June 18, 1929. M. H. BORLAND 1,717,364

SAFETY DEVICE FOR MANHOLE COVERS OR THE LIKE

Filed May 3, 1927 2 Sheets-Sheet 1

Fig. 1.

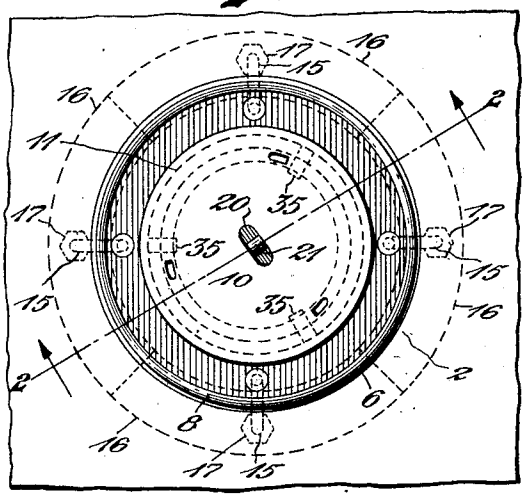
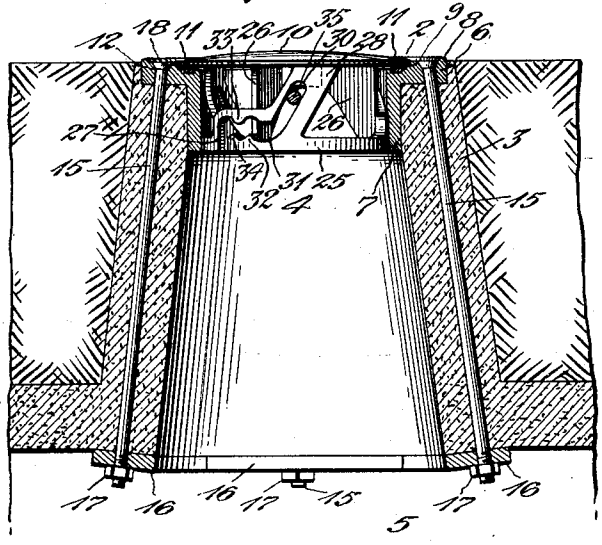


Fig. 2.



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Fig. 3.

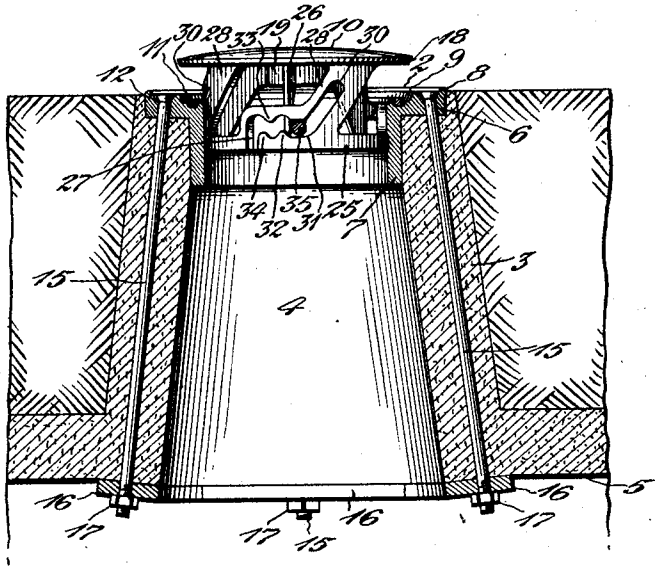
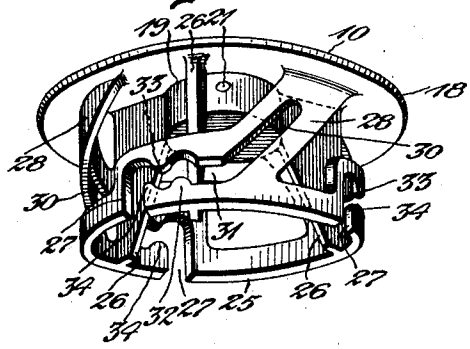


Fig. 4.



