April 12, 1966 W. L. FLOEHR 3,245,359

GEAR TRAIN DISCHARGE GATE OPERATING MECHANISM

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FIG. 1

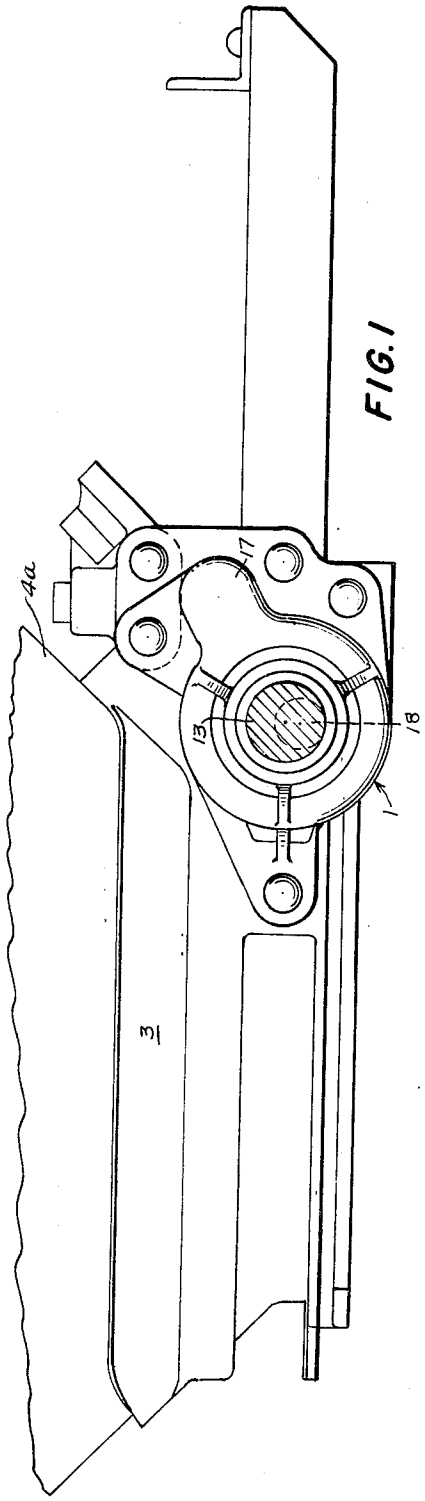
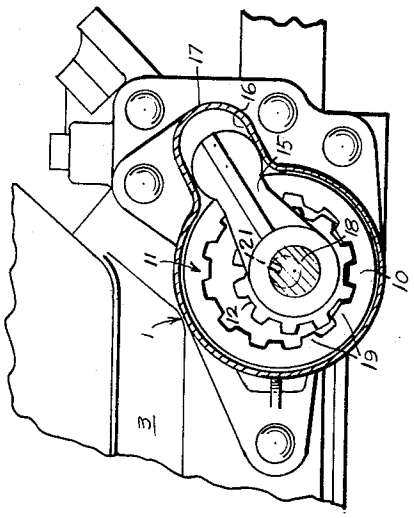


