Jan. 11, 1944. C. H. FOLMSBEE 2,339,006

SWINGING DOME COVER

Filed Feb. 21, 1941 2 Sheets-Sheet 1

Fig. 1.

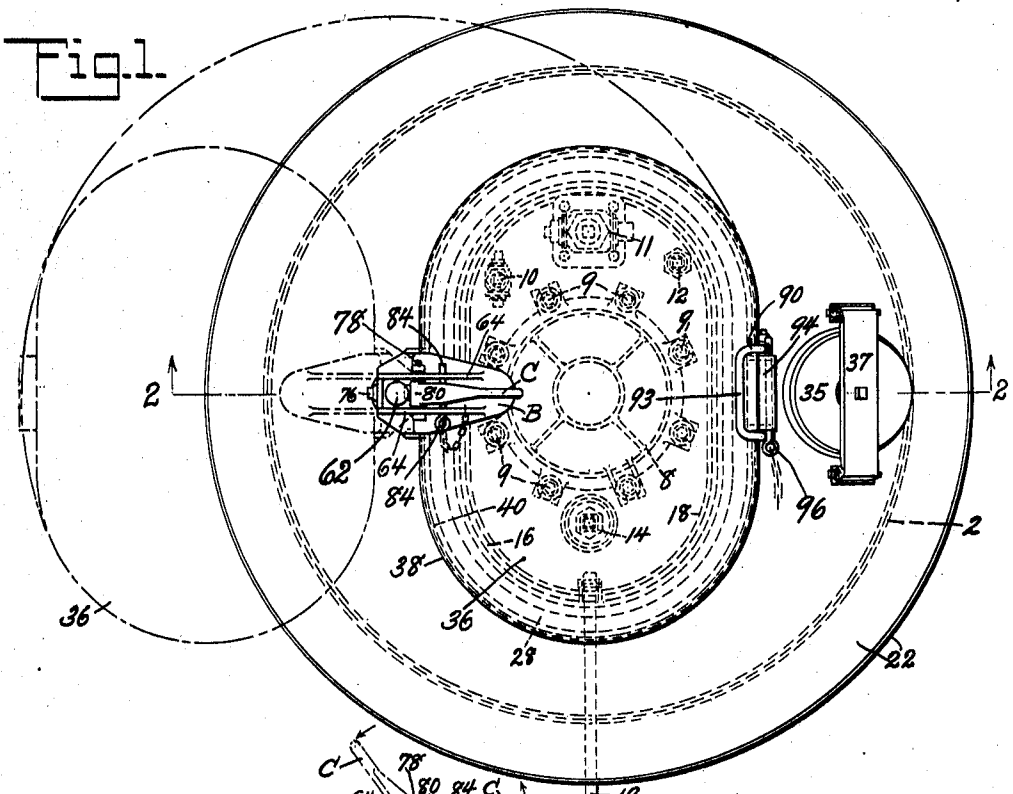


Fig. 2.

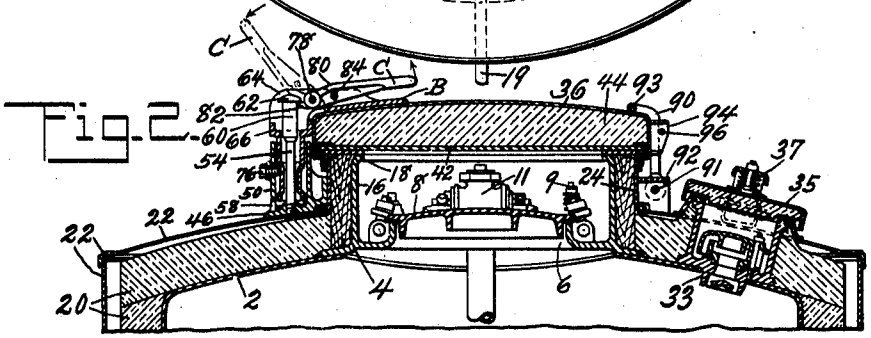
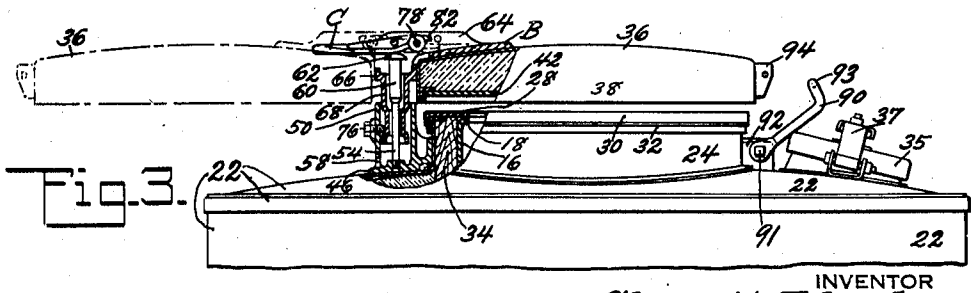


