Nov. 8, 1932. R. E. DALY 1,887,120

CAR UNLOADING TIPPLE

Filed April 16, 1931 3 Sheets-Sheet 1

Fig. 1.

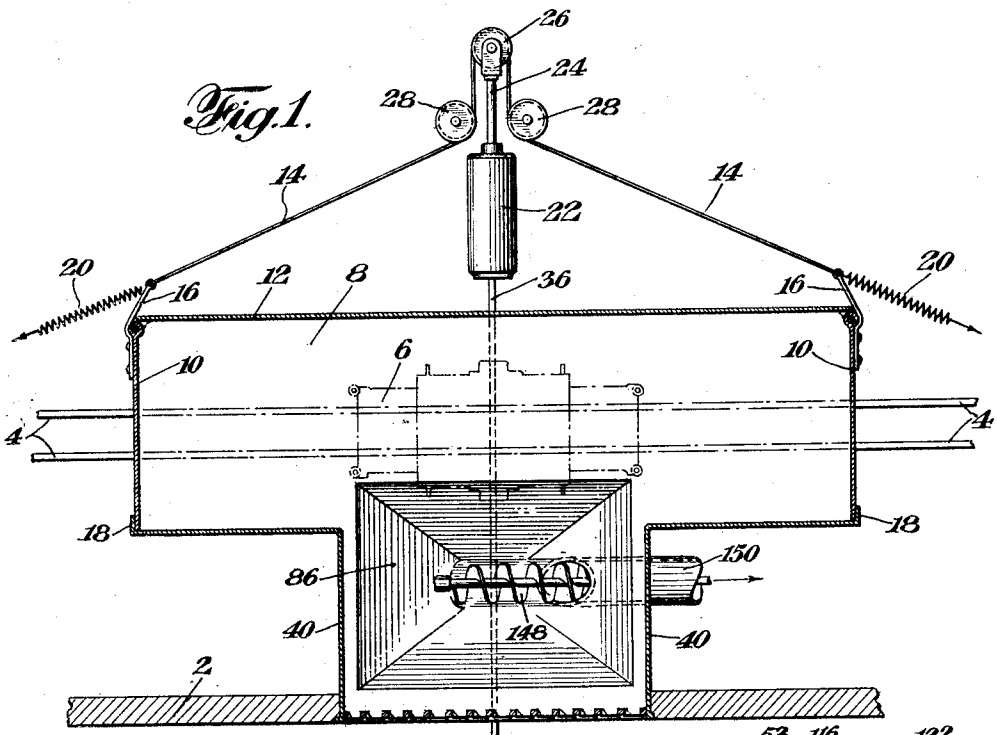


Fig. 2.

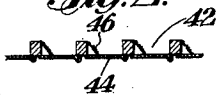


Fig. 3.