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UNITED STATES PATENT OFFICE.

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SAFETY DEVICE FOR MANHOLE COVERS OR THE LIKE.

Application filed May 3, 1927. Serial No. 188,586.

This invention relates to safety devices for the covers of manholes or other openings leading from underground basins, passages or conduits; for the vent openings in tanks; for hatches on ships; and for other similar purposes.

A principal object of the invention is to provide a cover or closure for manholes, hatchways and other openings having means for securing it in the opening to permit it to lift therefrom, but to prevent it from being blown off and projected upwardly under the force of an explosion in or below the manhole or opening.

Another object of the invention is to provide a device of the type specified wherein the cover or closure may be conveniently applied to its seat in the opening and removed therefrom while being locked against accidental release or forcible projection from the opening.

Another object of the invention is to provide a device of the type specified in which the locking device is of simple construction and proof against derangement or getting out of order.

Further objects of the improvement are set forth in the following specification, which describes a preferred embodiment of the invention as illustrated in the accompanying drawings. In the drawings:

Fig. 1 is a plan view showing the improved device with the manhole cover seated in its frame or ring;

Fig. 2 is a vertical sectional view taken on line 2—2 of Fig. 1 and showing the manhole cover in its normal seated position;

Fig. 3 is a similar view showing the manhole cover raised to vent the opening and held from release by the locking means; and

Fig. 4 is an enlarged perspective view of the cover showing the improved locking means on its under side.

My improved device is adapted for use with manholes or vent openings leading from underground chambers, culverts and conduits, such, for instance, as the conduits for electrical transmission or telephone cables; for vent openings in tank cars; for hatches in the decks of ships, or for any like purpose. In the present application I have preferred to describe and illustrate the invention by way of example as employed in a manhole leading from an underground conduit.

Referring to the drawings, 2 designates an annular frame or seat-ring which is permanently affixed in place in the masonry 3 forming the walls of the manhole opening 4 leading to an underground passage, chamber, culvert or conduit 5 beneath a street or highway. The seat-ring 2 is preferably formed with an annular flange 6 embedded in the masonry and provided with a depending cylindrical flange or skirt 7 lining the upper walls of the manhole. As herein shown the flange 6 has a circular bead or rim 8 projecting slightly above the level of the roadway or pavement through which the manhole leads and on its inner rim is an annular recess or depression 9 in which the rim of the cover 10 seats. If desired the recess 9 may have an annular gasket or seat-ring 11 fitted thereto on which the cover rests to provide a tight joint.

The annular flange 6 of the seat-ring 2 is provided with a plurality of countersunk holes 12 adapted to receive the headed ends of rods or bolts 15 which extend downwardly through the walls of the manhole, being preferably embedded in the masonry. The lower ends of the rods or bolts 15 project through holes in a flat ring or flange 16 and are threaded to receive suitable nuts 17. The ring or flange 16 is preferably made in sections of arcuate form so that it may be entered down through the manhole and fitted against the under side of the walls thereof to provide means for anchoring the ends of the bolts 15 which clamp the seat-ring 2 in place. Through this arrangement, or by any other suitable means, the seat-ring 2 is securely held in place at the top of the manhole to prevent it from being blown upwardly therefrom.

The improved manhole cover 10 and its locking device are shown in detail in Fig. 4 of the drawings. The cover 10 may be of circular outline with a beveled rim 18 adapted to fit within the tapered recess 9 in the top of the frame or ring 2. The under side of the cover 10 is flat to adapt it to rest against the inserted seat-ring 11 and the top of the cover may be either flat or crowned as shown in Figs. 2 and 3. Depending from the center of the cover 10 is a reinforcing hub or boss 19 and the top of the cover has a slot or depression 20 formed therein, see Fig. 1. A pin or bolt 21 is driven through the sides of the hub 19 to extend across the slot 20 whereby to

provide means for lifting or turning the cover with the hook or like appliance.

