Jan. 26, 1965 C. J. KORANDA 3,167,222

HOPPER CAR

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Fig. 1

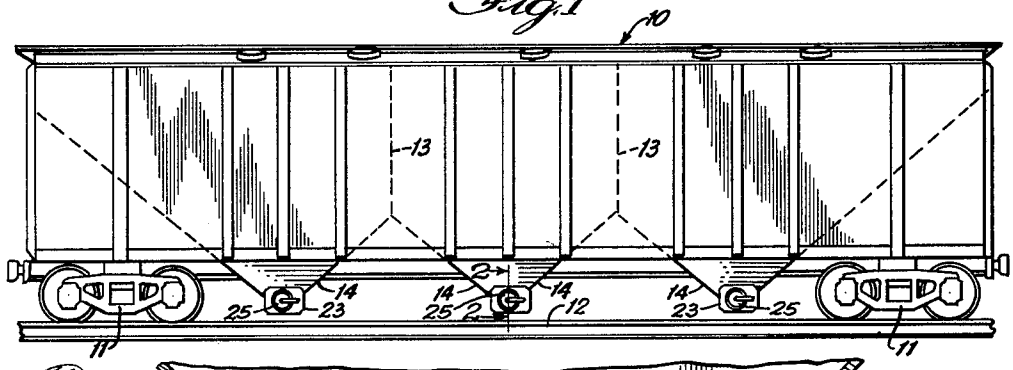


Fig. 2

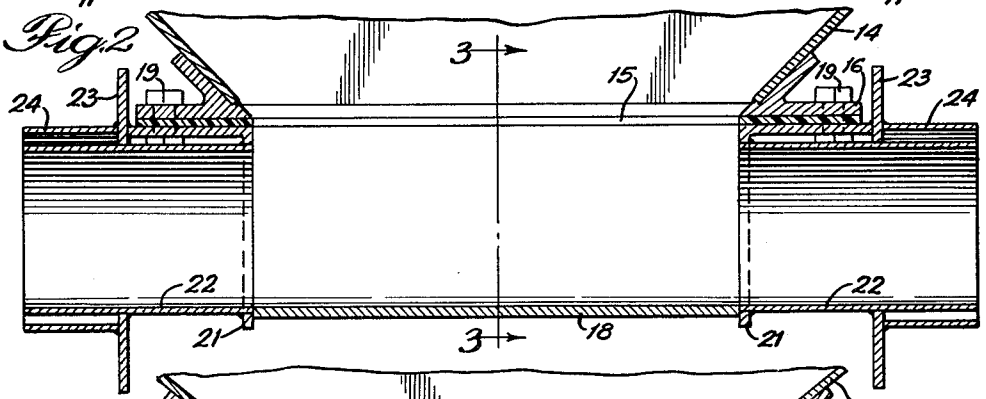


Fig. 3