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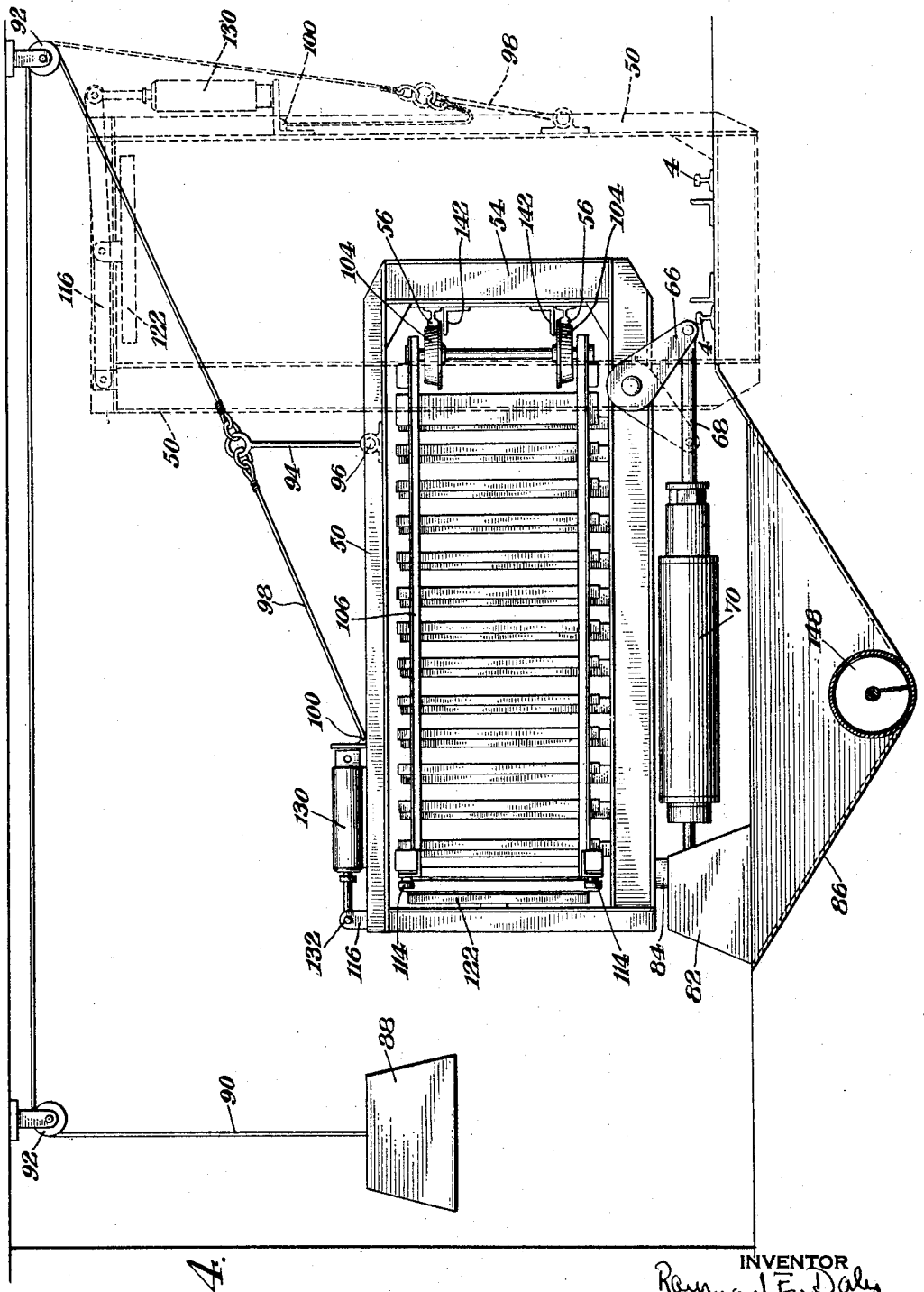


Fig. 4.

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Fig. 5.