FIG. 3



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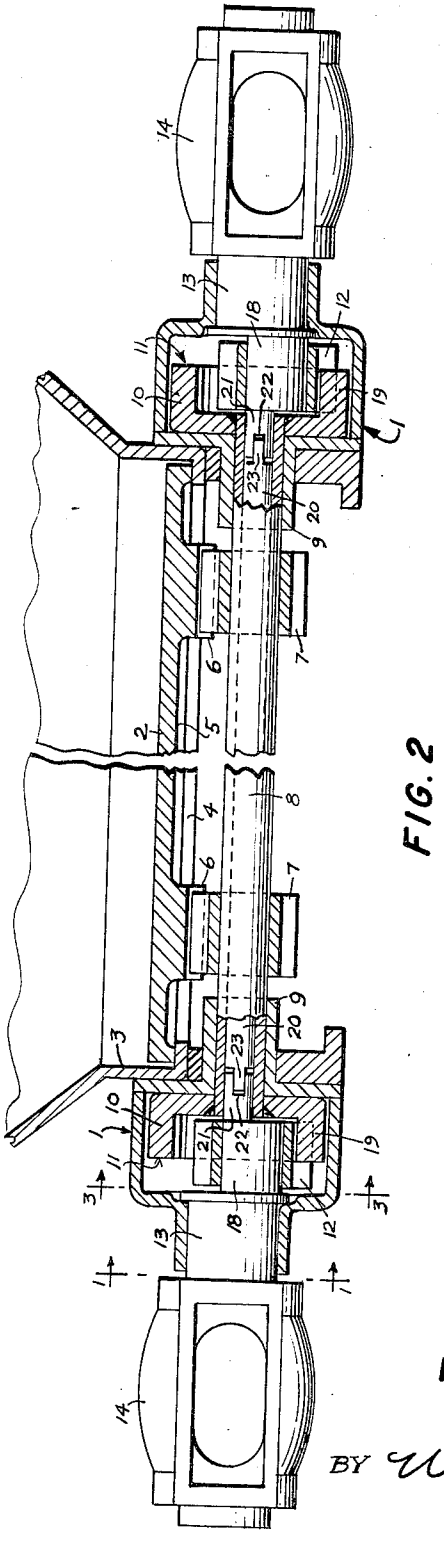


FIG. 2

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GEAR TRAIN DISCHARGE GATE OPERATING MECHANISM

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10 Claims. (Cl. 105—305)

This invention relates to mechanisms for operating discharge gates of railway hopper cars.

The primary object of the invention is to provide an improved discharge gate mechanism which is operable from either side of a car without jamming despite having a power train at each side.

Another object of the invention is to provide an improved discharge gate mechanism wherein power trains at opposite sides of the gate are so connected that either can be operated without interference by the other.

An additional object of the invention is to provide a discharge gate mechanism having power trains at opposite sides of the gate wherein the driving and driven gears of each train have individual driving connections to the corresponding gears of the other train.

Other objects and advantages of the invention will appear hereinafter in the detailed description, be particularly pointed out in the appended claims and be illustrated in the accompanying drawings, in which:

FIGURE 1 is a side elevational view taken partly on lines 1—1 of FIGURE 2 of a typical installation of a preferred embodiment of the discharge gate mechanism of the present invention;

FIGURE 2 is a vertical sectional view of the structure of FIGURE 1 taken centrally of the drive shaft; and

FIGURE 3 is a fragmentary vertical sectional view taken along lines 3—3 of FIGURE 2.

Referring now in detail to the drawings in which like reference characters designate like parts, the improved discharge gate mechanism of the present invention is designed for application to a discharge or slide gate of a railway hopper car. Demands of railroads have required discharge gates of certain types of hopper cars to be operable from either side of the car. The mechanism of this invention meets this requirement and also enables the gate to be operated with sufficient force to meet any service condition. Thus, should the gate become frozen, cemented or otherwise bonded to its frame, the mechanism enables the gate to be opened without following the usual practice and resorting to a sledge hammer to break it away. The force available in the mechanism also permits the discharge of lading to be controlled by enabling the gate to be closely partly or completely at any time it is desired to curtail or shut off flow from the associated hopper.

Possessing the above capabilities, the improved discharge gate mechanism of this invention, designated generally as 1, has been applied for purposes of illustration to a conventional discharge or slide gate 2 slidably mounted for reciprocable movement between open and closed positions in a frame 3 fixed to and bounding a discharge opening 4 of a hopper 4a of a railway hopper car (not shown). For driving it between open and closed

positions, the gate 2 has fixed to or rigid or integral with its underside 5 a pair or plurality of transversely spaced, substantially parallel racks 6 each engaged by one of a plurality of correspondingly spaced pinions 7 of the mechanism 1. The pinions 7 in turn are keyed or otherwise fixed against relative rotation to a drive shaft 8 extending normal or at right angles to the racks 6 and journalled in bearings or bushings 9 fixed to the opposite side of the frame 3. The drive shaft 8 projects through the bearings 9 and is fixed, as by welding, at each end to a driven gear 10 of a power gear train 11. The driving or drive gear 12 of each of the pair of gear trains 11 is connected to an operating or actuating shaft 13 concentric or coaxial with the drive shaft 8 and extending outwardly beyond the frame 3, each operating shaft conveniently carrying on its outer end portion a capstan or like means 14 for receiving or accommodating an actuating bar or lever (not shown) for applying leverage to the mechanism.