The improved locking means for the cover may be embodied in an annular flange or skirt 25 depending from the bottom of the cover 10 surrounding its hub 19 and adapted to fit within the cylindrical flange 7 of the seat-ring 2. To reduce the weight of the cover its skirt or flange 25 is preferably made of skeleton structure and supported and braced by flat ribs 26 radiating from the central hub 19. The lower circumferential rim of the flange or skirt 25 is practically continuous except for slotted openings 27 extending vertically therethrough. This rim of the flange 25 is joined to the bottom of the cover 2 by angular portions 28 formed to the same circular contour as the rim and slotted longitudinally to provide inclined cam-grooves 30. The grooves or slots 30 extend at an angle of substantially 45 degrees to the vertical and preferably there are three or more, spaced equidistantly around the circumference of the skirt or flange 25. The lower end of each cam-slot 30 is continued in a horizontal slot 31 leading to one of the vertical slots or openings 27 through a zigzag or tortuous course. Referring particularly to Fig. 4, as herein shown the horizontal slot 31 is interrupted on its bottom edge by an upstanding rounded lug or abutment 32 with the upper edge of the slot curved to conform thereto. The abutment 32 forms a stop or detent adjacent the end of the slot 31 for a purpose as later explained, and preferably a second stop 34 is provided at a point beyond the first stop. In the construction herein illustrated the passage 31 is directed downwardly around a projection or abutment 33 on the upper edge of the slot and finally passes into the vertical slot 27 across the top of a second upstanding abutment or stop 34.

The above-described slots in the flange or skirt 25 of the cover 2 are adapted to be engaged by three or more pins or studs 35 projecting inwardly from the flange or skirt 7 of the seat-ring 2. When the cover 10 is set in position with its skirt 25 entered into the seat-ring its lower rim will rest upon the pins or studs 35. A turning movement of the cover will bring the vertical slots 27 in its skirt or flange 25 into register with the pins 35, whereupon the cover will drop down slightly until the upper edges of the slots 31 seat against the pins. Then by turning the cover still further in a clockwise direction the tortuous portions of the slots or grooves 31 will ride over the pins 35 while the cover rises and falls slightly to accommodate the slots to the pins, until finally the pins are engaged in the inclined cam-portions 30 of the slots, allowing the cover to drop down onto its seat as shown in Fig. 2 of the drawings.

The application of the cover to place it in its frame or seat-ring is made very readily by engaging a hook or bar with the cross-pin 21 in its central slot 20 and turning the cover in the manner above explained. When the cover has been applied to position in this manner it cannot be accidentally displaced or removed under the blows of traffic or from other cause since the tendency will be to hold it down. In order to remove the cover from the opening it must be raised with respect to its seat-ring and this is accomplished by turning the cover manually in a contra-clockwise direction. When the cover 10 is rotated to the left the engagement of the pins 35 with the inclined slots 30 will cause it to rise until the pins pass through the tortuous slots 31 and into the vertical entrance-openings 27. At this point the locking means is released and the cover may be lifted out from its seat-ring. It will thus be seen that the cover may be conveniently set in place or removed from the manhole opening without manipulating any bolts, nuts or other fastening means.

As before noted, the principal purpose of the present improvement is to provide a safety locking device to prevent the cover from being forcibly projected from the top of the manhole or other opening should an explosion occur therein. Highly explosive gases are liable to collect in manholes, conduits and other underground passages and may be detonated from a spark; for instance, in case of a short circuit caused by defective insulation on electrical cables, or from other causes. This dangerous condition prevails in street or highway manholes where gas mains are located adjacent cable conduits, a leak in the pipes allowing the gas to escape and seep through the ground into the conduit or manhole. There have been many instances of explosions in manholes in city streets and great damage and loss of life may be incurred by the blowing up of the covers. An explosion may occur at one point and be communicated along the conduit or underground passage to cause a series of detonations resulting in the upheaval of a number of covers in city streets where traffic is heaviest and the chances for destruction very great. Similar dangerous conditions prevail in tank cars and on vessels used for transporting gasoline and oil from which volatile vapors are given off, and also on yachts, motor boats, and other ships having hatches communicating with compartments below deck. It is my belief that no efficient and reliable means have heretofore been proposed to prevent such accidental blowing off of covers or hatches, and the present invention provides a most practical safety device for this purpose. Should an explosion occur the cover is permitted to rise to a limited extent to vent the opening and release the

gases, but is prevented from forcible projection into the air, the method of operation of the device being as follows:

Under normal conditions the cover 10 is seated in its frame 2 with the under side of its rim resting against the annular seat-ring 11. If an explosion should occur in the manhole or the conduit connecting therewith its force is directed upwardly against the bottom of the cover, thereby tending to raise it away from its seat. As the cover is lifted by the force of the explosion it must be rotated as the inclined or helical grooves or slots 30 slide over the pins 35 and this causes a camming action, tending to resist the upward movement of the cover. In other words, the upward movement of the cover is retarded, but, nevertheless, it is prompt enough to immediately carry its rim away from the seat on the ring 2 whereby a vent is formed for the escape of the exploding gases through the top of the manhole. As the cover slides upwardly the vent opening is increased in area so that finally the force of the explosion will be expended when the cover reaches its upward limit of movement with the pins 35 bottoming in the under side of the grooves 31. The pins will thus bring up against the stops or abutments 32 to prevent the cover from turning any further to release its locking means. At this juncture, if the force of the explosion is entirely relieved the cover will drop back slightly with the upper straight edges of the grooves 31 resting on the pins 35 to hold the cover in raised position. Should, however, the force of the explosion or the effect of momentum be such as to continue the rotative movement of the cover still further the pins 35 may ride up over the curved stop or abutment 32 and down into the depression therebeyond. It is to be understood that ordinarily the first stops 32 are sufficient for restraining the cover from further movement so that it will be locked in raised position as shown in Fig. 3 of the drawings. That is to say, the second upstanding abutments 34 are provided as a precautionary measure to avoid any possible chance of the cover being entirely released, it being practically impossible for the cover to be turned by the force of the explosion to such an extent as to permit the pins 35 to travel the whole length of the tortuous passages 31 leading from the inclined slots 30 to the vertical openings 27.

It is to be particularly noted that when the cover is carried upwardly or raised with its rim above the seat in its frame it will be held in this position until closed manually by rotating it in a clockwise direction. This provides that should the cover be once lifted by the force of an explosion it cannot close of itself again to confine the pent up gases which are liable to be subjected to another detonation. For this reason the raising of any one cover in a series of manholes acts to vent the conduit to a sufficient extent to prevent explosions at other points.

It is to be observed that while my improved locking device for the manhole cover is extremely simple in construction and arrangement it nevertheless provides for most efficient action to open and vent the manhole, conduit or other chamber without danger of the cover being forcibly ejected or blown upwardly from the top thereof. While designed for simplicity and economy in cost of manufacture the whole device is nevertheless strong and rugged to resist any explosive force against the cover and is proof against damage or derangement of the locking mechanism. The invention is thus most efficient and reliable for the purpose described, being adapted to prevent damage, destruction and loss of life through explosions in manholes or street openings, in tanks, on vessels and in any other locations.

While I have herein described and illustrated one preferred embodiment of the invention by way of example only, it is to be understood that various modifications may be made in the structure and arrangement of the parts of the device without departing from the spirit or scope of the invention. For instance, the grooves or slots herein shown as formed in the skirt of the cover may be reversed in position and located in the interior of the flanged seat-ring with the pins projecting from a depending portion of the cover. Other changes may be made in the form and construction of the device and its method of application which would fall within the scope and purview of the appended claims and, therefore, without limiting myself in this respect, I claim:

1. A safety device for manholes, hatchways and other openings comprising a frame, a cover adapted to seat on said frame, means between the cover and frame acting to permit the cover to lift to a predetermined extent from its seat under the force of an explosion, and means to lock the cover from returning to seated position on the frame after it has once been lifted therefrom, whereby to provide a free vent for the explosive gases.

2. A safety device for manholes, hatchways and other openings comprising a frame, a cover adapted to seat on the frame, means adapted to permit the cover to lift to a predetermined extent from its seat under the force of an explosion, and means to lock the cover from further movement in either direction until it is operated manually to release it from the frame or to return it to closed position.