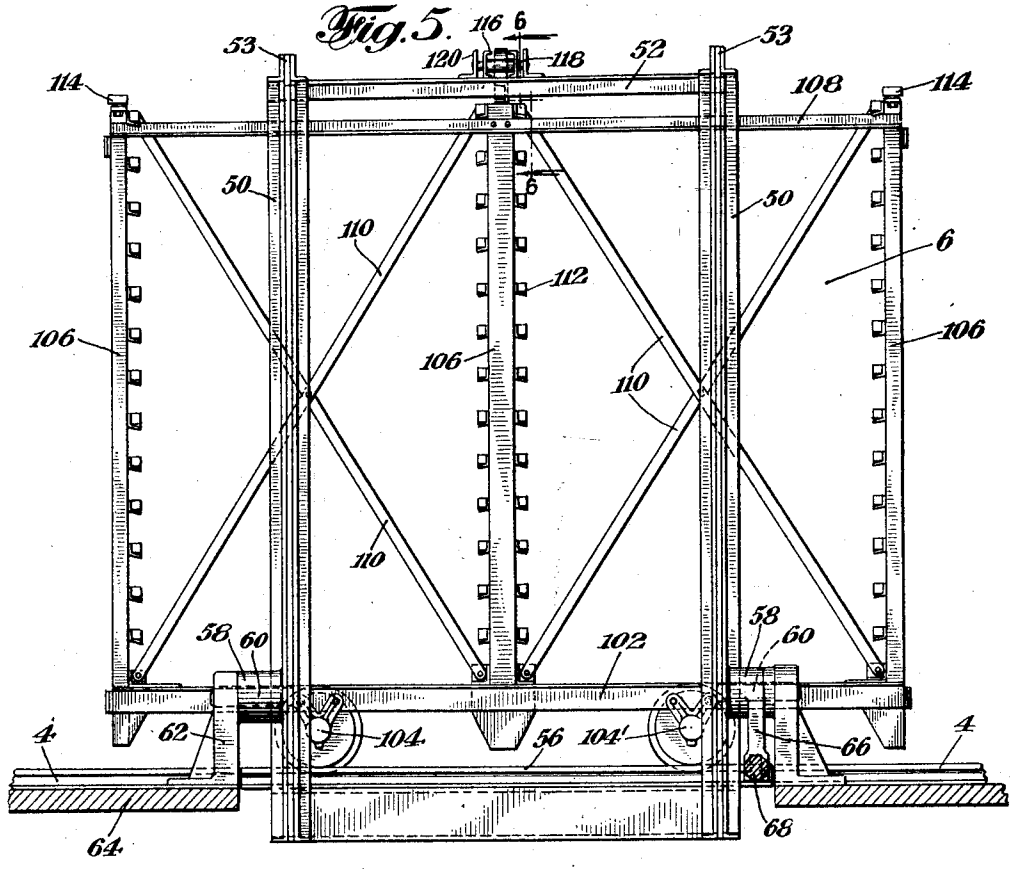


Fig. 6.

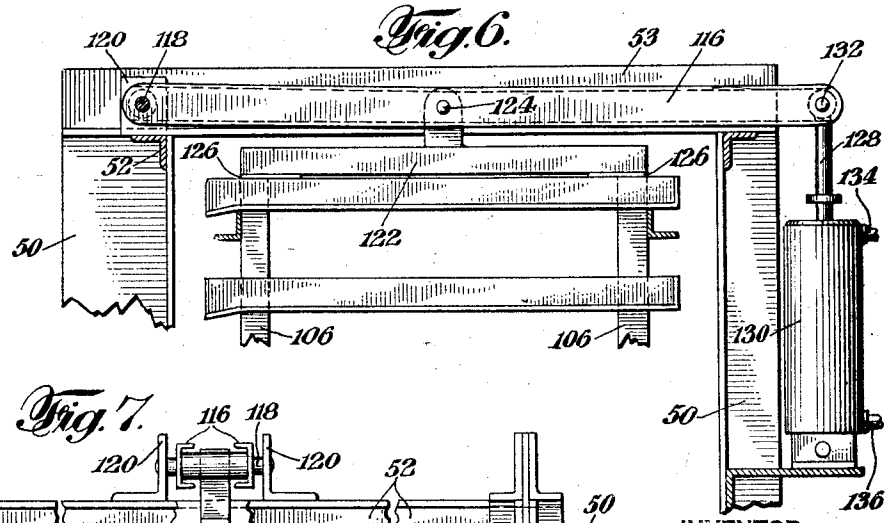
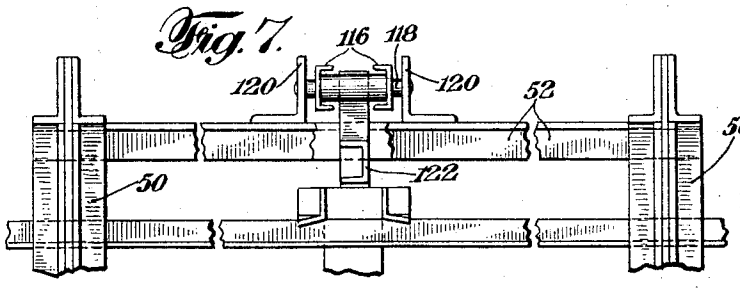


Fig. 7.