Each of the gear trains 11 is preferably of the type disclosed in my copending application, Serial No. 754,834, now Patent No. 3,021,798, issued February 20, 1962, as providing a maximum mechanical advantage within a minimum of space and thus avoiding possible encroachment upon A.A.R. equipment limit lines. In accordance with this preference, the driven gear 10 of each gear train 11 is an internal or internally toothed gear and the driving gear 12 is an externally toothed pinion having an axially offset arm 15, the outer portion of which rides or slides in a fixed slot or guideway 16. Conveniently formed in a radially outstanding portion of a housing or casing 17 riveted or otherwise fixed or attached to the adjoining side of the frame 3 and both enclosing or containing the related gear train 11 and journalling the operating shaft 13 connected thereto, the slot 16 acts through the arm 15 to restrain or prevent rotation of the driving gear 12 and force the latter to reciprocate eccentrically within the driven gear 10. To impart eccentric movement to it, the driven gear 10 is rotatably mounted on a crank pin 18 formed integrally with and intermediate the extremities of the related or associated operating shaft 13. With the driving gear 12 so mounted, rotation of its operating shaft 13 will cause the crank pin 18 to rotate within it, the consequent eccentric movement of the driving gear and its retainment against rotation by the offset retaining arm 15 causing it to reciprocate and in succession engage the teeth 19 of and rotate the driven gear 10 and therethrough the drive shaft 8.

The difficulty with power gear trains, particularly of the type illustrated, is that, while readily operable when driven through their driving gears, they tend to jam if the drive is in the opposite direction from their driven gears to their driving gears. Thus, if the only connection between the gear trains 11 of the illustrated mechanism 1 were the drive shaft 8 fixed to their driven gears 10, operation of the mechanism from either side of a car through one of the gear trains would pose no problem with that gear train but tend to jam the opposite or other gear train, since force would be transmitted to the latter through its driven gear.

Such potential interference with operability of the mechanism of this invention is avoided by individually or

separately connecting the corresponding gears of the gear trains such that, on drive of the mechanism through one of the gear trains, each of the driving and driven gears of the other or driven train will be drivably connected individually to and operated or driven by and in unison with the corresponding driving or driven gear of the driving gear train. This is accomplished by use as the driving shaft 8 of a tubular rather than a solid member and mounting concentrically or coaxially in that shaft a second shaft or connecting rod 20 which may be solid and is drivably connected at opposite ends to the driving gears 12 of the two gear trains. For the illustrated gear trains, the driving connection between the connecting rod 20 and the driving gears 12 is obtained by projecting or extending the concentric inner ends 21 of the operating shafts 13 into the opposite ends of the hollow drive shaft 8 and providing a tongue-and-groove or like connection against relative rotation between the inner end of each operating shaft and the adjoining end of the connecting rod, hereby providing radial grooves or slots 22 in the inner ends of the operating shafts 13 and interfitting tongues 23 on the ends of the connecting rod 20. Slidable axially into interfitting relation, the tongue and groove of each of the illustrated connections has the advantage of enabling either gear train to be applied and removed readily for maintenance or repair and without interference in the interim with operation of the slide gate by the balance of the mechanism.

From the above detailed description, it will be apparent that there has been provided an improved discharge gate mechanism which is simple and rugged in construction and effective and trouble-free in operation. It should be understood that the described and disclosed embodiment is merely exemplary of the invention and that all modifications are intended to be included which do not depart from the spirit of the invention or the scope of the appended claims.

Having described my invention, I claim:

1. In a mechanism for operating a discharge gate of a railway hopper car, the combination of a plurality of power gear trains for alternately transmitting operating power to said gate, each of said trains having intermeshing driving and driven gears and being drivable only through its driving gear, and means drivably connecting each of the driving and driven gears of each train to the corresponding gear of the other train for individually operating corresponding gears of said train in unison on operation of one train.