Fig. 3.



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Filed Feb. 21, 1941 2 Sheets-Sheet 2

Fig. 4.

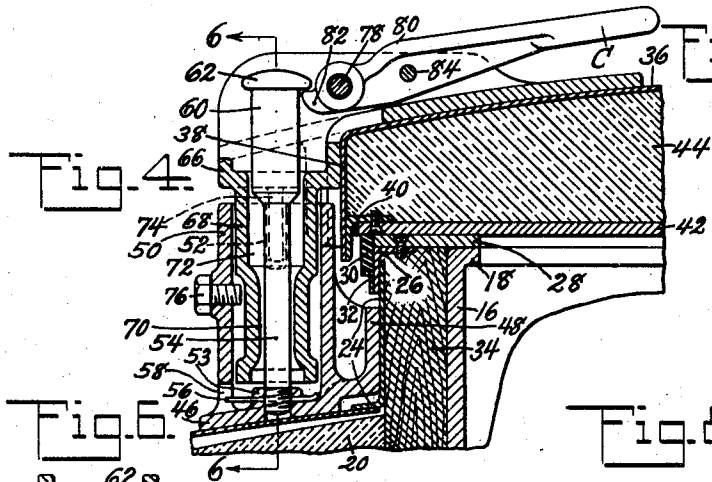


Fig. 9.

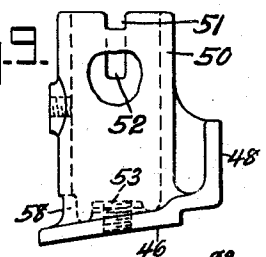


Fig. 6.

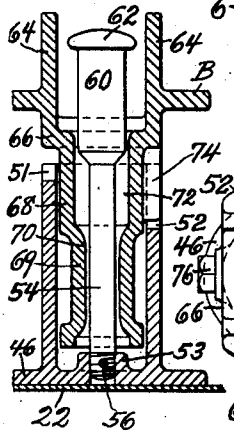


Fig. 5.

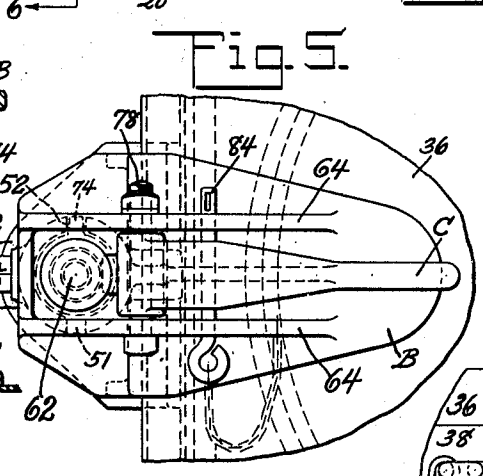


Fig. 8.

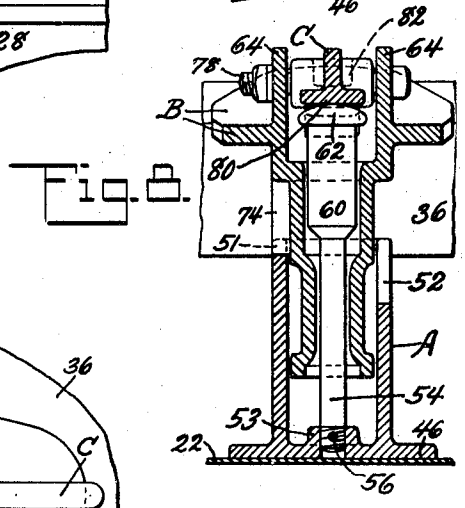


Fig. 10.