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Patented Nov. 8, 1932 1,887,120

UNITED STATES PATENT OFFICE

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CAR UNLOADING TIPPLE

Application filed April 16, 1931. Serial No. 530,513.

This invention relates to a car unloading tipple particularly adapted for use in the unloading of material which may possibly explode as through the formation of dust, and the general object of the invention is to provide a closed unloading tipple within which the car may be confined when it is being unloaded, the chamber having yielding shutters or closures for openings through which the gases may pass to the exterior of the building in case of explosion. Mechanism is also provided for mechanically unloading the car within the tipple chamber, said mechanism being controlled entirely from the exterior of the chamber.

In many manufacturing and producing plants, various explosive materials are transported, and otherwise handled, within the plant, and it frequently happens that, in spite of all precautions, a spark sets off the material, causing great damage to the plant and possible injury and loss of life to the workmen who are handling the material or operating the car which is carrying it. The situation is particularly dangerous when a car is being dumped and fine particles of the material are in the air, which may be ignited by a spark caused by parts of the car or unloading mechanism striking something else.

The present invention is intended for use in a plant handling such explosive material and will be described specifically in its application to a plant producing and handling starch.

In starch factories, the refining operations of producing the starch are completed in a wet process and the starch must thereafter be dried and otherwise handled. The wet starch is loaded onto trays placed in cars which run through a drying kiln and, after drying the trays are removed and the starch is dumped into a hopper or other receptacle from which it may be discharged in any desired way. The dry starch produces a great deal of dust when it is dumped from the trays. The dust is explosive and, if it happens to be ignited by a spark, which may occur when the car is being dumped, there is quite frequently a very serious explosion.

The car unloading tipple which will hereinafter be described, has a closed dumping chamber with one or more doors through which the car may pass into and out of the chamber. The doors are adapted to be closed when the car is within the chamber and is in the process of being dumped. In order to prevent wrecking the plant if an explosion should occur, the chamber is provided with openings leading to the exterior of the plant. The openings are large enough to permit the escape of the gases at the abnormal pressures which occur when the explosion takes place, but are normally closed by yieldable closures which are arranged to move outwardly to relieve the pressure within the chamber in case of an explosion, thereby permitting the immediate and complete escape of the explosive gases.

In order to obviate the necessity of workmen having to be present in the unloading or dumping chamber when the car is being dumped, mechanism is provided for closing the door or doors to the chamber and unloading the car, said mechanism being entirely operable from the exterior of the chamber. The mechanism is preferably so arranged that when the car is fixed to the dumping frame, the door or doors to the chamber are simultaneously closed so that the car cannot properly be unloaded before it is completely isolated from the interior of the factory within the chamber, which is completely closed except that, in case of explosion, the shutters may automatically open to permit the explosive gases to escape to the outside of the factory.

Other objects and features of the invention will more fully appear from the following claims taken in conjunction with the

description and the accompanying drawings which, however, must be considered as merely illustrating and in no way limiting the invention to the embodiment shown and described.

The drawings illustrate in section, elevation, diagram and detail a selected form of construction adapted for use with and as a part of the invention and embody the broad principles thereof.

In the drawings:

Fig. 1 is a sectional plan view of the unloading tipple showing the closed chamber with yieldable shutters, the dumping frame, the hopper, and the means for operating the doors to the chamber.

Fig. 2 is a vertical section through the shutter wall of the chamber showing one form of the shutters which may be used to permit the escape of the explosive gases.

Fig. 3 is a somewhat diagrammatic elevation of the dumping frame showing the means for clamping the car in the frame and then dumping it, with the necessary connections.

Fig. 4 is an end view of the dumping frame having a car in the frame in dumping position above the hopper.

Fig. 5 is a side view of the car within the dumping frame.