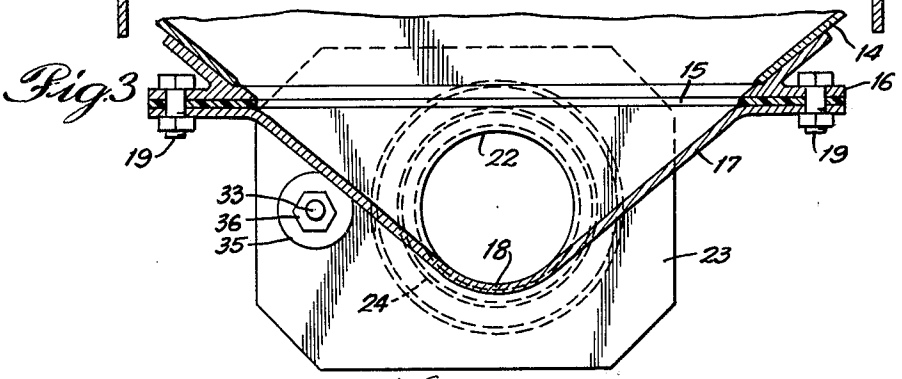
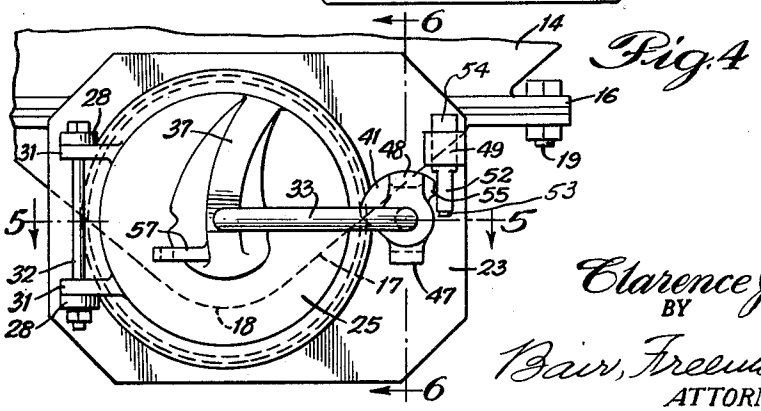


Fig. 4



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Fig. 5

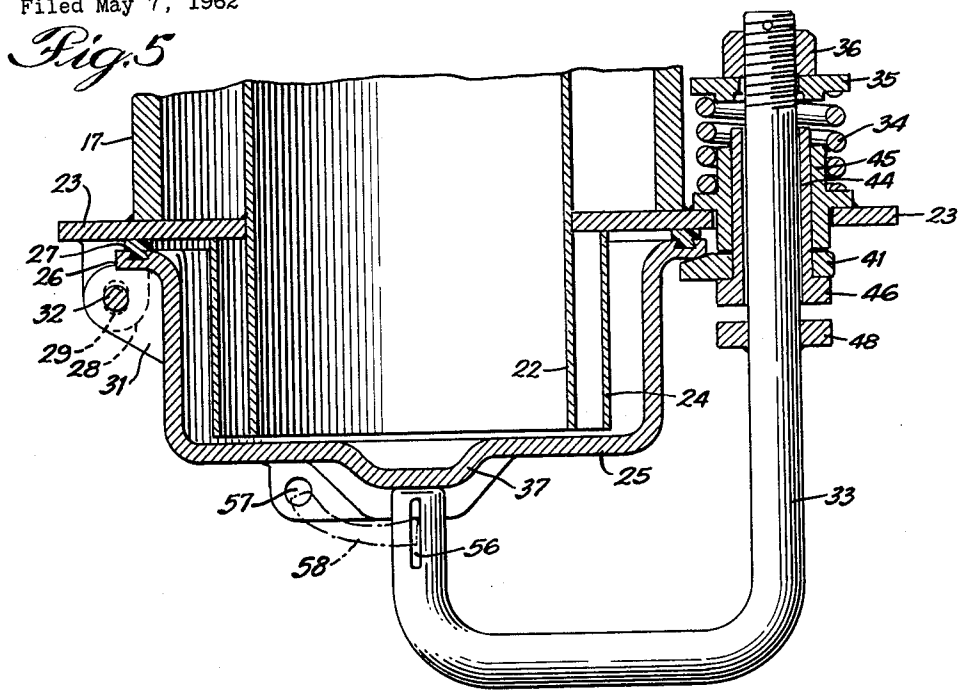
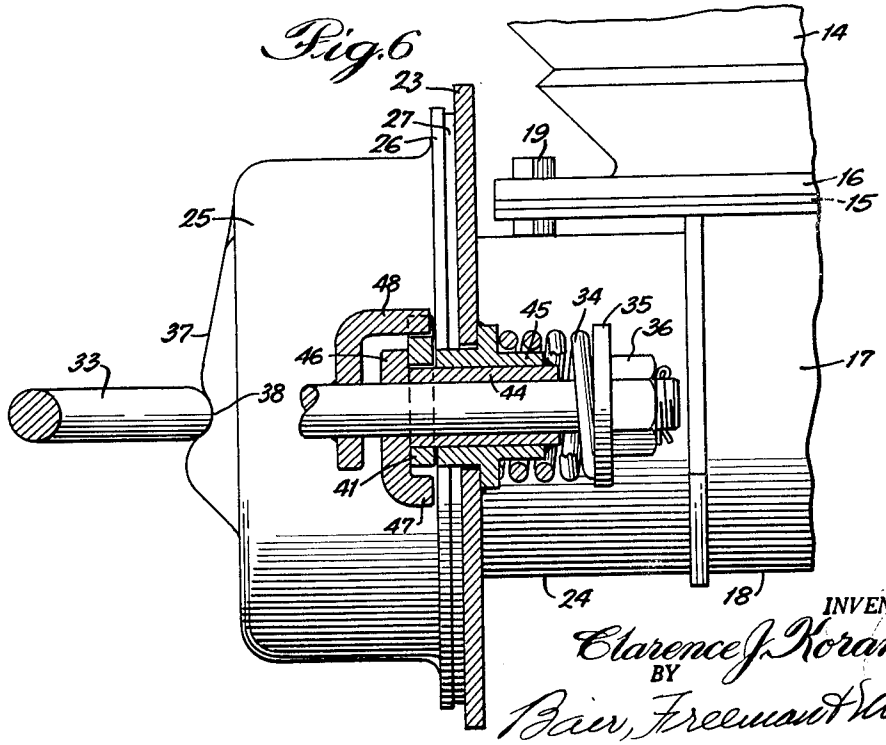