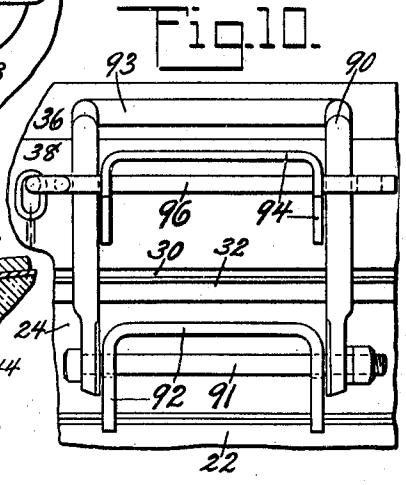
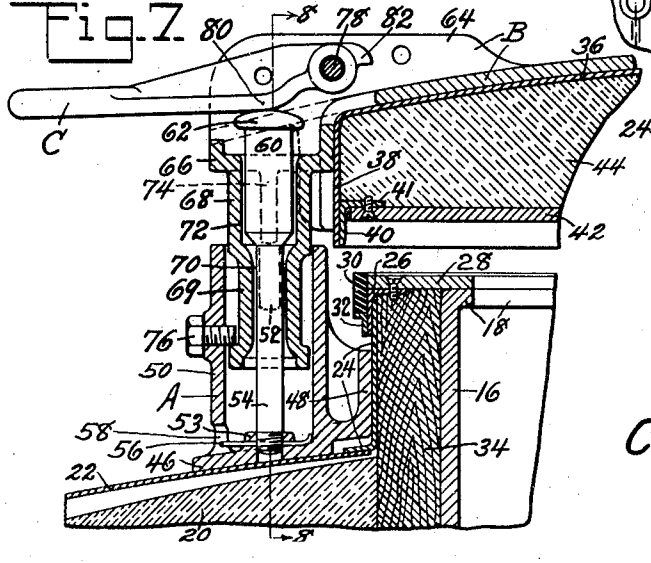


Fig. 7.



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Patented Jan. 11, 1944 2,339,006

UNITED STATES PATENT OFFICE

2,339,006

SWINGING DOME COVER

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Application February 21, 1941, Serial No. 380,077

10 Claims. (Cl. 220—36)

This invention relates to swinging covers in general and in particular to swinging dome covers of the insulated type intended for use on insulated railway tank cars.

In the past substantially all insulated railway tank cars have had insulation extending up to the dome ring but not over the ring, thus the metal forming the ring, as well as the loading and unloading and safety fixtures, were exposed to direct heat loss. In recent years it has become customary to ship certain commodities which will solidify or become highly viscous if their temperature reaches approximately atmospheric temperature. At present the commodities are loaded in an extremely hot condition and rushed as fast as possible to the destination in order to prevent a solidification or congealing of the commodity being carried. It has been found that an extremely large amount of heat is radiated by the necessary metallic fixtures and protecting dome ring. It has also been found that if these exposed fixtures and dome ring are properly insulated the heat losses from the lading are very materially reduced and the length of time the car or tank may be in transit can be nearly doubled without a solidification of the commodity being carried. However, it was found impossible to properly insulate the dome ring and fixtures by utilizing known methods for, due to the extreme size of the tanks and loading racks, it was impossible to utilize a hinged or other type insulated cover. It is an object, therefore, of the present invention to provide a highly efficient insulated dome cover which may be swung to an out-of-use position and without interfering with necessary and existing obstructions.

A further object of the invention is the provision of an insulated dome cover which may be lifted and rotated or swung about a vertical axis to an out-of-use position.

Another object of the invention is the provision of an improved insulated dome cover having means to lift the cover for swinging about a vertical axis and which means also serves as a lock for retaining the cover in an in-use position.

