tank 15. The inner termination of the recess 17 is substantially higher than the heel 18, so that the rear part of the saddle forms a back stop 20, or buttress, very positively supporting the tank 15 against inward lateral movement. The angular extent of the recess 17 with respect to the cylindrical axis of the tank is sufficient to afford a good bearing and support for the wall of the tank when pressed snugly into the saddles, at the same time that the necessary buttress effect at the back is attained.

Each tank 15 is provided with a filling and vent fitting 21 of customary construction. Along the rear side of the tank an L angle bar 22 has one flange secured flat against the wall of the tank a distance above the back portion 20 of the saddle, its other flange extending rearwardly from the tank.

Swivelled in this flange there are two or more turnbuckle links 23 the upper screw 24 of which may be permanently swivelled on the bar 22, while the lower screw rod 25 thereof is formed with an upwardly tapered wedge-shaped head or anchor 26 stopping short of the deck 13 a substantial distance. Forming part of, or mounted on the inner ends of the saddles 16, there are anchor grips 27 arranged and constructed to grip the anchor heads respectively.

Each of these grips consists in this instance of a stationary jaw 28 and a relatively movable jaw 29 pivoted thereto.

The two jaws are arranged so as to meet at a plane nearly or quite alined with the rod 25 when the head is between the jaws, and they are recessed and notched as at 30 on their opposed faces to fit the inclined surfaces of the head 26 and to receive the rod 25.

The head 26 is rectangular in cross section, having opposite wedge faces convergent upwardly, and the recesses 30 are correspondingly shaped, so that sloping sides of respective recesses will fit the respective adjacent wedge faces of the head 26. The depth of the recesses vertically is greater than the corresponding dimension of the head 26, and the inner, sloping, upper sides of the recesses are planiform, and extend to a junction with each other above the anchor head. The jaws are also notched longitudinally so that they may fit around the rod 25 with their inclined faces meeting above the head 26.

The pivoted jaws 29 are both arranged to swing longitudinally of the tank in the same direction in separating from the stationary jaws and each is formed with a reduced stem portion 31 extending downward closely adjacent the stationary jaw and pivoted at its lower extremity in a housing 32 secured to the adjacent saddle. Each pivoted jaw is also formed with an outwardly extended shoulder 33 a distance from its pivot, on its side opposite the stationary jaw. This forms an over hang under which a prop dog 34 may engage to

bear upwardly against the shoulder at its outer part and prevent pivotal outward movement of the jaw 29. The dog is pivoted and shaped so as to be movable out from under the shoulder 33 and to clear the pivoted jaw by a moderate extent of movement so that the latter may move clear of the head 26 and permit the latter to draw upward between the opposed jaws. In the present instance the dogs have arms 35 extended downwardly and connected for simultaneous movement by a link system which may be manually, mechanically or electrically operated as found expedient. In the instant case respective links 36 are pivoted to the ends of the arms 35 and extended toward each other as nearly alined as practicable, and connected to opposite ends of a solenoid core 37 mounted slidably in responsive relation to a solenoid coil 38 appropriately mounted between the saddles 16 on a bed plate 39 attached to the inner ends of the saddles. Attachment of the plate 39 to the deck 13 serves also to secure the saddles in place.

The solenoid coil may be connected in an open circuit 41 with any suitable electrical source available in the regular equipment of the vehicle and formally indicated as a battery 40 in Fig. 8, where solenoid coils for the two jettison tanks are connected in multiple in the circuit 41 and the circuit is arranged to be closed by any one of several conventional button switches 42, which may be conveniently located in the turret and elsewhere on the vehicle. Other means may be substituted for operating the anchor dogs, or may be used in conjunction therewith as an emergency release.

Each of the saddles 16 has formed therein immediately inward of the heel portion 18 a small lock recess 43, and secured to the external face of the tank 15 there is an angle bar 44 positioned with one flange flat against the tank surface and a dependent flange 45 projecting into the recesses 43, dependent flange 45 cooperating with each heel portion 18 or fulcrum element, at the inner side thereof formed by lock recess 43, to provide interlocknig retaining members for the tank at normal mounted position of the latter as will now be apparent. The outer sides of these recesses have an overhang or inward extension 46, and the flange 45 is inclined outwardly at such an angle as to engage under the over hang a distance beyond a vertical line dropped from the extremity of the over hang. Thereby, upward movement of the tank 15 is prevented, as well as tendencies thereof to rotate under pull of the anchor devices overcome.