Fig. 6



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Fig. 7

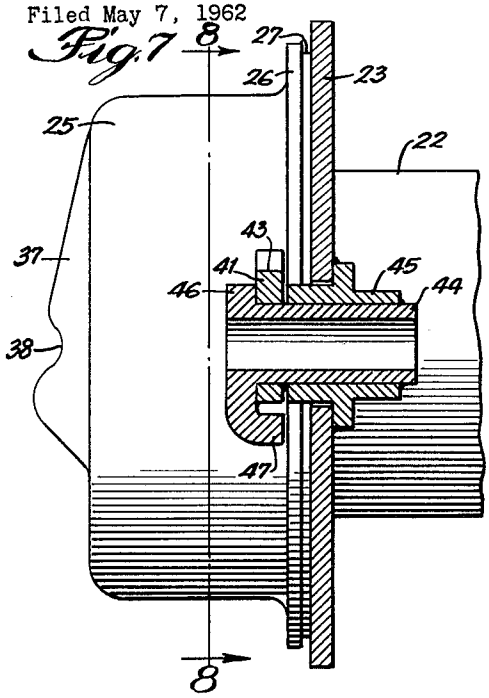


Fig. 8

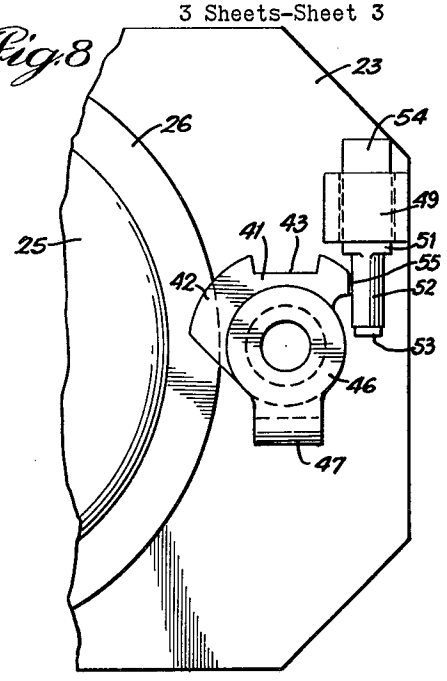
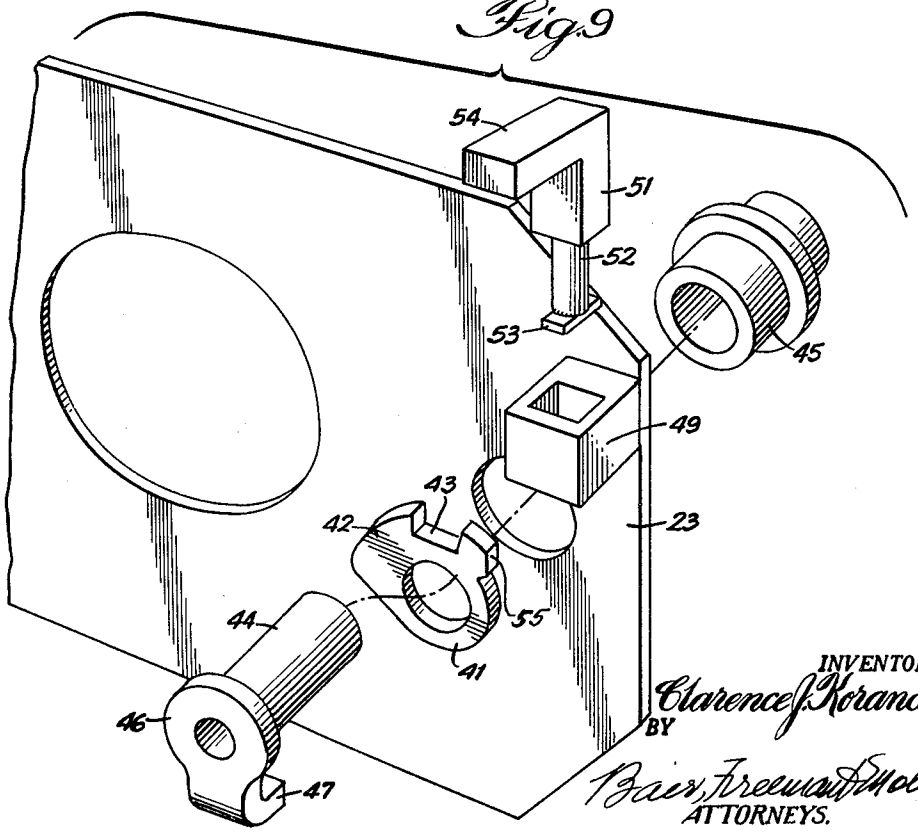


Fig. 9



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3,167,222

HOPPER CAR

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Filed May 7, 1962, Ser. No. 192,710
8 Claims. (Cl. 222—512)

This invention relates to hopper cars and more particularly to a discharge construction for a hopper car and to a closure therefor.

It has heretofore been proposed to provide discharge structures for hopper car compartments formed with a horizontally extending discharge tube through which dry material in the car can be discharged by air flow either under pressure or induced by vacuum. Several problems and disadvantages have resulted from these known structures, one of which is the difficulty of removing all of the material from the car and discharge structure. In transferring plastic pellets or granules, for example, retention of even as few as one or two pellets may contaminate an entire compartment full of material of a different color or character, and the relatively small pellets or granules are easily retained in any recesses or sharp angles in the compartment or the discharge structure.

Another problem is the providing of a closure for the discharge tube which seals securely and yet which can be opened easily. Closures as heretofore used are commonly secured in closed position by hand screws which are easily damaged in use and which are apt to be jammed by foreign material collecting in their threads. Such closures are usually connected to the car by a chain so that they will not be lost but can hang down when opened and are extremely apt to be damaged by any movement of the car when in this condition.

It is accordingly an object of the present invention to provide a hopper car having a discharge structure which presents a smooth, continuous surface with no pockets or sharp angles therein for easy and complete removal of material in the hopper compartment.

