This invention relates to dual dump gate construction, and, more particularly, to a discharge mechanism for use with bottom dump trailers.

Fill-dirt (earth) and similar cohesive or adhesive materials have a high angle of repose, requiring extraordinarily large area dump gates in relation to the hopper areas containing the load mass. This is to prevent bridging of the load, which restricts or prevents the release of the material when the gates are opened for dumping. The resulting large area in contact with the load sets up excessive friction which must be overcome when opening the gates for dumping. The power requirements for opening large area gates against the excessive load friction usually exceed that which is available. It is, therefore, an object of this invention to provide a gate construction which overcomes this drawback. More particularly, it is an object of the invention to provide a dual gate construction which uses the natural bridging characteristics of material to relieve the movable, powered gates of most of the load until they are partially opened, thereby greatly reducing the power requirements and permitting fast and clean dumping of the hopper contents. In this manner, the inherent disadvantage of prior art practices has been converted to an asset.

Another object of the invention is to provide a dual dump gate construction wherein unique mechanical means are provided for sequential gate opening whereby a discrete opening movement of outer gates actuates inner gates to open and relieve a bridged condition of the cohesive material.

Yet another object of the invention is to provide a dual dump gate construction wherein uniquely arranged and shrouded power means are provided for sequentially opening the gates.

Other objects and advantages of the invention may be seen in the details of construction and operation set down in this specification.

The invention is explained in conjunction with an illustrative embodiment in the accompanying drawing, in which:

FIG. 1 is a perspective view of a trailer equipped with gates constructed according to the instant invention;

FIG. 2 is an enlarged fragmentary perspective view of a portion of the trailer showing the gates in open position;

FIG. 3 is a view similar to FIG. 2 but showing the gates in closed position;

FIG. 4 is a fragmentary end elevational view of the trailer body showing the gates in closed position;

FIG. 5 is a view similar to FIG. 4 but showing the gates in partially opened condition, i.e., the lower or outer gates being partly open while the inner or upper gates are still closed;

FIG. 6 is a view similar to FIGS. 4 and 5 and constitutes a later condition of the elements in the sequence of opening wherein both sets of gates are in open condition;

FIG. 7 is an enlarged fragmentary sectional view such as would be seen along the sight line 7—7 applied to FIG. 4;

FIG. 8 is a fragmentary perspective view of the power means for opening the gates and in a condition corresponding to the gates being open;

FIG. 9 is a view similar to FIG. 8 but wherein the parts are arranged in the condition they maintain when the gates are closed; and

FIGS. 10–12 are schematic sectional views of the gate construction showing the three stages of operation corresponding to FIGS. 4–6.

In the illustration given and with particular reference to FIG. 1, the numeral 20 designates generally a trailer for the transportation of dirt or like cohesive material susceptible of bridging and therefore difficult to dump. The trailer 20 includes a hopper-like body 21 and a wheeled trailer carriage 22. The forward end of the trailer 20 is equipped with a hitch portion 23.

In FIG. 1, the numerals 24 designate outer gates on one side of the trailer which are actuated by power means 25, it being appreciated that a second set of gates cooperating with the gates 24 is located on the opposite side of the trailer but not shown in FIG. 1. The particular trailer illustrated in FIG. 1 has two compartments within the hopper body 21 occasioned by the interposition of the transverse wall 26. It will be appreciated that a greater or lesser number of compartments, and thus series of gates, may be utilized within the practice of the invention.

Operation in general

It is believed that the invention can be more quickly understood by first considering the operation in general and by reference to the schematic showing in FIGS. 10–12. In FIG. 10, the numeral 24 again designates a hopper body, and a load L is confined within the hopper body, being supported in part by the lower gates 24 and an upper pair of gates each designated 27. It will be noted that the gates 27 do not close completely and that the closure of the open bottom of the hopper is provided by the coaction of the two gates 24. However, the gates 27 advantageously support the load L in a bridge fashion.

Turning now to FIG. 11, it will be noted that the lower gates (now designated 24”) are partly open so as to permit a portion of the load L’ to be dispensed while the remainder of the load L remains in the well known bridge fashion. The gates 27 in FIG. 11 correspond in position to the gates 27 in FIG. 10.

Turning now to FIG. 12, it will be noted that now the outer gates (now designated 24”) have swung fully open and that the inner gates (now designated 27”) have likewise swung from the original inwardly-angled configuration to a generally vertical configuration. This results in a change in character of the load to the reverse of bridging, and this is designated by the symbol L”. Thus, when the outer gates 24 are approximately halfway open—to the position 24” shown in FIG. 11—the inner gates are caused to open, releasing the bridged mass and permitting it to collapse and fall in the manner schematically depicted in FIG. 12.