These and other objects of the invention will be apparent to persons skilled in the art from a study of the following description and accompanying drawings, in which

Figure 1 is a plan view of a tank dome with the improved dome cover applied thereto;

Fig. 2 is a transverse sectional view taken substantially on line 2—2 of Figure 1;

Fig. 3 is an elevational view of the improved dome cover with parts broken away to better disclose the relation of parts and with the cover raised ready to be swung to a position indicated by line and dash outline;

Fig. 4 is an enlarged sectional view of the improved pivotal mounting for the cover and showing the cover in closed and locked position;

Fig. 5 is an enlarged plan view of the improved cover pivot means;

Fig. 6 is a sectional view taken substantially on line 6—6 of Fig. 4;

Fig. 7 is an enlarged sectional view similar to Fig. 4 but showing the cover in a raised position ready to be swung or rotated;

Fig. 8 is a sectional view taken substantially on line 8—8 of Fig. 7;

Fig. 9 is an elevational view of the bearing or socket casting, and

Fig. 10 is an elevational view of the locking means used to retain the free edge of the cover in closed position.

Referring to the drawings in detail, it will be seen that only the dome portion of a tank has been shown, but it is to be understood that this dome is connected to and forms a part of a complete railway car of the type generally used to transport liquid commodities. In the present case the dome sheets 2 are formed with the customary opening which is closed by means of a dome ring casting 4, preferably welded to the dome sheets. The dome casting is provided with a manhole 6 adapted to be closed by a manhole cover 8 held in place by any suitable means such as bolts 9. The bottom portion of the dome ring casting is formed with openings adapted to receive various fixtures such as air inlet 10, siphon pipe connection and valve 11, vacuum relief valve 12 and discharge valve control mechanism 14, which may be merely a packed stem extending from the outlet valve through the dome ring casting. In order to comply with governmental requirements the fixtures just referred to must be protected by an upstanding flange 16 which in the present case is formed with an inturned lip 18. Such protection of the fixtures of necessity provides a cavity and since moisture may gain access to this cavity a drain 19 is provided extending from the space through the insulation and jacket later to be described. This drain is provided at its inner end with a check valve opening inward, thus requiring a manual operation to drain trapped moisture, while permitting an automatic inlet in case the vacuum relief valve should operate. The tank shell and dome is insulated in the usual manner by insulation 20 protected by a jacket 22 which

conforms to the tank and dome contour and has an upstanding ring or flange 24 conforming to but spaced from the flange 16 of the dome ring. As more clearly shown in Figs. 4 and 7, an angle member 26 surrounds and caps the edge of the jacket flange 24 and has one leg turned inwardly with its upper surface substantially in alignment with the upper surface of lip 18 of the dome ring flange. This inturned leg is adapted to support and have secured thereto a ring or oval 28 of some suitable, strong insulating material, such as Masonite, manufactured by the Masonite Corporation of Chicago, Illinois. The outer edge of this insulating ring or oval is shown as substantially flush with the outer surface of the downturned leg of angle 26 in order to provide a smooth surface for reception of an elastic gasket 30 stretched or snapped into position surrounding the ring and supported against vertical shifting by a small angle 32 welded or otherwise secured to the lower edge of the downturned leg of the angle 26. The space between jacket flange 24 and dome ring flange 16 will be filled with some suitable insulating material with at least part of the material having sufficient strength to retain the flanges in spaced relation; for example, wood strips 34 may be used with the circumferential spaces between the strips filled by a loose insulating material such as glass wool. Thus it will be seen that the dome ring and dome will be thoroughly insulated and that there is no metallic contact between the inner tank shell and the metal jacket protecting the insulation. Excessive pressure within the tank is prevented by application of a safety vent 33 fastened to the dome and having flanges extending outwardly substantially through the insulation but insulated from the jacket or outer covering of the tank. Heat losses from the safety vent are prevented by application of an insulated lid 35, spring urged into position by means of a spring and strap 37 attached to the tank jacket, thus effectively insulating the vent while permitting discharge of excess pressure in case the disc of the vent should rupture.