According to a feature of the invention, the discharge structure includes a trough whose side walls form a smooth continuation of the lower sloping walls of the hopper compartment and having an arcuate bottom forming a continuation of the lower part of the discharge tube. This construction provides a relatively large discharge opening from the hopper compartment and easy, smooth flow of the material from the hopper compartment through the discharge tube and is easy to clean to remove the last particles of material.

Another object is to provide in a hopper car a closure which is permanently hinged to the discharge structure to swing between open and closed positions and which is supported in either position in such a way as to be protected against damage.

Still another object is to provide a hopper car in which the hinged discharge closure is securely and uniformly held in its closed position to seal the discharge opening tightly.

According to a feature of the invention, the closure is engaged by the free end of a pivoted arm which is resiliently supported on the discharge structure to press the closure tightly into its sealed position. The arm may engage a cam wedge surface on the closure to develop a high sealing force and may be secured against unauthorized removal by a sealing strip threaded through openings in the arm and in an eyelet on the closure.

The closure may also be latched closed according to another feature of the invention by a rotatable latch member which is turned by the arm and which engages the periphery of the closure opposite to its hinge mounting.

Preferably the rotatable latch member is supported coaxially with but independently of the arm so that in the event of breakage or other damage to the arm the rotatable latch member will still hold the closure in its closed position.

Accidental releasing of the rotatable latch member may also be prevented by a latch bar engaging a circumferential latch surface thereon. Preferably, the latch bar is slidable vertically between operable and release positions and is made of non-circular section so that it can be turned to prevent accidental sliding in a complementary non-circular socket.

The above and other objects and features of the invention will be more readily apparent from the following description when read in connection with the accompanying drawings, in which:

FIG. 1 is a side elevation of a hopper car embodying the invention;

FIG. 2 is an enlarged partial section on the line 2—2 of FIG. 1;

FIG. 3 is a section on the line 3—3 of FIG. 2;

FIG. 4 is an enlarged elevational view of the closure in its closed position;

FIGS. 5 and 6 are enlarged sections on the lines 5—5 and 6—6 respectively of FIG. 4;

FIG. 7 is a partial section at right angles to FIGS. 5 and 6 showing the rotatable latch construction;

FIG. 8 is an enlarged partial elevation on the line 8—8 of FIG. 7; and

FIG. 9 is a disassembled perspective view of the rotatable latch construction.

The invention is illustrated as applied to a conventional hopper car indicated generally at **10** which is supported on trucks **11** for movement over standard railways rails **12**. The hopper car is divided by internal walls indicated by dotted lines **13** into a plurality of compartments, each of which comprises a hopper having inwardly and downwardly sloping lower walls **14**. The angle of the walls **14** is so selected that dry material in the car will slide freely down them to an enlarged generally rectangular outlet opening **15** as best seen in FIGS. 2 and 3. The walls **14** carry an outwardly extending flange **16** surrounding the opening **15** and to which a discharge structure embodying the invention may be mounted.

The discharge structure as shown comprises a horizontal trough **17** having inwardly and downwardly sloping side walls which form smooth continuations of opposite hopper walls **14** merging into an arcuate bottom portion **18** whose axis extends horizontally. The upper edges of the trough are formed with outwardly extending flanges mating with the flanges **16** and secured thereto by fastenings such as bolts **19** with a suitable sealing gasket therebetween.

The trough **17** is provided with end plates **21** permanently secured thereto as by welding and which are formed with aligned circular openings therethrough. Horizontally extending discharge tubes **22** are secured in the openings as by welding and extend horizontally from opposite ends of the trough. As best seen in FIG. 3 the radius of curvature of the tubes **22** is the same as that of the lower arcuate bottom portion **18** of the trough so that the bottom surfaces of the tubes form smooth continuations of the bottom surfaces of the troughs.