It will be appreciated that when the anchor devices are released and tilting of the tank outward occurs, the initial pivotal movement of the tank on the heel portions 18 will cause the lower flange 45 to swing rearward in the recesses 43, divergent from the part 46, and then to swing upward out of the recess 43. The member 45 and heel portion 18, with the part 46 thus constitute a separable fastener or lock (the part at the same time being a fulcrum and support) which is automatically separated or unlocked by the tilting of the tank. To insure the function indicated, therefore, the recesses extend inwardly and upward with sufficient clearance to permit these movements of the flange therein.

A drain fitting and separable fuel conduit coupling 47 of novel construction coordinated with the function of the anchor device, saddles and other features, is provided, as shown in detail in Figs. 4 and 5. This comprises a base plate 48 secured to the wall of the tank and having an

integral externally threaded centrally recessed boss 49 on which there is screwed a stud sleeve 50 consisting of a generally cylindrical axially bored member the upper half of which is slightly enlarged. Its upper end is rabbeted and threaded to receive the boss 49 and the bore is also enlarged there affording a conical seat 51 at the beginning of the bore enlargement, to accommodate a poppet valve 52 for movement to and from the seat 51. The valve is held yieldingly to its seat by a compression spring 53 seated in the recessed end of the boss 49.

The reduced part of the bore opens through the lower end of the sleeve and receives slidingly a drain tube 54, set axially in the bottom of a cup member 55, which fits loosely around the stud part 50' forming the lower reduced half of the sleeve. The cup is held yieldingly in engaged position here by a plurality of spring pressed ball poppets 56 set in the side of the stud 50' and engaging in a circumscribing channel 57 in the wall of the cup, so that the latter may be pushed into place where the poppets will spring into the channel 57 and retain the cup in place, but yieldable to a pull of sufficient force on the cup to cause the outer side of the channel to press the poppets inward until they may slide on the wall of the cup above the channel. An elastic compressible gasket ring 58 is shown confined between the upper edge of the cup and the external conical shoulder 59 at the junction of the smaller and larger parts of the sleeve, the edge of the cup being bevelled to parallel the shoulder 59. When the cup is at normal engaged position with the poppets engaging the channel 57, the tube 54 extends above the seat 51 at the middle of the sleeve 50, and supports the valve 52 away from the seat 51. The upper end of the tube above the seat 51 is formed with a multiplicity of small ports 60, the valve has scalloped edge portions 61, and the base plate 49 is parted centrally at 62 in communication with an outlet opening 63 in the wall of the tank 15, although any other form of duct connection may be formed between the tank and interior of the sleeve 50 above the seat 51. The bottom of the cup 55 is suitably thickened to support the tube 54 effectively, the cup bottom being bored and tapped and the tube threaded and screwed thereinto. A conventional compression fitting 64 is engaged in the lower outer end of the tube, coupling a flexible fuel conduit 65 to the tube. This conduit is extended to one end of a filter T device 66 within the vehicle. The pipe 65 is provided with an ample slack portion 67 near the coupling with the tank 15, and inwardly of this slack portion the conduit is preferably anchored at 68 to a structural part of the vehicle. The pipes 65 from both tanks 15 are connected to the filter T at its upper part and the latter has a T outlet 69 below, from which feed pipes 70 extend to the filler necks 71 of respective tanks 12, into which they are let by appropriate coupling.

The cup 55 is provided with an eye 72, to which a chain 73 is linked, this chain being also anchored to the plate 39, as shown. This chain has a small amount of slack therein, but less than the slack 67 in the flexible conduit. It should be sufficient to permit the tank 15 to roll a distance from initial position fitted in the recessed parts of the saddle blocks and on the heel 18 and sloping surface of the ramp 19 a short distance before the chain becomes taut against the cup 55.

The saddle 16 has a pair of spring seats 74 therein, these seats being located inwardly of a perpendicular from the axis of the tank and being inclined so as to lie in a plane normal to a radius of said axis medially of the seats. A strong helical wire compression spring 75 is set and secured upon each seat, the spring constructed to extend beyond the position of the adjacent wall of the tank 15 when the spring is unloaded, and constructed to exert sufficient reactive force when compressed to equal the weight of the tank or a substantial part thereof.

Angle lugs 77 are secured to the surface of the tank 15, positioned and arranged to fit between the saddles 16 and prevent longitudinal slippage of the tank on the saddles.

As a protection for the drain fitting upper part when dropping from place on release, a shroud piece 78 is provided, secured to the tank 15 around the outlet. This member consists of a thick cylindrical wall of suitable metal having an interior diameter much greater than that of the sleeve 50, and a length somewhat longer than the sleeve. It is set against the face of the tank in concentric relation to the sleeve 50 and welded in place or otherwise secured.