In order to close the dome ring opening a dome cover is provided having a dome-like outer sheet 36 with its edges or flanges 38 directed downwardly and having secured thereto an angle or other member 40 with one leg 41 directed inwardly and spaced above the lower edge of the cover sheet flange. This inturned flange 41 has secured thereto a sheet 42 of any suitable non-metallic insulating material of considerable strength, such as Masonite. The space between the cover sheet 36 and sheet 42 is adapted to be filled by any suitable insulating material 44, thus it will be seen that an insulated cover has been provided without any metallic path for loss of heat from the cavity in the dome ring housing the necessary fixtures. It will also be seen that the gasket 30 projects slightly above ring 28 and will accordingly be compressed when the cover is lowered into position, thereby effectively preventing any leakage from the space even though the sheet 42 and ring 28 should be slightly warped or irregular. Any entrance of moisture or other material will be prevented by the extended flange of the cover which will also act as a cover centering means and protector for the rubber or other elastic material gasket 30.

In order to retain the cover in attached and operative position on the tank a base or bearing socket A is provided and this casting, as more clearly shown in Figs. 4 to 9, inclusive, has a jacket contacting portion 46 and a jacket flange contacting portion 48 integrally tied together and preferably welded or otherwise secured directly to the tank jacket. The jacket contacting portion of the casting has formed integrally therewith an upstanding tubular projection or bearing socket 50. This bearing or socket is provided with a short notch 51 and long notch 52 extending downwardly from the upper edge of the casting and for a purpose later to be described. The jacket contacting portion 46 is formed with a raised boss 53 having a threaded opening formed therein to receive the lower end of bolt 54 which will be screwed into the boss and locked therein by a cotter or other pin 56 driven into position through an opening 58 formed in the lower portion of the bearing socket. The bolt 54 is, as shown, located substantially on the axis of the socket and has the upper end of the shank enlarged as at 60, with the enlarged shank terminating in a mushroom head 62.

The dome cover sheet has attached thereto, as by welding or any suitable means, a casting B having spaced upstanding flanges or ears 64 which are integrally tied together and to the main part of the casting by a ledge 66. This ledge has integrally formed therewith a projecting journal or trunnion 68 of considerable length and having an upper and lower bearing surface joined by a recessed portion 69. The journal or trunnion is provided with a central opening having a lower portion 70 of a relatively small diameter and an upper portion 72 of a relatively large diameter adapted to cooperate with the small and large diameter portions of the bolt shank carried by the bearing or trunnion socket. One side of the journal or trunnion has formed thereon an outstanding projection 74 of sufficent width and length as to engage with slots 51 and 52 of the base bearing or trunnion socket. When in assembled position with the journal or trunnion located within the bearing or socket separation of the two parts will be prevented, not only by the bolt previously referred to, but also by a screw bolt 76 extending through the bearing or socket portion wall and into the space on the trunnion provided by the reduced diameter portion 69. Thus it will be seen that the trunnion or journal is free to rotate in the socket or bearing but cannot be vertically separated.

In order to lift and lock the dome cover an operating handle C is provided and is trunnioned on a bolt or other means 78 extending across and supported by the ears or flanges 64 previously referred to. The operating handle is formed with a portion 80 adapted in one position of the operating handle to contact the mushroom head of the bolt carried by the bearing or socket. The handle is also provided with a projecting finger 82 adapted to engage under the mushroom head of the bolt to hold the cover in lowered position, such holding being positively accomplished by means of a pin 84 extending through ears or flanges 64 and through the operating handle. Additional locking means for the free edge of the cover is provided and this consists of a deformed U-shaped latch 90 pivoted to the tank jacket by a bolt 91 carried in bracket 92 welded or otherwise secured to the tank jacket. The deformed U latch has an upper offset portion 93 adapted to engage over the sheet forming the insulated dome cover, while the legs of the U are adapted to straddle a bracket 94 welded or otherwise secured to the flange of the insulated dome cover. Outward swinging of the latch is permitted or prevented by means

of insertion or removal of a locking pin 96 extending through the legs of bracket 94 and overlapping the outstanding arms of the latch, all as clearly shown in Figs. 1, 2 and 10.