The means for opening the outer gates 24 will now be described and with reference to FIGS. 4–6. In FIG. 4, the numeral 25 again designates generally the power means for opening the lower gates. In the illustration given, this takes the form of a cylinder and piston rod unit 28, optimally of the double-acting type, with the cylinder portion of the unit being supplied through lines 29 and 30 (so designated only relative to the left-hand unit in FIG. 4). For the purpose of supporting the unit 28 and the gate construction generally, the hopper body 21 is equipped with a generally rectangular discharge portion or throat as at 31. The particular throat 31 can also be readily appreciated from a consideration of FIGS. 2 and 3. Along a pair of opposite sides as at 32 and 33, the throat 31 is equipped with a mounting bracket 34 (better seen in FIGS. 8 and 9). The bracket 34 may be weldably secured to
3,298,745 the side walls 32 and 33, and it is seen that each bracket 34 is generally channel-shaped. Still referring to FIGS. 8 and 9, it will be noted that the bracket 34 adjacent its lower end is equipped with a pivot rod 35 for supporting the butt end of the cylinder and piston rod unit 28. The piston rod 36 of the unit 28 is pivotally connected as at 37 to a lever member 38. The lever member 38 is also channel-shaped and acts as a shroud to protect the unit 28 while functioning to interconnect the unit 28 with its associated gate 24. For this purpose, the lever member 38 is pivotally mounted by means of a rod 39 on the bracket 34 and at its other end is equipped with a pair of links 40 which pivotally means the reference position (relative to crank 47) as seen in FIG. 6 to a position of moving engagement resulting in the ultimate pivoting over-center of the crank 47 to return to the FIG. 4 position. The crank 47 has its other arm portion, i.e., the one not connected to the link 50, arranged to abut a stop 54 (see FIG. 4) at the completion of the closure movement.

I also find it advantageous to provide an equalizer mechanism generally designated 55 (see FIG. 4), which includes a lever 56 pivotally mounted on the connecting walls 46 and which is interconnected by means of links 57 and 58 to the two outer gates 24.

The manner of supporting and locking the gates may be varied depending upon the type of material handled. In some cases the bridging may be used to advantage and thereafter destroyed through employment of only one pivotal inner gate, or by developing a mutual lock.

While in the foregoing specification a detailed description of an embodiment of the invention has been set down for the purpose of illustration, many variations in the details herein given may be made by those skilled in the art without departing from the spirit and scope of the invention.

I claim:

1. A dual dump gate construction, comprising a hopper having an open bottom, the first pair of co-acting gates pivotally mounted on said hopper for closing said open bottom, means on said hopper for opening and closing said first pair of gates, a second pair of co-acting gates pivotally mounted in said hopper partially closing said open bottom to temporarily support a bridged mass during initial opening of said first pair of gates, and means on said first pair of gates for opening said second pair of gates during the opening of said first pair of gates including an over-center bell crank on said hopper normally maintaining said second pair of gates in partially closed position and lug means on said first pair of gates for upsetting said bell crank.

2. The structure of claim 1 in which said means for opening said first pair of gates includes a cylinder and piston rod unit for each of said first pair of gates, a channel-shaped lever pivotally mounted on said hopper at one end and at the other end connected to one of said first pair of gates, said unit being interconnected between said hopper below said lever and an intermediate portion of said lever member, whereby said lever member is shrouded in shrouding relation with said cylinder and piston rod unit.

3. The structure of claim 2 in which an over-center linkage is interconnected between said lever member other end and the associated one of said first pair of gates whereby said first pair of gates is locked in a closed condition to prevent accidental dumping of a load.

4. A dual dump gate construction for a gravity discharge body having an open bottom, comprising a generally rectangular throat-like frame providing a bottom outlet for said body, a first pair of gates pivotally secured to the exterior of said frame and cooperative to close said open bottom, each gate of said first pair being generally C-shaped to provide upward arm portions pivotally secured at their upper ends to said frame, a second pair of gates pivotally mounted at their upper ends within said
frame for only partially closing said open bottom, the lower end of each of said second pair of gates being equipped with a linkage mechanism pivotally connected to said frame, said arm portions being equipped with means for actuating said linkage means to thereby open said second pair of gates after a limited opening movement of said first pair of gates.

5. The structure of claim 4 in which said linkage mechanism includes an L-shaped bell crank pivotally mounted on said frame and a link connecting one end of said bell crank with the lower end of its associated one of said second pair of gates, said actuating means including a pair of posts operative to move said L-shaped crank over-center for gravity dumping and supported locking, respectively.