3. A device of the type specified comprising a seat-ring for a manhole or other opening, a cover adapted to seat on said ring to close the opening, means on one of said elements having slots inclined to the vertical

and extending circumferentially of the seat-ring into vertical openings, detent abutments at the ends of the inclined slots, and pins projecting from the other element and normally engaging in the inclined slots to permit the cover to be raised to a considerable extent under the force of an explosion, said slots being open at their ends beyond the abutments to permit release of the pins to allow removal of the cover when it is manually rotated to slide the pins over the abutments.

4. In a device of the type specified, the combination of a seat-ring for manholes, hatchways or other openings, a cover adapted to seat on the ring and provided with a depending cylindrical flange, said flange having vertical openings in its lower rim leading to inclined slots extending circumferentially of the flange, and means projecting from the interior of the seat-ring and normally engaging in the inclined slots to adapt the cover to lift to a considerable extent under the force of an explosion while thereafter holding it above the seat-ring, said cover being adapted for removal by manually rotating it to bring the engaging means in register with the openings in the lower rim of its flange.

5. In a device of the type specified, the combination of a seat-ring for manholes, hatchways and other openings, a cover adapted to seat on said ring and formed with a depending cylindrical flange fitted to slide through the opening in the seat-ring, said flange formed with inclined slots leading downwardly and communicating with vertical openings in the bottom rim of the flange, detent abutments interrupting the entrances between the slots and openings, and projections on the interior of the seat-ring adapted to normally engage with the slots in the flange to permit the cover to lift under the force of an explosion and to cause it to be rotated slightly whereby the projections are carried beyond the ends of the inclined slots to lock the cover in raised position in the manner and for the purpose substantially as described.

6. In a device of the type specified, the combination of a seat-ring for manholes, hatchways and other openings, a cover adapted to seat on said ring and provided with a depending flange adapted to enter therethrough, said flange formed with vertical openings leading from its lower rim into tortuous passages extending circumferentially thereof and connected to inclined slots leading upwardly therefrom, and projections on the interior of the seat-ring adapted to normally engage with the inclined slots in the flange to permit the cover to lift under the force of an explosion and to cause it to be rotated slightly whereby the projections are engaged with the circumferential passages to prevent it from being released from the seat-ring until it is turned manually to cause the projections to ride through the tortuous passages.

7. In a device of the type specified, the combination of a seat-ring for manholes, hatchways and other openings, rods extending downwardly from the seat-ring through the walls of the manhole, means adjacent the bottom of the opening for anchoring the rods to adapt them to clamp the seat-ring in place, a cover adapted to seat on the ring and provided with a depending flange fitted to the opening therein, said flange formed with a plurality of vertical openings leading into grooves extending circumferentially of the cover with inclined cam-slots at their ends, and projections on the interior of the seat-ring engaging said grooves in the manner and for the purpose substantially as described.

8. In a device of the type specified, the combination of a seat-ring having an annular flange and a depending cylindrical portion, bolts extending downwardly from the annular flange, a sectional ring adapted to abut the under side of the walls of a manhole or other opening to receive the ends of the bolts on the seat-ring, means to secure the ends of said bolts to said sectional ring, a cover adapted to seat on the seat-ring and formed with a depending cylindrical skirt having inclined slots in its sides, said slots being continued circumferentially in a zig-zag course and terminating in vertical openings leading through the bottom of the depending skirt of the cover, and pins projecting from the interior of the seat-ring to adapt them to be engaged with the openings and slots in the depending portion of the cover in the manner and for the purpose substantially as described.

9. A safety device for manholes, hatchways and other openings comprising a seat-ring, a cover adapted to seat on said ring, inclined grooves on one of said elements, projections on the other element engaging in the grooves to adapt the cover to lift to a predetermined extent under the force of an explosion, tortuous passages at the ends of the grooves into which the projections slide to prevent the cover from being blown off and to lock it from closing after it has once been lifted, and open slots at the ends of the tortuous passages through which the projections are adapted to pass to allow the cover to be released whereby it may be manually removed from the seat-ring.

In testimony whereof I affix my signature.

MATTHEW H. BORLAND.