Each of the tubes has secured thereto as by welding a mounting plate **23** which projects transversely beyond the outer wall of the tube. Preferably, a short tubular section **24** of larger diameter than the tubes **22** is secured to each of the mounting plates and extends outward therefrom coaxially with the end portions of the tubes **22** as shown. The tubes **22** may be of a size to receive a conventional 5" discharge coupling and the tubular sections **24** may be of a size to receive a conventional 6" discharge coupling so that standard discharge couplings

of either size which are commonly encountered in use of the cars may readily be attached without requiring any special fittings or modification of the discharge structure.

One of the discharge tubes may be connected to a source of vacuum with the opposite discharge tube either remaining closed or connected to a source of air under pressure. This type of unloading operation forms no part of the present invention and will not be described further herein.

The discharge tubes, however, must be sealed during transport of the car to prevent loss of the compartment contents by removable closures which may be selectively opened to permit the coupling of discharge conduits thereto. For this purpose a cup shaped closure or cover member **25** is provided of a size to fit over the extending end portions of the conduits **22** and **24** and to seal against the supporting plate **23**. As best seen in FIG. 5 the cover **25** is formed with an outwardly extending rim flange **26** carrying a resilient sealing ring **27** formed of rubber or the like to press sealingly against the face of the mounting plate **23**.

The cover is supported by a vertical hinge at one side of the discharge pipe for swinging movement in a horizontal plane between its open and closed positions. As shown, the hinge is formed by lugs **28** extending outwardly from the mounting plate **23** at vertically spaced points and having elongated slots **29** formed therein with the length of the slots being normal to the mounting plate. Similar lugs **31** secured to the cover are formed with openings registering with the openings in the lugs **28**, and a pintle such as an elongated bolt **32** is passed through the openings. With this construction the cover can be swung to its closed position as shown in FIG. 5 and in that position can float slightly to enable uniform sealing pressure to be applied around the entire periphery of the sealing ring **27** to seal the cover securely. When the cover is opened it can be swung horizontally to one side of the discharge tube and will be held by the hinge in that position where it is extremely unlikely to be damaged.

For holding the cover in its closed position a J-shaped arm **33** is provided having its long end extending slidably and rotatably through the mounting plate **23** and urged by a spring **34** toward the center of the trough. Preferably the spring abuts against an adjusting plate **35** held in adjusted position by a nut **36** threaded on to the end of the arm by means of which the spring pressure can be adjusted. The opposite end of the arm is adapted to swing over the central part of the cover when it is in its closed position to urge the cover yieldingly against the mounting plate **23** and into sealing engagement therewith. For this purpose the outer surface of the cover is preferably offset to define a cam wedge surface **37** along which the end of the arm **33** will ride when the arm is moved toward its locking position. The cam wedge surface is preferably provided wtih a detent notch **38** in the center of the cover which will receive the end of the arm and hold it yieldingly against accidental removal.

When the arm is swung to its locking position as shown in FIGS. 4 to 6, its end will rest in the detent notch **38** and the pressure produced by the spring **34** will press the cover tightly and resiliently into sealing engagement with the mounting plate securely to seal the discharge tube. It will be seen that considerable sealing pressure can be developed because of the cam wedge surface **37**, it being necessary in some cases to force the arm into its locking position by pounding it with a hammer or the like. Similarly, where extremely high sealing pressures are involved, it may be necessary to hammer the end of the arm out of the detent notch **38** to release it.

The cover is further latched in closed position by a rotatable latch member **41** mounted for rotation on the mounting plate coaxially with the arm **33**. As best seen in FIG. 8, the latch member **41** has a latching portion **42** terminating in an arcuate edge and formed with a peripheral notch **43**. The latch member is cut away opposite the portion **42** to a diameter which will clear the flange **26** of the closure. When the latch member is turned counterclockwise to the position shown in FIG. 8, the portion **42** will ride over the adjacent part of the flange **26** and will hold it securely in its sealed position. It will be understood that the under surface of the portion **42** may be tapered to produce a wedging effect as the latch member is turned.