It is believed that the assembly and operation of the insulated dome cover should be obvious from the preceding description of the component parts. However, to further clarify the matter a description of the assembly and operation will be given. After the tank and dome and dome ring have been insulated in the manner described and covered by the jacket, the base casting or bearing or bearing socket A is attached to the tank jacket, then the prefabricated insulated dome cover with its attached casting B is lowered in position with the trunnion 68 dropping into the socket of the jacket carried member. With the lid or cover in lowered position on the insulating ring 28 the locking screw bolt 76 may be tightened and, if desired, welded in place to prevent unauthorized removal. The special dual diameter bolt with mushroom head is then screwed into position and keyed in place, thus becoming in effect a part of the base. In other words, it becomes a bearing extension as well as a thrust bearing lock as will be later understood. With the cover in lowered and retained position it will be noted that trunnion lug 74 is in engagement with slot 52 of the bearing or socket 50, thus effectively stopping any rotational movement of the cover which might result in injury to the gasket 30.

With the parts assembled and in the position shown in full line of Figs. 1, 2 and 4 the locking pin 96 is removed, after which the latch 90 may be rotated to the full line position of Fig. 3, thus clearing what may be termed the free edge of the swinging dome cover. Removal of locking pin 84 will permit a rotation of the operating handle C to the line and dash position of Fig. 2, thus bringing locking finger 82 out of engagement with the under surface of mushroom head 62 of the bolt or bearing extension. Further rotation of the operating handle will cause portion 80 of the handle to bear upon the mushroom head as a fulcrum and cause a lift of the entire insulated cover to the full line position shown in Figs. 3 and 7. As shown, particularly in Fig. 7, the projection for lug 74 on the trunnion is now out of engagement with slot 52 and the operator can now swing the lid or cover to the line and dash position of Fig. 1 and Fig. 3 with the result that the dome fixtures will be exposed for loading or unloading of the tank. When the dome cover is in the line and dash position of Figs. 1 and 3 the lug or projection 74 of the journal or trunnion will be in position directly above slot 51 of the bearing or socket member and accordingly as soon as the operator releases pressure on operating handle the lug will drop into this short slot and the parts will then be in the positon shown in Fig. 8. In this position, of course, the lid is held in a partially raised position and also held against rotation since the lug 74 is in slot 51. When it is desired to return the lid to normal closed position, force is simply applied to the operating handle again lifting the lid and raising lug 74 out of slot 51, after which the lid is swung back to the full line position of Fig. 3. Release of the operating handle will now allow the lid or cover to drop into closed position as shown in Figs. 1, 2 and 4, as well as 6 which more clearly shows the engagement of lug 74 and slot 52. Rotation of operating handle C to the position shown in the full line of Fig. 4 will cause finger 82 to engage under the mushroom head of the special bolt thereby forcing this edge of the cover toward the tank compressing gasket 30 and effectively sealing the joint between the tank and lid. Operation and locking of latch 90 will now place the lid in final closed position and the car is ready for transit.

From the preceding description it will be seen that the casting carried by the tank jacket serves as a bearing or socket for the journal or trunnion carried by the lid or cover, while the special bolt with the mushroom head acts as a bearing or socket extension in that it guides the cover during rotation in the raised position. This special bolt also serves as a thrust bearing through provision of the mushroom head and the cooperating bearing portion 80 of the operating handle. Also this special bolt, due to finger 82 of the locking handle and the special mushroom head, also serves as a lock for retaining the cover in closed position.

While the insulated dome cover and its operating mechanism has been described more or less in detail, it will be obvious that various modifications, other than those shown and described, will suggest themselves to persons skilled in the art and all such modifications and rearrangements of parts are contemplated as will fall within the scope of the appended claims defining my invention.

What is claimed is:

1. In a combined operator and locking arrangement for the swinging hatch covers of railway cars, the combination of a socket member secured to the car, a trunnion secured to the cover and engageable within said socket member, said trunnion being axially slidable and rotatable in said socket, and a swinging operating handle carried by the cover and engageable with a portion of the socket member to form in part means locking the cover in place, said operating handle also being engageable with another portion of said socket member to raise the cover by causing axial sliding of the trunnion in the socket member.