2. In a mechanism for operating a discharge gate of a railway hopper car, the combination of a plurality of power gear trains for alternately transmitting operating power to said gate, each of said trains having intermeshing driving and driven gears and being drivable only through its driving gear, a common drive shaft connecting said driven gears and drivably connected to said gate for driving said gate between open and closed positions, and means separate from said drive shaft for drivably connecting the driven gears of said trains.

3. In a mechanism for operating a discharge gate of a railway hopper car, the combination of a plurality of power gear trains for alternately transmitting operating power to said gate, each of said trains having intermeshing driving and driven gears and being drivable only through its driving gear, a common drive shaft connecting said driven gears and drivably connected to said gate for driving said gate between open and closed positions, and means separate from and coaxial with said drive shaft for drivably connecting the driving gears of said trains.

4. In a mechanism for operating a discharge gate of a railway hopper car, the combination of a plurality of power gear trains mounted at opposite sides of said gate for driving said gate between open and closed positions from either side of a hopper car, intermeshing driving and driven gears in each of said trains, a drive shaft connecting the driven gears of said trains and drivably connected to said gate, and means drivably connecting the driving gears of said trains including a shaft separate from and coaxial with said drive shaft.

5. In a mechanism for operating a discharge gate of a railway hopper car, the combination of a plurality of power gear trains mounted at opposite sides of said gate for driving said gate between open and closed positions from either side of a hopper car, intermeshing driving and driven gears in each of said trains, a hollow drive shaft connecting the driven gears of said trains and drivably connected to said gate, and means drivably connecting the driving gears of said trains including a separate shaft in and coaxial with said drive shaft.

6. In a mechanism for operating a discharge gate of a railway hopper car, the combination of a plurality of power gear trains mounted at opposite sides of said gate for driving said gate between open and closed positions from either side of a hopper car, intermeshing driving and driven gears in each of said trains, and a plurality of separate coaxial shafts each drivably connecting one of the driving and driven gears of one train to the corresponding gear of the other train.

7. In a mechanism for operating a discharge gate of a railway hopper car, the combination of a plurality of power gear trains mounted at opposite sides of said gate for driving said gate between open and closed positions from either side of a hopper car, intermeshing driving and driven gears in each of said trains, a drive shaft connecting the driven gears of the trains and drivably connected to the gate, an operating shaft drivably connected to the driving gear of each train and coaxial with the drive shaft, and shaft means coaxial with and extending axially of said shaft and connected to said operating shafts for drivably connecting the driving gears of the trains therethrough.

8. In a mechanism for operating a discharge gate of a railway hopper car, the combination of a plurality of power gear trains mounted at opposite sides of said gate for driving said gate between open and closed positions from either side of a hopper car, intermeshing driving and driven gears in each of said trains, a hollow drive shaft connecting the driven gears of said trains and drivably connected to said gate, a plurality of operating shafts each drivably connected to the driving gear of one of said trains, said operating shafts being coaxial with and projecting from opposite ends into said drive shaft, and a shaft in and extending axially of said drive shaft and connected to said operating shaft for drivably connecting said driving gears therethrough.

9. In a mechanism for operating a discharge gate of a railway hopper car, the combination of a plurality of power gear trains mounted at opposite sides of said gate for driving said gate between open and closed positions from either side of a hopper car, a non-rotatable driving pinion and a driven gear internally engaged by said pinion in each of said trains, a hollow drive shaft connecting the driven gears of the trains and drivably connected to the gate, a plurality of operating shafts each eccentrically mounting a pinion of one of said trains, said operating shafts being coaxial with and projecting from opposite ends into said drive shaft, and a shaft in and extending axially of said drive shaft and connected to said operating shafts for drivably connecting said pinions therethrough.

10. In a mechanism for operating a discharge gate of a railway hopper car, the combination of a plurality of power gear trains mounted at opposite sides of said gate for driving said gate between open and closed positions from either side of a hopper car, a non-rotatable driving pinion and a driven gear internally engaged by said pinion in each of said trains, a hollow drive shaft connecting the driven gears of the train and drivably connected to said gate, a plurality of operating shafts each eccentrically mounting a pinion of one of said trains, said operating shafts being coaxial with and projecting from opposite ends into said drive shaft, and a shaft in and extending

axially of said drive shaft and tongue-and-slot connected at opposite ends to said operating shafts for drivably connecting said pinions therethrough.

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