Fig. 6 is a detail of the top of the dumping frame showing the pressure bar and air cylinder which operates it, the pressure bar being in contact with the top of the car, taken on line 6—6 of Fig. 5, looking in the direction of the arrows.

Fig. 7 is a side view of the top of the dumping frame and pressure bar, and car.

Only such parts of the factory are shown as will enable the invention to be understood in its association therewith, the same being the exterior wall 2 of the factory and the tracks 4 on which the car 6 comes to and leaves the dumping chamber 8.

The dumping chamber 8 may conveniently be provided with doors 10 at each end so that the cars may enter the chamber at one end, and leaves the chamber at the other end after pausing at the center of the chamber to be dumped. The doors 10 are hinged to the wall 12 of the chamber and are closed by ropes or cables 14 connected to arms 16 on each door. The doors 10 preferably swing inwardly and when in closed position abut flanges 18 which securely hold them in place to prevent the doors from being blown out if an explosion occurs, thus preventing the explosive gases from escaping into the interior of the factory. Except when closed by the cables 14 and their associated mechanism, the doors are held open by springs 20 which have sufficient force to open the doors whenever the tension on the cables 14 is released.

The cables 14 may conveniently be operated to close the doors by a fluid operated mechanism which includes a fluid cylinder 22 out of which moves a piston 24 having a pulley 26 on its end so that when the piston 24 is forced out of the cylinder, the cables 14 are pulled to close the doors. Direction pulleys 28 lead the cables from the piston pulley 26 to the door arms 16. By this mechanism both doors are operated simultaneously and with substantially equal force. When the pressure within the cylinder 22 is released, the springs 20 pull open the doors 10 and force the piston 24 back into the cylinder 22. Air is preferably used to operate the cylinder 22 as the air is expandable and maintains a resilient pressure on the cables.

The air to operate the cylinder 22 comes from the air supply pipe 30 through a fourway control valve 32, to the T connection 34 from which pipe 36 leads the air to the cylinder 22. The control valve 32 is located exterior of the chamber 8. When the doors are to be opened, the valve 32 is operated to permit the air to escape from cylinder 22 through pipe 36 and valve 32 to exhaust pipe 38, and the springs 20 open the doors.

When the doors 10 are shut, the chamber 8 is entirely closed. The chamber is so built, however, that a portion 40 of its walls lead to the wall 2 of the building. The wall of the building is provided with openings 42 which permit the escape of the explosive gases should an explosion occur within the chamber. The openings 42 are closed by shutters 44, or other suitable devices, which can easily yield outwardly under the abnormal gas pressures built up by the explosion. The shutters may, if desired, be held closed by springs 46. If the shutters 44 are horizontally hinged, they will usually remain closed by their own weight and the springs 46, if used, should not be under sufficient tension to prevent the shutters from yielding outwardly very easily in case of an explosion.

In order to dump the car when it is within the chamber 8, the car is run on to a dumping frame 48. This frame comprises the uprights 50 which are joined at the top by the top cross pieces 52 and 53, and the bottom cross pieces 54 upon which latter crosspieces are laid the dumping tracks 56. The dumping frame 48 is rotatably supported on the trunnions 58 which may be connected by shafts 60 to bearings 62 mounted on the floor 64 of the dumping chamber. The frame may be tilted around the shafts 60 by the arm 66 which is firmly fastened to or a part of one of the trunnions 58, and the arm 66 is in turn moved to tilt the dumping frame by the piston 68 of the hydraulic cylinder 70. The piston within the cylinder 70 is moved by water or oil which comes from a pressure supply pipe 72 through a fourway valve 74 and then may pass to the cylinder 70 either by the pipe 76 or 78. By properly operating the valve 74, the water or oil may be forced

into the cylinder 70 through the pipe 76 to force the piston 68 outwardly, thereby tilting the dumping frame from the position shown in Fig. 3 to the position shown in Fig. 4. When the frame is to be moved from its tilted position to its upright position, the valve 74 is operated to permit the oil or water to escape from one end of the cylinder 70 through the pipe 76 to the waste or return pipe 80 while other water or oil under pressure is pumped into the other end of the cylinder 70 through the pipe 78. It is to be understood that the valve 74 is located exteriorly of the dumping chamber 8 so that the dumping frame can be tilted to dump the material from the car 6 after the doors 10 are closed and without the operator being within the dumping chamber where he could be injured by an explosion.