In use, the apparatus being constructed as described, the supports for the tanks 15 being in place on the vehicle, and the fuel connections installed as indicated, the air vents customarily formed in the caps 76 of the filler necks 71 are closed permanently in any suitable way, the piping to the cup 55 and the cup thereafter serving to admit air to the permanent tanks 12. The jettison tanks may be put in place empty and filled while in place on the vehicle or may be filled beforehand. In either case the tank 15 is positioned with the outstanding flange 45 at the lowermost part of the tank and alined with the recesses 43 as the tank is lowered to a position slightly outward of the heels 18. As soon as the tank rests on these heels with the flange 45 entered in the recesses, the tank is rolled inward on the heels 18 until it rests snugly in the recesses 17 and against the rear parts or backstops 20, and the springs 75.

The turn buckle devices, which in the meantime have been swinging free from the back bar 22, are now adjusted with the anchor heads 26 between the jaws 28—29 and in the notches 30, while the dogs 34 are moved to locking or prop positions under the shoulders 33 of the jaws 29.

Next, each turn buckle yoke is rotated to draw hard downward on the back bar 22. This will cause a slight rotation of the tank 15 around its axis until the flange 45 engages snugly under the overhang 46, in case any clearance occurred there in the initial placement of the receptacle, and will also anchor the tank securely against rolling or upward movement from the saddles. This is the normal loaded position of the tank. The permanent fuel system of the vehicle may now be coupled to the auxiliary tanks by manual presentation of the cups 55 around the extremities of the lower stud parts 50' of the sleeves 50 and thrust there onto and against the elastic ring 58 until the poppets 56 enter the channels 57 in the walls of the cups. This causes the tubes 54 to lift the valves 52 and permit flow of fuel from the tanks 15 to the permanent tanks 12 as indicated. The latter will now become filled and will remain full while the coupling continues, until the fuel of the auxiliary tanks is exhausted. During this use of the auxiliary fuel supply the necessary admission of air will occur through the filler caps at 21. Subsequent to depletion of fuel in the tank 15, if the coupling at 47 is continued, relief of vacuous condition in

the tanks 15 will be effected through the vents at 21, the tanks 15, and the fuel conduits from the latter to the tanks 12.

At any instant that it is necessary or determined to be desirable to dispense with and jettison the tanks 15, an occupant of the vehicle may press the button of one switch 42, and the tanks 15, full or empty, will be immediately and automatically jettisoned.

Upon closure of the switch the circuit 41 is completed through the solenoids 38 at each tank anchorage, drawing the links 36 so as to move the dogs 34 from under the shoulders 33 of the movable grip jaws 29 and freeing the latter for release movement from the anchor heads 26. The turn buckle assembly, by its tension, and under the urging of the springs 75 acting on the tanks 15, will force the heads 26 upwardly, wedging the jaws of the grip devices apart and freeing and clearing the heads 26 entirely. This leaves the tanks 15 free to roll outward on the heels 18 and ramps, and this movement of the tanks is effected by the springs 75.

By locating the heels 18 close under the axes of the tanks 15, the forces of the springs 75 become highly effective in moving the tanks so that moderate force only is required, and very prompt jettison movement is effected when the release devices are operated. The jettisoned tank may be recovered and used again as described.

After release of the jaws the forces of the springs 75 will be supplemented by lateral inertia forces incident to the frequent motions of the vehicle, and also by gravity under lateral inclinations of the vehicle which will occur alternately in each direction on ordinary roads or field terrain, and the rolling movement on the ramps 19 will be continued by gravity as soon as the centers of gravity of tanks 15 pass beyond the apices of the heels 18.

In the rolling of the tanks 15 outward their motion will be accelerated and the slack of the chains taken up at the same time that parts of the flexible conduits 65 are drawn outward.

About when the axis of the cup 55 and stud 50' are disposed on a line between the anchored end of the chain 73 and the axis of the tank 15 the chain will become taut and the inertia of the tank 15 and contents will cause the stud 50' to be drawn from the cup. This will permit the spring 53 to seat the valve 52 preventing escape of any fuel remaining in the tank 15.

Thereafter air will be admitted to the permanent tanks 12 through the cups 55 the flexible conduit and piping to the necks.

I have disclosed the invention with particularity in the best form thus far known to me, but it will be understood that this is purely exemplary and that various changes in construction and arrangement of parts substitution of materials and equivalents, mechanical or otherwise, may be made without departing from the spirit of the invention as set forth in the appended claims, wherein I claim:

1. In a jettison tank and mount a base tank support including a saddle having an inner tank anchoring side and an outer discharge side, a tank thereon having its vertical diameter immediately adjacent said outer discharge side and tiltably movable thereover from a released but otherwise normal mounted position toward the discharge side, upper and lower retainer members comprising respectively a rigid projection on the tank and a fulcrum element on said saddle at the discharge side thereof constructed, arranged

and adapted to interlock at normal mounted position of the tank to hold the outer part of the tank against upward or outward movement translatively, and shaped so that the one will move clear of the other under tilting motion of the tank, and a releasable anchor device coengaged between the inner side of the tank and support.