2. In a combined operator and locking arrangement for the swinging hatch covers or railway cars, the combination of a socket member secured to the car, a trunnion secured to the cover and mounted in the socket member for axial and rotational movements relative thereto, and an operating handle carried by the cover and swingable to two positions of engagement with the socket member, said handle in one of its positions constituting in part means locking the cover in place and in the other of its positions acting as a lever causing axial movement of the trunnion within the socket member.

3. In a combined operator and locking arrangement for the swinging hatch covers of railway cars, the combination of a socket member secured to the car, a hollow trunnion secured to the cover and mounted in the socket member for axial and rotational movements relative thereto, a mushroom head bolt extending axially through the trunnion and fastened to said socket member, and a swinging operating handle pivoted to the cover and having a finger adapted to be engaged under the mushroom head of the bolt upon swinging of said handle in one direction to form in part means locking the cover in place on the car.

4. In a combined operator and locking arrangement for the swinging hatch covers of railway cars, the combination of a socket member

secured to the car, a hollow trunnion secured to the cover and mounted in the socket member for axial and rotational movements relative thereto, a mushroom head bolt extending axially through the trunnion and fastened to said socket member, and a swinging operating handle pivoted to the cover and having a bearing portion engageable with the mushroom head of the bolt, said operating handle serving as a lever bearing on the mushroom head as a fulcrum to lift the cover by an axial sliding of the trunnion in the socket member.

5. In a combined operator and locking arrangement for the swinging hatch covers of railway cars, the combination of a socket member secured to the car, a hollow trunnion secured to the cover and mounted in the socket member for axial and rotational movements relative thereto, means extending axially through the hollow trunnion and fastened to said socket member, and an operating handle pivoted on the cover and swingable to bring two portions thereof into engagement with said means, one of the portions cooperating with said means to form in part a lock retaining the cover in place and the other portion cooperating with said means acting as a fulcrum upon which the cover may be raised or lowered by using the operating handle as a lever.

6. In a combined operator and locking arrangement for the swinging hatch covers of railway cars, the combination of a bearing member secured to the car, a journal member secured to the cover and controlled by the bearing member for both rotational and axial movements, and means carried by one of said members and cooperating with the other of said members to raise or lower said cover by axial movement of the journal.

7. In a combined operator and locking arrangement for the swinging hatch covers of railway cars, the combination of a bearing member secured to the car, a journal member secured to the cover and controlled by the bearing member for both rotational and axial movements, and means carried by one of said members and cooperating with the other of said members to raise or lower said cover by axial movement of the journal, said means also cooperating with the other of said members to form in part a lock for said cover when in lowered position.

8. In a combined operator and locking arrangement for the swinging hatch covers of railway cars, the combination of a bearing member secured to the car, a journal member secured to the cover and controlled by the bearing member for both rotational and axial movements, an operating handle pivoted on said cover and having a projection engageable in one position of the handle with a portion of said bearing member to form in part means locking the cover in lowered position, said operating handle also serving as a lever having a part engageable in another position of the handle with a portion of the bearing member serving as a fulcrum for raising the cover.

9. In a combined operator and locking arrangement for the swinging hatch covers of railway cars, the combination of a bearing member secured to the car, a journal member secured to the cover and controlled by the bearing member for both rotational and axial movements, an operating handle pivoted on said cover and having a projection engageable in one position of the handle with a portion of said bearing member to form in part means locking the cover in lowered position, said operating handle also serving as a lever having a part engageable in another position of the handle with a portion of the bearing member serving as a fulcrum for raising the cover, and means formed on said bearing member and on said trunnion, said means cooperating when the cover is lowered to prevent any swinging of the cover.

10. In a combined operator and locking arrangement for the swinging hatch covers of railway cars, the combination of a bearing member secured to the car, a journal member secured to the cover and controlled by the bearing member for both rotational and axial movements, an operating handle pivoted on said cover and having a projection engageable in one position of the handle with a portion of said bearing member to form in part means locking the cover in lowered position, said operating handle also serving as a lever having a part engageable in another position of the handle with a portion of the bearing member serving as a fulcrum for raising the cover, and means formed on said bearing member and on said trunnion and cooperating to prevent any swinging of the cover when in fully open or closed positions.

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