When the dumping frame 48 is in horizontal position, its free end may be supported on the pillar 82, which preferably is provided with a rubber shock absorber 84, in such a position that the contents of the car will be dumped into the hopper 86. A dumping frame counterweight 88 is preferably a part of the dumping mechanism and is connected to the dumping frame by the cable 90 which passes over the pulleys 92 on the ceiling of the chamber. The end of the cable 90 which is opposite from the counterweight 88 may be connected to a ring and bar 94 hinged to the dumping frame at 96 and also connected to the frame at 100 near its free end by the short cable 98 to obtain and equalize the effect of the counterweight both when the frame is in its upright or loading position and when it is in its tilted or dumping position. Other arrangements of counterweighting may be used so that only a relatively small cylinder 70 which operates at a relatively low hydraulic pressure, is necessary.

The car 6 is fixed to the dumping frame when the frame is tilted, and mechanism is provided whereby the car can be clamped in a dumping frame without the necessity of a workman entering the dumping chamber. For this purpose the car is preferably constructed in the manner most clearly shown in Figs. 4 and 5 of the drawings. The car has base members 102 mounted on trucks 104 with uprights 106 extending upwardly from the base members and joined at their tops by upper members 108. Braces 110 may be used as desired to strengthen the frame of the car. The uprights 106 carry supports 112 to hold pans or trays which contain relatively thin layers of starch, so that the material can be dried quickly, and each end upright may carry a roller 114 adapted to prevent the car from tilting when it is in the drying chamber.

On the upper part of the dumping frame is mounted a pressure lever 116 which may conveniently be a pair of parallel bars hinged on a bearing 118 supported in angle irons 120 mounted on one of the crosspieces 52 of the dumping frame in such a position that it is directly above the central upright of the car when the car is properly placed in the dumping frame. The pressure lever 116 carries a pressure bar 122 which is pivoted at 124 to the lever 116 in such a position that it bears against the opposite central uprights 106 of the car. Rubber pads 126 are preferably fastened to the lower side of the pressure bar 122 to make contact with the tops of the central uprights 106 thus preventing the possibility of a spark being formed when the pressure bar 122 is forced against the top of the car and also assisting in holding the car firmly within the frame when it is tilted. The pressure bar 122 is moved, through the pressure lever 116, by the piston 128 of a fluid pressure cylinder 130, which piston is hinged at 132 to the free end of the pressure lever. The fluid to operate the piston 128, is allowed to enter one or the other end of the cylinder 130 by means of pipes 134 and 136 which are connected to the four-way control valve 32 by flexible hoses 138 and 140. The flexible hoses are used in order to permit movement of the dumping frame while controlling the operation of the cylinder 130 and its associated pressure bar 122. Air is preferably used to operate the piston 128 because the air maintains a constant resilient pressure of the pressure bar 122 against the top of the car. The pipe 134 is so connected to the cylinder 130 that when fluid under pressure is admitted to the cylinder through pipe 134, the piston 128 is operated to force the pressure bar 122 against the top of the car, and the pipe 36 is connected to the same outlet of the valve 32 so that the proper movement of the valve 32 forces the pressure bar 122 against the top of the car and simultaneously operates the cylinder 22 to close the doors 10 of the dumping chamber. As valve 32 is located on the outside of the dumping chamber 8, the car is fixed to the dumping frame and the doors 10 of the chamber 8 are closed without it being necessary for a workman to be in the dumping chamber. Angle irons 142 beside the tracks in the dumping frame prevent the wheels of the car from slipping off the tracks when the frame is tilted, but they are not absolutely necessary because the force of the pressure bar 122 against the top of the car is sufficient to clamp the car firmly against the rails.