2. The structure of claim 1, in which the tank is cylindrical at the part over and outward of said retainer members, said support terminating closely adjacent a longitudinal element of the cylinder alined with the retainer member on the tank, whereby the tank may tilt on the lower retainer member and roll thereover when the tank is released.

3. The structure of claim 1 in which the tank is cylindrical at the part over and outward of said retainer members, said support terminating closely adjacent a longitudinal element of the cylinder alined with the retainer member on the tank, whereby the tank in tilting movement will pivot on the terminal part of the support, said retainer member on the support being an upwardly and inwardlly inclined member, said retainer member on the tank being a rigid member fixed with the tank projected therefrom obliquely toward the discharge side of the support so as to underlie the retainer member on the support so as to describe an arc under tilting of the tank whereby to move from an engaged position to a cleared position relative to the retainer member on the support.

4. The structure of claim 1 in which said inner tank anchoring side of said support engages the tank as a buttress at a high elevation on the tank and said anchor device is a tension member which includes a piece fixed to a high level part of the tank at its inner side, the anchor device being coupled directly to the high inner side of the support.

5. In a jettison tank and mount, a base support including a member having a discharge side and an anchor side, a tank thereon tiltably movable thereon from a normal mounted position toward the discharge side of the mount, a rigid projecting member at the lower part of the tank extending longitudinally of the tank and inclined downwardly and toward the discharge side of the base support, a rigid projecting member on the support outwardly of the projecting member on the tank, and overlying the latter in normal mounted position of the tank, said projecting members constituting interlocking retaining members for the tank at normal mounted position of the latter and being so arranged that under initial tilting movement of the tank movement of the one on the tank will be inwardly divergent from the one on the support to move from under the latter, and a releasable tension device engaged between the support and tank at the anchor side.

6. The structure of claim 1 in which each of said retainer members has an inclined part arranged to be in lapping relation to the other, so that one on the tank may engage under the other on the support when the tank is in normal loaded position, the inclined part on the support being extended in the direction of relative rotating movement of the other with the tank when the tank moves tiltingly on the support.

7. The structure of claim 1 in which one said retainer member is on the tank and comprises a rigid tongue-like member fixed on the tank inclined downward and toward the discharge side of the support across a vertical line, and the

other of the retainer members is on the support inwardly of the axis of tilting movement of the tank on the support and inclined upward and inwardly over the first named retainer member in lapping relation, the path of initial movement of the first named retainer member under tilting movement of the tank on the support being divergent from the overlying parts of the second named retainer member.

8. In a vehicle of the character described, a support thereon having an inner buttress part and an outer discharge side stopping immediately adjacent a bound of the vehicle shaped and arranged as a terminal fulcrum part to support in a tiltable condition a receptacle when set in an unsecured but otherwise normal loaded position on said support against said buttress part, so that the receptacle may tilt by gravity over the support toward said discharge side and outward beyond said bound, a separable fastener connected directly to a high inner part of the wall of the receptacle inwardly of the axis of tliting movement of the receptacle on the fulcrum part and to an anchor on the vehicle inward of the receptacle, means remotely controlled to release said fastening at will, and a separable fastening including one member secured to the wall of the receptacle immediately adjacent said fulcrum part and a complementary member on the fulcrum part having interlocking relation to said one member at normal loaded position of the receptacle, said one member on release of said fastening being movable translatively as a unit with the receptacle around said axis in a direction to unlock and diverge from said complementary member under tilting movement of the receptacle on said fulcrum part.

9. A jettison tank mounting and jettison device comprising a saddle support member having an

outer discharge side and an inner anchor side, the upper side of said support member being shaped to fit the periphery of a tank and providing an inner buttress adjacent said inner anchor side and a fulcrum element terminating at said outer discharge side immediately adjacent the vertical diameter of a tank supported by said support member, a spring seat in said support member located inwardly of said fulcrum element, a compression spring positioned on said spring seat to bear against a tank supported by said support member in a direction tending to move the tank from the support member, said spring member having a high unloaded position within the space for such tank so as to be compressed by such tank when the latter is supported by said support member, said spring being constructed to exert sufficient reactive force when so compressed by such tank to tilt such tank from said support member when such tank is free, and means releasable at will to secure a tank on said support member.

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