The latch member is rotatably supported on a tubular pin **44** which is secured in a bushing **45** which is in turn secured to the mounting plate **23**. The latch member **41** is rotatably supported on the tubular pin **44** and engages the end of the bushing **45** to be held thereby spaced outwardly from the mounting plate **23** the proper distance to overlie and engage the flange **26** of the cover. The tubular pin **44** terminates in an end flange **46** which overlies the latch member **41** to hold it against axial movement and which is formed with an inwardly extending ear **47** extending toward the mounting plate to limit rotation of the latch member **41**.

The locking arm **33** extends slidably and rotatably through the tubular pin **44** with the spring **34** abutting against a flange on the bushing **45** as seen in FIG. 5. Further, the locking arm **33** carries an outwardly and axially projecting lug **48** which extends into the notch **43** as seen in FIG. 6 so that when the locking arm **33** is turned the latch member **41** will be turned with it. It will be noted, however, that in the event the locking arm **33** should become broken or totally disconnected from the assembly, the latch member **41** will continue to hold the cover in closed position at the side thereof opposite to the hinge so that the contents of the compartment will not be lost.

As a further safety measure the rotatable latch member **41** is itself latched against accidental rotation. For this purpose a tubular socket **49** having a non-circular rectangular opening therethrough is secured to the mounting plate **23** above and slightly to one side of the latch structure mounting as seen best in FIGS. 8 and 9. A vertically slidable latch pin is slidable through the socket and is formed with an upper rectangular portion **51** complementary to the rectangular opening in the socket and with a lower circular portion **52**. Preferably, a stop bar **53** is welded to the lower end of the circular portion **52** to prevent the latch bar from being pulled vertically through the socket and completely removed therefrom. At its upper end the latch bar is formed with an angularly extending finger piece **54** by which it may be operated.

With the rotatable latch member **41** in its latching position as shown in FIG. 8 the latch bar may be turned to the position shown in FIGS. 8 and 9 so that it can drop down to the illustrated position. In this position the pin **52** registers with a circumferential latching shoulder **55** on the latch member **41** to prevent it from turning clockwise out of its latching position. This is the normal position of the parts during transport of the car.

When it is desired to open the closure for unloading the car, the latch bar may be raised until the circular portion **52** thereof lies in the opening in the socket **49** and may then be turned through 90°. In this position, because of the non-circular rectangular shape of the bar portion **51** and the complementary shape of the opening in the socket, the latch bar will be held in its elevated, non-effective position. At this time the locking arm **33** may be turned to move its end out of registration with the cover and, at the same time, will move the latch member **41** to its released position. At this time the cover is free to be swung to its open position and the unloading operation may proceed in the desired manner.

It will be noted that with the construction of the present invention the lower tapering side walls of the hopper compartment blend smoothly into the discharge trough

which in turn blends smoothly into the discharge tube so that there are no pockets or sharp angles in which material can collect and be retained. The car will therefore be completely emptied, and after emptying the discharge structure may easily be inspected visually and further swept out manually if necessary to insure that none of the material remains in it. Furthermore, the hopper compartment is securely sealed during operation and is secured against any accidental opening. This may be further insured by forming the free end of the locking arm 33 with an opening 56 therethrough. The cover may be formed with an eyelet 57 adjacent to its central position and a standard railway sealing strip as indicated in dotted lines at 58 may be threaded through the eyelet and the opening 56 to seal the locking arm against movement and to seal the car against unauthorized access.

While one embodiment of the invention has been shown and described in detail, it will be understood that this is illustrative only and is not to be taken as a definition of the scope of the invention, reference being had for this purpose to the appended claims.