An interlocking device may, if desired, be used to control the mechanism for dumping the car from the mechanism for clamping the car in the dumping frame and closing the doors 10 of the chamber 8, so that the dumping frame cannot be tilted unless and until the clamping mechanism has moved

into clamping position and the doors of the chamber are closed. Such interlocking and control mechanism may be a pressure operated valve 144 located in the water or oil supply pipe 72 on the pressure side of the four-way valve 74 and connected by a pipe 146 to the pipe 36. The valve 144 is controlled by the pressure in the pipe 36 and is set for such a pressure that it remains closed to prevent the flow of water or oil through the pipe 72 except when the full air pressure is in the pipes 36 and 138. With this arrangement of valves and interlocking control mechanism, the air in pipes 36 and 138 must be at full pressure and therefore the car must be securely clamped in the dumping frame and the doors 10 of the chamber 8 must be closed, before the valve 144 opens to permit the water or oil to flow through the pipe 72 into the cylinder 70 to tilt the dumping frame. If the workman who is operating the tipple is careless and operates the valve 74 in an attempt to tilt the dumping frame before he has operated the valve 32 to close the doors 10 and simultaneously clamp the car within the frame, or if he carelessly throws the valve 32 so as to admit air to the hose 140 instead of hose 138, nothing will happen because the valve 144 will not permit the oil or water to flow into the cylinder 70; also if the air pressure in the air supply pipe 30 happens to fall below the pressure necessary to securely clamp the car in the dumping frame, which pressure is also the pressure necessary to open the valve 144, nothing will happen when the valve 74 is operated, even though the workman has properly operated the valve 32.

The hopper 86 is preferably located within the extension of the dumping chamber which leads to the portion of the wall which contains the shutters 44 because if an explosion occurs it is usually centered around the material which is in the hopper or which is falling from the car into the hopper, and the center of a possible explosion is therefore located as near to the shutters 44 as is possible, the resiliency of the air in the main portion of the dumping chamber being utilized to absorb some of the shock of the explosion, thus preventing the full force of the explosion being exerted against the doors and other parts of the chamber. A screw conveyor 148 or other suitable means which prevents the access of air into the chamber through the hopper, is preferably used to withdraw the material from the hopper through the pipe 150 which carries the material to other parts of the factory, such as a storage bin or the packaging apparatus.

The operation of the device can now be more clearly explained. The workman pushes the loaded car along tracks 4 into the dumping frame 48 and, after properly centering the car, leaves the chamber. Since both control valves 32 and 74 are exterior of the chamber, a single workman can not clamp the car to the dumping frame or close the doors or tilt the car until he is out of the chamber. The valve 32 is then operated from the exterior of the chamber to admit air under pressure to the cylinders 22 and 130 which simultaneously closes the doors 10 and forces the pressure bar 122 firmly against the top of the car to clamp the car against the rails 56 within the dumping frame. If the workman does not operate the valve 32, or if he operates it in such a way as not to clamp the car in the dumping frame and close the doors 10 of the chamber, or if the air pressure is not sufficient to securely clamp the car in the frame, the valve 144 does not open and the frame can not be tilted. If all of these conditions are met and the valve 74, which is also located exterior of the dumping chamber 8, is then operated to admit water or oil to the cylinder 70, the dumping frame is tilted from the dotted line position shown in Fig. 4 to the full line position thereby dumping the material from the car into the hopper 86. The valve 74 is then moved to permit the water or oil to escape from the full end of the cylinder 70 and to enter the other end to return the dumping frame and car to the upright position. The dumping frame and car move rather easily due to the effect of the counterweight 88. If an explosion should occur while the material is being dumped from the car into the hopper, the shutters 44 merely move upwardly and outwardly to permit the explosion gases to escape through the openings 42 and to relieve the pressure, and then they close, either of their own weight or due to the action of the springs 46. After the dumping frame has been returned to its upright position, the valve 32 is moved to relieve the pressure on the full end of the cylinders 22 and 130 whereupon the springs 20 open the doors 10 and then, upon further movement of the valve 32, air is permitted to enter the other end of the cylinder 130 to move the pressure bar 122 upwardly from the top of the car. The car having been dumped and the danger of an explosion having passed, the workman may enter the chamber 8 and push the emptied car from the chamber and place another loaded car in the dumping frame in position to be dumped.

Although a particular and preferred form of the invention has been described, it is recognized that various modifications in construction and auxiliary apparatus may be made and it is, therefore desired that the invention be construed as broadly as the claims taken in conjunction with the prior art may allow.

What I claim is:

1. In combination with a car unloading tipple, a closed dumping chamber having a

wall provided with openings, a hopper into which the load is dumped, means for removing the material from the hopper while preventing the entry of air into the chamber through the hopper, a door for permitting the car to pass into the chamber and adapted to be closed when the car is within the chamber, and yieldable closures for said openings adapted to relieve abnormal gas pressures within the chamber.

2. A car unloading tipple having in combination, a closed dumping chamber, a door for permitting the car to pass into the chamber and adapted to be closed when the car is in the chamber, a movable dumping frame within the chamber, mechanism for closing the door and for operating the dumping frame and means to prevent the operation of the dumping frame until the door is closed.

3. A car unloading tipple having in combination, a closed dumping chamber, a door for permitting the car to pass into the chamber and adapted to be closed when the car is in the chamber, a dumping frame within the chamber, means for fixing the car to the frame, and mechanism for closing the door, said means and mechanism being simultaneously operable from the exterior of the chamber.

4. A car unloading tipple having in combination, a closed dumping chamber, a door for permitting the car to pass into the chamber and adapted to be closed when the car is within the chamber, a dumping frame within the chamber, means for fixing the car to the frame, mechanism for closing the door, and a single controlling element exterior of the chamber for operating said fixing means and said door closing mechanism.

5. A car unloading tipple having in combination, a closed dumping chamber, a door for permitting the car to pass into the chamber and adapted to be closed when the car is within the chamber, a dumping frame, means for fixing the car to the frame, mechanism for closing the door, and a single control element exterior of the chamber for simultaneously fixing the car to the frame and closing the door.

6. A car unloading tipple having in combination, a closed dumping chamber, a door for permitting the car to pass into the chamber and adapted to be closed when the car is within the chamber, a dumping frame within the chamber, means for fixing the car to the frame, mechanism for closing the door, and a single control element exterior of the chamber for simultaneously releasing the car from the frame and releasing the door to permit it to open.

7. A car unloading tipple having in combination, a closed dumping chamber, a door for permitting the car to pass into the chamber and adapted to be closed when the car is within the chamber, a dumping frame within the chamber, a pressure bar on the frame in position to press against the car to hold it in the frame, fluid pressure operating means to operate said pressure bar, fluid pressure operating means for closing said door, and control means exterior of the chamber for simultaneously operating both of said fluid pressure operating means.

8. In combination with the wall of a building, a chamber inside such wall, an opening through such wall from such chamber, shutters for such opening adapted to remain closed under normal conditions but to open readily under the influence of abnormal pressure in such chamber, a car tipple in such chamber, a door for such chamber to admit a car therein and to close the chamber when a car is in the tipple and means operable from a point outside such chamber but inside such building wall for first closing the doors and then operating such tipple, whereby if an explosion occurs in such chamber during unloading of a car the force of such explosion will be directed into an area separated from the operator.

9. A combination as specified in claim 8 which further includes means for withdrawing from such chamber material which has been dumped from a car while maintaining such chamber substantially closed.

10. A combination as specified in claim 8 which further includes fluid operated means controllable from outside said chamber for locking the car to said tipple.

11. A combination as specified in claim 8 which further includes means for locking the car to said tipple operable as an incident to closing the doors and operating the tipple.

In testimony that I claim the foregoing, I have hereunto set my hand this 13th day of April, 1931.

RAYMOND E. DALY.