What is claimed is:

1. In combination with a tubular discharge member having a discharge opening, a closure for the opening hinged at one side thereof for swinging from a closed position overlying the opening to an open position swung away from the opening, an arm pivotally mounted at one end at one side of the opening with its other end free to swing and with its free end movable centrally over the closure when it is in its closed position to engage the closure and hold it closed, and a rotatable latch member rotatably mounted at the side of the opening remote from the hinged connection of the closure thereto and connected to the arm to be turned thereby into latching engagement with the closure when the arm is moved over the closure.

2. In combination with a tubular discharge member having a discharge opening, a closure for the opening hinged at one side thereof for swinging from a closed position overlying the opening to an open position swung away from the opening, an arm pivotally mounted at one end at one side of the opening with its other end free to swing and with its free end movable over the closure when it is in its closed position to engage and hold it closed, a rotatable latch member connected to the arm to be turned thereby into latching engagement with the closure at the side thereof opposite to the hinged side thereof when the arm is moved over the closure, the latch member being formed with a peripheral latching surface, and a manually operable latching lug engageable with the latching surface to latch the arm and latch member against turning.

3. The construction of claim 2 in which the outer face of the closure is formed with a cam wedge surface engageable with the free end of the arm to cam the closure toward its closed position.

4. For use with a hopper car comprising a compartment tapering inwardly and downwardly at its opposite sides to an elongated rectangular discharge opening and a trough member secured to the compartment under the opening having inwardly and downwardly tapering sides defining smooth continuations of the opposite sides of the compartment and merging into an arcuate section bottom, a circular discharge tube at at least one end of the trough whose bottom portion forms an elongation of the bottom portion of the trough, a cover for the discharge tube hinged to the tube at one side thereof for swinging from an open position beside the tube to a closed position overlying the end of the tube, an arm pivoted at one end on an axis parallel to and at one side of the tube with its other end free for swinging centrally over the outer face of the cover when the cover is in its closed position, a cam surface on the outer face of the cover engageable with the free end of the arm, a spring acting on the arm urging its free end toward the discharge tube thereby to press the cover resiliently toward its closed position, and a rotatable latch member connected to the arm to be turned thereby into latching engagement with the cover when the arm is moved over the cover for engagement with the cam surface.

5. In combination with a discharge tube having a discharge opening, a plate secured to the tube adjacent to its free end and projecting laterally beyond the tube, a cover hinged on a vertical axis to the plate at one side of the tube to swing from an open position beside the tube to a closed position overlying the end of the tube, a latching arm pivoted at one end in the plate at the other side of the tube and having its other end offset to overlie the outer face of the cover when it is in its closed position and a rotatable latch member mounted coaxially with the arm and connected thereto to be rotated thereby into latching engagement with the periphery of the cover when the arm is turned to latching position with its free end overlying the cover.

6. The construction of claim 5 in which the rotatable latch member is mounted on the plate by a tubular shaft through which the arm extends slidably and rotatably whereby breakage or removal of the arm will not affect the rotatable latch member.

7. In combination with a discharge tube having a discharge opening, a plate secured to the tube adjacent to its free end and projecting laterally beyond the tube, a cover hinged on a vertical axis to the plate at one side of the tube to swing from an open position beside the tube to a closed position overlying the end of the tube, a latching arm pivoted in the plate at the other side of the tube and having its free end offset to overlie the outer face of the cover when it is in its closed position, a rotatable latch member mounted coaxially with the arm and connected thereto to be rotated thereby into latching engagement with the periphery of the cover when the arm is turned to latching position with its free end overlying the cover, the latch member being cut away through a portion of its periphery to leave a circumferential latching surface, and a manually operable latching bar engageable with said latching surface to hold the latch member against turning out of latching engagement with the cover.

8. The construction of claim 7 in which the latching bar includes a non-circular shank portion slidable vertically downward through a socket of complementary section to its latching position, the latching bar being turnable when it is raised to its inoperative position with said shank portion above the socket to engage the top of the socket and hold the latching bar against downward movement.

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